Bulk Electric System Definition Task Force
Initial Proposal and Discussion
May 15, 2009
Comments due June 29, 2009

This document, the initial proposal of the Bulk Electric System Definition Task Force (BESDTF), presents two options for clarifying the definition of "Bulk Electric System"[1]. The BESDTF acknowledges that these options are not yet fully detailed. The BESDTF looks forward to incorporating and responding to parties' comments in subsequent versions of its proposal. The BESDTF encourages parties to respond to the questions set forth in ***Appendix D.***

This document consists of the following sections:

1. INTRODUCTION AND HISTORY

The purpose of the BESDTF is to provide clarity as to which power system elements are deemed to be part of the Bulk Electric System (BES).

NERC's definition of the Bulk Electric System is:

> *As defined by the Regional Reliability Organization, the electrical generation resources, transmission lines, interconnections with neighboring systems, and associated equipment, generally operated at voltages of 100 kV or higher. Radial transmission facilities serving only load with one transmission source are generally not included in this definition.*[2]

In 2005, a WECC task force developed nine "characteristics" intended to clarify the term "generally" used in the NERC BES definition. In Order 693, Paragraph 77, FERC directed NERC to provide them with a complete set of regional definitions of bulk electric system and any regional documents that identify critical facilities to which the Reliability Standards apply (i.e.,

[1] Members of the BESDTF have noted that there is ambiguity in the use of both the terms "Bulk Power Systems" and "Bulk Electric System" in the Statement of Compliance Registry Criteria Rev 5.0, October 16, 2008. Members of the BESDTF have requested that WECC/NERC specifically clarify whether the terms are used interchangeably within the Statement of Compliance Registry Criteria. The BESDTF intends to focus its efforts on the term "Bulk Electric System" based on guidance in Order 693, paragraph 75 and the task delegated to the BESDTF by RPIC.

[2] NERC February 12, 2008 Glossary of Terms, available at http://www.nerc.com/files/Glossary_12Feb08.pdf. The same definition is included in NERC's Statement of Compliance Registry Criteria, Version 5, at 4, available at http://www.nerc.com/files/Statement_Compliance_Registry_Criteria-V5-0.pdf.

facilities below a 100 kV threshold that have been identified by the regions as critical to system reliability)." Subsequently, NERC sent a data request to the regional entities asking for regional definitions and clarifications. The WECC Joint Guidance Committee approved sending the nine characteristics to NERC in response to this data request, although they were never reviewed and acted upon by a WECC standing committee or by the WECC Board. NERC then sent the nine characteristics to FERC, and they were subsequently posted on the WECC web site's glossary. After these nine characteristics were posted with the definition of BES on the WECC web site's glossary, some parties used these nine characteristics to challenge their compliance registration. As a result, in August 2008 the WECC Board directed the Reliability Policy Issues Committee (RPIC) to re-examine the BES definition. In September 2008, a task force of RPIC members and other interested parties was convened for this purpose. In December 2008, the Board approved the BESDTF's recommendation to clarify to NERC and FERC that WECC was not using the nine characteristics to guide its Compliance Monitoring and Enforcement Program (CMEP) functions, including registration. The "policy" phase of the BESDTF wound down in early 2009, and in March 2009 WECC announced that the BESDTF was seeking volunteers to take on the "technical" effort of drafting language to clarify the BES definition. Per RPIC's February 2009 direction, the effort to draft clarifying language will largely follow the WECC standards development process. A meeting of parties interested in the BESDTF was held on April 7 and 8, 2009, in Salt Lake City. This document contains the initial options developed by the BESDTF in this process.

2. DOCUMENT CATEGORIZATION

While the BESDTF followed the steps set forth in the WECC standards development process to provide adequate due process, the BES definition is not a standard. The final work product of this group – clarification to the BES definition – is proposed to be a Board Policy, and will follow the Board Policy template. Information on WECC document categories can be found at http://www.wecc.biz/documents/meetings/board/RPIC/2008/Document%20Categories_BOD%20approved_8-15-08.pdf.

3. REGULATORY CONTEXT

The United States' Congress' definition of the Bulk-Power System, which was later codified in FERC regulation, is as follows:

> *Facilities and control systems necessary for operating an interconnected electric energy transmission network (or any portion thereof); and electric energy from generation facilities needed to maintain transmission system reliability. The term does not include facilities used in the local distribution of electric energy.*[3]

NERC TO/TOP registration criteria relies on the Regional Reliability Entity (WECC) to define what constitutes (i) an "integrated transmission element associated with the bulk power system 100 kV and above" and (ii) "lower voltage [transmission elements] necessary to provide for the reliable

[3] Energy Policy Act Section 215 (16 USC Ch12, Sub-chapter II, Section 824o) and FERC Electric Reliability Organization and Reliability Regulations (18 CFR Part 39, Section 39.1), available at http://www4.law.cornell.edu/uscode/16/usc_sec_16_00000824---o000-.html and http://www.balch.com/files/upload/FERC's-ERO-%20Reliability-Regulations-Post-Order-693-(4-6-07)-(2).pdf, respectively.

operation of the interconnected transmission grid" or "associated with facilities included on a critical facilities list that is defined by the regional entity."[4]

Further, NERC allows Regional Entities to "exclude an organization that meets the criteria described above as a candidate for registration if it believes and can reasonably demonstrate to NERC that the bulk power system owner, operator, or user does not have a material impact on the reliability of the bulk power system" [5] and, in "considering registration of an organization not meeting (e.g., smaller in size than) the criteria may propose registration of that organization if the Regional Entity believes and can reasonably demonstrate[5] that the organization is a bulk power system owner, or operates, or uses bulk power system assets, and is material to the reliability of the bulk power system."

Consistent with legislative intent, NERC has provided broad deference to the Regional Reliability Organizations in defining the BES and reliability standard registration; however, to date, the WECC Board has not approved specific criteria to be used, which has caused uncertainty with regard to the implementation of NERC reliability standards. The BESDTF intends to recommend objective criteria to clearly define the above underlined terms as they relate to the BES and the NERC Statement of Compliance Registration Criteria.

4. TRANSMISSION SYSTEM RELIABILITY

Congress' definition of the BES includes a reference to "transmission system reliability," and Congress and FERC have provided the following definition for "Reliable Operation" within EPAct Section 215 and the associated FERC Order:

> ***Reliable Operation:*** *Operating the elements of the Bulk Electric System within equipment and electric system thermal, voltage and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, Cyber Security Incident, or unanticipated failure of system elements.*[6]

The BESDTF recommends adopting this definition for the term Reliable Operation as used in the NERC TO/TOP registration criteria. For reference, the BESDTF includes a list of other relevant definitions from the NERC and WECC glossaries in ***Appendix A*** to this document.

The BESDTF further recommends that this definition of Reliable Operation be used as the basis of interpreting the term "reliability" as it is used in Congress' BES definition, i.e. "transmission system reliability," and NERC's Statement of Compliance Registry Criteria Note #1, i.e. "material impact on the reliability of the bulk power system." BESDTF's recommended definitions are as follows:

> Transmission System Reliability or Reliability of the Bulk Electric System:
> The ability of the elements of the Bulk Electric System to operate within equipment and electric system thermal, voltage and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, including a Cyber Security Incident, or unanticipated failure of system elements.

[4] NERC October 16, 2008 Statement of Compliance Registry Criteria, Section III(d), Pg 9, available at http://www.nerc.com/files/Statement_Compliance_Registry_Criteria-V5-0.pdf.
[5] Ibid, Note 1, Pg 10.
[6] Ibid (Footnote 2).

5. TREATMENT OF RADIAL TRANSMISSION LINES

The NERC BES definition generally excludes "radial transmission facilities serving only load with one transmission source" in a separate sentence without a reference to voltage level. Additionally, NERC limits its TO/TOP registration criteria to "integrated" transmission elements associated with the BES 100 kV and above (or lower voltages as defined by the Regional Entity)[7]; therefore, a transmission element that is properly excluded pursuant to the radial exclusion would not be "integrated" into the BES regardless of voltage.

Additionally, Footnote No. 4 of the NERC Statement of Compliance Registry Criteria states the following:

> Footnote 4: However, ownership of radial transmission facilities intended to be covered by the Vegetation Management Standard,[FAC-003] (applicable to transmission lines 200 kV and above) would be included in this definition.

To date, this footnote has been interpreted as invoking full TO/TOP registration and compliance for the owners of such facilities. Inasmuch as the BESDTF is proposing two options for determining whether facilities are part of the BES, under Option 1 the BESDTF offers that radial transmission facilities serving only load with one transmission source could be excluded from the definition of BES, independent of voltage level, if it is determined that the facilities do not have a material impact on the Reliable Operation of the BES. Under Option 2, this exclusion would not apply to radial lines operated above 200 kV (see Section 7).

6. PROPOSED APPROACH

The BESDTF first reviewed the "nine characteristics" which were developed and submitted to NERC but never acted on by a standing committee or the Board. A summary of BESDTF's reaction to the "nine characteristics" is provided in ***Appendix B*****.**

Regardless of which of the options offered below is ultimately adopted, Reliability Coordinators are required to obtain information relating to the operation of the bulk power system within their respective areas. In light of this requirement, Reliability Coordinators may request the submittal of information for network facilities that ultimately are not determined to be BES facilities. WECC Reliability Coordination staff indicates that they will explain why they require information from non-BES facilities when seeking such information.

Option 1 is a "hybrid" approach to clarifying which elements belong to the BES. That approach consists of:

1. **Threshold for inclusion in the BES.** A set of threshold principles which would establish the set of elements presumed to be part of the BES, subject to:

2. **A "material impact" assessment.** The second prong of the proposed hybrid approach is an assessment, through technical studies, of whether the element has a **"material impact"** on the reliability of the BES. If an element demonstrates that it does not have a material impact on the reliability of the BES, it is not part of the BES, regardless of the voltage at which it is operated. Conversely, if the application of the material impact assessment demonstrates that an element below the threshold voltage has a material impact on BES reliability, it becomes part of the BES.

[7] NERC Statement of Compliance Registry Criteria, Version 5, Section III.d.1, page 9.

For registration purposes, NERC requires WECC to prove "no material impact" in order to exclude entities with facilities above 100 kV. Similarly, NERC requires WECC to prove "material impact" in order to register entities whose facilities are all below 100 kV.

Option 2 is a stand-alone proposal that does not include an assessment of "material impact", due to the difficulty and possible subjectivity in defining "material impact". This approach consists of clarifying which elements belong to the BES based only on operating voltage.

7. BESDTF STRAW PROPOSALS

The BESDTF has considered, and seeks input on, the following options for clarifying the definition of the Bulk Electric System:

1. Option 1 - Hybrid approach: voltage threshold and material impact assessment

a. Voltage Threshold

i. 100 kV threshold (Option 1A)

The current NERC definition roughly establishes a 100 kV "bright line", in that facilities above 100 kV are presumed to be part of the BES, while facilities below 100 kV are presumed to not be part of the BES. The 100 kV "bright line" could be the "threshold principle" that would establish the presumed set of BES facilities, subject to the material impact assessment set forth below.

The current threshold voltage level is the 100 kV threshold that is part of the NERC BES definition. The BESDTF is not aware of any technical justification for the 100 kV threshold; see Section 2 of Appendix C for further discussion on this topic. BESDTF members have noted that this level may inadvertently classify as BES some facilities that are operated above 100 kV but are designed and intended to serve as distribution facilities. The BESDTF acknowledges that the 100 kV threshold is the *de facto* threshold, and that adopting a threshold voltage different from 100 kV would also require a substantial burden of justification, but also intends to consider if a different threshold may be more appropriate.

If an element is operated at a voltage below the threshold voltage level, it is presumed to not be a part of the BES. If parties can demonstrate through the application of the assessment that an element operated at a voltage below the threshold voltage level has a material impact on the reliability of the BES, that element will be part of the BES.

ii. 200 kV threshold (Option 1B)

This option is identical to Option 1A, with the exception of the voltage threshold at which the "bright line" is established. In this Option 1B, 200kV is the threshold used, above which an element is presumed to be a part of the Bulk Electric System.

BESDTF NOTE REGARDING CONDSIDERATION OF A THRESHOLD VOLTAGE OTHER THAN 100 KV (Option 1B and Option 2): In Order 693, the Commission approved NERC's BES definition, which included a reference to regional definitions. Order 693 and 693A, however, framed the accepted definition of the BES as generally including facilities 100 kV and above. The Commission was clear that 100 kV was not a fixed cutoff, stating that the definition provides "some flexibility in its application."[8] The Commission's conclusion, however, focused on facilities serving only load and facilities under 100 kV that are critical to the BES. The language did not provide clear authority to a region to significantly deviate from the NERC definition. Consequently, significant deviation from the NERC definition will likely require specific approval by the Federal Energy Regulatory Commission. Seeking approval from the Commission will require prior coordination with NERC. Furthermore, the Commission has no statutory deadline to respond to WECC's proposal, so implementation of a voltage threshold other than 100 kV will likely be delayed.

b. Proposed Material Impact Assessment

The proposed Material Impact Assessment is intended to be applied in the following way: If none of the answers to the questions is "yes", the element does not have a material impact. If any of the answers to the questions is "yes", the element has a material impact.

- Does loss of the element initiate Special Protection System action?
- Does the element require the use of a Special Protection System to comply with NERC Transmission Planning (TPL) standards?
- Does the element have, or is a part of a group of elements with a rating established in the WECC Path Rating Catalog?

  [BESDTF note: the BESDTF has discussed that paths may be in the Path Rating Catalog not necessarily because they have independently been determined to be "key" facilities, but because the owners of those facilities have included those paths to "protect" the transfer ratings of the paths. The BESDTF seeks input on this issue.]
- Is the element necessary to provide off-site station service to a nuclear generating station?
- Is the element part of a black-start cranking path described in a Black Start Capability Plan?

The BESDTF also considered other material impact assessment criteria and seeks industry input on those criteria in **Appendix D.**

[8] Order 693A at 11.

2. Option 2 - Classification by Voltage

The Bulk Electric System is that portion of the electric transmission system which encompasses the electrical generation resources, transmission lines, interconnections with neighboring systems, and associated equipment, generally operated at voltages 100 kV or higher.

The term "generally" as used above is further clarified to include the transmission elements as specified in the following three voltage ranges:

Transmission Elements Operated at 200kV or Above

All transmission elements, regardless of configuration or function

Transmission Elements Operated Between 100kV and 200kV

All transmission elements characterized by any one or more of the following,

- *An element of an existing WECC Transfer Path in the WECC Path Rating Catalog, or*
- *Included in an interconnection between two Balancing Areas, or*
- *Included in a WECC-Approved Special Protection System, or*
- *Directly involved in the supply of off-site station service to a Nuclear Generating station*

Transmission Elements Operated Below 100kV

All such elements that are included in an interconnection between two Balancing Areas

Discussion and other materials supporting Option 2 are included as **Appendix C**.

8. AGGREGATE EFFECT

NERC's Statement of Compliance Registry Criteria contains the following note:

If an entity is part of a class of entities excluded based on the criteria above as individually being unlikely to have a material impact on the reliability of the bulk power system, but that in aggregate have been demonstrated to have such an impact it may be registered for applicable standards and requirements irrespective of other considerations.

The BESDTF intends to clarify the BES definition in a way to make the determination of BES elements objective, rather than subjective. This note is subjective, in that it provides no objective test as to how the aggregate impact of facilities is determined, and whether such impact is material to the reliability of the bulk electric system. The BESDTF seeks input on how to limit the subjective application of this note.

APPENDIX A – OTHER RELEVANT DEFINITIONS

Angular Stability: Angular positions of rotors of synchronous machines relative to each other remain constant (synchronized) when no disturbance is present or become constant -- synchronized -- following a disturbance. If the interconnected transmission system changes too much or too suddenly, some synchronous machines may lose synchronism resulting in a condition of angular instability.

Cascading: The uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread electric service interruption that cannot be restrained from sequentially spreading beyond an area predetermined by studies.

Critical Cyber Asset: Cyber Assets essential to the reliable operation of Critical Assets.

Critical Asset(s): Facilities, systems, and equipment which, if destroyed, degraded, or otherwise rendered unavailable, would affect the reliability or operability of the Bulk Electric System.

Cyber Security Incident: Any malicious act or suspicious event that (i) compromises, or was an attempt to compromise, the Electronic Security Perimeter or Physical Security Perimeter of a Critical Cyber Asset, or, (ii) disrupts, or was an attempt to disrupt, the operation of a Critical Cyber Asset.

Disturbance: An unplanned event that produces an abnormal system condition, any perturbation to the electric system or the unexpected change in ACE that is caused by the sudden failure of generation or interruption of load.

Stability Limit: The maximum power flow possible through some particular point in the system while maintaining stability in the entire system or the part of the system to which the stability limit refers.

Thermal Limit (Rating): The maximum amount of electrical current that a transmission line or electrical facility can conduct over a specified time period before it sustains permanent damage by overheating or before it sags to the point that it violates public safety requirements.

Uncontrolled Separation: The unanticipated switching of system elements at locations and in a sequence which have not been planned and cause separation of system elements.

Voltage Collapse: A power system at a given operating state and subject to a given disturbance undergoes voltage collapse if post-disturbance equilibrium voltages are below acceptable limits. Voltage collapse may be total -- blackout -- or partial and is associated with voltage instability and/or angular instability.

Voltage Instability: A system state in which an increase in load, disturbance, or system change causes voltage to decay quickly or drift downward, and automatic and manual system controls are unable to halt the decay. Voltage decay may take anywhere from a few seconds to tens of minutes. Unabated voltage decay can result in angular instability or voltage collapse.

APPENDIX B – BESDTF REACTION TO THE "NINE CHARACTERISTICS"

Now that it is involved in the same exercise, the BESDTF appreciates the efforts of the task force that assembled these "nine characteristics". It is no simple matter to provide clarity to a very general definition, and to do so in a manner that is simultaneously simple, straightforward, and thorough. In general, the BESDTF embraced the "characteristics" that could be objectively applied, and had concerns about those "characteristics" that were more subjective. The BESDTF's reaction to each specific characteristic is provided in italics below.

Bulk Electric System

The bulk electric system is a term commonly applied to that portion of an electric utility system, which encompasses the electrical generation resources, transmission lines, interconnections with neighboring systems, and associated equipment, generally operated at voltages of 100 kV or higher.

WECC uses the following characteristics to add clarity to the term "generally," which is used in two places in the NERC definition of 'bulk electric system"

1. The system element is listed in the definition of a Transfer Path.

   BESDTF: The BESDTF agrees that the purpose of the BES is to transfer bulk power from location to location within the Western Interconnection. To that end, including WECC Transfer Paths in the list of BES elements seems appropriate. However, the BESDTF is concerned that there are no objective criteria to determining which paths are WECC Transfer Paths.

2. An (N-1) outage of the system element necessitates a reduction in a Transfer Path's limit on actual power flow.

   BESDTF: The BESDTF believed that affecting the amount of power that could be transferred across a Transfer Path would cause an element to be classified as belonging to the BES, subject to the concerns expressed in (1).

3. Measurements of the system element's electrical parameters (e.g. MW, MVAr, amperes, frequency or volts) are included in either a System Operating Limit or an Interconnection Reliability Operating Limit being monitored by the Reliability Coordinator.

   BESDTF: The BESDTF notes that there are questions about whether the WECC uses IROLs. Intuitively, facilities or groups of facilities to which an SOL or IROL apply should belong to the BES.

4. An (N-1) outage of the system element is included in the list of outages used by a Reliability Coordinator in real-time contingency analysis.

   BESDTF: As with Item (9), the BESDTF was concerned that merely including an element in a contingency analysis list, in and of itself, was not an objective measure of whether it belonged to the BES.

5. Planned outages of the system element are coordinated with neighboring transmission providers. As examples, the elements identified in the Northwest Power Pool Coordinated Outage System list of Significant Facilities for Outage Coordination in Section H,

APPENDIX B – BESDTF REACTION TO THE "NINE CHARACTERISTICS"

Appendix B.

BESDTF: The BESDTF offers that merely coordinating outages with an adjacent transmission provider is not, in and of itself, an indication that the element belongs to the BES.

6. The system element is either directly involved in supplying off-site station service to nuclear power plants, or its loss causes station service problems that require corrective actions.

   BESDTF: This characteristic surfaced a discussion regarding BES facilities and "critical" facilities. Critical facilities warrant inclusion in the BES, but the converse is not necessary true. The NUC-001 standard may impose requirements sufficient to ensure the reliability of nuclear facilities without facilities providing station service being included in the BES.

7. The system element is listed in the "WECC-Wide Key Facility List - Transmission" table in Appendix A of the WECC Regional Reliability Plan.

   BESDTF: As with item (1), while it seems intuitively obvious that "key facilities" would be part of the BES, the BESDTF is concerned that the list of "key facilities" has been compiled through the application of subjective, rather than objective, criteria and is subject to change without due process or input from facility owners and operators.

8. The system element's status or electrical parameters are incorporated into a remedial action scheme described in the WECC Operating Procedures.

   BESDTF: If the network element is part of a Remedial Action Scheme that is necessary to ensure system performance is within the performance required by the TPL standards, that network element intuitively would be a BES element. However, merely describing that procedure in the WECC Operating Procedures is a very subjective criterion.

9. The system element is identified by that region's Reliability Coordinator as being part of the "Bulk Electric System".

   BESDTF: In seeking to clarify the BES definition, the BESDTF is seeking to reduce the amount of subjectivity that can be exercised to determine if an element belongs to the BES. While the BESDTF respects the critical function Reliability Coordinators perform, the BESDTF is uncomfortable with having an element determined to be part of the BES at the sole discretion of the Reliability Coordinator. As noted above, WECC RCs may ask for information for network elements without having to make those elements part of the BES.

Note: The nine characteristics listed above were developed by the WECC Bulk Electric System Task Force for the purpose of clarifying the term "generally" and were sent to NERC, and forwarded to FERC pursuant to Order No. 693, Mandatory Reliability Standards for the Bulk Power System (118 FERC ¶ 1,218, paragraph 77). The Reliability Policy Issues Committee (RPIC) will request approval to review the characteristics from the WECC Board at the August 2008 Board Meeting, and may recommend refinement of the definition.

APPENDIX C – MATERIALS OFFERED IN SUPPORT OF OPTION 2, CLASSIFICATION BY VOLTAGE

1. OPTION 2 - BULK ELECTRIC SYSTEM DEFINITION

The Bulk Electric System is that portion of the electric transmission system which encompasses the electrical generation resources, transmission lines, interconnections with neighboring systems, and associated equipment, generally operated at voltages 100 kV or higher.

The term "generally" as used above is further clarified to include the transmission elements as specified in the following three voltage ranges:

Transmission Elements Operated at 200kV or Above

All transmission elements, regardless of configuration or function

Transmission Elements Operated Between 100kV and 200kV

All transmission elements characterized by any one or more of the following,

- *An element of an existing WECC Transfer Path in the WECC Path Rating Catalog, or*
- *Included in an interconnection between two Balancing Areas, or*
- *Included in a WECC-Approved Special Protection System, or*
- *Directly involved in the supply of off-site station service to a Nuclear Generating station*

Transmission Elements Operated Below 100kV

All such elements that are included in an interconnection between two Balancing Areas

2. 100 kV – 200 kV FACILITIES SHOULD NOT ALL BE AUTOMATICALLY CONSIDERED BES

These 100-200 kV facilities, hereafter referred to in this Appendix C as "100 kV" facilities, are, in almost all cases, configured in such a way as to serve as a sub-transmission delivery system to a geographically and electrically confined distribution system. They are typically operated as local area loops to provide supply redundancy to the distribution stations which they serve, but in general do not carry bulk system transfers between systems or between Balancing Authority Areas. The general premise inherent in this Option 2 is that the 100 kV facilities throughout the Western Interconnection, other than the limited few which comprise a Transfer Path, carry insignificant amounts of bulk power flow. In other words, the flows on these facilities amount to the sum of the distribution load being served in the area, and they do not carry any appreciable portion of bulk power transfers across Balancing Authority Areas or between Balancing Authority Areas.

The voltage of facilities considered as BES increased over time as more remote generation was built, technology advanced, and higher transmission capacities were needed. In the West, remote generation is a significant portion of most entities' resource portfolios. Transmission facilities, typically greater than 200 kV, were constructed to get that remote generation to the load

center, an adjacent load center, or to the market. Due to the relatively long distances from remote resources to the load, entities recognized a need for higher voltage transmission lines and adopted 230 kV, 345 kV, and 500 kV as typical bulk transmission voltages.

It seems unlikely that any new bulk transmission service would be constructed at a voltage between 100 kV and 200 kV. The WECC Transmission Expansion Planning Policy Committee's (TEPPC) 2009 Synchronized Study Program (Study Program) identifies 46 transmission additions in the planning stages. The Study Program information is drawn from study requests submitted to TEPPC, project websites, submissions by project sponsors and PCC logs for Regional Project Reviews (also called Phase 0) and the logs for Phases 1, 2 and 3 of the Path Rating Process. All 46 proposed transmission additions are 200 kV or higher voltage. Over time as transmission voltages move to 765 kV or higher, some transmission facilities that are today considered to be BES may well be relegated to serve load and lose their significance for bulk transfers.

3. ANSWERS TO FREQUENTLY ASKED QUESTIONS

The following remarks are an attempt to clarify and respond to those comments as well as others that have occurred during the BES definition process.

a) Isn't this concept too simple?

The Option 2 proposal is similar to the existing NERC BES definition. One potential objective of a more complicated definition might be to try to find a mechanism to exclude facilities. While this is not unreasonable, it introduces the dreaded 'material impact' concept and inevitable gray areas where it will almost certainly be difficult to determine what is in or out and raise questions about who the arbiter is and why your equipment is in but mine is out. Determining material impact would require a herculean effort by staff in short supply with other important work. Diverting staff to determine material impact might even cause reliability problems because staff would be diverted from other critical reliability issues. Judging by the efforts (years of work) of other NERC Regions, the "material impact" definition appears to be a monumental task and, very likely, unattainable because of the dynamic nature of the diverse electric system.

b) Don't we need clearer specification of BES equipment (not just transmission)? For example, what about generating plants?

Good question. Please see the BESDTF's request for input, question 10 in Appendix D.

c) Can't we develop some technical criteria which would prove the presence or absence of material impact?

Proving or disproving material impact is likely to be a complex and difficult task. At the very least, all facilities are required to meet the performance standards defined in the TPL standards. If they don't, then system modifications will be required to fix the problem. Therefore the final result will be that all facilities meet the performance standards now and in the future. So if all facilities meet the TPL performance standards, does that mean that they don't have material impact? Or does that mean that a loss of a line serving a 70 MW load or generator is not material, but loss of a line serving 71 MW is? Or maybe the value should be 72 or 78, and what happens if the load grows by 10 MW, etc.

APPENDIX C – MATERIALS OFFERED IN SUPPORT OF OPTION 2, CLASSIFICATION BY VOLTAGE

d) Should we define material impact as any equipment which could cause "…uncontrolled separation, cascading outages, or voltage collapse?"

Using this definition can be viewed as circular. NERC Transmission Planning Standards (TPL-001 thru TPL-004) require all equipment of the interconnected power system to be thoroughly evaluated and studied. If any element(s) causes instability, cascading outages, thermal overloads, etc., then the impact of the element(s) must be mitigated. Therefore, if all WECC interconnected equipment meets the TPL Standards then the loss of two lines, or two generators, will not cause "…uncontrolled separation, cascading outages, or voltage collapse…"

e) Why not utilize the hybrid approach with exception tests/criteria?

As noted previously, it is very difficult to develop, apply, and enforce tests or other criteria related to 'material impact' and impact test results could change over time. Any "material impact" matrix developed can and will be challenged because of the dynamic nature of the interconnected power system.

f) It appears that 200 kV is the Option 2 threshold. Isn't the selection of 200 kV arbitrary? Given the apparent lack of technical justification for 100 kV, it may be no more arbitrary than 100 kV. If it can be demonstrated that the change to 200 kV does not adversely impact reliability and that all standards are applied and enforced, no adverse impact should result. As noted in Section 1.0, the premise underlying Option 2 is that 100kV class facilities throughout the Western Interconnection, other than the limited few which comprise a Transfer Path, carry insignificant amounts of bulk power flow."

For example, the table below shows the average capacity of transmission lines by voltage class based on the continuous ratings shown in the WECC 2009 HS3 power flow base case. Data was deleted in some instances where it was obviously incorrect (9999 MW) or where the impedance for the line was very small which probably indicates a bus tie. As can be seen the nominal average capacity of lines below 200 kV is significantly below that of the 200-300 kV range (13.3 % and 28.1% respectively). This is directly reflective of the smaller impact these sub transmission lines have on the interconnected system relative to high voltage lines

Voltage Range	Number of Powerflow Lines (WECC Total)	Max Line Capacity (MVA)	Min Line Capacity (MVA)	Average Line Capacity (MVA)
0-100 kV	4111	420.0	1.1	68.8
100-200 kV	6847	796.7	5.0	145.3
200-300 kV	2207	753.0	198.8	516.5
300 - 400 kV	194	2,500.0	300.0	959.8
>400 kV	402	7,066.8	387.5	2,489.8

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g) The original NERC definition of BES includes an exemption for radial transmission facilities, but this definition does not?

It is the viewpoint of this subgroup that the radial exemption for lines over 200 kV would no longer apply if this alternative BES definition is adopted. If a radial line is operated at 230 kV it should be included as part of the BES.

4. **EXCERPTS FROM NERC STANDARDS INDICATING VARIABILITY IN APPLICATION OF STANDARDS AND SUPPORT FOR 200 kV THRESHOLD**

The following two prominent and reliable NERC references make clear that a deliberate delineation is being made at the 200 kV threshold. It is suggested in each of these references that facilities in the 100 kV-200 kV voltage range might be considered for inclusion depending upon the relative importance or criticality of those facilities according to either the Region or the Planning Coordinator.

NERC Standard FAC-003-1 Vegetation Management
Applicability section 4.3 states the following:

*4.3 This standard shall apply to all transmission lines operated at **200kV** and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.*

NERC Protection System Maintenance: A Technical Reference – Section 2.2 Applicability of New Protection System Maintenance Standards

Maintenance requirements and approaches presented in Sections 8 through 14 below are intended to apply to all of the following facilities:

1. *Protection Systems for transmission equipment operated at **200kV** and above.*
2. *Protection Systems for transmission equipment operated at 100kV to 200kV as designated by the Planning Coordinator as critical to the reliability of the electric system.*
3. *Protection Systems for transformers with low voltage terminals connected at **200kV** and above.*
4. *Protection Systems for transformers with low voltage terminals connected at 100kV to 200kV as designated by the Planning Coordinator as critical to the reliability of the electric system.*
5. *Protection Systems of generator step-up transformers for individual generators of greater than 20 MVA (gross nameplate rating) with high side terminals connected to facilities defined in items 1 or 2 above, and all generator step-up transformers in generation plants greater than 75MVA (gross aggregate nameplate rating).*
6. *Protection Systems of generator auxiliary load transformers (regardless of where they are connected) in generation plants greater than 75MVA (gross aggregate nameplate rating)*
7. *Protection Systems for individual generators of greater than 20 MVA (gross nameplate rating) connected through step-up transformers as described in (5) and all generators*

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greater than 20 MVA (gross nameplate rating) in generation plants greater than 75 MVA (gross aggregate nameplate rating).

8. *The protection systems, including all applicable protection systems from item 7 above, for the system interface facilities for installations such as wind farms which are aggregated through a single connection point to the system, greater than 75MVA (gross aggregate nameplate rating).*
9. *Protection Systems for Underfrequency load shedding (UFLS) and Undervoltage load shedding (UVLS), and special protection schemes (SPS) which are subject to the various NERC Standards, even if connected to the power system at voltages lower than those stated in (1) and (2) above.*

Additional NERC Standards with varying threshold criteria are shown below. This is clear evidence that various NERC standards apply different criteria that are beyond the current BES definition.

- FAC-003-1 Section A 4.3
  This standard shall apply to all transmission lines operated at 200 kV and above and to any lower voltage lines designated by the RRO as critical to the reliability of the electric system in the region.

- FAC-008-1
  To ensure that Facility Ratings used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

- FAC-009-1
  To ensure that Facility Ratings used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

- FAC-011-1
  To ensure that System Operating Limits (SOLs) used in the reliable operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

- TOP-003 (R1.2)
  "any foreseen outage of a transmission line or transformer greater than 100 kV or generator greater than 50 MW".

- IRO-002-1 (R6)
  Each Reliability Coordinator shall monitor Bulk Electric System elements (generators, transmission lines, buses, transformers, breakers, etc.) that could result in SOL or IROL violations within its Reliability Coordinator Area. Each Reliability Coordinator shall monitor both real and reactive power system flows, and operating reserves, and the status of Bulk Electric System elements that are or could be critical to SOLs and IROLs and system restoration requirements within its Reliability Coordinator Area.

- IRO-003-2 (R1)

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Each Reliability Coordinator shall monitor all Bulk Electric System facilities, which may include sub-transmission information, within its Reliability Coordinator Area and adjacent Reliability Coordinator Areas, as necessary to ensure that, at any time, regardless of prior planned or unplanned events, the Reliability Coordinator is able to determine any potential System Operating Limit and Interconnection Reliability Operating Limit violations within its Reliability Coordinator Area

- IRO-005-2 (R1)
  Each Reliability Coordinator shall monitor its Reliability Coordinator Area parameters, including but not limited to the following:

- IRO-005-2 (R1.1)
  Current status of Bulk Electric System elements (transmission or generation including critical auxiliaries such as Automatic Voltage Regulators and Special Protection Systems) and system loading.

- PRC-STD-005-1 (WR1)
  All bulk power transmission elements (i.e. lines, stations and rights of way) included as part of the transmission facilities (or required to maintain transfer capability) impacting each of the transmission paths listed in Attachment A – WECC Table 2 shall be inspected and maintained in accordance with this criterion, taking into consideration diverse environmental and climatic conditions, terrain, equipment, maintenance philosophies, and design practices.

5 WECC 100 kV TRANSFER PATHS ARE RELATIVELY INSIGNIFICANT

WECC maintains a list of Transfer Paths of the Western Interconnection. The official document is entitled the "WECC Path Rating Catalog." All of these Transfer Paths are evaluated periodically, normally on an annual basis, to ensure that their listed transfer capabilities continue to be valid and that simulations of transfers across these Paths can be demonstrated to meet all applicable NERC and WECC Standards. This list may not contain all of the transmission lines deemed "significant" in the Western Interconnection, but it does contain a list of paths whose owners have deemed significant enough to protect the ratings of these paths through inclusion in the Path Rating Catalog. This list contains many of the transmission lines that represent significant interconnections between systems and Balancing Authority Areas for transferring bulk electric power throughout the Interconnection. Hence, this list arguably contains significant bulk power transmission interconnections in the Western Interconnection.

Close examination of these WECC Transfer Paths shows that the majority of these Transfer Paths consist of elements that are operated at voltages above 200 kV. Of the 70 Transfer Paths, 46 of them, or 66%, are entirely operated at greater than 200kV. These 46 Transfer Paths, however, account for over 78% of the total transmission capacity of the group of Transfer Paths. More importantly, there are 253 unique transmission elements comprising these 70 Transfer Paths, and of those, 211 of them, or 83%, are above 200 kV. This suggests that 100 kV facilities are less important in bulk power transfers in the Western Interconnection.

APPENDIX D – RESPONSE QUESTIONS

The BESDTF requests that, in addition to other comments parties may wish to provide, that parties respond to the following questions. These responses will help shape the future direction of the BESDTF's efforts to clarify the definition of "Bulk Electric System". The BESDTF appreciates and looks forward to comments.

1) Do you support Option 1, the use of a threshold coupled with material impact tests (i.e. the "hybrid" approach) to clarify which facilities are included in the BES? Why or why not?

2) Do you support the "Option 2" proposal? Why or why not?

3) Do you support the use of a 100 kV threshold (Option 1A)? Why or why not?

4) Do you support the use of a 200 kV threshold (Option 1B)? Why or why not?

5) Do you support a different threshold? What value? Why?

6) Do you support the inclusion of significant load loss as a characteristic to determine "material impact"? Why or why not?

7) Do you support an element's inclusion in the WECC Path Rating Catalog as a characteristic to determine "material impact"? Why or why not?

8) Should the proposed material impact assessment include a criterion that an element should be part of the BES if its loss would cause the loss of some amount of load or interruption of service to some number of end-use customers? *(The reporting requirements in EOP-004, for example, specify that events causing the loss of 300 MW of load or 50,000 end-use customers must be reported.)* Why or why not?

9) NERC CIP Standards direct that entities conduct a risk-based assessment to determine which of their facilities are "Critical Assets". Should designation as a "Critical Asset" result in that element being part of the BES? Why or why not?

10) While NERC registration guidelines direct that GO/GOP requirements apply to any generator above 20 MVA individually or 75 MVA in aggregate connected to the BES, is there a size at which any generator, regardless of whether it is connected to the BES, should be considered part of the BES? If so, what is that size? If not, why not? Are there other criteria (e.g., reliability must-run or local reliability status) that should be considered for including generators in the BES?

11) How should relay failure factor into the material impact assessment?

12) Are there other "material impact" considerations that should be made? What are they and why?

13) How could the application of the "Aggregate Effect" provision be made objective?

14) Should transformers with low-side voltages less than the threshold voltage be included in the BES? Why or why not?

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15) Step 4 of the WECC standards development process also states that:

> Along with the draft, the Subgroup[9] will prepare and post an impact assessment report. Alternatively, the Subgroup may request input from affected parties regarding their estimated cost to implement the draft Standard and will use that data to prepare an impact assessment report, which will be posted for comment when it becomes available.

In accordance with Step 4 above, the drafting team requests that each applicable entity review the proposed draft and report (to the drafting team) the estimated fiscal impact of the draft if it is implemented as proposed. This would include (i) expenses such as staffing changes and other Operating and Maintenance related expenses, or (ii) cost benefit or savings, including reduced risks. Each applicable entity is also encouraged to report any latent or indirect costs and ramifications that may be identified by that entity.

Estimated costs of implementation: Estimates are solicited. Please describe the fiscal impacts, either direct or indirect, and their estimated associated costs. To the extent you have supporting evidence, please attach it.

Estimated benefit or savings of implementation: Estimates are solicited. Please describe the fiscal impacts, either direct or indirect, and their estimated associated cost benefit or savings. To the extent you have supporting evidence, please attach it.

16) The BESDTF requests the industry provide any comments it may have that are not covered by the questions above.

[9] The Subgroup in this case is the BESDTF.