

May 6, 2014

**VIA ELECTRONIC FILING**

Ellen Desmond  
Director of Legal Affairs & Administration  
New Brunswick Energy and Utilities Board  
P.O. Box 5001  
15 Market Square, Suite 1400  
Saint John, NB  
E2L 4Y9

Re: *North American Electric Reliability Corporation*

Dear Ms. Desmond:

The North American Electric Reliability Corporation (“NERC”) hereby submits Notice of Filing of the North American Electric Reliability Corporation of Revisions to the Definition of “Bulk Electric System.” NERC requests, to the extent necessary, a waiver of any applicable filing requirements with respect to this filing.

Please contact the undersigned if you have any questions.

Respectfully submitted,

/s/ Holly A. Hawkins  
Holly A. Hawkins  
*Associate General Counsel for  
North American Electric Reliability  
Corporation*

Enclosure

3353 Peachtree Road NE  
Suite 600, North Tower  
Atlanta, GA 30326  
404-446-2560 | [www.nerc.com](http://www.nerc.com)



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- Exhibit D** White Paper on Bulk Electric System Radial Exclusion (E1) Low Voltage Loop Threshold – PRIVILEGED AND CONFIDENTIAL VERSION
- Exhibit E** Summary of Development History and Record of Development of Proposed Definition of “Bulk Electric System”
- Exhibit F** Standard Drafting Team Roster for Project 2010-17



subject of Federal Energy Regulatory Commission (“FERC”) Order Nos. 773 and 773-A (“Phase 1 BES Definition”). Phase 2, the subject of this filing, addresses FERC’s directives in Order Nos. 773 and 773-A, and responds to industry concerns raised during development of Phase 1. The proposed revisions to the BES Definition build upon Phase 1 and include significant improvements to the Inclusions and Exclusions, without modifying the core definition. In particular, the addition of Note 2 to Exclusion E1 (Radial Systems), which functionally allows for a configuration with a loop of 50 kV or less to qualify for Exclusion E1, is a well-designed solution that is technically supported by the analysis provided in **Exhibit D** and satisfies FERC’s directives in Order Nos. 773 and 773-A.

The proposed revisions to the BES Definition are expected to result in minimal changes to the Elements included in the BES, although some changes are expected as Regional Entities transition to a consistent approach in application of the BES Definition. The proposed revisions to the BES Definition add clarity and granularity that will allow for greater transparency and consistency in the identification of Elements and facilities that make up the Bulk Electric System (“BES”) and is responsive to the technical and policy concerns discussed in Order Nos. 773 and 773-A. Provided below is a detailed explanation of the elements of the BES Definition and the proposed Phase 2 revisions.

#### **A. Overview of the Elements of the BES Definition**

The proposed BES Definition consists of a “core” definition and a list of configurations of facilities that will be included or excluded from the “core” definition, *i.e.*, Inclusions and Exclusions. The Inclusions address five specific facilities configurations to provide clarity that the facilities described in these configurations are included in the BES. Similarly, the Exclusions address four specific facilities configurations that are *not* included in the BES.

The Inclusions and Exclusions address typical system facilities and configurations such as generation and radial systems, provide additional granularity that improves consistency, and provide a practical means to determine the status of common system configurations.

The core definition, with the more granular proposed Inclusions and Exclusions, should produce consistency in identifying BES Elements across the reliability regions. The case-by-case exception process, to add elements to, and remove elements from, the BES adds transparency and uniformity to the process of determining what constitutes the Bulk Electric System.<sup>2</sup>

## **B. Summary of Proposed Revisions to the BES Definition**

No changes are proposed to the core BES Definition, Inclusion I3 (Blackstart Resources) or Exclusion E2 (Behind the Meter Generation). Minor clarifying changes are proposed to:

- Inclusion I1 (Transformers);
- Inclusion I2 (Generating Resources); and
- Inclusion I5 (Static or Dynamic Reactive Power Devices).

Substantive revisions are proposed to Inclusion I4 (Dispersed Power Producing Resources) and Exclusions E1 (Radial Systems), E3 (Local Networks) and E4 (Reactive Power Devices), as described below.

- Inclusion I4 (Dispersed Power Producing Resources):
  - Collector systems, from the point where the generation aggregates to 75 MVA to a common point of connection at a voltage of 100 kV or above, are proposed to be included in the BES.
- Exclusion E1 (Radial Systems):
  - A threshold of 50 kV is proposed as the operating voltage below which loops between radial systems will not preclude the application of Exclusion E1;<sup>3</sup>

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<sup>2</sup> NERC is filing this day amendments to the NERC Rules of Procedure to include the new BES Definition.

<sup>3</sup> This ensures that Elements at or above 100 kV in a looped configuration are not excluded from the BES by application of Exclusion E1. *See* Order No. 773-A at P 44.

- In accordance with Order Nos. 773 and 773-A, Exclusion E1 is proposed to be modified so that it does not apply to tie-lines, *i.e.*, generator interconnection facilities, for BES generators.
- Exclusion E3 (Local Networks):
  - In accordance with Order Nos. 773 and 773-A, the 100 kV minimum operating voltage for Exclusion E3 is proposed for removal;
  - In accordance with Order Nos. 773 and 773-A, Exclusion E3 is proposed to be modified so that it does not apply to tie-lines, *i.e.*, generator interconnection facilities, for BES generators;
  - A revision is proposed to Exclusion E3 to include any part of a permanent Flowgate.
- Exclusion E4 (Reactive Power Devices):
  - A revision is proposed to Exclusion E4 to remove ownership implications consistent with the component-based nature of the BES Definition.

Together, these proposed revisions improve upon the Phase 1 Definition of BES and provide a technically grounded and legally supportable foundation for identifying Elements and facilities that make up the BES. The proposed BES Definition is designed to ensure that all facilities necessary for operating an interconnected electric energy transmission network are included in the BES. The proposed BES Definition is consistent, repeatable, and verifiable and will provide clarity that will assist NERC and affected entities in implementing Reliability Standards.

### **C. Implementation**

The Phase 1 version of the BES Definition is scheduled to go into effect on July 1, 2014. The implementation plan for the proposed Phase 2 BES Definition states that the Definition “shall become effective on the first day of the second calendar quarter after the date that the definition is approved by an applicable governmental authority...”<sup>4</sup>

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<sup>4</sup>

*See Exhibit B.*



The proposed Phase 2 BES Definition will supersede, in its entirety, the Phase 1 version. The revisions to the BES Definition have been processed well in advance of the Phase 1 BES July 1, 2014 effective date.

## **II. REQUEST FOR PRIVILEGED TREATMENT**

NERC is requesting that portions of **Exhibit D**, a white paper on the BES Radial Exclusion (E1) low voltage loop threshold, be treated as privileged and confidential. Information in **Exhibit D** includes confidential information as defined by the NERC Rules of Procedure. This includes non-public information related to Registered Entity sensitive business information and confidential information regarding critical energy infrastructure. A non-public version of the information redacted from the public filing is available upon request. Because information in **Exhibit D** is deemed confidential by NERC, Regional Entities and Registered Entities, NERC requests that the confidential, non-public information be provided special treatment.

## **III. NOTICES AND COMMUNICATIONS**

Notices and communications with respect to this filing may be addressed to the following:

Charles A. Berardesco  
Senior Vice President and General Counsel  
Holly A. Hawkins  
Associate General Counsel  
Stacey Tyrewala  
Senior Counsel  
North American Electric Reliability  
Corporation  
1325 G Street, N.W., Suite 600  
Washington, D.C. 20005  
(202) 400-3000  
(202) 644-8099 – facsimile  
[charlie.berardesco@nerc.net](mailto:charlie.berardesco@nerc.net)  
[holly.hawkins@nerc.net](mailto:holly.hawkins@nerc.net)  
[stacey.tyrewala@nerc.net](mailto:stacey.tyrewala@nerc.net)

Mark G. Lauby  
Vice President and Director of Standards  
Laura Hussey  
Director of Standards Development  
North American Electric Reliability  
Corporation  
3353 Peachtree Road, N.E.  
Suite 600, North Tower  
Atlanta, GA 30326  
(404) 446-2560  
(404) 446-2595 – facsimile  
[mark.lauby@nerc.net](mailto:mark.lauby@nerc.net)  
[laura.hussey@nerc.net](mailto:laura.hussey@nerc.net)

#### **IV. BACKGROUND**

##### **A. NERC Reliability Standards Development Process**

The proposed BES Definition was developed in an open and fair manner and in accordance with the Reliability Standard development process. NERC develops Definitions in accordance with Section 300 (Reliability Standards Development) of its Rules of Procedure and the NERC Standard Processes Manual.<sup>5</sup> NERC’s proposed rules provide for reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing Reliability Standards and thus satisfies the criteria for approving Reliability Standards. The development process is open to any person or entity with a legitimate interest in the reliability of the Bulk-Power System. NERC considers the comments of all stakeholders, and a vote of stakeholders and the NERC Board of Trustees is required to approve a Definition before the Definition is submitted to the applicable governmental authorities. The proposed BES Definition was developed in accordance with NERC’s ANSI-accredited processes for developing and approving Definitions. **Exhibit E** includes a summary of the development history and

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<sup>5</sup> The NERC Rules of Procedure are available at <http://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx>. The NERC Standard Processes Manual is available at [http://www.nerc.com/comm/SC/Documents/Appendix\\_3A\\_StandardsProcessesManual.pdf](http://www.nerc.com/comm/SC/Documents/Appendix_3A_StandardsProcessesManual.pdf).

record of development of the Definition, and details the processes followed to develop the Definition.

## **B. Procedural Background**

On April 4, 2006, NERC submitted proposed Reliability Standards, proposed regional differences, and the NERC Glossary, which includes NERC's BES Definition.

On November 18, 2010, FERC revisited the BES Definition in Order No. 743, which directed NERC, through NERC's Reliability Standards Development Process, to revise its BES Definition to ensure that it encompasses all facilities necessary for operating an interconnected transmission network.<sup>6</sup> FERC also directed NERC to address FERC's technical and policy concerns. Among FERC's concerns were: (i) inconsistencies in the application of the definition; (ii) a lack of oversight, and (iii) exclusion of facilities from the BES required for the operation of the interconnected transmission network. In Order No. 743, FERC concluded that the best way to address these concerns was to eliminate the Regional Entity discretion to define the BES without NERC or FERC review, maintain a bright-line threshold that includes all facilities operated at or above 100 kV except defined radial facilities, and adopt an exemption process and criteria for removing from the BES those facilities that are not necessary for operating the interconnected transmission network. In Order No. 743, FERC allowed NERC to "propose a different solution that is as effective as, or superior to, the Commission's proposed approach in addressing the Commission's technical and other concerns so as to ensure that all necessary facilities are included within the scope of the definition."<sup>7</sup> FERC directed NERC to file the revised BES Definition and its process to exempt facilities from inclusion in the BES within one

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<sup>6</sup> Order No. 743, 133 FERC ¶ 61,150 at P 16.

<sup>7</sup> *Id.*

year of the effective date of the final rule.<sup>8</sup> In Order No. 743-A, FERC reaffirmed its determinations in Order No. 743.

On March 1, 2012, NERC submitted two filings resulting from the directives in Order No. 743: (1) NERC's proposed revision to the BES Definition which includes provisions to include and exclude facilities from the "core" definition; and (2) revisions to NERC's Rules of Procedure to add a procedure creating an exception process to classify or de-classify an element as part of the BES. One of the March 1 filings also contained a notice of a revised BES Definition in the NERC Glossary. The definition consists of a "core" definition and a list of facilities and configurations that will be included in, or excluded from, the "core" definition. NERC proposed the following "core" BES Definition:

Unless modified by the [inclusion and exclusion] lists shown below, all Transmission Elements operated at 100 kV or higher and Real Power and Reactive Power resources connected at 100 kV or higher. This does not include facilities used in the local distribution of electric energy.

FERC issued the BES Notice of Proposed Rulemaking ("NOPR") on June 22, 2012, and required that comments be filed within 60 days after publication in the *Federal Register*, or September 4, 2012.<sup>9</sup> While seeking comment on various provisions of NERC's petitions, the NOPR proposed to approve NERC's modification to the currently-effective BES Definition and changes to the Rules of Procedure to add the exception process. The NOPR also requested comment on the

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<sup>8</sup> *Id.* at P 113.

<sup>9</sup> *Revisions to Electric Reliability Organization Definition of Bulk Electric System and Rules of Procedure*, 139 FERC ¶ 61,247 (June 22, 2012) ("NOPR").

appropriate role for NERC and FERC in the identification of BES facilities and elements. NERC submitted comments on September 4, 2012, and reply comments on September 19, 2012.<sup>10</sup>

On December 20, 2012, in Order No. 773, FERC issued a Final Rule approving modifications to the currently-effective definition of BES developed by NERC. In Order No. 773-A, FERC issued an order on rehearing and clarification. In the Orders, FERC has directed NERC to: (1) modify the exclusions for radial systems (Exclusion E1) and local networks (Exclusion E3) so that they do not apply to tie-lines, *i.e.* generator interconnection facilities, for BES generators; and (2) modify the local network exclusion to remove the 100 kV minimum operating voltage to allow systems that include one or more looped configurations connected below 100 kV to be eligible for the local network exclusion.<sup>11</sup> The proposed revisions to the BES Definition address FERC's concerns, as explained below.

## **V. JUSTIFICATION**

As discussed herein, the proposed BES Definition is just, reasonable, not unduly discriminatory or preferential, and is in the public interest. Provided below is an explanation of the components of the BES Definition and the proposed revisions.

### **A. Discussion of Proposed Revisions to the Definition of “Bulk Electric System”**

No changes are proposed to the core BES Definition, Inclusion I3 (Blackstart Resources) or Exclusion E2 (Behind the Meter Generation). Minor clarifying changes are proposed to Inclusions I1 (Transformers), I2 (Generating Resources), and I5 (Static or Dynamic Reactive Power Devices). Substantive revisions are proposed to Inclusion I4 (Dispersed Power Producing

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<sup>10</sup> NERC's initial comments are available here: [http://www.nerc.com/files/FINAL\\_Comments\\_BES\\_NOPR\\_complete.pdf](http://www.nerc.com/files/FINAL_Comments_BES_NOPR_complete.pdf) and NERC's reply comments are available here: [http://www.nerc.com/files/FINAL\\_BES\\_NOPR\\_Reply%20comments\\_clean.pdf](http://www.nerc.com/files/FINAL_BES_NOPR_Reply%20comments_clean.pdf).

<sup>11</sup> Order No. 773 at PP 155, 164.

Resources) and Exclusions E1 (Radial Systems), E3 (Local Networks), and E4 (Reactive Power Devices).

1. “Core” Definition

**Bulk Electric System (BES):** Unless modified by the lists shown below, all Transmission Elements operated at 100 kV or higher and Real Power and Reactive Power resources connected at 100 kV or higher. This does not include facilities used in the local distribution of electric energy.

No revisions are proposed to the core Definition or the accompanying “note”<sup>12</sup> which applies to the entire Definition and recognizes that Elements may be included or excluded on a case-by-case basis through the Rules of Procedure exception process. The core Definition is used to establish the bright-line of 100 kV, the overall demarcation point between Bulk Electric System and Non-Bulk Electric System Elements.

2. Inclusions

Inclusions identify specific facility configurations to provide clarity that the facilities described are included in the Bulk Electric System (unless the facilities are excluded based on one of the specific Exclusions in the BES Definition) and reduce the potential for the exercise of discretion and subjectivity.

*a. Inclusion I1 (Transformers)*

**Inclusion I1 (Transformers):** Transformers with the primary terminal and at least one secondary terminal operated at 100 kV or higher unless excluded by application of Exclusion E1 or E3.

A minor clarifying change is proposed to Inclusion I1—the phrase “under Exclusion E1 or E3” is proposed to be changed to “by application of Exclusion E1 or E3.” Inclusion I1 provides clarification regarding exactly which transformers are part of the Bulk Electric System. This clarification is necessary because transformers have windings operating at different voltages

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<sup>12</sup> Note - Elements may be included or excluded on a case-by-case basis through the Rules of Procedure exception process.

and multiple windings in some circumstances. Inclusion I1 includes in the Bulk Electric System those transformers operating at 100 kV or higher on the primary winding and at least one secondary winding, so as to be in concert with the core definition. The 100 kV threshold for secondary windings provides a clear demarcation between facilities used to transfer power as opposed to those that serve Load because transformers with two terminals >100 kV transfer power between portions of the BES. In Order No. 773, FERC stated that Inclusion I1 is “a reasonable approach to identifying transformers that are appropriately included as part of the bulk electric system.”<sup>13</sup>

***b. Inclusion I2 (Generating Resources)***

**Inclusion I2 (Generating Resources):** Generating resource(s) including the generator terminals through the high-side of the step-up transformer(s) connected at a voltage of 100 kV or above with:

- a) Gross individual nameplate rating greater than 20 MVA. Or,
- b) Gross plant/facility aggregate nameplate rating greater than 75 MVA.

Inclusion I2 has been revised for clarity but is substantively unchanged. The language of Inclusion I2 has been separated into sub-parts (a) and (b) in order to clarify the relationship between these sub-parts—this is an “or” statement. Inclusion I2 mirrors the text of the NERC *Statement of Compliance Registry Criteria* (Appendix 5B of the NERC Rules of Procedure) for generating units, and Inclusion I2 was approved by FERC in Order No. 773.<sup>14</sup> FERC “agree[d] with NERC and other commenters that multiple step-up transformers that are solely used to deliver the generation to the bulk electric system at 100 kV or above qualify the generator and the step-up transformers pursuant to inclusion I2.”<sup>15</sup>

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<sup>13</sup> Order No. 773 at P 80.

<sup>14</sup> Order No. 773 at P 91.

<sup>15</sup> *Id.*

*c. Inclusion I3 (Blackstart Resources)*

**Inclusion I3 (Blackstart Resources):** Blackstart Resources identified in the Transmission Operator’s restoration plan.

No revisions are proposed to Inclusion I3. Blackstart Resources are vital to the reliable operation of the Bulk Electric System.<sup>16</sup> Consequently, Blackstart Resources are included in the BES regardless of their size (MVA) or the voltage at which they are connected. The term “restoration plan” in inclusion I3 refers to the restoration plans in the EOP Reliability Standards.<sup>17</sup> In Order No. 773, FERC noted that “NERC’s inclusion of blackstart resources in the definition is an improvement to the definition.”<sup>18</sup>

*d. Inclusion I4 (Dispersed Power Producing Resources)*

Dispersed power producing resources are small-scale generation technologies using a system designed primarily for aggregating capacity providing an alternative to, or an enhancement of, the traditional electric power system. Examples could include, but are not limited to, solar, geothermal, energy storage, flywheels, wind, micro-turbines, and fuel cells.

**Inclusion I4 (Dispersed Power Producing Resources):** Dispersed power producing resources that aggregate to a total capacity greater than 75 MVA (gross nameplate rating), and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. Thus, the facilities designated as BES are:

- a) The individual resources, and
- b) The system designed primarily for delivering capacity from the point where those resources aggregate to greater than 75 MVA to a common point of connection at a voltage of 100 kV or above.

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<sup>16</sup> The term “Blackstart Resource” is defined in the NERC Glossary as “A generating unit(s) and its associated set of equipment which has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator’s restoration plan needs for real and reactive power capability, frequency and voltage control, and that has been included in the Transmission Operator’s restoration plan.”

<sup>17</sup> See Order No. 773 at P 102 (“We also agree with NERC’s statement that the ‘restoration plan’ in inclusion I3 refers to the restoration plans in the EOP Reliability Standards.”).

<sup>18</sup> Order No. 773 at P 102.



Inclusion I4 has been revised to clarify the facilities designated as BES by application of this Inclusion and to include the collector system at the point of aggregation, *i.e.*, “[t]he system designed primarily for delivering capacity from the point where those resources aggregate to greater than 75 MVA to a common point of connection at a voltage of 100 kV or above.”

*i. Inclusion of Collector Systems in the BES*

In the BES NOPR, FERC requested comments on this issue—whether Inclusion I4 “includes as part of the bulk electric system the individual elements (from each energy-producing resource at the site through the collector system to the common point at a voltage of 100 kV or above) used to aggregate the capacity and any step-up transformers used to connect the system to a common point at a voltage of 100 kV or above.” NERC, in its comments on the BES NOPR, stated that “[e]nergy delivery elements in collector systems and interconnection facilities were specifically not included in Inclusion I4, which deals exclusively with generation resources. This was intended to avoid categorically including as part of the BES assets that may include local distribution facilities.”

While FERC did not direct NERC to categorically include collector systems pursuant to Inclusion I4, FERC stated that it “disagrees that collector systems described in inclusion I4 that solely deliver aggregated generation to the bulk electric system contain local distribution facilities because power is delivered from the collector system to the bulk electric system.”<sup>19</sup> Upon reflection of FERC’s statement in Order No. 773 and input from FERC technical staff during standard development, the drafting team reconsidered its earlier position and revised Inclusion I4 to include collector systems from the point where the generation aggregates to 75 MVA to a common point of connection at a voltage of 100 kV or above.

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<sup>19</sup> Order No. 773 at P 114.

There are significant differences in collector system configurations; therefore, the standard drafting team did not establish a continent-wide bright-line determination for such Elements in their entirety. Rather, the standard drafting team identified the portions of the collector system which consistently provide a reliability benefit to the interconnected transmission network and are easily identified within collector systems. The result identifies the point of aggregation of 75 MVA and above and the interconnecting facilities to the interconnected transmission network. The aggregation threshold is consistent with the aggregation of capacity in Inclusion I2 and recognizes that the loss of those facilities would represent a loss of 75 MVA capacity to the Bulk Electric System and thus a potential reliability impact on the operation of the BES.

As FERC has noted, a bright-line threshold eliminates ambiguity.<sup>20</sup> While FERC has stated that “[i]n general...it is appropriate to have the bulk electric system contiguous, without facilities or elements ‘stranded’ or ‘cut-off’ from the remainder of the bulk electric system...”,<sup>21</sup> the standard drafting team determined that the inclusion of the collector system in Inclusion I4 is appropriate and consistent with the overall tenet of the BES Definition, which is to identify Elements that provide a reliability benefit to the interconnected transmission network. On a “bright-line” basis, the standard drafting team only included those portions of the collector system that are strictly utilized for delivering the aggregated capacity of the dispersed power resources to the interconnected transmission system. The intervening equipment is being treated in a similar fashion to Cranking Paths. Furthermore, where collector systems support the reliable operation of the surrounding interconnected transmission system and do not have a distribution

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<sup>20</sup> Order No. 743 at P 141.

<sup>21</sup> Order No. 773 at P 165.

function, those excluded facilities may be candidates for inclusion through the BES Exception Process.

*ii. Inclusion of Variable Generation Resources*

Consistent with FERC’s recognition that the purpose of Inclusion I4 is to include variable generation,<sup>22</sup> all forms of generation resources, including variable generation resources, continue to be included in the proposed revisions to the BES Definition. This is not a proposed change. Owners and operators of variable generation resources meeting the Registry Criteria have always been subject to registration and compliance with Reliability Standards. As FERC noted in Order No. 773, “owners and operators of these resources that meet the 75 MVA gross aggregate nameplate rating threshold are, in some cases, already registered and have compliance responsibilities as generator owners and generator operators.”<sup>23</sup>

Given the increasing penetration of wind, solar, and other non-traditional forms of generation, the standard drafting team believes that continuing the inclusion of individual variable generation units within the scope of a bright-line BES Definition is appropriate to ensure that, where necessary to support reliability, these units may be subject to Reliability Standards.

*e. Inclusion I5 (Static or Dynamic Reactive Power Devices)*

**Inclusion I5 (Static or Dynamic Reactive Power Devices):** Static or dynamic devices (excluding generators) dedicated to supplying or absorbing Reactive Power that are connected at 100 kV or higher, or through a dedicated transformer with a high-side

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<sup>22</sup> Order No. 773 at P 115 (“We disagree . . . that inclusion I4 should be interpreted to not include the dispersed power producing resources within a wind plant in the [BES]. We agree with NERC’s statement that the purpose of this inclusion is to include such variable generation (e.g., wind and solar resources). NERC noted that, while such generation could be considered subsumed in inclusion I2 (because the gross aggregate nameplate rating of the power producing resources must be greater than 75 MVA), NERC considered it appropriate for clarity to add this separately-stated inclusion to expressly cover dispersed power producing resources using a system designed primarily for aggregating capacity. In addition, although dispersed power producing resources (wind, solar, etc.) are typically variable suppliers of electrical generation to the interconnected transmission network, there are geographical areas that depend on these types of generation resources for the reliable operation of the interconnected transmission network. The Commission believes that owners and operators of these resources that meet the 75 MVA gross aggregate nameplate rating threshold are, in some cases, already registered and have compliance responsibilities as generator owners and generator operators.”).

<sup>23</sup> *Id.*

voltage of 100 kV or higher, or through a transformer that is designated in Inclusion I1 unless excluded by application of Exclusion E4.

Inclusion I5 has been revised to clarify that Exclusion E4 (Reactive Power Devices) would exclude Elements identified for inclusion in Inclusion I5. As FERC noted in Order No. 773, Exclusions E1 and E3 would not override Inclusion I5 because Exclusions E1 and E3 exclude transmission elements only and not resources.<sup>24</sup> Exclusion E4, which is specific to resources (*i.e.*, Reactive Power devices), would override Inclusion I5. This clarification is an improvement to the BES Definition as it makes the relationship between specific and related Inclusions and Exclusions transparent, which will facilitate consistent application of the BES Definition by industry.

FERC approved Inclusion I5 in Order No. 773 and stated that “the inclusion adds clarity to the application of the bulk electric system definition by providing specific criteria for reactive power devices.”<sup>25</sup> Similarly, the proposed revision to Inclusion I5 provides additional clarity.

### 3. Exclusions

Exclusions identify facility configurations that should not be included in the Bulk Electric System. The four Exclusions are for: (1) radial systems; (2) behind-the-meter generating units; (3) local networks; and (4) retail customer Reactive Power devices. As explained in Section VI below, Exclusions do not automatically supersede Inclusions. For example, if an Element qualifies under Inclusion I3 (Blackstart Resources), the Element would not be eligible for exclusion by application of any potential Exclusion (in this case, likely Exclusion E1 or

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<sup>24</sup> Order No. 773 at P 123 (“The Commission does not agree with G&T Cooperatives that Exclusions E1 and E3 override inclusion I5 and exclude the reactive power devices. Exclusions E1 and E3 exclude transmission elements only and not resources.”).

<sup>25</sup> Order No. 773 at P 123.

Exclusion E3) because Blackstart Resources are included in the BES regardless of configuration or location.

*a. Exclusion E1 (Radial Systems)*

**Exclusion E1 (Radial Systems):** A group of contiguous transmission Elements that emanates from a single point of connection of 100 kV or higher and:

- a) Only serves Load. Or,
- b) Only includes generation resources, not identified in Inclusions I2, I3, or I4, with an aggregate capacity less than or equal to 75 MVA (gross nameplate rating). Or,
- c) Where the radial system serves Load and includes generation resources, not identified in Inclusions I2, I3 or I4, with an aggregate capacity of non-retail generation less than or equal to 75 MVA (gross nameplate rating).

Note 1 – A normally open switching device between radial systems, as depicted on prints or one-line diagrams for example, does not affect this exclusion.

Note 2 – The presence of a contiguous loop, operated at a voltage level of 50 kV or less, between configurations being considered as radial systems, does not affect this exclusion.

There are two substantive proposed revisions to Exclusion E1: (1) the addition of Note 2; and (2) the addition of Inclusions I2 and I4 in parts (b) and (c). As explained below, these proposed revisions satisfy FERC’s directives in Order Nos. 773 and 773-A. The technical analysis provided in **Exhibit D** supports the proposed addition of Note 2.

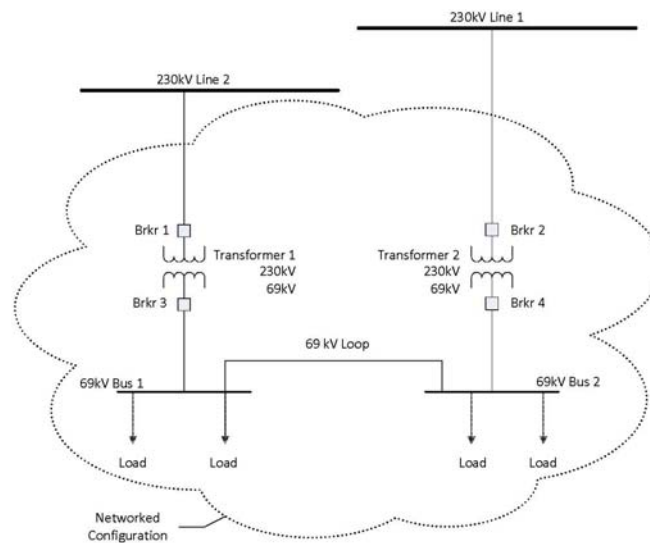
Exclusion E1 (Radial Systems) provides for the exclusion of radial systems that meet the specific criteria identified in the exclusion language. By definition, radial systems only consist of “transmission Elements.” Therefore, Exclusion E1 does not allow for the exclusion of Real Power and Reactive Power resources captured by Inclusions I2 through I5, nor generator step-up transformers or portions of collector systems captured by Inclusions I2 and I4.

*i. Networked Configuration with a sub-100 kV Loop*

In Order No. 773, FERC held that radial systems with elements operating at 100 kV or higher in a configuration that emanate from two or more points of connection cannot be deemed

“radial” if the configuration remains contiguous through elements that are operated below 100 kV.<sup>26</sup> FERC held that such a configuration is a networked configuration and does not qualify for Exclusion E1. FERC included a depiction of this configuration, reproduced below, in Order No. 773 as Figure 3.

**FERC Order No. 773 Figure 3  
Networked Configuration w/69 kV Loop**

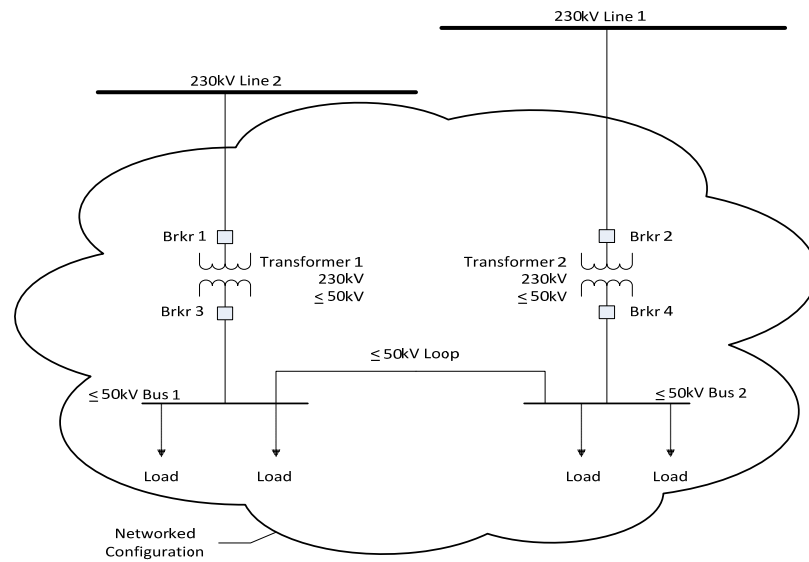


FERC disagreed with commenters that this decision is contrary to the language of Exclusion E1 and directed NERC to ensure that Elements at or above 100 kV in a looped configuration are not excluded from the BES under Exclusion E1.<sup>27</sup> Similarly, FERC directed NERC to remove the 100 kV floor in Exclusion E3 (Local Networks).<sup>28</sup> Removing the 100 kV minimum operating voltage in Exclusion E3 allows networked configurations below 100 kV, that may not otherwise be eligible for Exclusion E1, to be eligible for Exclusion E3.

<sup>26</sup> Order No. 773 at P 155.  
<sup>27</sup> Order No. 773-A at P 36.  
<sup>28</sup> Order No. 773-A at P 125.

In consideration of FERC’s directives, Exclusion E1 has been revised to include Note 2. Note 2 to Exclusion E1 states that the “presence of a contiguous loop, operated at a voltage level of 50 kV or less, between configurations being considered as radial systems, does not affect this exclusion.” Under the Phase 1 BES Definition, the presence of a loop meant that a configuration would be ineligible for consideration under Exclusion E1 and instead would have to be considered under Exclusion E3. Note 2 functionally allows for a configuration with a loop of 50 kV or less to qualify for Exclusion E1– this is illustrated below in Figure A.

**NERC Figure A Networked Configuration w/ a 50 kV (or less) Loop**



This improvement to the BES Definition is responsive to FERC’s concerns in Order Nos. 773 and 773-A. FERC stated in Order No. 773-A that “[i]t strikes us as unreasonable to characterize lines as radial by ignoring connecting facilities below 100 kV.”<sup>29</sup> Instead, Note 2 recognizes the physical realities of the interconnected transmission system. For example, it would be an illogical result for two otherwise radial systems connected by a 2 kV loop to be

<sup>29</sup> *Id.*

deemed a local network simply by virtue of the presence of this 2 kV loop. With this understanding, the standard drafting team set out to determine at which voltage level the presence of a loop could create an impact on the BES. The standard drafting team conducted technical analysis including modeling the physics of loop flows through sub-100 kV systems, in order to determine an appropriate threshold.

In Order Nos. 773 and 773-A, FERC indicated that additional factors beyond impedance must be considered to demonstrate that looped or networked connections operating below 100 kV need not be considered in the application of Exclusion E1.<sup>30</sup> The standard drafting team conducted a two-step process to establish a technical justification for the establishment of a voltage threshold below which sub-100 kV loops do not preclude the application of Exclusion E1.

- **Step 1:** A review was performed to determine the minimum voltage levels that are monitored by Balancing Authorities, Reliability Coordinators, and Transmission Operators for Interfaces, Paths, and Monitored Elements. This minimum voltage level reflects a value that industry experts consider necessary to monitor and facilitate the operation of the Bulk Electric System. This step provided a technically sound approach to screen for a minimum voltage limit that served as a starting point for the technical analysis performed in Step 2 of this study.
- **Step 2:** Technical studies modeling the physics of loop flows through sub-100 kV systems were performed to establish which voltage level, while less than 100 kV, should be considered in the evaluation of Exclusion E1.

Under Step 1, each Region was requested to provide the key groupings of elements they monitor to ensure reliable operation of the interconnected transmission system. This list, contained in **Exhibit D** Appendix 1, was reviewed to identify the lowest voltage element in the major element groupings monitored by operating entities in the eight Regions. Identification of

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<sup>30</sup> Order No. 773 at P 155, n.139 (“the Commission believes that excluding these configurations solely on the level of impedance does not consider other factors, including voltage, the system configuration, type of conductors, length of conductors, and proximity of the networked system in the interconnected transmission network.”).



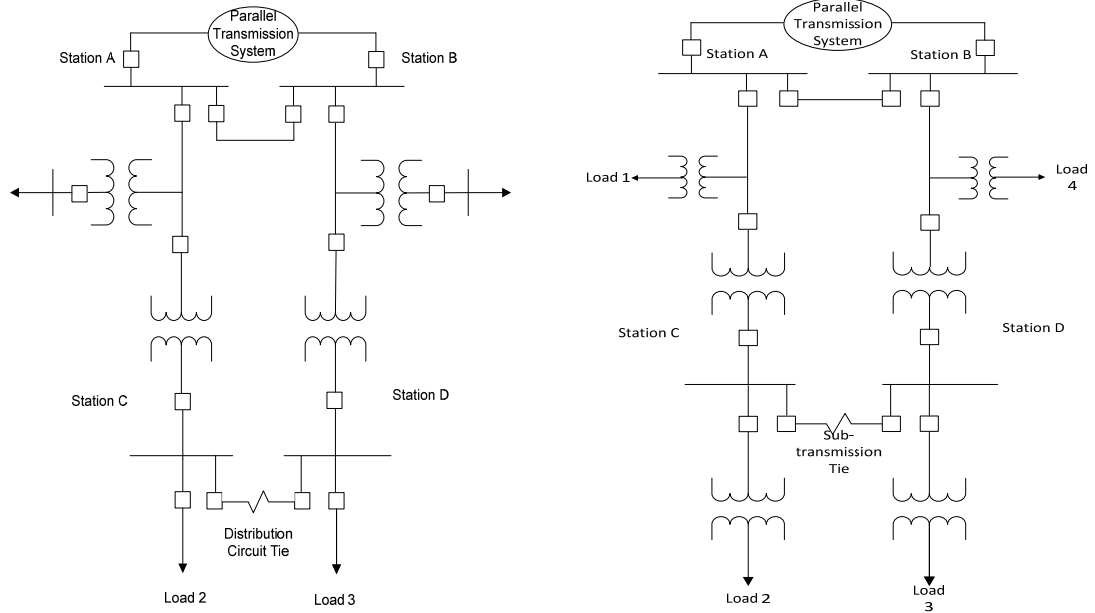
this lowest voltage level served as a starting point to begin a closer examination into the voltage level where the presence of a contiguous loop should not preclude the evaluation of radial systems when applying Exclusion E1 of the BES definition.

The threshold of 30 kV was established in Step 1 as a reasonable starting point to initiate the technical sensitivity analysis performed in Step 2 of this study. The purpose of this step was to determine if there is a technical justification to support a voltage threshold for the purpose of determining whether facilities greater than 100 kV can be considered to be radial when applying the BES Definition Exclusion E1. If the resulting voltage threshold was deemed appropriate through technical study efforts, then contiguous loop connections operated at voltages below this value would not preclude the application of Exclusion E1. Conversely, contiguous loops connecting radial lines at voltages above this kV value would negate the ability for an entity to use Exclusion E1 for the subject facilities.

This study focused on two typical configurations: a distribution loop and a sub-transmission loop. Examples of these configurations are depicted below in Figures B and C.

**NERC FIGURE B: Example of a Radial System with Low Voltage Distribution Loop**

**NERC FIGURE C: Example of a Radial System with Sub-Transmission Loop**



The study evaluated a range of voltages for the loop and the parallel transmission system with the goal of determining the voltage level below which single Contingencies on the transmission system would not result in power flow from a low voltage distribution or sub-transmission loop to the BES. The study included sensitivity analysis varying the loads and impedances. Variations in loop and transmission system impedances account for a range of physical parameters such as conductor length, conductor type, system configuration, and proximity of the loop to the transmission system. This study provided the low voltage floor that can be used as a consideration for BES Exclusion E1.

The proposed revisions are an equally effective and efficient solution to addressing FERC’s concerns in Order Nos. 773 and 773-A. The analysis described herein establishes that a 50 kV threshold for sub-100 kV loops, such as those depicted above in Figures B and C, does not preclude the application of Exclusion E1. This approach should ease the administrative burden on entities in order to prove that they qualify for an Exclusion and is an improvement to the BES Definition.

*ii. Generator Interconnection Facilities*

The proposed addition of Inclusions I2 (Generating Resources) and I4 (Dispersed Power Producing Resources) in parts (b) and (c) of Exclusion E1 satisfy FERC's directive to modify Exclusions E1 and E3 to ensure that generator interconnection facilities at or above 100 kV connected to BES generators identified in Inclusion I2 are not excluded from the BES.<sup>31</sup>

In Order No. 773, FERC stated that, if the generator is necessary for the operation of the interconnected transmission network, it is appropriate to have the generator interconnection facility operating at or above 100 kV that delivers the generation to the BES included as well.<sup>32</sup> Consistent with this directive and with this logic, parts (b) and (c) of Exclusion E1 have been modified to incorporate references to Inclusions I2 and I4. This proposed revision ensures that generator interconnection facilities at or above 100 kV connected to BES generators identified in Inclusions I2 and I4 are not excluded from the BES.

*b. Exclusion E2 (Behind the Meter Generation)*

**Exclusion E2 (Behind the Meter Generation):** A generating unit or multiple generating units on the customer's side of the retail meter that serve all or part of the retail Load with electric energy if: (i) the net capacity provided to the BES does not exceed 75 MVA, and (ii) standby, back-up, and maintenance power services are provided to the generating unit or multiple generating units or to the retail Load by a Balancing Authority, or provided pursuant to a binding obligation with a Generator Owner or Generator Operator, or under terms approved by the applicable regulatory authority.

No revisions are proposed to Exclusion E2. Exclusion E2 excludes from the BES a generating unit or units on the customer's side of the retail meter that serves all or part of the retail Load, so long as the following two conditions are met: (i) the net capacity provided by the

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<sup>31</sup> Order No. 773-A at P 50 ("We grant rehearing to the extent that, rather than direct NERC to implement exclusions E1 and E3 as described above, we direct NERC to modify the exclusions pursuant to FPA section 215(d)(5) to ensure that generator interconnection facilities at or above 100 kV connected to bulk electric system generators identified in inclusion I2 are not excluded from the bulk electric system.").

<sup>32</sup> Order No. 773 at PP 164-65.

generating unit(s) to the BES does not exceed 75 MVA, and (ii) standby, back-up, and maintenance power services are provided to the generating unit(s) or the retail Load by a Balancing Authority, or pursuant to a binding obligation with a Generator Owner or Generator Operator, or under terms approved by the applicable regulatory authority. Under these circumstances, the generating unit(s) are not necessary for the reliable operation of the interconnected transmission system, and therefore do not need to be included in the BES, because they serve a single retail Load, provide a limited amount of capacity to the BES, and are fully backed up by other resources. FERC approved Exclusion E2 in Order No. 773 and noted that it “provides additional clarity to the definition of bulk electric system.”<sup>33</sup>

*c. Exclusion E3 (Local Networks)*

**Exclusion E3 (Local Networks):** Local networks (LN): A group of contiguous transmission Elements operated at less than 300 kV that distribute power to Load rather than transfer bulk power across the interconnected system. LN’s emanate from multiple points of connection at 100 kV or higher to improve the level of service to retail customers and not to accommodate bulk power transfer across the interconnected system. The LN is characterized by all of the following:

- a) Limits on connected generation: The LN and its underlying Elements do not include generation resources identified in Inclusions I2, I3, or I4 and do not have an aggregate capacity of non-retail generation greater than 75 MVA (gross nameplate rating);
- b) Real Power flows only into the LN and the LN does not transfer energy originating outside the LN for delivery through the LN; and
- c) Not part of a Flowgate or transfer path: The LN does not contain any part of a permanent Flowgate in the Eastern Interconnection, a major transfer path within the Western Interconnection, or a comparable monitored Facility in the ERCOT or Quebec Interconnections, and is not a monitored Facility included in an Interconnection Reliability Operating Limit (IROL).

Exclusion E3 has been substantively revised in accordance with FERC’s directives in Order Nos. 773 and 773-A; the 100 kV minimum operating voltage for Exclusion E3 has been

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<sup>33</sup> Order No. 773 at P 183.

removed. In addition, several clarifying changes are proposed for approval. Exclusion E3 (Local Networks) provides for the exclusion of local networks that meet the specific criteria identified in the exclusion language. By definition, local networks only consist of “transmission Elements.” Therefore, Exclusion E3 does not allow for the exclusion of Real Power and Reactive Power resources captured by Inclusions I2 through I5, nor generator step-up transformers or portions of collector systems captured by Inclusions I2 and I4.

*i. Removal of the 100 kV Floor*

In Order Nos. 773 and 773-A, FERC directed NERC to modify Exclusion E3 to remove the 100 kV minimum operating voltage in the local network definition.<sup>34</sup> In Order No. 773-A, FERC agreed that “removing the phrase ‘or above 100 kV but’ from the definition of local networks in the first sentence of exclusion E3 is an appropriate way to meet FERC’s directive to remove the 100 kV minimum operating voltage in the local network definition.”<sup>35</sup> Consistent with FERC’s direction, the phrase “or above 100 kV but” has been removed from Exclusion E3 in the proposed BES Definition.

*i. Generator Interconnection Facilities*

The proposed addition of Inclusions I2 (Generating Resources) and I4 (Dispersed Power Producing Resources) in part (a) of Exclusion E3 satisfy FERC’s directive to modify Exclusions E1 and E3 to ensure that generator interconnection facilities at or above 100 kV connected to BES generators identified in Inclusion I2 are not excluded from the BES.<sup>36</sup>

In Order No. 773, FERC stated that, if the generator is necessary for the operation of the interconnected transmission network, it is appropriate to have the generator interconnection

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<sup>34</sup> Order No. 773 at P 199 (“we direct NERC to modify exclusion E3 to remove the 100 kV minimum operating voltage in the local network definition.”); Order No. 773-A at P 34.

<sup>35</sup> Order No. 773-A at P 40.

<sup>36</sup> Order No. 773-A at P 50.

facility operating at or above 100 kV that delivers the generation to the BES included as well.<sup>37</sup> Consistent with this directive and with this logic, part (a) of Exclusion E3 have been modified to incorporate references to Inclusions I2 and I4. This proposed revision ensures that generator interconnection facilities at or above 100 kV connected to BES generators identified in Inclusions I2 and I4 are not excluded from the BES.

*ii. Flowgate*

A change is proposed to part (c) of Exclusion E3 to include any part of a permanent Flowgate. The standard drafting team believes that the reliable operation of the interconnected transmission system requires operator situational awareness of any and all parts of permanent Flowgates in order to adequately provide for reliable operation.<sup>38</sup> Hence, the presence of any part of a Flowgate should preclude the application of Exclusion E3 and is an improvement to the BES Definition.

*iii. Clarifying Changes*

In the revised BES Definition, the term “retail customer Load” has been simplified to “retail customers” in order to provide clarity. A clarifying change is also proposed to part (b) to make clear that the term “Power” refers to “Real Power,” rather than Reactive Power.<sup>39</sup> “Real Power” is defined in the NERC Glossary as “[t]he portion of electricity that supplies energy to the load.” These revisions clarify the plain words of the proposed BES Definition.

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<sup>37</sup> Order No. 773 at PP 164-65.

<sup>38</sup> See Consideration of Comments: Project 2017-17: August 2, 2013 at p. 17.

<sup>39</sup> The term “Reactive Power” is defined in the NERC Glossary as “The portion of electricity that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power must be supplied to most types of magnetic equipment, such as motors and transformers. It also must supply the reactive losses on transmission facilities. Reactive power is provided by generators, synchronous condensers, or electrostatic equipment such as capacitors and directly influences electric system voltage. It is usually expressed in kilovars (kvar) or megavars (Mvar).”

*d. Exclusion E4 (Reactive Power Devices)*

**Exclusion E4 (Reactive Power Devices):** Reactive Power devices installed for the sole benefit of a retail customer(s).

Exclusion E4 has been revised to remove ownership implications as the BES Definition is a component-based definition and does not take into account the ownership of the actual equipment. Exclusion E4 is the technical equivalent of Exclusion E2 for reactive power devices. FERC accepted Exclusion E4 in Order No. 773.<sup>40</sup>

The proposed revision to Exclusion E4 is responsive to concerns raised by industry representatives, which have noted that Exclusion E4 should not be confined to such devices that are owned and operated by a retail customer solely for its own use because there are instances in which capacitor banks have been installed for the benefit of a steel-making facility but, for various reasons, that equipment is owned, operated and maintained by its local utility. In Order No. 773, rather than directing such a change, FERC noted that this issue could be explored by NERC in the development of Phase 2 of the BES Definition.<sup>41</sup> The proposed revision to Exclusion E4 improves the clarity of this Exclusion and is consistent with the purpose of the BES Definition.

**VI. APPLICATION OF THE DEFINITION OF BULK ELECTRIC SYSTEM**

The proposed BES Definition is generally applied in three steps, as discussed below. Going forward, NERC will work with industry regarding the application of the BES Definition to the configuration of Elements.

**STEP 1: CORE DEFINITION:** The core definition is used to establish the bright-line of 100 kV, the overall demarcation point between BES and Non-BES Elements. The core BES

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<sup>40</sup> Order No. 773 at P 237.

<sup>41</sup> Order No. 773 at P 237.

Definition identifies the Real Power and Reactive Power resources connected at 100 kV or higher, as included in the BES. To fully appreciate the scope of the core definition, an understanding of the term “Element” is needed. “Element” is defined in the NERC Glossary as: “Any electrical device with terminals that may be connected to other electrical devices such as a generator, transformer, circuit breaker, bus section, or transmission line. An element may be comprised of one or more components.”

**STEP 2:** INCLUSIONS: This step involves applying the specific Inclusions, provides additional clarification for the purposes of identifying specific Elements that are included in the BES. The Inclusions address Transmission Elements and Real Power and Reactive Power resources with specific criteria to provide for a consistent determination of whether an Element is classified as BES or non-BES. There are five Inclusions in the Definition. The facilities described in Inclusions I1, I2, I4 and I5 are each operated (if transformers – Inclusion I1) or connected (if generating resources, dispersed power producing resources or Reactive Power resources – Inclusions I2, I4 and I5) at or above the 100 kV threshold. Inclusion I3 encompasses Blackstart Resources identified in a Transmission Operator’s restoration plan, which are necessary for the reliable operation of the interconnection transmission system and should be included in the BES regardless of their size (MVA) or the voltage at which they are connected.

**STEP 3:** EXCLUSIONS: This step evaluates specific situations for potential exclusion from the BES. The exclusion language is written to specifically identify Elements or groups of Elements for exclusion from the BES. Step three (3) should be applied in the following sequence:

- Exclusion E2 (Behind the Meter Generation) provides for the specific exclusion of certain Real Power resources that reside behind-the-retail meter (on the customer’s side) and supersedes the more general Inclusion I2 (Generating Resources). Behind-the-meter generation that meets these specific criteria do not



affect reliability of the BES because the net capacity supplied to the BES is less than 75 MVA and the specific criteria impose obligations to support reliability when the resources are unavailable.

- Exclusion E4 (Reactive Power Devices) provides for the specific exclusion of Reactive Power devices installed for the sole benefit of a retail customer(s) and supersedes the more general Inclusion I5 (Static or Dynamic Reactive Power Devices). Reactive Power devices installed for the sole benefit of a retail customer are, by definition, not required for operation of the interconnected transmission system.
- Exclusion E3 (Local Networks) provides for the exclusion of local networks that meet the specific criteria identified in the exclusion language. Exclusion E3 does not allow for the exclusion of Real Power and Reactive Power resources captured by Inclusions I2 through I5. In instances where a transformer (under Inclusion I1) is an Element of a local network (under Exclusion E3), the transformer would be excluded pursuant to Exclusion E3. Exclusion E3 may not be used to exclude transmission Elements (captured by the core definition and Inclusion I1) when Real Power resources are present that are captured by Inclusion I2, I3, or I4. This assures that interconnection facilities for BES generators are not excluded.
- Exclusion E1 (Radial Systems) provides for the exclusion of ‘transmission Elements’ from radial systems that meet the specific criteria identified in the exclusion language. Exclusion E1 does not allow for the exclusion of Real Power and Reactive Power resources captured by Inclusions I2 through I5. In instances where a transformer (under Inclusion I1) is an Element of a radial system (under Exclusion E1), the transformer would be excluded pursuant to Exclusion E1. Exclusion E1 may not be used to exclude transmission Elements (captured by the core definition and Inclusion I1) when Real Power resources are present that are captured by Inclusion I2, I3, or I4. This assures that interconnection facilities for BES generators are not excluded.

Merely applying the core Definition, and the Inclusions or Exclusions is not necessarily the end of the inquiry regarding whether an Element is part of the BES as entities may seek a case-specific exception.

NERC will continue to work with industry regarding the application of the BES Definition. As explained herein, the proposed BES Definition is a significant improvement that is technically supported and satisfies FERC’s directives in Order Nos. 773 and 773-A. The

proposed BES Definition is consistent, repeatable, and verifiable and will provide clarity that will assist NERC and affected entities in implementing Reliability Standards.

Respectfully submitted,

*/s/ Stacey Tyrewala*

Charles A. Berardesco  
Senior Vice President and General Counsel  
Holly A. Hawkins  
Associate General Counsel  
Stacey Tyrewala  
Senior Counsel  
North American Electric Reliability  
Corporation  
1325 G Street, N.W., Suite 600  
Washington, D.C. 20005  
(202) 400-3000  
(202) 644-8099 – facsimile  
[charlie.berardesco@nerc.net](mailto:charlie.berardesco@nerc.net)  
[holly.hawkins@nerc.net](mailto:holly.hawkins@nerc.net)  
[stacey.tyrewala@nerc.net](mailto:stacey.tyrewala@nerc.net)

*Counsel for the North American Electric  
Reliability Corporation*

**Date: May 6, 2014**

**Exhibits A – F**

**(Available on the NERC Website at**

[http://www.nerc.com/FilingsOrders/ca/Canadian%20Filings%20and%20Orders%20DL/Attachments\\_BE  
S\\_Definition\\_filing.pdf](http://www.nerc.com/FilingsOrders/ca/Canadian%20Filings%20and%20Orders%20DL/Attachments_BE_S_Definition_filing.pdf))