
**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

**North American Electric Reliability
Corporation**

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Docket No. _____

**PETITION OF THE
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION
FOR APPROVAL OF PROPOSED RELIABILITY STANDARD
FAC-003-4**

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Pursuant to Section 215(d)(1) of the Federal Power Act (“FPA”)¹ and Section 39.5 of the regulations of the Federal Energy Regulatory Commission (“FERC” or “Commission”),² the North American Electric Reliability Corporation (“NERC”)³ hereby requests Commission approval of proposed Reliability Standard FAC-003-4 (*Transmission Vegetation Management*) (Exhibit A), the associated Implementation Plan (Exhibit B), and retirement of currently-effective Reliability Standard FAC-003-3. Proposed Reliability Standard FAC-003-4 will apply the same Violation Risk Factors (“VRFs”) and Violation Severity Levels (“VSLs”) as applicable to currently effective Reliability Standard FAC-003-3. Therefore, this Petition does not include a separate justification for the VRFs and VSLs. This Petition also attaches copies of those Electric Power Research Institute (“EPRI”) reports (Exhibit E), which led to the revisions proposed in Reliability Standard FAC-003-4. The NERC Board of Trustees adopted proposed Reliability Standard FAC-003-4 on February 11, 2016.

NERC requests that the Commission approve proposed Reliability Standard FAC-003-4, as just, reasonable, not unduly discriminatory or preferential, and in the public interest. NERC also requests that the Commission accept the proposed Implementation Plan and retirement of

¹ 16 U.S.C. § 824o (2012).

² 18 C.F.R. § 39.5 (2014).

³ The Commission certified NERC as the electric reliability organization (“ERO”) in accordance with Section 215 of the FPA on July 20, 2006. *N. Am. Elec. Reliability Corp.*, 116 FERC ¶ 61,062 (2006).

Reliability Standard FAC-003-3 effective the first day of the first calendar quarter that is three months after the effective date of the Commission’s order approving the standard. On this effective date, proposed Reliability Standard FAC-003-4 will supersede and replace FAC-003-3.

As required by Section 39.5(a) of the Commission’s regulations,⁴ this Petition presents the technical basis and purpose of proposed Reliability Standard FAC-003-4, a summary of the development history (Exhibit F), and a demonstration that the proposed Reliability Standard meets the criteria identified by the Commission in Order No. 672 (Exhibit C).⁵

I. EXECUTIVE SUMMARY

The purpose of proposed Reliability Standard FAC-003-4 is to require entities to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW to reduce the risk of vegetation-related outages that could lead to Cascading. Proposed Reliability Standard FAC-003-4 reflects revisions developed under Project 2010-07.1 Vegetation Management to provide a revised gap factor applied in the Gallet equation supporting the appropriate Alternating Current Minimum Vegetation Clearance Distances (referred to herein as “MVCD values”) stated under the Reliability Standard.⁶ The MVCD value reflects the minimum distance between vegetation and conductors to prevent a flash-over. This revised gap factor was developed as a result of the 2015 Technical Report prepared by EPRI entitled *Supplemental Testing to Confirm or Refine Gap Factor Utilized in Calculation of Minimum Vegetation Clearance Distances (“MVCD”): Tests: Results and*

⁴ 18 C.F.R. § 39.5(a) (2014).

⁵ The Commission specified in Order No. 672 certain general factors it would consider when assessing whether a particular Reliability Standard is just and reasonable. *See Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards*, Order No. 672, FERC Stats. & Regs. ¶ 31,204, at PP 262, 321-37, *order on reh’g*, Order No. 672-A, FERC Stats. & Regs. ¶ 31,212 (2006).

⁶ Non-substantive edits are also included for the standard.

Analysis (“EPRI Report”),⁷ filed at the Commission in Docket No. RM12-4-000 in compliance with the Commission’s directive in Order No. 777.⁸ The EPRI Report, the preliminary report preceding it, and EPRI’s recent update to the EPRI Report filed in Docket No. RM12-4-000 are attached at Exhibit E.

As reflected in this Petition and the attached exhibits, the EPRI test results indicated that MVCD values under currently effective Reliability Standard FAC-003-3 might not be suitable or sufficiently conservative in all situations. The EPRI testing revealed that the gap factor used to determine those MVCD values under the Gallet equation was too high for all situations with varying tree and conductor configurations. The gap factor is a multiplier that adjusts MVCD values for different configurations of vegetation and conductors to avoid flashover (a lower gap factor correlates to higher MVCD values). The EPRI tests thus led to the conclusion that MVCD values under existing Reliability Standard FAC-003-4 appeared low. The EPRI test results demonstrated the Gallet equation should apply a more conservative, lower, gap factor of 1.0 to calculate MVCD values for Reliability Standard FAC-003-4. Proposed Reliability Standard FAC-003-4, therefore proposes higher and more conservative MVCD values. These higher MVCD values will enhance reliability and provide additional confidence by applying a more conservative approach to determining the vegetation clearing distances.

⁷ *North American Electric Reliability Corporation submits Electric Power Research Institute 2015 Technical Report*, Docket No. RM12-4-002 (filed Aug. 12, 2015) (attaching the EPRI Report, as attachment 1).

⁸ *See Revisions to Reliability Standard for Transmission Vegetation Management*, Order No. 777, 142 FERC ¶ 61,208, at P 59 (2013) (stating, “direct NERC to conduct or contract testing to develop empirical data regarding the flashover distances between conductors and vegetation.... A statistical analysis would then evaluate the test results and provide empirical evidence to support an appropriate gap factor to be applied in calculating minimum clearance distances using the Gallet equation”); and *North American Electric Reliability Corporation submits Electric Power Research Institute 2015 Technical Report*, Docket No. RM12-4-002 (filed Aug. 12, 2015) (“EPRI Report”). Unless otherwise designated, capitalized terms shall have the meaning set forth in the *Glossary of Terms Used in NERC Reliability Standards* (“NERC Glossary of Terms”), available at http://www.nerc.com/files/Glossary_of_Terms.pdf.

This Petition accomplishes NERC's stated intention, in submitting the EPRI Report, to initiate a Standards Authorization Request to adjust the MVCD values in the Reliability Standard to reflect the results of the EPRI Report.⁹ NERC respectfully requests that the Commission approve proposed Reliability Standard FAC-003-4 and the associated Implementation Plan as just, reasonable, not unduly discriminatory or preferential, and in the public interest.

II. NOTICES AND COMMUNICATIONS

Notices and communications with respect to this filing may be addressed to:¹⁰

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III. BACKGROUND

A. Regulatory Framework

By enacting the Energy Policy Act of 2005,¹¹ Congress entrusted the Commission with the duties of approving and enforcing rules to ensure the reliability of the Nation's Bulk-Power System, and with the duties of certifying an ERO that would be charged with developing and

⁹ See, *supra* n. [7], at attachment 2, NERC Summary *FAC-003-3 Minimum Vegetation Clearance Distances*, at p. 1 (stating, "This final report includes the final gap-factor testing results that will be used to initiate a focused Standard Authorization Request (SAR) to adjust the MVCD values in NERC Reliability Standard FAC-003-3.").

¹⁰ Persons to be included on the Commission's service list are identified by an asterisk. NERC respectfully requests a waiver of Rule 203 of the Commission's regulations, 18 C.F.R. § 385.203 (2014), to allow the inclusion of more than two persons on the service list in this proceeding.

¹¹ 16 U.S.C. § 824o (2012).

enforcing mandatory Reliability Standards, subject to Commission approval. Section 215(b)(1) of the FPA states that all users, owners, and operators of the Bulk-Power System in the United States will be subject to Commission-approved Reliability Standards.¹² Section 215(d)(5) of the FPA authorizes the Commission to order the ERO to submit a new or modified Reliability Standard.¹³ Section 39.5(a) of the Commission’s regulations requires the ERO to file with the Commission for its approval each Reliability Standard that the ERO proposes should become mandatory and enforceable in the United States, and each modification to a Reliability Standard that the ERO proposes should be made effective.¹⁴

The Commission is vested with the regulatory responsibility to approve Reliability Standards that protect the reliability of the Bulk-Power System and to ensure that such Reliability Standards are just, reasonable, not unduly discriminatory or preferential, and in the public interest. Pursuant to Section 215(d)(2) of the FPA¹⁵ and Section 39.5(c) of the Commission’s regulations, “the Commission will give due weight to the technical expertise of the Electric Reliability Organization” with respect to the content of a Reliability Standard.¹⁶

B. NERC Reliability Standards Development Procedure

The proposed Reliability Standard was developed in an open and fair manner and in accordance with the Commission-approved Reliability Standard development process.¹⁷ NERC

¹² *Id.* § 824o(b)(1).

¹³ *Id.* § 824o(d)(5).

¹⁴ 18 C.F.R. § 39.5(a).

¹⁵ 16 U.S.C. § 824o(d)(2).

¹⁶ 18 C.F.R. § 39.5(c)(1).

¹⁷ *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards*, Order No. 672 at P 334, FERC Stats. & Regs. ¶ 31,204, *order on reh’g*, Order No. 672-A, FERC Stats. & Regs. ¶ 31,212 (2006) (“Further, in considering whether a proposed Reliability Standard meets the legal standard of review, we will entertain comments about whether the ERO implemented its Commission-approved Reliability Standard development process for the development of the particular proposed Reliability Standard in a proper manner, especially whether the process was open and fair. However, we caution that we will not be sympathetic to arguments by interested parties that choose,

develops Reliability Standards in accordance with Section 300 (Reliability Standards Development) of its Rules of Procedure and the NERC Standard Processes Manual.¹⁸

In its order certifying NERC as the Commission's ERO, the Commission found that 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,¹⁹ and thus satisfy certain of the criteria for approving Reliability Standards.²⁰ 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 stakeholders must approve, and the NERC Board of Trustees must adopt a Reliability Standard before the Reliability Standard is submitted to the Commission for approval.

C. Procedural History of Proposed Reliability Standard FAC-003-4

This section summarizes the development history of proposed Reliability Standard FAC-003-4.

1. History of Reliability Standard FAC-003-4 and Order No. 777

The Commission approved FAC-003-1 in Order No. 693.²¹ Thereafter, on December 21, 2011, NERC filed Reliability Standard FAC-003-2 in Docket No. RM12-4-000 to expand applicability of the Reliability Standard to include overhead transmission lines that are operated below 200 kV, if they are either an element of an Interconnection Reliability Operating Limit or an element of a Major WECC Transfer Path. Reliability Standard FAC-003-2 incorporated a

for whatever reason, not to participate in the ERO's Reliability Standard development process if it is conducted in good faith in accordance with the procedures approved by FERC.").

¹⁸ 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.

¹⁹ *N. Am. Elec. Reliability Corp.*, 116 FERC ¶ 61,062 at P 250 (2006).

²⁰ Order No. 672 at PP 268, 270.

²¹ Order No. 693, at P 735.

new minimum annual inspection requirement, and incorporated new minimum vegetation clearance distances into the text of the standard. On March 21, 2013, in Order No. 777, the Commission approved Reliability Standard FAC-003-2.²² In Order No. 777, the Commission stated:

While we approve NERC's use of the Gallet equation to determine the minimum vegetation clearance distances, we believe it is important that NERC develop empirical evidence that either confirms assumptions used in calculating the MVCD values based on the Gallet equation, or gives reason to revisit the Reliability Standard. Accordingly, consistent with the Notice of Proposed Rulemaking (NOPR) proposal, the Commission directs that NERC conduct or contract testing to obtain empirical data and submit a report to the Commission providing the results of the testing.²³

NERC contracted EPRI to assist NERC with performing a collaborative research project, to comply with the Commission's directive. NERC submitted a compliance filing on Order No. 777 on July 12, 2013, which the Commission accepted on September 4, 2013.²⁴

While Reliability Standard FAC-003-2 was pending Commission approval, NERC filed Reliability Standard FAC-003-3 to maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way and minimize encroachments from vegetation located adjacent to the rights of way, thus helping to prevent the risk that vegetation-related outages could lead to Cascading.²⁵ Reliability Standard FAC-003-3 applied a phased-in effective date, to provide Generator Owners with an opportunity

²² *Revisions to Reliability Standard for Transmission Vegetation Management*, Order No. 777, 142 FERC ¶ 61,208 (2013).

²³ Order No. 777, at P 3.

²⁴ *See, Compliance Filing of NERC*, Docket No. RM12-4-001 (filed Jul. 12, 2013); and *N. Am. Elec. Reliability Corp.*, Docket No. RM12-4-001 (Sept. 4, 2013) (unpublished letter order).

²⁵ *Petition of the North American Electric Reliability Corporation for Approval of Proposed Standards FAC-001-1, FAC-003-3, PRC-004-2.1a and PRC-005-1.1b*, Docket No. RM12-16-000 (filed Jul. 30, 2012).

to transition to compliance with the standard.²⁶ On September 19, 2013, in Order No. 785, the Commission approved Reliability Standard FAC-003-3.²⁷

Throughout this time, NERC continued working with stakeholders and EPRI to develop empirical data regarding flashover distances between conductors and vegetation to calculate MVCD values. On July 31, 2014, NERC submitted an informational filing to provide an interim status update on NERC's activities.²⁸ NERC's interim status update explained that, consistent with NERC's earlier 2013 compliance filing, NERC's primary objective under this project was to determine the appropriate gap factor for use in the Gallet equation. Preliminary results in 2014 indicated that the gap factor should be adjusted from 1.3 to 1.0, to result in MVCD values that are higher than those in the currently effective standard.²⁹

2. **Project 2010-07.1 Vegetation Management and EPRI Report**

In 2015, NERC worked with EPRI to finalize gap factor verification. On August 12, 2015, NERC submitted the final EPRI Report reflecting the final results of this gap-factor testing.³⁰ Exhibit E reflects the EPRI Report and a preliminary report, which later culminated in the EPRI Report. Exhibit E also includes an update prepared by EPRI in anticipation of this Petition. The results of the EPRI Report and testing confirmed the preliminary results identified

²⁶ *Id.* at pp. 23-24.

²⁷ *Generator Requirements at the Transmission Interface*, Order No. 785, 144 FERC ¶ 61,221 (2013).

²⁸ *Informational Filing of the North American Electric Reliability Corporation*, Docket Nos. RM12-4-000 et. al. (filed Jul. 31, 2014).

²⁹ *Id.* at pp. 2-3. *See also, id.* at n. 4 (explaining that the Gallet equation is an accepted method for calculating the air gap required between a conductor and a transmission line tower (*i.e.*, the grounded object) to avoid flashover. The Gallet equation is used to calculate the minimum air gap that could exist between a conductor and vegetation (conductor-to-vegetation gap) to avoid a flashover. This calculated minimum conductor-to-vegetation gap would then be used to set the MVCD values. The Gallet equation is particularly useful as it works for a variety of conductor-to-vegetation gap configurations. The conductor-to-vegetation gap configuration may consist of the conductor being located vertically above and horizontally to the side of the vegetation in concern, or any combination thereof.).

³⁰ *North American Electric Reliability Corporation submits Electric Power Research Institute 2015 Technical Report*, Docket No. RM12-4-002 (filed Aug. 12, 2015) (attaching the EPRI Report, as attachment 1)

in 2014 and resulted in NERC Project 2010-07.1 Vegetation Management. That project resulted in this Petition with revised MVCD values that have been calculated using the revised gap factor.

IV. JUSTIFICATION FOR APPROVAL

As discussed below and in Exhibit C, proposed Reliability Standard FAC-003-4 satisfies the Commission's criteria in Order No. 672 and is just, reasonable, not unduly discriminatory or preferential, and in the public interest. The proposed Reliability Standard is also consistent with the Commission's directive in Order No. 777, that the standard apply MVCD values supported by empirical data. The following subsections provide: (A) a description of the proposed standard, its reliability purposes, and applicable entities; (B) justification for the proposed Reliability Standard, detailing the proposed revisions; and (C) discussion of the enforceability of the proposed Reliability Standard.

A. Proposed Reliability Standard FAC-003-4 and Applicable Entities

The purpose of proposed Reliability Standard FAC-003-4 is “[t]o maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation-related outages that could lead to Cascading.”

The standard applies to Applicable Transmission Owners and Applicable Generator Owners. These are the same entities currently subject to Reliability Standard FAC-003-3. The Reliability Standard establishes Applicable Transmission Owners and Applicable Generator Owners as follows:

- Applicable Transmission Owners are Transmission Owners that own the following Transmission Facilities defined in Section 4.2 of the Reliability Standard:

- 4.2. Facilities: Defined below (referred to as “applicable lines”), including but not limited to those that cross lands owned by federal , state, provincial, public, private, or tribal entities:
 - 4.2.1. Each overhead transmission line operated at 200kV or higher.
 - 4.2.2. Each overhead transmission line operated below 200kV identified as an element of an IROL under NERC Standard FAC-014 by the Planning Authority.³¹
 - 4.2.3. Each overhead transmission line operated below 200 kV identified as an element of a Major WECC Transfer Path in the Bulk Electric System by WECC.
 - 4.2.4. Each overhead transmission line identified above (4.2.1 through 4.2.3) located outside the fenced area of the switchyard, station or substation and any portion of the span of the transmission line that is crossing the substation fence
- Applicable Generator Owners are Generator Owners that own the following generation Facilities defined in Section 4.3 of the Reliability Standard:
 - 4.3. Generation Facilities: Defined below (referred to as “applicable lines”), including but not limited to those that cross lands owned by federal , state, provincial, public, private, or tribal entities:
 - 4.3.1. Overhead transmission lines that (1) extend greater than one mile or 1.609 kilometers beyond the fenced area of the generating station switchyard to the point of interconnection with a Transmission Owner’s Facility or (2) do not have a clear line of sight from the generating station switchyard fence to the point of interconnection with a Transmission Owner’s Facility and are:
 - 4.3.1.1. Operated at 200kV or higher; or
 - 4.3.1.2. Operated below 200kV identified as an element of an IROL under NERC Standard FAC-014 by the Planning Authority; or
 - 4.3.1.3. Operated below 200 kV identified as an element of a Major WECC Transfer Path in the Bulk Electric System by WECC.

B. Justification for Proposed Reliability Standard FAC-003-4 and Revisions

The proposed Reliability Standard is updated in order to reflect the revised MVCD values, as adjusted for the revised, lower, gap factor reflected in the EPRI Report, and to reflect

³¹ Non-substantive edits included updating the Reliability Standard and Implementation Plan to the current Results-Based template for Reliability Standards. Apart from the Reliability Standard, the Standard Drafting Team took the opportunity to update the information Guideline and Technical Basis for the proposed Reliability Standard.

certain non-substantive edits to bring the Reliability Standard into conformity with more recently developed Reliability Standards. The gap factor is a multiplier within the Gallet equation, which adjusts the MVCD values required for different configurations of objects and conductors.³² A lower gap factor, for example, correlates with a higher MVCD values and a higher gap factor correlates to a lower MVCD values.

In particular, the EPRI testing (i) determined the switching impulse strength of the air gap between a conductor and natural trees, (ii) validated the revision of the gap factor to 1.0, and (iii) determined the proper MCVD values for Reliability Standard FAC-003.³³ As planned when NERC submitted the EPRI Report, the EPRI test results led to a Standards Authorization Request to adjust MVCD values in Reliability Standard FAC-003-4, for submission to the Commission by the end of the first quarter of 2016.³⁴ Since that time, NERC has worked with industry to develop proposed Reliability Standard FAC-003-4, by updating Table 2 of the standard to reflect the results of the EPRI Report and make non- substantive edits. The proposed Reliability Standard is intended to replace and retire Reliability Standard FAC-003-3, consistent with the Implementation Plan.

The revisions described herein and reflected at Table 2 of FAC-003-4 are reflected in Exhibit A.³⁵ Table 2 was also moved out of the Guideline and Technical Basis document for

³² As the Standard Drafting Team discussed in Exhibit D, “The ‘*Transmission Vegetation Management NERC Standard FAC-003-2 Technical Reference*’ states that the probability of an air gap flashover between a conductor and a tree at MVCDs is 10-6; however, [the Standard Drafting Team] have been unsuccessful in confirming the assumptions associated with the statement. Based on [the Standard Drafting Team] best understanding of the approach developed by the original authors, [the Standard Drafting Team] have used accepted methodology to provide an estimate. The resulting calculated risk of a flashover is 2.49 X 10-4, based on a probability of flashover of 0.135% at MVCD and a transient overvoltage that has a 2% probability of exceeding the defined levels. This equates to less than one flashover across MVCDs per 4000 switching surges.” *See*, Exhibit D, at p. 5 (internal citations omitted).

³³ *See* Exhibit E and Exhibit D (including the EPRI analyses and Standard Drafting Team summary review).

³⁴ *Id.* at Transmittal.

³⁵ *See* Exhibit A for full redline.

clarity. The modifications to Table 2 will require responsible entities to implement MVCD values that reflect the appropriate gap factor resulting from the empirical data and analysis summarized in the EPRI Report. In addition, based on feedback received from the advisory group,³⁶ the Standard Drafting Team added MVCD values up to 15,000 feet (4,267 meters).³⁷ These changes to Table 2 are the only substantive changes made to the currently effective version of the Reliability Standard.

C. Enforceability of Proposed Reliability Standard FAC-003-4

The proposed Reliability Standard includes Measures that support each Requirement to help ensure that the Requirements will be enforced in a clear, consistent, non-preferential manner and without prejudice to any party. The proposed Reliability Standard also includes VRFs and VSLs for each Requirement. The VSLs and VRFs are part of several elements used to determine an appropriate sanction when the associated Requirement is violated. The VSLs provide guidance on the way that NERC will enforce the Requirements of the proposed Reliability Standards. The VRFs assess the impact to reliability of violating a specific Requirement.

In this Petition, NERC proposes to utilize the same VRFs and VSLs in effect for FAC-003-3 for FAC-004-4. In 2013, the Commission approved these VRFs and VSLs.³⁸ As a result, the VRFs and VSLs for the new Requirements in proposed Reliability Standard comport with NERC and Commission guidelines.

V. EFFECTIVE DATE

NERC respectfully requests that the Commission approve proposed Reliability Standard

³⁶ The advisory group was the team of NERC Staff, arborists, and industry members that assisted in developing the EPRI test plan and scope of work for the EPRI testing.

³⁷ Non-substantive edits included updating the Reliability Standard and Implementation Plan to the current Results-Based template for Reliability Standards. Apart from the Reliability Standard, the Standard Drafting Team took the opportunity to update the information Guideline and Technical Basis for the proposed Reliability Standard.

³⁸ See, Order No. 785, at P 1.

FAC-003-4 effective on the first day of the first calendar quarter that is three months after the effective date of the Commission's order approving the standard. In addition, NERC requests retirement of Reliability Standard FAC-003-3. Reliability Standard FAC-003-4 will replace and supersede currently-effective Reliability Standard FAC-003-3.

VI. CONCLUSION

For the reasons set forth above, NERC respectfully requests that the Commission approve (i) proposed Reliability Standard FAC-003-4 as reflected in Exhibit A; (ii) the Implementation Plan included in Exhibit B; and (iii) the retirement of currently-effective Reliability Standard FAC-003-3.

Respectfully submitted,

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