FAC-003-3 Compliance Using a Defined ROW Width

By William Porter, Director of Consulting Services

Clients and Transmission Owners:

“According to the North American Electric Reliability Corporation (NERC) Auditors will be able to request supporting information used to set the width of the right-of-way (ROW), including any of the available information listed in the (ROW) definition” (FERC Order 777, 2013, p.55-para.107).

Introduction

It has been brought to CNUC’s attention by sources close to the Federal Energy Regulatory Commission (FERC) and NERC that NERC auditors will be requesting documentation of the methodology for determining ROW width. CNUC recommends the following actions related to ROW width to ensure continued compliance under the newly adopted FAC-003-3:

- Have vegetation managers and compliance managers verify there are written documents that define ROW widths for all FAC-003-3 applicable lines and that these documents are consistent with the NERC definition of ROW
- Include ROW width measurements and whether target trees are on or off the ROW in transmission line inspection documents
- Establish a policy to identify conditions off-ROW that are within your control
- Maintain records of off-ROW inspections including documentation of conditions and the actions taken to reduce the risk of outages caused by off-ROW trees
- Establish a policy/policies for all vegetation within the boundaries of the ROW to prevent encroachments of the minimum vegetation clearance distance (MVCD)
- Maintain records of locations that are exceptions to on-ROW policies and the actions taken to prevent MVCD violations

Utility companies must be able to provide NERC and regional regulator authorities with compliant evidence of how their ROW widths are determined. These documents should be on a case by case basis where there is variability and they should be reflective of engineering or construction specifications.

Facts about Transmission ROW Widths in North America

To put the magnitude and complexity of ROW dimensions in context, the following may be of value to the reader. CNUC performed a study of ROW widths in the U.S. and the following is a list of conclusions from that study. The source of the information is at the end of each finding.

1. ROW widths vary considerably. – CNUC Benchmark
2. 100 feet was the width reported by the largest number of companies. – CNUC Benchmark
3. A majority of ROW widths are 100 feet or less, given about 60% of transmission miles in North America are under 200kV. – CNUC Benchmark
4. More than 30% of companies reported their FAC-003 regulated 230kV lines have 100 foot ROW width. This percent may have increased due to the number of transmission upgrades on sub-200kV lines. – CNUC Benchmark
5. 230kV is the FAC-003 regulated transmission voltage reported by the largest number of companies. – CNUC Benchmark
6. The standard for 230kV is apparently 150 feet, according to the NERC Vegetation Management Standard Drafting Team. – Draft 4 FAC-003-2 2010
7. In an Argonne National Laboratory Report, 40 companies reported 230kV ROW less than 75 feet. – Argonne National Laboratory 2007
8. For most companies, newly planted trees are not addressed until they are an issue. – CNUC Benchmark
9. ROW widths should be based on more variables besides voltage. – CNUC 2004 Final Report to FERC
10. Restrictive easement agreements can place higher risk burdens on utility companies. – CNUC 2004 Final Report to FERC
11. The lowest National Electrical Safety Code (NESC) required conductor height to ground surface below for 500kV is in pedestrian only areas –24 feet. PPL Electric Utilities requires more than double this amount. – PPL Report
12. Going by the standard minimum vertical clearances for conductors, the potential for tree fall-in hazards is greater in areas where only pedestrians can traverse than where trains or vehicles pass. – CNUC Analysis

In Order 777, FERC determined filings by NERC that pertain to FAC-003-2 must be consolidated and made available along with the standard on the NERC website (FERC Order 777, #90 p. 47). The following documents referenced in this discussion can be found on the NERC website:

- Comments of NERC in Response to FERC NOPR to adopt FAC-003-2 (NERC 2012)
- Final Order 777 in which FERC adopts FAC-003-2 (FERC 2013)
- NERC Petition to FERC to seek approval of FAC-003-2 and the three proposed definitions of Right-of-Way, Vegetation Inspection and Minimum Vegetation Clearance Distance (MVCD). (NERC, December 21, 2011)
- FERC Order 693 Final Rule Adopting Mandatory Reliability Standards for the Bulk Electric System (FERC, March 16, 2007)
Transmission Row Definitions

ROW definition mandated by paragraph 734 from FERC Order 693

The remainder of this article focuses on how the ROW definition affects the implementation of FAC-003-3 and the potential interpretations that may be applied by NERC auditors and industry practitioners. There are several points to consider that support the above recommendations, which can strengthen program compliance and prepare for regulatory oversight in the future. The discussion begins with the question, why did NERC and FERC decide the ROW definition was necessary?

In 2007, FERC Order 693 made 88 NERC Reliability standards mandatory and enforceable. One of the reliability standards adopted by Order 693 was the first national utility vegetation management standard – FAC-003-1. This mandatory standard was crafted and approved after more than 100 years of overhead electric ROW management for which there wasn't any national or international standard. A precedent for such a standard was the state of New York's rule for transmission vegetation management adopted in 1980 (16 NYCRR Part 84). FAC-003 is a watershed moment in the history of electricity and modern arboriculture. It marks a moment when infrastructure ROW is being elevated to a global purpose; a narrow strip of land that is as important as the transmission lines that occupy its space.

In Order 693 FERC acknowledged that more standards were needed and some standards would need revisions. Several items in FAC-003-1 were found to be insufficient by FERC and FERC ordered NERC to make corrections through a revision process. One of the issues requiring a revision was the definition of ROW. Paragraph 734 of Order 693 acknowledges that the vegetation management necessary for safeguarding the reliability of the North American grid may not be encompassed in existing legal rights. Although the following statement is clear in saying legal rights for vegetation management may go beyond what is necessary for reliability, it implies the opposite may also be true. There may be situations where companies do not have the legal right to perform appropriate vegetation management, such as to remove a tree endangering the bulk electric system. FERC agreed with the industry (FirstEnergy) and required NERC to define what the ROW is so that everyone would be clear in compliance with the law.

734. FirstEnergy suggests that rights-of-way be defined to encompass the required clearance areas instead of the corresponding legal rights, and that the standards should not require clearing the entire right-of-way when the required clearance for an existing line does not take up the entire right-of-way. The Commission believes this suggestion is reasonable and should be addressed by the ERO. Accordingly, the Commission directs the ERO to address this suggestion in the Reliability Standards development process. (FERC Order 693, 2006)
ROW Definition Interpreted by FERC and NERC

After approximately seven years of living under FAC-003-1, in 2014 FERC and NERC finally revised the standard and added a new definition of the ROW. However, this definition goes beyond what FirstEnergy initially requested.

The revised standard, FAC-003-3, now requires utilities to have a defined ROW width that is supported by engineering requirements and compliance to the standard may involve both on-ROW and off-ROW vegetation. To ensure reliability, the standard could not limit compliance activities to a defined ROW width or space, such as what FirstEnergy had suggested. In FAC-003-3, FERC and NERC have crafted the compliance requirements so that some parts of the standard apply to trees in the ROW space and some apply to trees outside the ROW space. In other words, if you are on the defined ROW you must comply with the Minimum Vegetation Clearance Distance, regardless of any circumstances (other than certain exceptions). If you are off the ROW, there are requirements but they are more complex and some of them not as clear.

In order for on- and off-ROW requirements to be enforceable, you must know the ROW boundaries and they must be determined in a specific way. In early drafts of FAC-003-2, the standards drafting team made it clear that utilities were only responsible for vegetation growing in the space that they defined as the ROW. However, FERC became suspicious that reliability may be compromised by the self-interest of utilities. Consequently, in FERC’s Notice of Proposed Rulemaking (NOPR) to adopt FAC-003-2, it was suggested that transmission owners (TO) would be inclined to arbitrarily narrow ROW widths to reduce their risk of non-compliance.

On December 21, 2012, NERC filed an official response to FERC’s NOPR to adopt FAC-003-2. In this document, NERC responded to FERC’s concern over ROW width being set for self-interest. NERC declared that vegetation growing into the MVCD is a violation regardless of ROW width. NERC also stated that fall-ins and blow-ins that occur from outside the ROW are not a violation of the MVCD as defined in R1 and R2. (NERC 2012 p.16-17). In this same passage NERC also stated that:

For the remaining encroachments due to “fall-ins” or “blow-ins,” the Transmission Owner still must have robust vegetation management practices in place and implement them effectively to properly manage danger timber outside of the Right-of-Way, but within the Transmission Owner’s control, to ensure no encroachments occur. Otherwise, the Transmission Owner risks violating Requirements R6 and R7 of FAC-003-2, as described in response to P 101 of the NOPR below. (NERC 2012 p. 17)

NERC also stated that public scrutiny of a sustained outage provides incentive for TOs to properly set ROW widths to ensure there is sufficient land to operate a transmission line. The bottom line is that the ROW width must meet the ROW definition that NERC proposed and FERC approved in 2013. The ROW
definition specifies the application of engineering or construction standards, even if the only evidence of the engineering specifications is a pre-2007 vegetation management document.

Once utilities have selected the method of determining ROW width and all applicable circuits have been assigned a proper and legal width, then compliance becomes easier, at least for on-ROW vegetation. However, when considering management options for off-ROW, compliance to FAC-003-3 is far less clear and may potentially raise a question of interpretation. The phrase "within the transmission owners control" found in the standard and in interpretive documents is the operative word for off-ROW management, but is somewhat ambiguous. For example, legal channels are an available option when a utility needs to remove or prune a tree for the purpose of safety and electric reliability. What is within a utility’s control can easily extend beyond the language of easements and defined ROW widths. Utilities have won lawsuits in courts for removing trees where no easement language exists. In most cases, a utility needs only to ask for permission to gain the legal right to prune a tree.

FERC and NERC address the gray area of what is within the utility’s control in their interpretations of off-ROW requirements, but a future FAC-003 revision may be needed to further clarify the requirements for managing off-ROW vegetation. Depending on which passage in FERC Order 777 is cited, the off-ROW area under the control of the transmission owner is either “in” the legal ROW or it is some unspecified area beyond the legal ROW. For example, the following statement is from paragraph 113 of Order 777:

113. In the NOPR, the Commission agreed with NERC that fall-ins of green or healthy trees outside the corridor-based right-of-way, but within the right-of-way controlled by the transmission owner, would not violate FAC-003-2.

The preceding statement suggests there is indeed a finite width for which the TO is responsible that delineates on-ROW and off-ROW. However, FERC and NERC are also very explicit in stating there are compliance responsibilities that exist off-ROW. In the FERC approved definition of Vegetation Inspection, it states:

118. Commission Determination: …NERC defines the term “Vegetation Inspection” as “[t]he systematic examination of vegetation conditions on a Right-of-Way and those vegetation conditions under the Transmission Owner’s control that are likely to pose a hazard to the line(s) prior to the next planned maintenance or inspection.

Again the phrase “under the transmission owner’s control” suggests that off-ROW requirements could be interpreted in various ways. Some stakeholders may assert the only vegetation that is within the utility’s control are trees within the legal easement area. That approach may be more risky both for reliability and for compliance. Although the definition of Vegetation Inspections is not specific about what is a TO’s control, it definitely requires transmission owners to perform a systematic examination of off-ROW hazard trees. It is reasonable to conclude that this would encompass some border zones that contain off-ROW and off-easement trees that are a threat to the line. CNUC recommends specific off-
ROW vegetation conditions should fall within the transmission owners’ requirements for a systematic vegetation inspection. Additionally, FERC and NERC agree that inspections alone are not enough. Appropriate follow-up work covered by an annual plan is required. Paragraph 119 describes what the auditor will be examining:

119. Thus, the fall-in of danger tree from outside the defined right-of-way but within a transmission owner’s control would likely merit examination to determine whether the transmission owner is properly conducting the annual Vegetation Inspection as required by Requirement R6 and performing the annual work plan as required by Requirement R7. In this context, we find the explanation of NERC and other commenters informative that it is not sufficient for a transmission owner simply to demonstrate that it identifies danger trees and has a program for managing the risk of fall-in. Rather, a transmission owner must have a well-managed, danger tree management program as carried out through Requirements R6 and R7. (FERC Order 777 #119pp 61-62.)

The degree of transmission owner control is debatable and it could be tested at some time in the future. Danger trees are identified in American National Standards Institute (ANSI) A300 as trees off-ROW with a probability of falling into conductors. The following statement provides guidance for ambivalence about managing off-ROW trees and it is referenced by FERC in paragraph 119. The statement is from the “Guideline and Technical Basis”, which is contained in FAC-003-3:

“In general, the vegetation management maintenance approach should use the full extent of the applicable Transmission Owner’s or applicable Generator Owner’s easement, fee simple and other legal rights allowed.” (FAC-003-3 2015)

Other legal rights could simply be getting a property owner’s permission to prune or remove an off-ROW tree.

NERC auditors will expect to see inspection and maintenance records. Annual inspection records and follow-up inspections on higher risk off-ROW or off easement locations with an annual plan to remove the high-risk trees is a safe management practice. Obviously, if imminent threats are found during the inspections, they require action to prevent an unplanned outage regardless of whether the tree is on or off the legal easement.

The ROW Definition as Viewed in the Context of FAC-003-3

The following NERC statement made in response to the FERC NOPR further clarifies the official ROW definition:
“To determine the width needed to operate a transmission line and define its Right-of-Way to meet engineering or construction standards, Transmission Owners currently calculate the blowout of the line and then add a spark over distance. The Transmission Owner would also consider the land use adjacent to the Right-of-Way and determine whether any additional width is necessary. The revised definition of Right-of-Way would require the width of the Right-of-Way to be based on construction documents, pre-2007 vegetation maintenance records, or as-built blow-out standards. Construction documents would show the initial cleared width for the transmission line marked on drawings. Pre-2007 vegetation maintenance records are included in the revised definition so that in absence of a width provided in construction or engineering documents, the width can be set using evidence in maintenance records for a width that was in fact maintained prior to the FAC-003 Reliability Standard becoming mandatory. This information could be found in either inspection documents or bid documents for the transmission line.” (NERC 2012 p, 21).

Although the preceding discussion by NERC was written prior to the approval of FAC-003-3, it is a reference documents that is material to the understanding of the standard. In an earlier document before FERC had considered the problem of ROW width, NERC revealed their opinion of why the ROW had to be defined. This document called, Transmission Vegetation Management Standard FAC-003-2: Technical Reference (NERC Sept. 30, 2011, p. 12) defined Right-of-Way (ROW) as it is defined by NERC today and explained how the glossary definition was modified to address issues identified in paragraph 734 of Order 693:

NERC Definition of Right-of-Way (2015)
The corridor of land under a transmission line(s) needed to operate the line(s). The width of the corridor is established by engineering or construction standards as documented in either construction documents, pre-2007 vegetation maintenance records, or by the blowout standard in effect when the line was built. The ROW width in no case exceeds the Transmission Owner’s legal rights but may be less based on the aforementioned criteria.

Purpose of ROW Definition
The current NERC glossary definition of Right of Way has been modified to address the matter set forth in Paragraph 734 of FERC Order 693. The Order pointed out that Transmission Owners may in some cases own more property or rights than are needed to reliably operate transmission lines. This modified definition represents a slight but significant departure from the strict legal definition of “right of way” in that this definition is based on engineering and construction considerations that establish the width of a corridor from a technical basis. The pre-2007 maintenance records are included to allow the use of such vegetation widths if there were no engineering or construction standards that referenced the width of right of way to be maintained for vegetation on a particular line but the evidence exists in maintenance records for a width that was in fact maintained prior to this standard becoming mandatory. Such widths may be the only information available for lines that had limited or no vegetation easement rights and
were typically maintained primarily to ensure public safety. This standard does not require additional easement rights to be purchased to satisfy a minimum right of way width that did not exist prior to this standard becoming mandatory.

This definition does not imply that danger tree rights beyond the constructed and maintained width are incorporated in the definition; therefore fall-ins from outside the ROW but within an area with danger tree rights would not be considered fall-ins from within the ROW.

As the preceding statement suggests, the ROW definition serves not only to define the land area that is subject to compliance by inclusion, but it also demarcates a different land area of compliance—off-ROW. This off-ROW area is distinguished not only by its exclusion from the ROW but also by having no set outer boundary, limited utility rights of control, and a more limited application of FAC-003 compliance. Danger tree rights may be specified in some easements but not others. Other state laws and regulations may give the utility the rights that qualify as being on the transmission owner’s control. For off-ROW management of fall-in and blow-in conditions, the MVCD doesn’t apply, but Requirement 7 Annual Inspections and Requirement 8 Annual Plan do apply, as was stated by FERC in Order 777.

The purpose of FAC-003-3 was intended to limit or at least focus the scope of compliance to those off-ROW trees that can “grow” into lines, especially during maximum temperature loading. These trees are the main targets of off-ROW management as opposed to trees that can fall into the lines from outside the ROW during storms, or other force majeure events. However, the purpose of FAC-003-1 was originally thought to include trees that fall into conductors from off-ROW. The stated purpose of FAC-003-3 more clearly excludes off-ROW fall-in trees from the focus of the standard:

**FAC-003-3 Purpose**

To 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. (FAC-003-3)

The drafters of FAC-003-2 and the industry stakeholders attempted to define and limit the scope of the standard by relating compliance to cascading events. It was the industry’s position that trees off the ROW that fall into conductors do not cause cascading events. Wind events that cause trees to fail also cause cooling to the line and reduce line loads. Therefore, it was the opinion of the industry that wind events preclude the possibility of cascading. Cascading is known to occur when transmission lines trip off under maximum load due to extreme summer heat events and air-conditioning use. Note that the first FAC-003 did not specifically identify cascading in the purpose of the standard or in any of the requirements.

Throughout the five years of iterations, the drafting team persisted in its purpose to limit the scope of FAC-003-2 to a defined ROW, thereby rejecting the idea that utilities could somehow have obligations
off the ROW. In other words, by defining the width of the ROW, the team was defining the limits of compliance. This was most explicitly expressed when NERC asked FERC to approve the standard late in 2011. Apparently the exclusion of off-ROW trees is more related to limiting the scope of compliance and liability than any other reason. Otherwise, it wouldn’t be a violation of the MVCD for on-ROW trees that fall into the lines while not being a violation for the same in the case of off-ROW trees. Note that the following passage demonstrates how the standard protects the utility from a violation of the MVCD even when the off-ROW is within the legal rights of the utility.

Similar to FAC-003-1, FAC-003-2 does not require clearing the entire legal limits for a particular parcel of land to ensure reliability. Rather, the standard requires vegetation maintenance to adequately prevent outages from vegetation and requires the Transmission Owner to prevent encroachment within the MVCD in the operational corridor established under the modified ROW definition. This provides the Transmission Owner with flexibility in determining its approach to vegetation management and gives owners the authority to act in the best interest of reliability without mandating any specific strategy (such as clearing the entire width of the ROW). (NERC Petition to FERC for Approval of FAC-003-2 Dec. 2011 p.44)

As it has been demonstrated in this article, FERC didn’t agree with limiting the purpose of FAC-003-2 to preventing cascading events, nor did they believe that cascading or uncontrolled bulk electric system events are limited to lines sagging into conductors during extreme heating days. For this reason the Definition of ROW and the requirements of the standard have been interpreted by FERC to include management of off-ROW risk to the bulk electric system. Although NERC ultimately agreed with FERC on this point, the wording for the purpose of the standard was not amended and FAC-003-3 remains focused on cascading events only. As a result, off-ROW trees cannot be found in violation of the MVCD if there are no parts of the tree that extend into the defined ROW width. This is apparently true if the line can blow out passed the ROW boundary.

A UVM Definition of ROW

The following excerpted discussion states some of the issues with ROW widths from a vegetation management perspective. Although utility vegetation management (UVM) concerns overlap with the current engineering requirements for constructing lines there are issues that vegetation managers are left to struggle with that we often read about in the newspaper when property owners disagree with sound forestry decisions by educated and trained foresters. In the future it is hoped that rules, state and national, are inclusive of the concerns of ROW management from forestry, biological, environmental, and property ownership perspectives.

It appears that many utility companies rely on standard easement widths that are based on voltage, rather than the site-specific conditions. For example, many right-of-way documents state, “the utility shall have the right to adequately maintain the line.” We think such language is inadequate to avoid misunderstandings over the scope of work. Rather, ROW widths should
take into consideration specific factors such as conductor sag and sway, topography and the
mature height of local vegetation, among others. Finally, easement contract wording should be
explicit about the nature of the vegetation work required along the corridor. This would include
specific references to the use of all potential IVM techniques, including herbicides. ("Utility
Vegetation Management Final report", FERC, Cieslewicz, and Novembri, 2004 p. 71-72)

The Future of Off-ROW Management

A discussion about the state of the industry regarding the management of trees to prevent infrastructure
damages and electric interruptions is not the focus of this article but some mention about what the future
holds is important. If there is any ambivalence of purpose and action for on and off-ROW tree risk, it is a
result of conflicts between legal rights and management objectives, between cost and management
objectives, between customer satisfaction and management objectives, and between public opinion and
management objectives. Management objectives are certainly synonymous with compliance to FAC-
003-3. Reported grow-in outages have virtually disappeared on transmission ROWs. Only fall-in risk is
currently a concern. It is too early to tell what effect the new FAC-003-3 will have on fall-in risk from off-
ROW trees. It is important that future FAC-003 revisions are based on the best information that science
offers in order to resolve conflicts not resolved by FAC-003-3. One very important area of science is the
development of special technologies for measuring off-ROW risk.

Making informed decisions about danger trees should be defensible. The liability risks for making an
error in judgment should become less, while the liability risks for doing nothing to remediate danger
trees are likely to become greater. Grow-in outages have been virtually eliminated from the bulk electric
system since FERC adopted FAC-003-1. Nevertheless, outages continue to occur due to off-ROW tree
failures. Regulations will not be able to eliminate off-ROW risk. It would require too many trees to be
removed. It will take time for the science of arboriculture to improve its ability to identify hazard trees and
more time for the regulations to catch up with the science. In Order 777, FERC did not request further
revisions for off-ROW requirements. There will have to be some other compelling driver before NERC
will be likely to tackle grey areas. This could be a fire caused by an off-ROW tree or another massive
storm that dumps many off-ROW trees into transmission lines.

The Suitability of ROW Definitions for Lower Voltages

NERC's defined ROW width and distinctions between on-ROW and off-ROW requirements could be an
even more significant problem if applied to lower voltages with narrower ROWs. If similar rules are
drafted for lower voltage transmission or distribution lines where ROWs are not sufficiently wide to
prevent the majority of outages, then it will be necessary to define what is the extent of 'control'
necessary for off-ROW trees. To what extent are utilities obligated and what liability protections exist for
incidents that occur from off-ROW trees?
For a significant percent of the North American grid, easements do not exist, are out of date, are poorly written, inconsistent and/or highly variable. Even with more recent easements, transmission owner ROW legal rights are complex and variable. The need to define ROW width independent of legal easements implies that there are technical, safety, and reliability considerations that may need to be addressed and are distinctly outside the umbrella of legal easement language.

**Conclusion**

Utility companies must be able to provide NERC and regional regulator authorities with compliant evidence of how their ROW widths are determined. These documents should be on a case by case basis where there is variability and they should be reflective of engineering or construction specifications. If there are still questions about how to determine the ROW width, FERC has stated in Order 777 approving the standard that companies may request assistance from the regional regulatory organization or from NERC. The best management practice for off-ROW UVM is to inspect well on an annual basis and take action on known risks with a high probability of failure before the next cycle of inspection.