

May 28, 2020

**VIA ELECTRONIC FILING**

Ms. Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Re: **NERC Full Notice of Penalty regarding American Electric Power Service Corporation,  
FERC Docket No. NP20-\_-000**

Dear Ms. Bose:

The North American Electric Reliability Corporation (NERC) hereby provides this Notice of Penalty<sup>1</sup> regarding American Electric Power Service Corporation (AEP), NERC Registry ID# NCR00682,<sup>2</sup> with information and details regarding the nature and resolution of the violation<sup>3</sup> discussed in detail in the Settlement Agreement attached hereto, in accordance with the Federal Energy Regulatory Commission's (Commission or FERC) rules, regulations, and orders, as well as NERC's Rules of Procedure including Appendix 4C (NERC Compliance Monitoring and Enforcement Program (CMEP)).<sup>4</sup>

NERC is filing this Notice of Penalty with the Commission because ReliabilityFirst Corporation (ReliabilityFirst) and AEP have entered into a Settlement Agreement to resolve all outstanding issues arising from ReliabilityFirst's determination and findings of one serious risk violation of the Facilities Design, Connections, and Maintenance (FAC) Reliability Standards.

According to the Settlement Agreement, AEP neither admits nor denies the violation, but has agreed to the assessed penalty of one million dollars (\$1,000,000), in addition to other remedies and actions to

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<sup>1</sup> *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards, Order No. 672, 114 FERC ¶ 61,104, order on reh'g, Order No. 672-A, 114 FERC ¶ 61,328 (2006); Notice of New Docket Prefix "NP" for Notices of Penalty Filed by the N. Am. Elec. Reliability Corp., Docket No. RM05-30-000 (February 7, 2008); Mandatory Reliability Standards for the Bulk-Power System, Order No. 693, 118 FERC ¶ 61,218, order on reh'g, Order No. 693-A, 120 FERC ¶ 61,053 (2007).*

<sup>2</sup> AEP was included on the NERC Compliance Registry as a Distribution Provider (DP), Generator Owner (GO), Generator Operator (GOP), Resource Planner (RP), Transmission Owner (TO), and Transmission Operator (TOP) on May 30, 2007; and a Transmission Provider (TP) on June 20, 2018

<sup>3</sup> For purposes of this document, each violation at issue is described as a "violation," regardless of its procedural posture and whether it was a possible, alleged, or confirmed violation.

<sup>4</sup> See 18 C.F.R. § 39.7(c)(2) and 18 C.F.R. § 39.7(d).

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Washington, DC 20005  
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mitigate the instant violation and facilitate future compliance under the terms and conditions of the Settlement Agreement.

**Statement of Findings Underlying the Violation**

This Notice of Penalty incorporates the findings and justifications set forth in the Settlement Agreement, by and between ReliabilityFirst and AEP. The details of the findings and basis for the penalty are set forth in the Settlement Agreement and herein. This Notice of Penalty filing contains the basis for approval of the Settlement Agreement by the NERC Board of Trustees Compliance Committee (NERC BOTCC).

In accordance with Section 39.7 of the Commission’s regulations, 18 C.F.R. § 39.7 (2020), NERC provides the following summary table identifying each violation of a Reliability Standard resolved by the Settlement Agreement. Further information on the subject violation is set forth in the Settlement Agreement and herein.

Violation(s) Determined and Discovery Method								
*SR = Self-Report / SC = Self-Certification / CA = Compliance Audit / SPC = Spot Check / CI = Compliance Investigation								
NERC Violation ID	Standard	Req.	VRF/VSL	Applicable Function(s)	Discovery Method*	Violation Start-End Date	Risk	Penalty Amount
RFC2018020254	FAC-003-4	R2	High/Severe	TO	SR 8/21/2018	6/30/2018- 7/1/2018	Serious	\$1M

AEP is engaged in the generation and transmission of electricity throughout the United States. AEP is one of the nation’s largest generators of electricity, and owns nearly 38,000 MW of generating capacity. AEP also owns the nation’s largest electricity transmission system, a nearly 39,000-mile network that includes more 765 kV extra-high voltage transmission lines than all other U.S. transmission systems combined. AEP’s transmission system directly or indirectly serves approximately ten percent of the electricity in the Eastern Interconnection, the interconnected transmission system that covers 38 eastern and central U.S. states and eastern Canada, and approximately 11 percent of the electricity demand in Electric Reliability Council of Texas, the transmission system that covers much of Texas.

FAC-003-4 R2

On August 21, 2018, AEP submitted a Self-Report stating that as a Transmission Owner (TO), it was in potential violation of FAC-003-4 R2 after discovering that its Kammer-Mountaineer 765 kV circuit tripped and reclosed a single time, and on that same day, the circuit tripped again and locked out for a total

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duration of 28 hours and 17 minutes. Two trees were allowed to grow so close to the transmission line that the electrical current jumped from the transmission line to the trees. The current traveled from the transmission line to the ground, which the relays sensed as a fault and tripped the transmission line out of service.

The root cause of this noncompliance was ineffective program design, as AEP's program design relied on visual cues and professional and historical knowledge to assess the zones where complete clearing was not required, which proved ineffective, as AEP's forestry crews were unable to effectively assess conditions in this specific valley span.

ReliabilityFirst determined that the violation of FAC-003-4 R2 posed a serious and substantial risk to the reliability of the Bulk Power System (BPS). The significant failure revealed weaknesses in internal controls within AEP's Transmission Vegetation Management Program (TVMP) as AEP's inspections of this transmission line were inadequate. The risk posed by this violation is the overloading of other nearby transmission lines, which could result in loss of load and potentially a cascading outage. An unplanned outage of a 765 kV line carries with it the potential to significantly shift the flow of power that could result in potential overloads, loss of load, and cascading outages under different system conditions. However, the operating characteristics and design of AEP's 765 kV transmission system limited the likelihood that this violation would cause instability, uncontrolled separation, or cascading system failures. Specifically, the loading of the 765 kV transmission system typically results in fewer real-time contingency violations than on lower voltage systems. Additionally, AEP's protection system standard for the 765 kV transmission system requires the use of two high-speed protection systems. In this case, the protection system operated as designed, removing the line from service within 2.5 cycles. AEP continuously monitors N-1 contingencies in real time and did not identify any real-time contingencies during this event. AEP and PJM continuously monitor System Operating Limit (SOL) exceedances on adjacent lines and did not observe any adjacent facility exceedances as a result of this event. In this case, load was redistributed and no customer load loss occurred. The attached Settlement Agreement to this filing includes the facts regarding the violation that ReliabilityFirst considered in its risk assessment.

AEP submitted its Mitigation Plan to address the referenced violation. The attached Settlement Agreement includes a description of the mitigation activities AEP took to address this violation. A copy of the Mitigation Plan is included as Attachment B to the Settlement Agreement.

AEP certified that it had completed all mitigation activities.

Regional Entity's Basis for Penalty

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According to the Settlement Agreement, ReliabilityFirst has assessed a penalty of one million dollars (\$1,000,000) for the referenced violation. In reaching this determination, ReliabilityFirst considered the following factors:

1. AEP promptly identified and self-reported the violation at issue shortly after discovery.
2. AEP was cooperative throughout the entire compliance enforcement process.
3. The violation of FAC-003-4 R2 posed a serious and substantial risk to the reliability of the BPS.
4. There were no other mitigating or aggravating factors or extenuating circumstances that would affect the assessed penalty.

After consideration of the above factors, ReliabilityFirst determined that, in this instance, the penalty amount of one million dollars (\$1,000,000) is appropriate and bears a reasonable relation to the seriousness and duration of the violation.

### **Statement Describing the Assessed Penalty, Sanction, or Enforcement Action Imposed<sup>5</sup>**

#### **Basis for Determination**

Taking into consideration the Commission's direction in Order No. 693, the NERC Sanction Guidelines and the Commission's July 3, 2008, October 26, 2009 and August 27, 2010 Guidance Orders,<sup>6</sup> the NERC BOTCC reviewed the violation on May 12, 2020 and approved the resolution between ReliabilityFirst Corporation and American Electric Power Service Corporation. In approving the resolution, the NERC BOTCC reviewed the applicable requirements of the Commission-approved Reliability Standards and the underlying facts and circumstances of the violation at issue.

For the foregoing reasons, the NERC BOTCC approved the resolution and believes that the assessed penalty of one million dollars (\$1,000,000) is appropriate for the violation and circumstances at issue, and is consistent with NERC's goal to promote and ensure reliability of the BPS.

Pursuant to 18 C.F.R. § 39.7(e), the penalty will be effective upon expiration of the 30-day period following the filing of this Notice of Penalty with FERC, or, if FERC decides to review the penalty, upon final determination by FERC.

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<sup>5</sup> See 18 C.F.R. § 39.7(d)(4).

<sup>6</sup> N. Am. Elec. Reliability Corp., "Guidance Order on Reliability Notices of Penalty," 124 FERC ¶ 61,015 (2008); N. Am. Elec. Reliability Corp., "Further Guidance Order on Reliability Notices of Penalty," 129 FERC ¶ 61,069 (2009); N. Am. Elec. Reliability Corp., "Notice of No Further Review and Guidance Order," 132 FERC ¶ 61,182 (2010).

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**Attachment to be Included as Part of this Notice of Penalty**

The attachment to be included as part of this Notice of Penalty includes the following documents:

1. Settlement Agreement by and between ReliabilityFirst and AEP executed January 30, 2020;
2. AEP's Self-Report for FAC-003-4 R2 dated August 21, 2018, included as Attachment A to the Settlement Agreement; and
3. AEP's Mitigation Plan designated as RFCMIT014177-1 for FAC-003-4 R2 submitted February 27, 2019, included as Attachment B to the Settlement Agreement.

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

<p>*Persons to be included on the Commission’s service list are indicated with an asterisk. NERC requests waiver of the Commission’s rules and regulations to permit the inclusion of more than two people on the service list.</p> <p>Stephen Globeck*        Enterprise NERC Compliance Specialist Principal        American Electric Power Service Corp.        1 Riverside Plaza        Columbus, OH 43215        sjglobeck@aep.com        614-716-2374 Phone</p> <p>Philemon Korir*        Senior NERC Compliance Specialist        American Electric Power Service Corp.        1 Riverside Plaza        Columbus, OH 43215        pkkorir@aep.com        614-716-2324 Phone</p> <p>Tracy McLaughlin*        NERC Compliance Manager        American Electric Power Service Corp.        1 Riverside Plaza        Columbus, OH 43215        tamclaughlin@aep.com        614-716-2302 Phone</p> <p>Jessica Cano*        American Electric Power Service Corp.        1 Riverside Plaza        Columbus, OH 43215        jacano@aep.com</p>	<p>Teresina Stasko*        Assistant General Counsel and Director of Enforcement        North American Electric Reliability Corporation        1325 G Street NW Suite 600        Washington, DC 20005        (202) 400-3000        (202) 644-8099 – facsimile        teresina.stasko@nerc.net</p> <p>James McGrane*        Senior Counsel        North American Electric Reliability Corporation        1325 G Street NW, Suite 600        Washington, DC 20005        (202) 400-3000        (202) 644-8099 – facsimile        james.mcgrane@nerc.net</p> <p>Alexander Kaplen*        Associate Counsel        North American Electric Reliability Corporation        1325 G Street NW Suite 600        Washington, DC 20005        (202) 400-3000        (202) 644-8099 – facsimile        alexander.kaplen@nerc.net</p>
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### **Conclusion**

NERC respectfully requests that the Commission accept this Notice of Penalty as compliant with its rules, regulations, and orders.

Respectfully submitted,

/s/ Alexander Kaplen

Teresina Stasko

Assistant General Counsel and Director of  
Enforcement

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cc: American Electric Power Service Corporation  
ReliabilityFirst Corporation

Attachments



Settlement Agreement  
by and between ReliabilityFirst and AEP  
executed January 30, 2020



# RELIABILITY FIRST

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<b><i>In re:</i></b> AMERICAN ELECTRIC POWER	)	<b>Violation ID No.:</b>
SERVICE CORPORATION AS AGENT	)	
FOR APPALACHIAN POWER	)	RFC2018020254 (FAC-003-4 R2)
COMPANY, INDIANA MICHIGAN	)	
POWER COMPANY, KENTUCKY	)	
POWER COMPANY, KINGSFORT	)	
POWER COMPANY, OHIO POWER	)	
COMPANY, WHEELING POWER	)	
COMPANY, AEP OHIO	)	
TRANSMISSION COMPANY, AEP	)	
APPALACHIAN TRANSMISSION	)	
COMPANY, AEP WEST VIRGINIA	)	
TRANSMISSION COMPANY, AEP	)	
INDIANA MICHIGAN TRANSMISSION	)	
COMPANY AND AEP KENTUCKY	)	
TRANSMISSION COMPANY, INC.	)	
	)	
NERC Registry ID No. NCR00682	)	

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**SETTLEMENT AGREEMENT  
BETWEEN  
RELIABILITYFIRST CORPORATION  
AND  
AMERICAN ELECTRIC POWER SERVICE CORPORATION**

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## **I. INTRODUCTION**

1. ReliabilityFirst Corporation (“ReliabilityFirst”) and American Electric Power Service Corporation as agent for Appalachian Power Company, Indiana Michigan Power Company, Kentucky Power Company, Kingsport Power Company, Ohio Power Company, Wheeling Power Company, AEP Ohio Transmission Company, AEP Appalachian Transmission Company, AEP West Virginia Transmission Company, AEP Indiana Michigan Transmission Company and AEP Kentucky

Transmission Company, Inc. (“AEP”)<sup>1</sup> (collectively, the “Parties”) enter into this Settlement Agreement (“Agreement”) to resolve a violation by AEP of FAC-003-4 R2.<sup>2</sup>

2. The Parties stipulate to the facts in this Agreement for the sole purpose of resolving the violation. AEP neither admits nor denies that these facts constitute a violation of FAC-003-4 R2.

## II. OVERVIEW OF AEP

3. AEP is engaged in the generation and transmission of electricity throughout the United States. AEP is one of the nation’s largest generators of electricity, and owns nearly 38,000 MW of generating capacity. AEP also owns the nation’s largest electricity transmission system, a nearly 39,000-mile network that includes more 765 kV extra-high voltage transmission lines than all other U.S. transmission systems combined. AEP’s transmission system directly or indirectly serves approximately ten percent of the electricity demand in the Eastern Interconnection, the interconnected transmission system that covers 38 eastern and central U.S. states and eastern Canada, and approximately 11 percent of the electricity demand in Electric Reliability Council of Texas, the transmission system that covers much of Texas.
4. AEP is registered on the NERC Compliance Registry as a Distribution Provider, Generator Owner, Generator Operator, Resource Planner, Transmission Owner (“TO”), Transmission Operator, and Transmission Planner in the ReliabilityFirst region. AEP, in its capacity as a TO, is subject to compliance with FAC-003-4 R2.
5. This violation pertained to AEP’s Kammer-Mountaineer 765 kV transmission line. Vegetation growth caused a flashover to trees within the Minimum Vegetation Clearance Distance (“MVCD”) which caused the 765 kV transmission line to trip out of service for 28 hours and 17 minutes. The vegetation contact occurred in Wood County, West Virginia.

## III. EXECUTIVE SUMMARY

6. In August, 2018, AEP submitted a Self-Report for a potential violation of FAC-003-4 R2. On Saturday, June 30, 2018 the entity’s Kammer-Mountaineer 765 kV circuit tripped and locked out for 28 hours and 17 minutes due to vegetation growth within the MVCD that caused the transmission line to flashover to two trees. That flashover caused the 765 kV transmission line to trip out of service. The violation

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<sup>1</sup> AEP is an MRRE. ReliabilityFirst is the Lead Regional Entity and Midwest Reliability Organization (“MRO”) is the Affected Regional Entity. Although this is not a multi-regional issue, ReliabilityFirst provided notice to MRO of the disposition of this issue.

<sup>2</sup> This Agreement references the version of the Reliability Standard in effect at the time the violation began. AEP, however, committed to perform mitigating actions to comply with the most recent version of the Reliability Standard Requirement.

arose from ineffective inspections that missed vegetation growth into the MVCD.

7. Considering the foregoing and below, ReliabilityFirst has determined that the risk posed by the violation is serious and substantial and has levied a \$1,000,000 monetary penalty.

#### IV. VIOLATION

##### A. FAC-003-4 R2 (RFC2018020254)

8. FAC-003 ensures a Responsible Entity prevents outages from vegetation located on transmission rights-of-way (“ROW”), minimizes outages from vegetation located adjacent to ROW, maintains clearances between transmission lines and vegetation on and along transmission ROW, and reports vegetation related outages of the transmission systems.
9. A violation of FAC-003 R2 has the potential to affect the reliable operation of the Bulk Power System by increasing the likelihood that Registered Entities will not maintain safe clearances between transmission lines and vegetation.
10. FAC-003-4 R2 states:

**R2.** Each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the MVCD of its applicable line(s) which are not either an element of an IROL, or an element of a Major WECC Transfer Path; operating within its Rating and all Rated Electrical Operating Conditions of the types shown below:

- 2.4. An encroachment due to vegetation growth into the line MVCD that caused a vegetation-related Sustained Outage.

##### *Description of Violation and Risk Assessment*

11. On August 21, 2018, the entity submitted a Self-Report to ReliabilityFirst stating that, as a Transmission Owner, it was in potential violation of FAC-003-4 R2. *See, Self-Report, Attachment A.*
12. On Saturday, June 30, 2018 at 17:34, the entity’s Kammer-Mountaineer 765 kV circuit<sup>3</sup> tripped and reclosed a single time. At 18:27 on that same day, the circuit tripped and locked out until Sunday, July 1, 2018 at 22:44. The total duration of this trip and lock out was 28 hours and 17 minutes. Upon further investigation, the entity determined that the cause of the trip was vegetation growth that caused a

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<sup>3</sup> The 765 kV circuit is located near Wood County in Wilson, West Virginia.

flashover<sup>4</sup> to two trees within the MVCD.

13. The vegetation contact occurred in the span between towers 202 and 203 on the Kammer-Mountaineer 765 kV transmission line. The distance between towers 202 and 203 is approximately 2,198 feet. Because the span is both over a valley and greater than 1,500 feet, the span is considered a valley span. Therefore, AEP classified it as a “Right-of-Way with No Restrictions” and “>100’ Vertical Clearance Between Conductors at Maximum Sag and Ground” in its Transmission Vegetation Management Program (“TVMP”). AEP’s TVMP required different vegetation clearing activities at different intervals based off the span length and type between towers on transmission lines. After conducting post-event inspections, AEP determined this classification was incorrect because the terrain in the span had hills with less than 100 feet clearance, including the hill with the two trees that caused the outage.
14. As background, on May 31, 2018, prior to the violation start date, AEP’s Forestry Department conducted an aerial patrol of the Kammer-Mountaineer line, including span 202 to 203 in accordance with its TVMP. The line loading at the time was 1,009 MVA (25%), and personnel visually estimated the max sag and compared it to vegetation growth. Aerial patrol noted instances of brush on the 202 to 203 span that required follow-up inspection by ground patrol. On June 18, 2018, based on the aerial patrol results, entity contractors conducted a ground patrol of spans 202 to 203 on the Kammer-Mountaineer circuit. The ground patrol inspected the span and concluded that the distance between vegetation and conductor was not less than the trigger distance (27’4”) for clearing activity.
15. On June 30, 2018, at 18:27, the flashover and outage occurred. The loading of the circuit at the time was 1435 MVA, which is 35.5% of the 4047 MVA max rating. Weather conditions were fair with ambient temperature of 91 degrees Fahrenheit and no wind. With the loading on that day, the estimated sag at the location of the flashover and time of the event was 140.64 feet, leaving approximately 53.5 feet to the ground at that location.
16. During the morning of July 1, 2018, AEP’s Transmission Field Services conducted an emergency aerial patrol looking mainly for equipment issues. The aerial patrol noticed evidence of what appeared to be burned brush/trees in span 202 to 203. As a follow-up, also on July 1, a Transmission Field Services crew was dispatched along with a contractor forestry ground crew to inspect the span. The crew did not identify any burned brush or trees, likely due to the difficult terrain and thick vegetation. Additionally, the crew did not identify any issues of inadequate clearance and the line was re-energized.
17. Because of the inability to reconcile the varying inspection reports, on July 2, a

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<sup>4</sup> Two trees were allowed to grow so close to the transmission line that the electrical current jumped from the transmission line to the trees. The current traveled from the transmission line to the tree to the ground. The relays sense this as a fault and trip the transmission line out of service.

follow-up aerial patrol was conducted of span 202 to 203 by AEP's Forestry Department. The patrol noticed burnt trees and sent a ground patrol. Later on July 2, the entity sent a contracted ground crew to the span. The loading of the line at this time was 1721 MVA (42.5%). Because of the inability to identify specific issues, the crew began performing proactive clearing activities. A crew member saw smoke approximately 30 feet away from where they were working. After coordinating with System Operations, the crew continued clearing activities, including in the area where the crew member saw smoke. In that area, two trees showed signs of a flashover, such as soot, bark splitting, and scorched leaves on surrounding vegetation. It was determined that these two trees caused the outage on June 30, 2018.<sup>5</sup>

18. On July 11, 2018, an AEP Incident Investigation team (consisting of Subject Matter Experts ("SMEs") and management from Forestry, Transmission Line Engineering, and Compliance) visited the site. The team identified and measured the two trees that showed signs of a flashover. The entity determined the trees to be a White Oak measuring approximately 41' tall and an Ailanthus measuring approximately 41.5' tall. Given the estimated distance of 53.5' from conductor to ground at the time of the outage, the trees were approximately 12' from the conductor when the flashover occurred.
19. The root cause is ineffective program design as the entity relied on visual cues and professional and historical knowledge to assess the zones where complete clearing was not required (zones with greater than 100 foot clearance from conductor to ground). That proved ineffective as the forestry crews were unable to effectively assess conditions in this specific valley span. ReliabilityFirst determined that this noncompliance involves the management practices of work management and implementation as the entity's FAC-003 program was not effectively designed and implemented.
20. Additional contributing factors included the difficulty of assessing this valley span. Trigger distance is typically assessed using visual cues and professional knowledge. This span includes side hill and terrain variation, and the areas with less than 100' clearance were not readily apparent using visual cues. From the ground, given the surrounding vegetation and lack of clear line of sight, it was difficult to assess vegetation clearance distances. This is compounded by the difficulty of crew members knowing their specific location in the span. Gaining the proper perspective to assess clearances is very difficult. This resulted in the ground observer not identifying the encroachment that occurred at this specific location. Additionally, AEP found that the conductor in question sagged more steeply than expected at either end (similar to the shape of a bathtub), rather than consistently throughout the span, resulting in less clearance than expected at its ends, including at the location of the trees.

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<sup>5</sup> On July 3, 2018, AEP filed the 48-hour report to ReliabilityFirst based on information from the July 2 contractor ground patrol.  
Violation ID No. RFC2018020254

21. The violation lasted 28 hours and 17 minutes beginning June 30, 2018, the date the vegetation contact occurred and the transmission line tripped out of service and ending on July 1, 2018 when the entity put the transmission line back into service.
22. This violation posed a serious risk to the reliability of the bulk power system.<sup>6</sup> This violation involved a 765 kV transmission line that tripped out of service for 28 hours and 17 minutes. The risk posed by this violation is overloading of other nearby transmission lines, which could result in loss of load and potentially a cascading outage. However, the operating characteristics and design of AEP's 765kV transmission system limited the likelihood that this violation would cause instability, uncontrolled separation, or cascading system failures. Specifically, the loading of the 765 kV transmission system typically results in fewer real-time contingency violations than on lower voltage systems.<sup>7</sup> Additionally, AEP's protection system standard for the 765kV transmission system requires the use of two high-speed protection systems. In this case, the protection system operated as designed, removing the line from service within 2.5 cycles. Finally, AEP continuously monitors N-1 contingencies in real time and did not identify any real-time contingencies during this event. AEP and PJM continuously monitor System Operating Limit ("SOL") exceedances on adjacent lines and did not observe any adjacent facility exceedances as a result of this event. In this case, load was redistributed and no customer load loss occurred.<sup>8</sup> The transmission line affected is not an element of an Interconnection Reliability Operating Limit ("IROL"). Despite this, the risk remains serious because this violation involves a significant failure to follow AEP's TVMP and reveals weaknesses in the internal controls built into the TVMP as AEP's inspections of this transmission line were inadequate. Additionally, an unplanned outage of a 765 kV line carries with it the potential to significantly shift the flow of power that could result in potential overloads, loss of load, and cascading outages under different system conditions. No harm is known to have occurred.

#### *Mitigating Actions*

23. On February 27, 2019, the entity submitted to ReliabilityFirst a Mitigation Plan to address the violation of FAC-003-4 R2. See RFCMIT014177-1, **Attachment B**. The Mitigation Plan focuses on a conservative approach and has required substantial spending to bring the entity back into sustained compliance with FAC-003-4. The entity also has taken actions that go beyond what is necessary to comply with FAC-003-4 by conducting a third party review of the entire TVMP and

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<sup>6</sup> FAC-003-4 R2 has a VRF of "High" pursuant to the VRF Matrix. According to the VSL Matrix, this issue warranted a "Severe" VSL.

<sup>7</sup> For example, a review of all 2018 contingencies greater than 15 minutes in duration showed very few instances where a 765kV facility was identified. Additionally, the Kammer-Mountaineer 765kV circuit reached a peak load of 2269MVA in 2019, approximately 50 percent of its capability and typical for the 765kV transmission system. Because it is usually lightly loaded, it is less likely that the outage of a 765kV line would overload a nearby transmission line or cause a cascading outage.

<sup>8</sup> The line was lightly loaded at the time of the violation, which allowed the voltage to be redistributed to other transmission lines with no overloads or customer loss.

Violation ID No. RFC2018020254

benchmarking it against industry practices and by committing to perform a LiDAR survey of the entity's entire Extra High Voltage ("EHV") system. As of the date of the execution of this Agreement, no additional potential violations have been discovered as a result of the mitigation efforts. On February 27, 2019, ReliabilityFirst accepted the Mitigation Plan.

24. In the Mitigation Plan, the entity committed to take the following actions by May 28, 2020: The entity:

- 1) removed all suspect trees and brush from flashover location in Span 202 to 203 on the Kammer-Mountaineer 765kV Transmission line;
- 2) conducted additional inspections of lines with long spans and deep valleys. AEP also performed an engineering review of records to provide Forestry with the location of exception zones and terrain information;
- 3) performed vegetation clearing associated with Milestone 2;
- 4) conducted a third-party review of the entire TVMP and benchmarked against industry practices. This third-party review included an evaluation of the root cause analysis;
- 5) conducted LiDAR survey and analysis of Amos-Kammer line, which includes the Kammer-Mountaineer circuit, to provide engineering level precision of field conditions. The entity used the results of this trial LiDAR study to inform the development of the requirements, analytic methodology, and work plan steps that are part of milestones 6 and 7;
- 6) conducted LiDAR vegetation survey and analysis of approximately 1,000 miles of the AEP system;
- 7) integrated the results of the LiDAR vegetation analysis from milestones 5 and 6 into the 2019 Forestry work plan to address the risks associated with this outage;
- 8) developed and implemented a methodology that provides specific guidance to Forestry for spans that include both areas with greater than 100' clearance and less than 100' clearance. This additional information will allow Forestry to more clearly identify the appropriate vegetation management activity for those sections;
- 9) conducted LiDAR vegetation survey and analysis of the remainder of the entity EHV system and incorporated the results in Milestone 11;
- 10) completed associated clearing of initial LiDAR capture of approximately 1,000 miles;
- 11) integrated the results of the remaining LiDAR vegetation analysis into the 2019



- and 2020 Forestry work plans to address the risks associated with this outage;
- 12) completed associated clearing of initial LiDAR capture of approximately 1/3 of the remaining miles;
  - 13) will complete associated clearing of initial LiDAR capture of approximately 1/3 of the remaining miles; and
  - 14) will complete associated clearing of initial LiDAR capture of remaining miles.
25. The entity shall certify and provide evidence demonstrating the completion of the Mitigation Plan to ReliabilityFirst. ReliabilityFirst will verify the entity's completion of the Mitigation Plan.
  26. In addition to the steps in the Mitigation Plan, as a preventative measure, AEP has revised its TVMP to use LiDAR, depending on vegetation density per mile, every three, four, five, or six years on its transmission lines.<sup>9</sup> AEP determined that this new process will result in the efficient integration of LiDAR inspections with more traditional vegetation management techniques.<sup>10</sup> LiDAR is used as an additional layer to prevent encroachments into the MVCD. AEP will periodically review its use of LiDAR and make adjustments as needed. In addition to LiDAR, AEP will continue to conduct aerial patrols (in the spring and fall; aerial patrols after significant storm events when warranted; separate patrols by line personnel patrols once a year; and ground personnel performing follow up investigations). AEP also established a self-auditing process by an independent group within AEP (Transmission Reliability Assurance) to review vegetation management processes and performance on an ongoing basis. Long term process improvements (24 to 36 months) include the investigation and deployment of hybrid 3D viewing devices, 20 of which have been purchased and are being trained on now, and AI software packages that will allow in-the-field determination of vegetation issues against the worst-case model provided by LiDAR. Additionally, AEP has completed a Request for Information on replacing its work management system and is on track to replace it in 24 to 36 months, which will help to better manage and track the work being done. Also, AEP has obtained licenses to operate drones to assist in investigating challenging terrain, with a current plan to pilot the devices in 2020.

## **V. ADJUSTMENT FACTORS**

27. In addition to the facts and circumstances stated above, ReliabilityFirst considered

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<sup>9</sup> If less than five trees per mile, LiDAR will be used once every six years, if between 5 and 63 trees per miles, LiDAR will be used once every five years, if between 64 and 261 trees per mile, LiDAR will be used once every four years, and if more than 261 trees per mile, LiDAR will be used once every three years.

<sup>10</sup> The LiDAR inspection frequency was determined using a risk-based approach. Inspection frequency will be calculated by using the vegetation density from the results of the 2018/2019 LiDAR inspection of the entire AEP FAC-003 applicable system. AEP will use the vegetation density adjacent to the right-of-way to represent the propensity for vegetation growth inside the right-of-way.

Violation ID No. RFC2018020254

the following factors in its penalty determination.

*Self-Reporting*

28. Effective oversight of the reliability of the BES depends on robust and timely self-reporting by Registered Entities. AEP promptly identified and reported the violation at issue in this Agreement shortly after discovering the violation. AEP also timely submitted a 48-hour report to ReliabilityFirst because of the outage and based on information from the July 2, 2018 contractor ground patrol. Therefore, ReliabilityFirst awarded some mitigating credit for self-reporting this violation.

*Cooperation*

29. ReliabilityFirst considered AEP's cooperation during the Settlement Agreement process and awarded mitigating credit. AEP has been cooperative throughout the entire enforcement process. Following discovery of this violation, AEP met and communicated with ReliabilityFirst, including multiple in-person meetings at ReliabilityFirst, to discuss the violation and the mitigation. Through the enforcement process, AEP voluntarily provided ReliabilityFirst with an abundance of information regarding the violation and the mitigation that was detailed and timely.

*Compliance History*

30. When assessing the penalty for the violation at issue in this Agreement, ReliabilityFirst considered whether the facts of this violation constitute repetitive infractions. ReliabilityFirst considered the entity's compliance history and determined there were no relevant instances of noncompliance.
31. ReliabilityFirst did not consider the following prior violations repeat infractions warranting alternate disposition because the prior violations posed only moderate risk and did not involve the same or similar conduct. (RFC2013012301-AEP-FFT-Moderate and SPP201000356-AEP-SA-Moderate)

**VI. PENALTY**

32. Based upon the foregoing, AEP shall pay a monetary penalty of \$1,000,000 to ReliabilityFirst.
33. ReliabilityFirst shall present an invoice to AEP within 20 days after the Agreement is approved by the Commission or affirmed by operation of law. Upon receipt, AEP shall have 30 days to remit payment. ReliabilityFirst will notify NERC if it does not timely receive the payment from AEP.
34. If AEP fails to timely remit the monetary penalty payment to ReliabilityFirst, interest will commence to accrue on the outstanding balance, pursuant to 18 C.F.R. § 35.19a (a)(2)(iii), on the earlier of (a) the 31<sup>st</sup> day after the date on the invoice

issued by ReliabilityFirst to AEP for the monetary penalty payment or (b) the 51<sup>st</sup> day after the Agreement is approved by the Commission or operation of law.

## **VII. ADDITIONAL TERMS**

35. The Parties agree that this Agreement is in the best interest of BES reliability. The terms and conditions of the Agreement are consistent with the regulations and orders of the Commission and the NERC Rules of Procedure.
36. ReliabilityFirst shall report the terms of all settlements of compliance matters to NERC. NERC will review the Agreement for the purpose of evaluating its consistency with other settlements entered into for similar violations or under similar circumstances. Based on this review, NERC will either approve or reject this Agreement. If NERC rejects the Agreement, NERC will provide specific written reasons for such rejection and ReliabilityFirst will attempt to negotiate with AEP a revised settlement agreement that addresses NERC's concerns. If a settlement cannot be reached, the enforcement process will continue to conclusion. If NERC approves the Agreement, NERC will (a) report the approved settlement to the Commission for review and approval by order or operation of law and (b) publicly post the violations and the terms provided for in this Agreement.
37. This Agreement binds the Parties upon execution, and may only be altered or amended by written agreement executed by the Parties. AEP expressly waives its right to any hearing or appeal concerning any matter set forth herein, unless and only to the extent that AEP contends that any NERC or Commission action constitutes a material modification to this Agreement.
38. ReliabilityFirst reserves all rights to initiate enforcement action against AEP in accordance with the NERC Rules of Procedure in the event that AEP fails to comply with any of the terms or conditions of this Agreement. AEP retains all rights to defend against such action in accordance with the NERC Rules of Procedure.
39. AEP consents to ReliabilityFirst's future use of this Agreement for the purpose of assessing the factors within the NERC Sanction Guidelines and applicable Commission orders and policy statements, including, but not limited to, the factor evaluating AEP's history of violations. Such use may be in any enforcement action or compliance proceeding undertaken by NERC or any Regional Entity or both, provided however that AEP does not consent to the use of the conclusions, determinations, and findings set forth in this Agreement as the sole basis for any other action or proceeding brought by NERC or any Regional Entity or both, nor does AEP consent to the use of this Agreement by any other party in any other action or proceeding.
40. AEP affirms that all of the matters set forth in this Agreement are true and correct to the best of its knowledge, information, and belief, and that it understands that ReliabilityFirst enters into this Agreement in express reliance on the representations

contained herein, as well as any other representations or information provided by AEP to ReliabilityFirst during any AEP interaction with ReliabilityFirst relating to the subject matter of this Agreement.

41. The Parties stipulate that all required, applicable information listed in Section 5.3 of the CMEP is included within this Agreement.
42. Each of the undersigned agreeing to and accepting this Agreement warrants that he or she is an authorized representative of the party designated below, is authorized to bind such party, and accepts the Agreement on the party's behalf.
43. The undersigned agreeing to and accepting this Agreement warrant that they enter into this Agreement voluntarily and that, other than the recitations set forth herein, no tender, offer, or promise of any kind by any member, employee, officer, director, agent, or representative of the Parties has been made to induce the signatories or any other party to enter into this Agreement.
44. The Agreement may be signed in counterparts.
45. This Agreement is executed in duplicate, each of which so executed shall be deemed to be an original.

**[SIGNATURE PAGE TO FOLLOW]<sup>11</sup>**

**[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]**

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<sup>11</sup> An electronic version of this executed document shall have the same force and effect as the original.  
Violation ID No. RFC2018020254

**ENDORSED BY:**



Robert V. Eckenrod  
Vice President and General Counsel  
ReliabilityFirst Corporation

**JAN 30 2020**

Date

**AGREED TO AND ACCEPTED BY:**

**American Electric Power Service  
Corporation:**



Charles Patton  
Executive Vice President, External Affairs  
American Electric Power Service Corporation

**1-31-20**

Date

**ReliabilityFirst Corporation**



Timothy R. Gallagher  
President & Chief Executive Officer  
ReliabilityFirst Corporation

**JAN 30 2020**

Date

Attachment A  
AEP's Self-Report of Violation of FAC-003-4 R2  
submitted August 21, 2018

# ATTACHMENT A

## Self Report

Entity Name: American Electric Power Service Corporation [ Legal name see comment below] (AEP)

NERC ID: NCR00682

Standard: FAC-003-4

Requirement: FAC-003-4 R2.

Date Submitted: August 21, 2018

Has this violation previously No  
been reported or discovered?:

### Entity Information:

Joint Registration  
Organization (JRO) ID:

Coordinated Functional  
Registration (CFR) ID:

Contact Name: Nicholas Morton

Contact Phone: 6147162342

Contact Email: namorton@aep.com

### Violation:

Violation Start Date: June 30, 2018

End/Expected End Date: July 01, 2018

Reliability Functions: Transmission Owner (TO)

Is Possible Violation still No  
occurring?:

Number of Instances: 1

Has this Possible Violation No  
been reported to other  
Regions?:

Which Regions:

Date Reported to Regions:

Detailed Description and Cause of Possible Violation: On Saturday June 30, 2018 at 17:34, the Kammer-Mountaineer 765kV circuit (located near Wood County Wilson, West Virginia) tripped and reclosed a single time. At 18:27 the circuit tripped and locked out until Sunday July 1, 2018 at 22:44 (28 hours and 17 minutes). The cause was later determined to be vegetation growth that caused a flashover to two trees, presumably within the Minimum Vegetation Clearance Distance (MVCD).

The contact occurred in the span between towers 202 and 203 which spans 2,198'. Since the span is over a valley and greater than 1,500', the span was considered a "valley span." Therefore, it was classified in AEP's Transmission Vegetation Management Plan (TVMP, attached) on Page 19, Table 2 as a "Right-of-Way with No Restrictions" and ">100' Vertical Clearance Between Conductors at Maximum Sag and Ground." After post-event inspections, the terrain in the span was determined to have hills with less than 100' clearance, including the hill with the two trees that caused the outage. (see "Span Drawing.pdf")

Below is the sequence of events in chronological order.

On May 31, AEP Forestry conducted an aerial patrol of the Kammer-Mountaineer line, including span 202 to 203. The line loading at the time was 1,009 MVA (25%), and personnel visually estimated the max sag and compared to vegetation growth. Aerial patrol noted instances of brush on the 202 to 203 span that required follow-up inspection by ground patrol. However,

## Self Report

the aerial patrol inspection tool (Integrated Transmission Information System, ITIS Mobile) was only partially functional. The tool was unable to operate in "location-based" mode to record GPS coordinates. Additionally, the functionality for entering conditions was not available due to the computer "freezing". Therefore, the tool only recorded that the flight occurred, manual notes were taken for follow-up actions, and the approximate GPS coordinates of the brush were not recorded.

On June 18, based on the aerial patrol results, AEP contractors conducted a ground patrol of span 202 to 203 on the Kammer-Mountaineer circuit. The ground patrol inspected the span and concluded that the distance between vegetation and conductor was not less than the trigger distance (27'4") for clearing activity.

On June 30, at 18:27, the flashover and outage occurred. The loading of the circuit at the time was 1435 MVA, which is 35.5% of the 4047 MVA max rating. Weather conditions were fair with ambient temperature of 91 degrees F and no wind. With the loading on that day, the estimated sag at the location of the flashover and time of the event was 140.64' leaving approximately 53.5' to the ground at that location.

The morning of July 1, an emergency aerial patrol was conducted by AEP Transmission Field Services (TFS) looking mainly for equipment issues. The aerial patrol noticed evidence of what appeared to be burned brush/trees in span 202 to 203.

As a follow-up, on July 1, a TFS crew was dispatched along with a contractor forestry ground crew to inspect the span. The crew did not identify any burned brush or trees, likely due to the difficult terrain and thick vegetation. Additionally, the crew did not identify any issues of inadequate clearance and the line was re-energized.

Because of the inability to reconcile the varying inspection reports, on July 2, a follow-up aerial patrol was conducted of span 202 to 203 by AEP Forestry. The patrol noticed burnt trees and sent a ground patrol.

Later on July 2, a contracted ground crew was sent to the span. The loading of the line at this time was 1721 MVA (42.5%). Because of the inability to identify specific issues, the crew began performing proactive clearing activities. A crew member saw smoke approximately 30 feet away from where they were working. (It was determined to be approximately 1,050' from tower 202 toward 203.) After coordinating with System Operations, the crew continued clearing activities. Two trees showed signs of a flashover, such as soot, bark splitting, and scorched leaves on surrounding vegetation. It was determined that these two trees caused the outage on June 30th.

On July 3, AEP filed the 48-hour report to ReliabilityFirst based on information from the July 2 contractor ground patrol.

On July 11, the AEP Incident Investigation team (consisting of SMEs and Management from Forestry, Transmission Line Engineering, and Compliance) visited the site. The team identified and measured the two trees that showed signs of a flashover. They were determined to be a White Oak measuring approximately 41' tall and an Ailanthus measuring approximately 41.5' tall. Given the estimated distance of 53.5' from conductor to ground at the time of the outage, the trees were approximately 12' from the conductor when the flashover occurred.

The following contributing factors have been identified. The Forestry crews' ability to assess this valley span was less than AEP's program presumed. Trigger distance is typically assessed using visual cues and professional knowledge. This span includes extreme side hill and terrain variation, and the areas with less than 100' clearance were not readily apparent using visual cues. Furthermore, the partial availability of the aerial inspection tool on May 31 limited the location specificity of the aerial inspection record. Additionally,



Self Report

from the ground, given the surrounding vegetation and lack of clear line of sight, it is very difficult to assess vegetation clearance distances. This is compounded by the difficulty of crew members knowing their specific location in the span. Gaining the proper perspective to assess clearances is very difficult. This resulted in the ground observer not identifying the encroachment that occurred at this specific location.

Mitigating Activities:

Description of Mitigating Activities and Preventative Measure: Mitigating Activities: 1.COMPLETE - Removed all suspect trees and brush from location 2.COMPLETE - Conducted additional aerial inspection of the Appalachian range, areas of West Virginia, Virginia, Kentucky, and eastern and southern Ohio, with similar risk, i.e. potential for valley spans with greater than 1,500' spans 3.IN PROGRESS - Engineering review of drawings to identify and document additional risky locations, i.e. long spans with extreme side hills and/or terrain variation, to enhance our ability to inspect 4.IN PROGRESS - LIDAR review of Amos-Kammer line, which includes the Mountaineer-Kammer circuit to determine broader exposure and set criteria for future work 5.PLANNED - Clearing activities identified by 2 & 3 above

Additional Preventative Measures to be elaborated in formal Mitigation Plan:

- Modify TVMP and trigger clearance for valley spans
•Consider use of LIDAR for extra high voltage (EHV) lines
•As applicable, perform clearing activity identified by LIDAR
•Hire 3rd Party to review Vegetation Management practice

Date Mitigating Activities Completed:

Impact and Risk Assessment:

Potential Impact to BPS: Moderate

Actual Impact to BPS: Minimal

Description of Potential and Actual Impact to BPS: This violation posed moderate potential risk and minimal actual risk and did not pose a serious or substantial risk to the BPS. Growth into the MVCD could ultimately result in loss of customer load. However, in this instance, load was redistributed and no customer load loss was incurred. AEP is continuously monitoring N-1 contingencies and no overloads were identified due to the loss of the circuit. As a result, this outage did not cause a System Operating Limit exceedance on any of the remaining in-service facilities. Additionally, the line affected is not an element of an Interconnection Reliability Operating Limit. Finally, the risk from this incident was also limited by the fact that AEP has developed and otherwise successfully implemented its overall vegetation management program.

Risk Assessment of Impact to BPS: This violation posed moderate potential risk and minimal actual risk and did not pose a serious or substantial risk to the BPS. Growth into the MVCD could ultimately result in loss of customer load. However, in this instance, load was redistributed and no customer load loss was incurred. AEP is continuously monitoring N-1 contingencies and no overloads were identified due to the loss of the circuit. As a result, this outage did not cause a System Operating Limit exceedance on any of the remaining in-service facilities. Additionally, the line affected is not an element of an Interconnection Reliability Operating Limit. Finally, the risk from this incident was also limited by the fact that AEP has developed and otherwise successfully implemented its overall vegetation management program.

AEP has photos to provide and requests a short call with RF to share the

# ATTACHMENT A

## Self Report

Additional Entity Comments: information.

AEP is willing to meet and discuss the event and AEP's steps to remediate at RF's convenience.

Additional Comments		
From	Comment	User Name
No Comments		

Additional Documents			
From	Document Name	Description	Size in Bytes
Entity	TVMD-001_Transmission_Vegetation_Management_Program_v16.pdf		895,728
Entity	Span_Drawing.pdf		71,820

Attachment B  
AEP's Mitigation Plan designated as RFCMIT014177-1  
for FAC-003-4 R2 submitted February 27, 2019

# ATTACHMENT B

## Mitigation Plan

### Mitigation Plan Summary

Registered Entity: American Electric Power Service Corporation [ Legal name see comment below]

Mitigation Plan Code:

Mitigation Plan Version: 2

<u>NERC Violation ID</u>	<u>Requirement</u>	<u>Violation Validated On</u>
RFC2018020254	FAC-003-4 R2.	

Mitigation Plan Submitted On: February 27, 2019

Mitigation Plan Accepted On:

Mitigation Plan Proposed Completion Date: May 28, 2020

Actual Completion Date of Mitigation Plan:

Mitigation Plan Certified Complete by AEP On:

Mitigation Plan Completion Verified by RF On:

Mitigation Plan Completed? (Yes/No): No

## ATTACHMENT B

### Compliance Notices

Section 6.2 of the NERC CMEP sets forth the information that must be included in a Mitigation Plan. The Mitigation Plan must include:

- (1) The Registered Entity's point of contact for the Mitigation Plan, who shall be a person (i) responsible for filing the Mitigation Plan, (ii) technically knowledgeable regarding the Mitigation Plan, and (iii) authorized and competent to respond to questions regarding the status of the Mitigation Plan. This person may be the Registered Entity's point of contact described in Section B.
  - (2) The Alleged or Confirmed Violation(s) of Reliability Standard(s) the Mitigation Plan will correct.
  - (3) The cause of the Alleged or Confirmed Violation(s).
  - (4) The Registered Entity's action plan to correct the Alleged or Confirmed Violation(s).
  - (5) The Registered Entity's action plan to prevent recurrence of the Alleged or Confirmed violation(s).
  - (6) The anticipated impact of the Mitigation Plan on the bulk power system reliability and an action plan to mitigate any increased risk to the reliability of the bulk power-system while the Mitigation Plan is being implemented.
  - (7) A timetable for completion of the Mitigation Plan including the completion date by which the Mitigation Plan will be fully implemented and the Alleged or Confirmed Violation(s) corrected.
  - (8) Implementation milestones no more than three (3) months apart for Mitigation Plans with expected completion dates more than three (3) months from the date of submission. Additional violations could be determined or recommended to the applicable governmental authorities for not completing work associated with accepted milestones.
  - (9) Any other information deemed necessary or appropriate.
  - (10) The Mitigation Plan shall be signed by an officer, employee, attorney or other authorized representative of the Registered Entity, which if applicable, shall be the person that signed the Self Certification or Self Reporting submittals.
  - (11) This submittal form may be used to provide a required Mitigation Plan for review and approval by regional entity(ies) and NERC.
- The Mitigation Plan shall be submitted to the regional entity(ies) and NERC as confidential information in accordance with Section 1500 of the NERC Rules of Procedure.
  - This Mitigation Plan form may be used to address one or more related alleged or confirmed violations of one Reliability Standard. A separate mitigation plan is required to address alleged or confirmed violations with respect to each additional Reliability Standard, as applicable.
  - If the Mitigation Plan is accepted by regional entity(ies) and approved by NERC, a copy of this Mitigation Plan will be provided to the Federal Energy Regulatory Commission or filed with the applicable governmental authorities for approval in Canada.
  - Regional Entity(ies) or NERC may reject Mitigation Plans that they determine to be incomplete or inadequate.
  - Remedial action directives also may be issued as necessary to ensure reliability of the bulk power system.
  - The user has read and accepts the conditions set forth in these Compliance Notices.

## ATTACHMENT B

ReliabilityFirst

Confidential Non-Public Information

February 27, 2019

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### Entity Information

Identify your organization:

Entity Name: American Electric Power Service Corporation [ Legal name see comment below]

NERC Compliance Registry ID: NCR00682

Address: 1 Riverside Plaza  
Columbus OH 43215

Identify the individual in your organization who will serve as the Contact to the Regional Entity regarding this Mitigation Plan. This person shall be technically knowledgeable regarding this Mitigation Plan and authorized to respond to Regional Entity regarding this Mitigation Plan:

Name: Nicholas Morton  
Title: Manager, NERC Compliance  
Email: namorton@aep.com  
Phone: 614-716-2342

## ATTACHMENT B

### Violation(s)

This Mitigation Plan is associated with the following violation(s) of the reliability standard listed below:

Violation ID	Date of Violation	Requirement
Requirement Description		
RFC2018020254	06/30/2018	FAC-003-4 R2.
Each applicable Transmission Owner and applicable Generator Owner shall manage vegetation to prevent encroachments into the MVCD of its applicable line(s) which are not either an element of an IROL, or an element of a Major WECC Transfer Path; operating within its Rating and all Rated Electrical Operating Conditions of the types shown below:		

Brief summary including the cause of the violation(s) and mechanism in which it was identified:

On June 30, 2018, the Kammer-Mountaineer 765kV circuit tripped and reclosed a single time. At 18:27 the circuit tripped and locked out until Sunday July 1, 2018 at 22:44 (28 hours and 17 minutes). The cause of the line tripping was later determined to be vegetation growth that caused a flashover to two trees, within the Minimum Vegetation Clearance Distance (MVCD).

The root cause of this event is that AEP relied on visual cues, professional and historical knowledge to assess the zones where complete clearing was not required (zones with greater than 100' clearance from conductor to ground). The Forestry crews ability to assess conditions in this specific valley span was less than AEP's program presumed. This will be reviewed as part of the activities in Milestone #4.

Aerial patrols were not able to conclusively identify a location of the vegetation contact. The subsequently dispatched ground patrols had similar difficulties identifying the encroachment. Investigation of the outage revealed the following apparent causes:

- This span includes extreme side hill and terrain variation, and the areas with less than 100' clearance were not readily apparent using visual cues. AEP does not fully clear the Right-of-Way where the conductor-to-ground clearance is greater than 100' (clearance exception zone). This is done for environmental benefit and the 100' clearance-to-ground typically leaves adequate conductor clearance to vegetation for reliable operations. In this span there were three clearance exception zones. Over time, the ability to discern between the cleared and uncleared portions of the span became diminished.
- Aerial and ground visual observations were unable to identify threatening vegetation. Given the surrounding vegetation and lack of clear line of sight, it is very difficult to assess vegetation clearance distances. Identifying the specific vegetation was compounded by the difficulty of ground crew members knowing their specific location in the span. Gaining the proper perspective to assess clearances is very difficult. This resulted in the ground observer not identifying the encroachment that occurred at this specific location.
- Aerial and ground visual observations did not properly account for the increase in conductor sag expected during elevated temperature operation.

Relevant information regarding the identification of the violation(s):

As a result of the circuit tripping and locking out on June 30, 2018, an emergency aerial patrol was conducted on July 1, 2018 by AEP Transmission Field Services (TFS), looking mainly for equipment issues. The aerial patrol noticed evidence of what appeared to be burned brush/trees in span 202 to 203. A TFS crew was dispatched along with a contractor forestry ground crew to inspect the span. The crew did not identify any burned brush or trees, likely due to the difficult terrain and thick vegetation. Additionally, the crew did not identify any issues of inadequate clearance and the line was re-energized.

Because of the inability to identify the cause of the outage, on July 2, 2018 a follow-up aerial patrol was conducted of span 202 to 203 by AEP Forestry. The patrol noticed burnt trees and sent a ground patrol.

## ATTACHMENT B

Later on July 2, 2018 a contracted ground crew was sent to the span. The loading of the line at this time was 1721 MVA (42.5%). Because of the inability to identify specific issues, the crew began performing proactive clearing activities. A crew member saw smoke approximately 30' away from where they were working. (It was determined to be approximately 1,050' from tower 202 toward 203.) Two trees showed signs of a flashover, such as soot, bark splitting, and scorched leaves on surrounding vegetation. It was determined that these two trees were the cause of the outage on June 30, 2018.

### Plan Details

Identify and describe the action plan, including specific tasks and actions that your organization is proposing to undertake, or which it undertook if this Mitigation Plan has been completed, to correct the violation(s) identified above in Section C.1 of this form:

On July 3, 2018 AEP filed the 48-hour report to ReliabilityFirst based on information from the July 2, 2018 contractor ground patrol. Following the identification, AEP has initiated the following Mitigating Activities:

1. COMPLETE - Removed all suspect trees and brush from location
2. COMPLETE - Conducted additional aerial inspection of lines with a similar risk profile, i.e. spans greater than 1500' in length crossing valleys. The inspection covered the AEP transmission system in the Appalachian Mountain regions of West Virginia, Virginia, Kentucky, and eastern and southern Ohio
3. COMPLETE - Engineering review of drawings to identify spans with similar risk, i.e. long spans with extreme side hills and/or terrain variation, to enhance our ability to inspect
4. IN PROGRESS - LiDAR review of Amos-Kammer line, which includes the Kammer-Mountaineer circuit to determine broader exposure and set criteria for future work (LiDAR is a laser-based aerial surveying method)
5. PLANNED - Vegetation management work identified by mitigating activities 2 & 3 above

Provide the timetable for completion of the Mitigation Plan, including the completion date by which the Mitigation Plan will be fully implemented and the violations associated with this Mitigation Plan are corrected:

Proposed Completion date of Mitigation Plan: May 28, 2020

Milestone Activities, with completion dates, that your organization is proposing for this Mitigation Plan:

Milestone Activity	Description	*Proposed Completion Date (Shall not be greater than 3 months apart)	Actual Completion Date	Entity Comment on Milestone Completion	Extension Request Pending
1 - Remove Vegetation in Span 202 to 203	Removed all suspect trees and brush from flashover location in Span 202 to 203 on the Kammer - Mountaineer 765kV Transmission line.	07/02/2018	07/02/2018		No
2 - Extent of Condition Review of spans with valley spans on the transmission system	A. Conducted additional inspections of lines with long spans and deep valleys. B. Performed an	09/30/2018	09/30/2018		No



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February 27, 2019

Milestone Activity	Description	*Proposed Completion Date (Shall not be greater than 3 months apart)	Actual Completion Date	Entity Comment on Milestone Completion	Extension Request Pending
	engineering review of records to provide Forestry with the location of exception zones and terrain information.				
3 - Vegetation Clearing associated with Milestone 2	Perform vegetation clearing associated with Milestone 2.0	12/31/2018	12/31/2018		No
4 - Conduct Third-Party Review of TVMP	Conduct a third-party review of AEP's entire TVMP and benchmark against industry practices. This third-party review will include an evaluation of the root cause analysis.	03/31/2019			No
5 - LiDAR of Amos-Kammer Line	Conduct LiDAR survey and analysis of Amos-Kammer line, which includes the Kammer-Mountaineer circuit, to provide engineering level precision of field conditions. We will use the results of this trial LiDAR study to inform the development of the requirements, analytic methodology, and work plan steps that are part of milestones 6 and 7.	03/31/2019			No
6A - LiDAR of AEP EHV (greater than 200kV) Transmission system	Conduct LiDAR vegetation survey and analysis of approximately 1,000 miles of the AEP	04/30/2019			No

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ReliabilityFirst

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February 27, 2019

Milestone Activity	Description	*Proposed Completion Date <small>(Shall not be greater than 3 months apart)</small>	Actual Completion Date	Entity Comment on Milestone Completion	Extension Request Pending
	System				
7A - Modify the 2019 Vegetation Management Work Plan for the EHV System	Integrate the results of the LiDAR vegetation analysis from milestones 5.0 and 6.1 into the 2019 Forestry work plan to address the risks associated with this outage.	05/30/2019			No
8 - Develop and implement a methodology for valley spans.	Develop and implement a methodology that provides specific guidance to Forestry for spans that include both areas with greater than 100' clearance and less than 100' clearance. This additional information will allow Forestry to more clearly identify the appropriate vegetation management activity for those sections.	06/30/2019			No
6B - LiDAR of AEP EHV (greater than 200kV) Transmission system	Conduct LiDAR vegetation survey and analysis of the remainder of the AEP EHV system and incorporate the results in Milestone 7.2.	07/31/2019			No
6C - Complete clearing associated with LiDAR vegetation analysis	Complete associated clearing of initial LiDAR capture of approximately 1,000 miles	08/31/2019			No

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February 27, 2019

Milestone Activity	Description	*Proposed Completion Date (Shall not be greater than 3 months apart)	Actual Completion Date	Entity Comment on Milestone Completion	Extension Request Pending
7B - Modify the 2019 and 2020 Vegetation Management Work Plans for the EHV System	Integrate the results of the remaining LiDAR vegetation analysis into the 2019 and 2020 Forestry work plans to address the risks associated with this outage.	08/31/2019			No
7C - Complete clearing associated with LiDAR vegetation analysis	Complete associated clearing of initial LiDAR capture of approximately 1/3 of the remaining miles	11/30/2019			No
7D - Complete clearing associated with LiDAR vegetation analysis	Complete associated clearing of initial LiDAR capture of approximately 1/3 of the remaining miles	02/28/2020			No
7E - Complete clearing associated with LiDAR vegetation analysis	Complete associated clearing of initial LiDAR capture of remaining miles	05/28/2020			No

Additional Relevant Information

## ATTACHMENT B

### Reliability Risk

#### Reliability Risk

While the Mitigation Plan is being implemented, the reliability of the bulk Power System may remain at higher Risk or be otherwise negatively impacted until the plan is successfully completed. To the extent they are known or anticipated : (i) Identify any such risks or impacts, and; (ii) discuss any actions planned or proposed to address these risks or impacts.

This violation posed moderate potential risk and minimal actual risk and did not pose a serious or substantial risk to the BPS. Growth into the MVCD could ultimately result in loss of customer load. However, in this instance, load was redistributed and no customer load loss was incurred. AEP is continuously monitoring N-1 contingencies and no overloads were identified due to the loss of the circuit. As a result, this outage did not cause a System Operating Limit exceedance on any of the remaining in-service facilities. Additionally, the line affected is not an element of an Interconnection Reliability Operating Limit.

#### Prevention

Describe how successful completion of this plan will prevent or minimize the probability further violations of the same or similar reliability standards requirements will occur

In order to prevent this risk in the future, AEP plans to modify the Transmission Vegetation Management Program (TVMP) in the following ways:

1. Provide Foresters more information:
  - Clearly defined exception zones
  - More information relating terrain and conductor sag will be available to the Foresters in the field.
2. Adjust our assessment approach and clearance distances to mitigate this risk
3. Add a periodic LiDAR inspection as a preventative control to our ongoing aerial and ground inspection methodology

Describe any action that may be taken or planned beyond that listed in the mitigation plan, to prevent or minimize the probability of incurring further violations of the same or similar standards requirements

## ATTACHMENT B

ReliabilityFirst

Confidential Non-Public Information

February 27, 2019

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### Authorization

An authorized individual must sign and date the signature page. By doing so, this individual, on behalf of your organization:

- \* Submits the Mitigation Plan, as presented, to the regional entity for acceptance and approval by NERC, and
- \* if applicable, certifies that the Mitigation Plan, as presented, was completed as specified.

Acknowledges:

1. I am qualified to sign this mitigation plan on behalf of my organization.
2. I have read and understand the obligations to comply with the mitigation plan requirements and ERO remedial action directives as well as ERO documents, including but not limited to, the NERC rules of procedure and the application NERC CMEP.
3. I have read and am familiar with the contents of the foregoing Mitigation Plan.

American Electric Power Service Corporation [ Legal name see comment below] Agrees to be bound by, Plan, including the timetable completion date, as accepted by the Regional Entity, NERC, and if required, the applicable governmental authority.

Authorized Individual Signature: \_\_\_\_\_  
(Electronic signature was received by the Regional Office via CDMS. For Electronic Signature Policy see CMEP.)

Authorized Individual

Name: Wade A Smith

Title: SVP, Grid Development

Authorized On: October 03, 2018