APPALACHIAN POWER COMPANY
BEFORE THE
VIRGINIA STATE CORPORATION COMMISSION
CASE NO. PUR-2022-00163

APPLICATION FOR APPROVAL AND CERTIFICATION OF ELECTRICAL TRANSMISSION LINE

Reusens to Roanoke 138 kV Rebuild Project

VOLUME 1 OF 2

Application, Testimony, Response to Guidelines, and Exhibits

November 2022

VOLUME 1 - Application, Testimony, Response to Guidelines, and Exhibits

VOLUME 2 – Siting Study and VDEQ Supplement (2 Parts)

VOLUME 1

EXHIBITS

VOLUME 2, PART 1

MAPS AND ATTACHMENTS

REUSENS TO ROANOKE 138 KV REBUILD PROJECT SITING STUDY

VDEQ SUPPLEMENT

VOLUME 2, PART 2

ACS	American Community Service
ACSR	Aluminum Conductor Steel Reinforced
AEP	American Electric Power Company, Inc. (parent company of Appalachian)
AEPSC	American Electric Power Service Corporation
APCo	Appalachian Power Company (a unit of AEP)
Appalachian	Appalachian Power Company (a unit of AEP)
Application	Collectively refers to the application requesting Commission approval for the proposed Project, together with all of the supporting testimony, Response to Guidelines, Siting Study, VDEQ Supplement, tables, exhibits, attachments, figures and maps, etc.
ASCE	American Society of Civil Engineers
BMP	Best Management Practice
CBG	Census Block Group
CIR	Color Infrared
cmil	circular mil
Code	Code of Virginia
Company	Appalachian Power Company (a unit of AEP)
CPCN	Certificate of Public Convenience and Necessity
Dominion	Dominion Energy Virginia
ELF	Extremely Low Frequency
EMF	Electric and Magnetic Fields
EMF RAPID	Electric and Magnetic Fields Research and Public Information Dissemination
EPRI	Electric Power Research Institute
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
Hz	hertz
IARC	International Agency for Research on Cancer
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
kHz	kilohertz
kV	kilovolt (1,000 volts)
kV/m	kilovolt/meter (a unit of measurement for electric fields)
LiDAR	Light Detection and Ranging imagery
Line	Transmission Line or Power Line
Load Area	The load area depicted on Figure I-2 in Section I of the Response to Guidelines representing a combined peak load of approximately 130 MVA and provides support to the Company's Vinton, Bonsack, Lake Forest, Moseley, Centerville, Ivy Hill, and Coffee Substations.
mG	milligauss (a unit of measurement for magnetic fields)
MVA	megavolt ampere
MVAr	megavolt amps reactive
MW	milliwatt
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHD	National Hydrography Dataset
NHL	National Historic Landmark
NIEHS	National Institute of Environmental Health Services
NLCD	National Land Cover Database
NPL	National Priority List (maintained by USEPA)
NRCS	National Resources Conservation Service of the United States Department of Agriculture
NRHP	National Register of Historic Places

NUG	Non-Utility Generator
NWI	National Wetlands Inventory (maintained by the USFWS)
OPGW	Optical Ground Wire
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PJM	PJM Interconnection, L.L.C. - the RTO that coordinates the movement of wholesale electricity in parts of the Northeast, Mid-Atlantic and Midwest
POWER	POWER Engineers, Inc.
Project	The proposed transmission line rebuild and other proposed work detailed in Section I of the Response to Guidelines.
PSS	Palustrine Scrub-shrub Wetland
PUB	Palustrine Unconsolidated Bottom Wetland
QF	Qualifying Facilities
RCRA	Resource Conservation and Recovery Act Information System (maintained by USEPA)
Response to Guidelines	Response to “Guidelines of Minimum Requirements for Transmission Line Applications Filed under Title 56 of the Code of Virginia.”
ROW(s)	Right(s)-of-Way
RTO	Regional Transmission Organization
RTEP	Regional Transmission Expansion Plan
SCC	Virginia State Corporation Commission
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks
SCU	Stream Conservation Units
Siting Study	The Reusens to Roanoke 138 kV Rebuild Project Siting Study for the Reusens – Roanoke 138 kV Transmission Line asset to be rebuilt
Siting Team	A multidisciplinary team of experts in transmission line routing, impact assessment for a wide variety of natural resources and the human environment, impact mitigation, engineering, and construction management
SSURGO	Soil Survey Geographic Database
Supplemental	Projects initiated by the transmission owner in order to interconnect new customer load, address degraded equipment performance, improve operational flexibility and efficiency, and increase infrastructure resilience
TRI	Toxics Release Inventory (maintained by USEPA)
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VBMP	Virginia Base Mapping Program
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDEQ Supplement	The analysis included in Volume 2 of this Application, which addresses the environmental and historic features associated with the Project
VDWR	Virginia Department of Wildlife Resources
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VDOF	Virginia Department of Forestry
VDOT	Virginia Department of Transportation
VGIN	Virginia Geographic Information Network
VMRC	Virginia Marine Resources Commission
VOF	Virginia Outdoors Foundation
VPDES	Virginia Pollutant Discharge Elimination System
WHO	World Health Organization

To maintain and improve the reliability of electric service to customers in its service territory, Appalachian Power Company ("Appalachian" or "Company") is seeking permission for the Reusens to Roanoke 138 kV Rebuild Project (the "Project"), which consists of the following:

(a) A rebuild of the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double- circuit 138 kV line between the Company's Reusens Substation in Lynchburg, Virginia and its Roanoke Substation in Roanoke, Virginia;

(b) Reconfiguring approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1; and

(c) Expanding and replacing equipment at Centerville Substation.

See **Exhibit 1** for a map of the Project area.

The Project rebuilds an existing 138 kV transmission line due to the condition, performance, and risk associated with the asset. The transmission line to be rebuilt is approximately 90 years old, contains numerous open conditions due to age-related deterioration, and does not comply with current National Electric Safety Code ("NESC") Grade B loading criteria standards and current American Society of Civil Engineers ("ASCE") structural strength criteria. The transmission line has experienced poor operational performance due to multiple permanent and momentary outages, has outage risk to customers served at substations connected to the associated circuits, and has risk of future outages associated with the degraded condition of the pre-1930s equipment.

Approximately forty percent of the Project will be constructed on the existing right-of-way ("ROW") already acquired by the Company. Due to outage constraints, the remaining portion of the Project will be rebuilt parallel to or near the existing centerline, on new ROW, to minimize the duration of time the transmission line will be out of service.

The Company will rebuild the transmission line primarily using 138 kV double-circuit lattice steel towers, although steel monopole structures will be used at certain locations such as congested residential areas. The anticipated heights of the proposed structures on the Project range between 75 and 160 feet, with an average structure height of approximately 125 feet.

Because the Proposed Route is largely within or parallel to the existing transmission line ROW, the statutory preference to the use of existing ROWs, and because of the additional residential and environmental impacts associated with the acquisition of and construction on new ROW, the Company did not develop any alternative routes requiring significantly new ROW, not adjacent to existing ROW, for the Project.

The estimated functional cost of the Project is approximately $218.2 million, which includes approximately $210.2 million for transmission-related work and $8.0 million for substation-related work.

The proposed in-service date for the Project is December 2030. If the Commission approves the Project, the Company estimates that it will need approximately seven years after entry of the Commission's final approving order for engineering, design, ROW acquisition, permitting, material procurement and construction to place the Project in service.

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

APPLICATION OF
APPALACHIAN POWER COMPANY **CASE NO. PUR-2022-00163**

for Approval and Certification of the
Reusens to Roanoke 138 kV Rebuild Project
under Title 56 of the Code of Virginia

APPALACHIAN POWER COMPANY ("Appalachian" or the "Company"), a corporation duly organized and existing under the laws of the Commonwealth of Virginia, represents as follows:

1. Appalachian is a Virginia public service corporation providing electric service in Virginia and West Virginia and having an address of P.O. Box 2021, Roanoke, Virginia 24022.

2. To perform its legal duty to furnish adequate and reliable electric service, Appalachian must, from time to time, replace existing transmission facilities or construct new transmission facilities in its system.

3. In this Application, the Company proposes to construct, own, operate and maintain the Reusens to Roanoke 138 kV Rebuild Project, to be located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, Virginia. This Project consists of:

(a) A rebuild of the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double- circuit 138 kV line between the Company's Reusens and Roanoke Substations;

(b) Reconfiguring approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1; and

(c) Expanding and replacing equipment at Centerville Substation,

All components of this Project are more fully described in Section I of the Company's Response to Guidelines filed with this Application (such rebuild and other improvements collectively referred to as, the "Project"). The infrastructure needs to be replaced due to the condition, performance, and risk associated with the asset. The Project will replace aging infrastructure that is approximately 90 years old, contains numerous open conditions due to age-related deterioration, and does not comply with current National Electric Safety Code ("NESC") Grade B loading criteria standards and current American Society of Civil Engineers ("ASCE") structural strength criteria. The Project is necessary to ensure adequate and reliable electric service and accommodate future growth in Roanoke and Bedford Counties, the cities of Lynchburg and Roanoke, the towns of Vinton and Bedford,[1] and the surrounding areas.

4. Approximately forty percent of the Project will be constructed on the existing 100-foot-wide right-of-way ("ROW) already acquired by the Company. To minimize the duration of time the transmission line will be out of service, the remaining portion of the Project will be rebuilt parallel to or near the existing ROW on new 100-foot-wide ROW.

5. In support of this application, the Company is filing the testimony of:

a. Nicolas C. Koehler, P.E. as to need for the Project;

[1] The Company notes that the activities associated with the Project are not located within the town of Bedford; however, the Project will ultimately benefit the residents living in the Town because, with the Project, the Company intends to rebuild a 138 kV source that feeds the Town of Bedford's utility system.

b. Mary Jane L. McMillen, P.E., with regard to the transmission line engineering characteristics of the Project;

c. James K. Bledsoe, P.E., with regard to the substation engineering characteristics of the Project.

d. Xin Liu, P.E., regarding electric and magnetic field levels associated with the Project; and

e. Daniel Fraser, P.E., as to route review and certain environmental matters associated with the Project.

6. The Company is also filing: (a) a Response to Guidelines, responding to the "Guidelines of Minimum Requirements for Transmission Line Applications Filed Under Title 56 of the Code of Virginia" issued by the Commission's Division of Public Utility Regulation on August 10, 2017; (b) a Siting Study and VDEQ Supplement prepared by the Company's siting and environmental consultant, POWER Engineers, Inc.; and (c) related tables, exhibits, attachments and maps (including a digital geographic information system ("GIS") constraints map and GIS shapefiles of the Project via electronic filing).

7. The Company's testimony, Response to Guidelines, Siting Study, VDEQ Supplement and related materials filed with this Application establish that:

a. The Project is needed and the public convenience and necessity require the construction of the Project by Appalachian;

b. The proposed route for the Project reasonably minimizes adverse impact on the scenic assets, historic districts and environment of the area in which the Project will be located; and

c. The Project will support the Company's continued reliable electric service and accommodate future growth in Roanoke and Bedford counties, the cities of Lynchburg and Roanoke, the towns of Vinton and Bedford, the surrounding areas.

8. The proposed in-service date for the Project is December 2030. If the Commission approves the Project, the Company estimates that it will need approximately seven years after entry of the Commission's final approving order for engineering, design, ROW acquisition, permitting, material procurement and construction to place the Project in service. Accordingly, the Company asks that the Commission expedite its consideration of this Application to the extent permitted under applicable law.

9. The Company therefore requests:

a. That this Application be filed and docketed;

b. That the Commission cause notice of this Application to be given as required by Virginia Code Section 56-46.1 and the Utility Facilities Act, Virginia Code Sections 56-265.1 et seq.;

c. That the Commission Staff undertake an investigation of this Application and report its findings to the Commission;

d. That the Commission determine, as required by Virginia Code Sections 56- 46.1 and 265.2 (1) that the Project is needed and the public convenience and necessity require the construction by Appalachian of the Project; and (2) that the proposed route for the transmission line to be rebuilt included in the Project reasonably minimizes adverse impact on the scenic assets, historic districts and environment of the area concerned;

e. That the Commission approve the construction of the Project pursuant to Virginia Code Section 56-46.1 and any other applicable law; and

f. That the Commission grant Appalachian a certificate of public convenience and necessity under the Utility Facilities Act and grant such other relief as may be necessary for the construction and operation of the Project.

APPALACHIAN POWER COMPANY

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APCo Exhibit No. ___
Witness: NCK

DIRECT TESTIMONY OF
NICOLAS C. KOEHLER, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR 2022-00163

APCo Exhibit No. ___
Witness: NCK

SUMMARY OF DIRECT TESTIMONY OF NICOLAS C. KOEHLER, P.E.

My direct testimony supports Appalachian Power Company's ("Appalachian" or "the Company") Application and Response to Guidelines in connection with the Reusens to Roanoke 138 kV Rebuild Project ("Project"). I am sponsoring Section I of the Response to Guidelines (Necessity for the Project), including the associated figures and tables, and Exhibits 2 and 3.

Appalachian determined that the Company should rebuild its 43 mile-long Reusens – Roanoke 138 kV Transmission Line due to the condition, performance, and risk associated with the asset, as well as its inability to meet current National Electric Safety Code ("NESC") standards and current American Society of Civil Engineers ("ASCE") structural strength criteria, as discussed in more detail in Section I of the Response to Guidelines. The line asset subject to this Application carries portions of four electrical circuits: (1) Cloverdale (AP) – Reusens 138 kV, (2) Cloverdale (AP) – Roanoke 138 kV, (3) Moseley – Roanoke 138 kV, and (4) Moseley – Reusens 138 kV. The customer risk associated with the Project's circuits is a combined peak load of approximately 130 megavolt amperes ("MVA"). Accordingly, the Project will address Appalachian's obligation under Virginia law to provide adequate and reliable service to customers within its service territory. The proposed Project is located in Roanoke and Bedford Counties, Virginia, in the cities of Roanoke and Lynchburg, Virginia, and in the Town of Vinton, Virginia (collectively, the "Project Area"), all of which are in the northeastern part of Appalachian's Virginia service territory.

The transmission line to be rebuilt is over 90 years old, exhibits deterioration of structures and associated equipment throughout the asset, and, as stated above, does not comply with current NESC Grade B loading criteria or current ASCE structural strength criteria. The transmission line has experienced poor operational performance due to multiple momentary and permanent outages, has outage risk to customers directly served by the associated circuits, and has risk of future outages associated with the degraded condition of the pre-1930s equipment.

As a result, the transmission line cannot continue to adequately serve the needs of the Company and its customers. Additionally, the Project Area encompasses industrial, commercial, and residential load. Due to the limited amount of generation within the northeastern portion of Appalachian's service territory in Virginia, customers in the Project Area depend on the reliability of the transmission system that transfers power from generating facilities located farther away on the transmission system. Ultimately, completing the Project will support the Company's continued reliable electric service in the surrounding Project Area.

Lastly, the proposed in-service date for the Project is December 2030. The total estimated cost of the Project is approximately $218.2 million, which includes substation-related costs and transmission-related costs.

DIRECT TESTIMONY OF
NICOLAS C. KOEHLER, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

Q: PLEASE STATE YOUR NAME, ADDRESS AND PRESENT POSITION.

A: My name is Nicolas C. Koehler. My position is Director, East Transmission Planning for American Electric Power Service Corporation ("AEPSC"). AEPSC supplies engineering, financing, accounting, planning, advisory, and other services to the subsidiaries of the American Electric Power ("AEP") system, one of which is Appalachian Power Company ("Appalachian" or "the Company"). My business address is 8600 Smiths Mill Road, New Albany, Ohio 43054.

Q: PLEASE REVIEW YOUR EDUCATIONAL BACKGROUND AND YOUR WORK EXPERIENCE.

A: I received a Bachelor of Science–Electrical Engineering degree from Ohio Northern University in Ada, Ohio. In 2008, I joined AEP as a Planning Engineer where I advanced through increasing levels of responsibility. I received my professional engineer license in the state of Ohio in 2012 (license number 76967). In May 2019, I assumed my current position.

Q: WHAT ARE YOUR RESPONSIBILITIES AS DIRECTOR OF EAST TRANSMISSION PLANNING?

A: My role includes organizing and managing all activities related to assessing the adequacy of AEP's transmission network to meet the needs of its customers in a reliable, cost-effective, and environmentally compatible manner. I participate in planning activities with Appalachian to address overall system performance.

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A: The purpose of my testimony is to support certain aspects of Appalachian's Application to this Commission for approval and certification of the proposed rebuild project, Reusens to Roanoke 138 kV Rebuild Project (the "Project"). Specifically, the Company proposes to:

- Rebuild the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double-circuit 138 kV line between the Company's Reusens and Roanoke Substations.
- Reconfigure approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1.
- Expand and replace equipment at Centerville Substation.

The proposed Project is located in Roanoke and Bedford Counties, Virginia, in the Cities of Roanoke and Lynchburg, Virginia, and in the Town of Vinton, Virginia (collectively, the "Project Area"), all of which are in the northeastern part of Appalachian's Virginia service territory.

Q: WHICH OF THE SPECIFIC MATERIALS INCLUDED IN THE RESPONSE TO GUIDELINES ARE YOU SPONSORING?

A: I am responsible for Section I, Necessity for the Proposed Project. I also am responsible for Exhibits 2 and 3 filed with this Application in response to the Commission Staff's "Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia."

Q: WERE THE PORTIONS OF APPALACHIAN'S FILING WHICH YOU ARE SPONSORING PREPARED BY YOU OR UNDER YOUR SUPERVISION AND DIRECTION?

A: Yes.

Q: PLEASE SUMMARIZE THE NEED FOR THE PROJECT.

A: Appalachian determined that the Company should rebuild its Reusens – Roanoke 138 kV Transmission Line due to the condition, performance, and risk associated with the asset, as well as its inability to meet current National Electric Safety Code ("NESC") standards and American Society of Civil Engineers ("ASCE") structural strength criteria, as discussed in more detail in Section I of the Response to Guidelines. The line asset subject to this Application carries portions of four electrical circuits: (1) Cloverdale (AP) – Reusens 138 kV, (2) Cloverdale (AP) – Roanoke 138 kV, (3) Moseley – Roanoke 138 kV, and (4) Moseley – Reusens 138 kV. The customer risk associated with the Project's circuits is a combined peak load of approximately 130 megavolt amperes ("MVA"). Accordingly, the Project will address Appalachian's obligation under Virginia law to provide adequate and reliable service to customers within its service territory.

Q: WHAT ARE THE REASONS FOR THE REBUILD?

A: The transmission line to be rebuilt is over 90 years old, exhibits deterioration of structures and associated equipment throughout the asset, and does not comply with current NESC Grade B loading criteria or current ASCE structural strength criteria. The transmission line has experienced poor operational performance due to multiple momentary and permanent outages, has outage risk to customers directly served by the associated circuits, and has risk of future outages associated with the degraded condition

of the pre-1930s equipment.

As a result, the transmission line cannot continue to adequately serve the needs of the Company and its customers because of the combination of condition, performance, and risk of the infrastructure to maintain reliability of the existing transmission network that serves customers in the region, as discussed in further detail in Section I of the Response to Guidelines. Additionally, the Project Area encompasses industrial, commercial, and residential load. Due to the limited amount of generation within the northeastern portion of Appalachian's Virginia service territory, customers in the Project Area depend on the reliability of the transmission system that transfers power from generating facilities located farther away on the transmission system. Ultimately, completing the Project will support the Company's continued reliable electric service in the surrounding Project Area.

Q: PLEASE DESCRIBE THE OUTAGE CONSTRAINTS FOR THE PROJECT?

A: The existing Reusens – Roanoke 138 kV Transmission Line is outage constrained and based on preliminary analysis, can only be taken out of service for a limited amount of time; therefore, the Project cannot be rebuilt entirely within the existing ROW. The Company's planners worked with the siting team, including transmission line engineers, to review areas where rebuilding on and off centerline could minimize Project risk. See witness Fraser's testimony for information regarding the Proposed Route, which largely rebuilds within or parallel to the existing ROW.

Q: WHAT IS THE PROPOSED IN-SERVICE DATE FOR THE PROJECT?

A: Due to the Company's outage plan, the proposed in-service date for the Project is December 2030. The Company estimates that it will take approximately three years to

engineer, procure material, and build the first section of the Project and an additional four years to complete the Project in its entirety after a final order authorizing the Project is entered, totaling seven years to complete the entire Project. Refer to Section II.B.10 of the Response to Guidelines and Company witness McMillen's testimony for additional detail on the proposed construction sequence.

Q: WHAT IS THE TOTAL ESTIMATED COST OF THE PROJECT?

A: The total estimated cost of the Project is approximately $218.2 million. Out of the total estimated cost, the estimated substation-related cost is approximately $8.0 million, and the estimated transmission-related cost is approximately $210.2 million.

Q: DOES THE PROJECT CROSS ANY OTHER ELECTRIC UTILITY'S SERVICE TERRITORY? IF SO, DO THEY SUPPORT THE PROJECT?

A: A very small portion of the Project crosses the service territory of the Town of Bedford's utility service where the Project crosses U.S. Route 460 to the west of the town. The Town of Bedford has indicated support for the Project, which will rebuild a 138 kV source for its service.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.

APCo Exhibit No. ____
Witness: MJM

DIRECT TESTIMONY OF
MARY JANE L. MCMILLEN, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

APCo Exhibit No. ____
Witness: MJM

SUMMARY OF DIRECT TESTIMONY OF MARY JANE L. MCMILLEN, P.E.

My direct testimony supports the transmission line engineering aspects of Appalachian's Application and Response to Guidelines in connection with the Reusens to Roanoke 138 kV Rebuild Project ("Project"). I sponsor the description of the transmission lines and other engineering components of the Project in Sections II (but not Sections II.A.2, 3, and 9 and Section II.C) and V of the Response to Guidelines. I also sponsor Exhibits 5 – 12, a digital copy of the Virginia Department of Transportation ("VDOT") General Highway Maps for Bedford, Campbell, and Roanoke Counties showing the Project, and geographic information system ("GIS") shapefiles of the Project to be submitted electronically to the Commission with the Application in lieu of providing three hard copies.

The Project includes the following work:

- Rebuild the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double-circuit 138 kV line between the Company's Reusens and Roanoke Substations.
- Reconfigure approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1.
- Expand and replace equipment at Centerville Substation.

My testimony summarizes the numbers, multiple types, and height ranges of the transmission structures that will be used for the Project. Attempting to rebuild the entire approximately 43-mile-long double-circuit transmission line within the existing right-of-way ("ROW") would significantly increase the time needed to construct the Project. It would also result in a longer duration of circuit outages in which thousands of residential, commercial, industrial, and wholesale customers would be placed on radial feeds. Accordingly, approximately 18 miles of the Project will be rebuilt within the existing ROW in areas selected to minimize impacts to developments and to parcels with conservation easements. Approximately one mile of the proposed route for the Project diverts from the existing ROW to avoid existing residential, commercial, and community buildings that have been constructed adjacent to the existing transmission line. The remaining approximately 24 miles of the Project will be constructed in new ROW that is located parallel to the existing transmission line to minimize the duration of circuit outages.

The Company estimates that it will need approximately seven years from SCC approval of the Project for engineering, design, ROW acquisition, permitting, material procurement, outage coordination and constraints, and construction sequencing to place the entire Project in service.

DIRECT TESTIMONY OF
MARY JANE L. MCMILLEN, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

Q: PLEASE STATE YOUR NAME, PRESENT POSITION, AND BUSINESS ADDRESS.

A: My name is Mary Jane L. McMillen. I am the Manager of Transmission Line Engineering for American Electric Power Service Corporation ("AEPSC"). AEPSC is a subsidiary of American Electric Power Company, Inc. ("AEP") that provides corporate support services to the operating subsidiaries of AEP, including Appalachian Power Company ("Appalachian" or "Company"). My business address is 40 Franklin Road SW, Roanoke, Virginia, 24011.

Q: PLEASE REVIEW YOUR EDUCATIONAL BACKGROUND AND YOUR WORK EXPERIENCE.

A: I graduated from Purdue University with a Bachelor of Science in Civil Engineering followed by a Master of Science in Civil Engineering with an emphasis on Structural Engineering. I am a licensed professional engineer in the Commonwealth of Virginia. I worked for a number of years with an architectural and engineering firm, and I joined AEP in 2006 as a consultant. In 2013, I was hired by AEP as a full-time employee and was promoted to the position of Supervisor within Transmission Engineering Standards in 2014. I was promoted to my current position in AEPSC in 2019. I am responsible for coordinating and directing the engineering for the AEP transmission line system (including transmission lines operating at voltages from 34.5 kV through 765 kV) in Virginia, West Virginia, Tennessee, and Kentucky.

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A: The purpose of my testimony is to support the transmission line components of Appalachian's Application to this Commission for approval and certification of the Reusens to Roanoke 138 kV Rebuild Project (the "Project"). Specifically, the Company proposes to:

- Rebuild the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double-circuit 138 kV line between the Company's Reusens and Roanoke Substations.
- Reconfigure approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1.
- Expand and replace equipment at Centerville Substation.

The proposed Project is located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, all of which are in the northeastern part of Appalachian's Virginia service territory.

In this connection, I am sponsoring various sections of the Response to Guidelines filed by the Company together with the Application in response to the Commission Staff's "Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia."

Q: WHAT ARE YOUR RESPONSIBILITIES AS RELATED TO THE PROJECT?

A: As a Manager of Transmission Line Engineering at AEP, my primary duties involve the oversight of the engineering, design, material procurement, and other technical

requirements associated with the construction of the transmission lines associated with the Project.

Q: WHICH SPECIFIC MATERIALS INCLUDED IN THE RESPONSE TO GUIDELINES ARE YOU SPONSORING?

A: I am sponsoring: (1) the information describing the transmission line and other engineering components of the Project set forth in Sections II (excluding Section II.A.2, 3, and 9 and Section II.C) and V of the Response to Guidelines; (2) Exhibits 5 – 12; (3) a digital copy of the Virginia Department of Transportation ("VDOT") General Highway Maps for Bedford, Campbell, and Roanoke Counties, showing the Project which will be submitted electronically to the Commission with the Application in lieu of providing three hard copies; and (4) GIS shapefiles of the Project, which will be submitted electronically to the Commission with the Application.

Q: WERE THE PORTIONS OF APPALACHIAN'S FILING THAT YOU ARE SPONSORING PREPARED BY YOU OR UNDER YOUR SUPERVISION AND DIRECTION?

A: Yes.

Q: PLEASE DESCRIBE TRANSMISSION LINE ENGINEERING'S ROLE IN THE ROUTE REVIEW PROCESS.

A: Company transmission line engineers were part of the siting team and were involved throughout the route review process. Specifically, transmission line engineers conducted desktop and field reviews of the Proposed Route to validate feasibility of rebuilding the transmission line primarily within or parallel to the existing transmission line right-of-

way ("ROW") from an engineering and constructability standpoint. For more information on the route review process, please see Company witness Fraser's testimony.

Q: PLEASE DESCRIBE THE PROJECT TRANSMISSION LINE.

A: The transmission line component of the Project includes rebuilding the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double-circuit 138 kV line between the Company's Reusens and Roanoke substations. The transmission line will be rebuilt in the existing ROW for part of the route and in new ROW parallel to the existing ROW for part of the route. The Company intends to rebuild the line in this manner because the existing Reusens – Roanoke 138-kV Transmission Line can only be taken out of service for limited durations during spring and fall outage windows. Attempting to rebuild the entire approximately 43-mile-long double-circuit transmission line within the existing ROW would significantly increase the time needed to construct the Project. It would also result in a longer duration of circuit outages in which thousands of residential, commercial, industrial, and wholesale customers would be placed on radial feeds.

Accordingly, approximately 18 miles of the Project will be rebuilt within the existing ROW in areas selected to minimize impacts to developments and to parcels with conservation easements. Approximately one mile of the Proposed Route for the Project will divert from the existing ROW to avoid existing residential, commercial, and community buildings that have been constructed adjacent to the existing transmission line. The remaining approximately 24 miles of the Project will be constructed in new ROW parallel to the existing transmission line to minimize the duration of circuit outages. The Proposed Route for the transmission line is shown in Exhibit 1 and in detail

in the GIS Constraints Map, which is Exhibit 4.

Q: WHAT STRUCTURE TYPES WILL BE USED FOR THE PROJECT?

A: The Project typically requires two types of transmission structures for the double-circuit transmission line, as described in detail in Section II.B of the Response to Guidelines. The structure types included in this Application are preliminary and final structure types will be determined during final engineering, which includes ground surveys and geotechnical studies. Nevertheless, based on preliminary engineering, the Company anticipates primarily using double-circuit lattice steel towers and steel monopole structures for the 138 kV transmission line rebuild. The proposed structure types are described in detail in Exhibits 7 - 10.

Specifically, the Company plans to remove 195 lattice steel towers (see Exhibit 5) and five monopole structures (see Exhibit 6) and replace them with the following structure types: 144 lattice tower structures, which are best suited for medium-to-long spans (see Exhibit 7); 63 tangent davit arm monopole structures, which are best suited for medium-to-long spans (see Exhibit 8); 15 tangent braced-post monopole structures, which are best suited for short-to-medium spans and narrow ROWs (Exhibit 9); and 2 three-pole deadend tap structures, which are best suited for taps into substations, heavy line angle locations, and breaking wire tension (see Exhibit 10). Two existing lattice steel towers near the Company's Coffee and Ivy Hill substations will not be replaced as part of the Project because they were installed in 2009 and 1994, respectively.

Q: HOW DO THE HEIGHTS OF THE EXISTING AND PROPOSED STRUCTURES COMPARE TO EACH OTHER?

A: The details of the heights of the existing and proposed structures are described in Section II.B.3 and detailed in Exhibit 4. There is typically an approximate 25-foot increase in height between the existing structures and the proposed structures. The difference in height between the existing and proposed structures is necessary to accommodate (1) changes in industry code standards since the original construction and (2) a heavier conductor, which results in a greater amount of conductor sag between the structures.

There also are 24 proposed structures that have a height increase of 40 feet to 60 feet compared to the existing structures. The increased heights of these locations are required to accommodate clearances to (1) crossing distribution/transmission lines, (2) parallel distribution lines in close proximity, or (3) placement of proposed structures downhill from existing structures requiring the pole to be taller to meet the same conductor support point.

Q: WHY DID THE COMPANY CHOOSE STEEL LATTICE TOWERS AND STEEL POLES FOR THE REBUILD STRUCTURES?

A: The Company chose steel lattice towers to be the primary structure type for the Project. Lattice towers are an efficient and cost-effective type of structure for the support of long conductor spans in the rolling and steep terrain encountered on this rebuild between the cities of Roanoke and Lynchburg. The Company intends to use steel davit arm monopoles in residential areas because of their smaller footprint. The majority of the steel davit arm monopoles are located in the portions of the Proposed Route near Roanoke County and in the cities of Roanoke and Lynchburg, which consist of more densely populated residential areas. In the more rural/agricultural areas of the Proposed Route,

such as Bedford County, the Company intends to use the steel lattice towers for the Project.

Q: WILL THE COMPANY EMPLOY LOW-COST AND EFFECTIVE MEANS TO IMPROVE THE AESTHETICS OF THE PROPOSED TRANSMISSION LINE?

A: The proposed structures will use dulled or darkened galvanized steel and the conductors and ground wires will be non-specular. The Company chose galvanized steel for its durability and proven reliability in this region. The foregoing measures are a low-cost and effective means of improving the aesthetics of the proposed transmission lines, and thus reduce the visual presence of the new structures.

Q: WHAT IS THE COMPANY'S OPINION ON THE PROPOSED ROUTE?

A: The Company supports the siting team's conclusion that the Proposed Route for the Project – which mainly uses the existing ROW, or which uses ROW located parallel thereto due to outage constraints – is the most suitable and reasonably avoids or minimizes adverse impacts on landowners, historic resources, and environment of the area concerned. See Section II.A.9 of the Response to Guidelines and the Direct Testimony of Company witness Fraser for a detailed description of the Proposed Route. The Company reasonably expects that it will be able to efficiently and effectively engineer, build, operate, and maintain the transmission line with minimal adverse impacts on the environment.

Q: HOW WIDE OF A ROW DOES THE COMPANY TYPICALLY NEED FOR THE PROPOSED PROJECT?

A: The ROW for the Project will generally be 100 feet wide in areas of new, supplemental, or existing easements. Areas where the transmission line will be rebuilt within the

existing ROW (approximately 18 miles) are subject to existing easements, dating from the 1920s and 1930s.

Q: IS THERE ANY PART OF THE PROJECT THAT MAY REQUIRE MORE THAN A 100-FOOT-WIDE ROW?

A: In some locations, the ROW width will be increased as needed to comply with safety requirements. These locations are typically in long spans where the conductors can sway outside of a typical 100-foot ROW during extreme weather conditions. The precise location and extent of the places where the ROW would need to be more than 100 feet wide cannot be determined until the completion of detailed ground surveys and final engineering.

Q: ARE THERE ANY DWELLINGS IN THE PROPOSED ROW FOR THE PROJECT?

A: Eight residences encroach on the existing 100-foot ROW. Based on preliminary engineering analysis, the Company expects the Project can be designed and constructed - to avoid seven of those buildings in the conductor zone. Accordingly, and subject to completion of final engineering and ROW negotiations with affected landowners, the Company does not expect that these seven residential buildings located within the ROW will need to be removed to accommodate the rebuilt line. One residence on Village Drive in Bedford County currently encroaches on the existing 100-foot ROW and is in the conductor zone, thereby necessitating the removal of this encroachment.

Additionally, where the proposed rebuilt line will parallel the existing ROW, there will be two residences that will be located within the proposed 100-foot ROW. These residences will also be in the proposed conductor zone and will therefore need to

be removed. All the affected residences are identified in Exhibit 4, the GIS Constraints Map.

Q: PLEASE DESCRIBE ANY OTHER WORK RELATED TO THE CONSTRUCTION OF THE TRANSMISSION LINE PROJECT.

A: Temporary material laydown yards and access roads for structure erection and conductor stringing will be necessary. The final location and extent of required laydown yards and access roads cannot be determined until after completion of final line design, environmental studies, and subsequent field reconnaissance by the Company's construction representatives and land agents.

Q: DESCRIBE THE CONSTRUCTION ACTIVITIES FOR THE TRANSMISSION LINE COMPONENTS OF THE PROJECT.

A: Project construction activities include the installation and maintenance of soil erosion and sedimentation control measures; access road construction; removal of the existing transmission line wire, structures, and foundations; foundation, structure, and wire installation; and the subsequent rehabilitation of all areas disturbed during construction. All required environmental compliance permits and studies will be completed, and a stormwater pollution prevention plan will be developed and implemented under the state's "General Permit for Discharges of Stormwater from Construction Activities." Additionally, portions of the line that are in new ROW will be constructed prior to beginning the circuit outage in each section. Further details of each step of the construction activities can be found in Section II.A.10.

Q: WHY DOES THE COMPANY ANTICIPATE IT WILL REQUIRE SEVEN YEARS TO CONSTRUCT THE PROJECT?

A: In general, due to the size of the Project and availability of circuit outages, the Company estimates that once the Commission enters a final order authorizing the project, it will take (1) approximately three years to engineer, procure material, and build the first section of the Project (starting from Moseley Substation to Centerville Substation); and (2) an additional four years to complete the Project in its entirety, totaling seven years to complete the entire Project. The Company further notes that the length of the construction timeline is extended to seven years because the Company is limited in *when* the outages may take place. For example, the Company must plan for outages to take place predominantly during the spring and fall months because the lines must be in service during the Company's peak seasons, the winter and summer months, where the Company's customers need electricity the most and service therefore cannot be disrupted during these months. Risks to customers will be minimized by limiting construction within the existing ROW to lengths that can be completed within seasonal outages that can be obtained during periods of historically lower load levels. Portions of the line proposed in the new ROW can be built prior to the outages, further reducing the length of time needed for the outage. Please see Section II.A.10 and Exhibit 11 for additional details of the construction sequencing.

The Company recognizes that seven years is a long period of time for the construction of a proposed rebuild project; however, the Company intends to rebuild a line of unusual length within one project, a line 43-miles in length, all while minimizing customer outages. Upon approval of the Project, the Company estimates it will need

approximately 18 months before construction can begin to complete pre-construction activities. Once construction begins, it is estimated that an additional five years will be required to place the entire 43-mile-long line in service due, in part, to the outage constraints discussed in Company witness Koehler's testimony.

Q: THERE ARE CURRENTLY NINE LOCATIONS WHERE THIRD-PARTY CELLULAR ANTENNAS ARE COLLOCATED ON THE EXISTING TRANSMISSION STRUCTURES TO BE REBUILT. HOW WILL THESE COLLOCATIONS BE RESOLVED?

A: The Company will work with the cellular companies to determine the desire to perpetuate the collocation. Collocation poles for cellular antennas may impact the height and diameter of the transmission structure to accommodate cellular antenna requirements, which is discussed in Section II.B.3 of the Response to Guidelines.

Q: IS PLACING ALL OR PART OF THE TRANSMISSION LINES UNDERGROUND A REASONABLE OPTION?

A: No. The additional cost, reliability risks and environmental impacts associated with locating a line, in whole or in part, underground are not appropriate for this Project. Additionally, the Proposed Route reasonably avoids or minimizes adverse impacts on people and the scenic assets, historic resources and environment of the area concerned.

Q: PLEASE DESCRIBE THE DETAILS SURROUNDING THE CROSSING OVER THE BLUE RIDGE PARKWAY ("PARKWAY").

A: The Project has one crossing of the Blue Ridge Parkway. The existing transmission line alignment crosses the Blue Ridge Parkway with one structure (2-183) on the Blue Ridge Parkway property. For the proposed transmission line alignment, the Company intends to

utilize the same crossing and also have one structure (2-183A) within the Blue Ridge Parkway property. The lone structure will move further away from the road compared to the existing structure. A second structure (2-183B) is proposed to be located off of the Blue Ridge Parkway property to reduce the long span and the need for additional ROW beyond the 100-foot ROW currently maintained. Details of the crossing location can be found in Exhibit 4. The Parkway will not be used to access any of the Project structures during construction. Instead, access to existing structure 2-183 and proposed structure 2-183A will be contained within the existing transmission line easement ROW from the east of the Parkway.

Q: DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A: Yes.

APCo Exhibit No. ____
Witness: JKB

DIRECT TESTIMONY OF
JAMES K. BLEDSOE, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

APCo Exhibit No. ___
Witness: JKB

SUMMARY OF DIRECT TESTIMONY OF JAMES K. BLEDSOE, P.E.

My direct testimony supports Appalachian's Application and Response to Guidelines in connection with the Reusens to Roanoke 138 kV Rebuild Project ("Project"). I sponsor (1) the information describing the substation engineering components of the Project set forth in Section II.C of the Response to Guidelines, (2) Exhibit 13 to the Response to Guidelines, and (3) Exhibit 13-C in the Confidential Appendix. The substation components of the Project consist generally of expanding the existing Centerville Substation yard and upgrading equipment within the substation. Section II.C of the Response to Guidelines describes the technical features of the substation.

DIRECT TESTIMONY OF
JAMES K. BLEDSOE, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

Q: PLEASE STATE YOUR NAME, PRESENT POSITION AND BUSINESS ADDRESS.

A: My name is James K. Bledsoe. I am Manager, Station Engineering for American Electric Power Service Corporation ("AEPSC"). AEPSC is a subsidiary of American Electric Power Company, Inc. ("AEP") that provides corporate support services to the operating subsidiaries of AEP, including Appalachian Power Company ("Appalachian" or "Company"). My business address is 40 Franklin Road SW, Roanoke, VA 24011.

Q: PLEASE REVIEW YOUR EDUCATIONAL BACKGROUND AND YOUR WORK EXPERIENCE.

A: In 1990, I received a Bachelor of Science degree in Civil Engineering from Virginia Military Institute. I am a licensed professional engineer in the Commonwealth of Virginia. I joined the Company in 1990 as a Civil Engineer. I was promoted to the position of Engineering Supervisor with AEPSC in 2010, Transmission Line Engineering Manager with AEPSC in 2014, and then became Station Engineering Manager with AEPSC in 2019. I am responsible for coordinating and directing the station engineering for the AEP transmission system (including stations operating at voltages from 34.5 kV through 765 kV) in Virginia, West Virginia, Tennessee, and Kentucky.

Q: MR. BLEDSOE, WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A: The purpose of my testimony is to support certain aspects of Appalachian's Application (the "Application") to this Commission for approval and certification of the proposed Reusens to Roanoke 138kV Rebuild Project (the "Project"). In this connection, I am sponsoring various sections of the Response to Guidelines (the "Response to Guidelines") filed by the Company together with the Application in response to the Commission Staff's "Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia."

Q: WHAT ARE YOUR RESPONSIBILITIES AS RELATED TO THE PROJECT?

A: As Manager, Station Engineering, my primary duties involve the oversight of the engineering, logistical, and other technical requirements associated with the construction of the station components of the Project.

Q: WHICH SECTIONS IN THE RESPONSE TO GUIDELINES AND EXHIBITS ARE YOU SPONSORING?

A: I am sponsoring (1) the information describing the substation engineering components of the Project set forth in the Response to Guidelines, Section II.C, (2) Exhibit 13 to the Response to Guidelines, and (3) Exhibit 13-C in the Confidential Appendix.

Q: WERE THE PORTIONS OF APPALACHIAN'S FILING THAT YOU ARE SPONSORING PREPARED BY YOU OR UNDER YOUR SUPERVISION AND DIRECTION?

A: Yes.

Q: PLEASE DESCRIBE THE PROJECT'S STATION ENGINEERING COMPONENTS.

A: The substation components of the Project consist generally of the following:

- Existing substation yard expansion (approximately 166' x 153') and upgrades at Centerville Substation.

These Project station-engineering components are shown on the GIS Constraints Map, which is included as Exhibit 4 to the Company's Response to Guidelines.

Q: PLEASE SUMMARIZE THE DESIGN AND OPERATIONAL FEATURES OF THE PROJECT.

A: Please see Section II.C of the Response to Guidelines for complete details of the proposed substation design, but in general, they include a substation yard expansion and upgrades at Centerville Substation. For Operational Features of the proposed substation design, please see the testimony of Company witness Koehler and Section I of the Response to Guidelines.

Q: PLEASE DESCRIBE THE PROPOSED CENTERVILLE SUBSTATION UPGRADES.

A: The Company proposes to expand the gravel fenced portion of the existing Centerville Substation (approximately 166' x 153' expansion, 0.6 acres). In general, the Centerville Substation upgrades involve installing 138 kV, 3000A, 63KA circuit breakers to upgrade the 138 kV substation configuration, replacing antiquated 69 kV equipment, and installing all associated new buswork and structures. Section II.C of the Response to Guidelines describes the technical features of the substation in further detail.

Q: PLEASE GENERALLY DESCRIBE THE CONSTRUCTION ACTIVITIES FOR THE PROJECT.

A: Construction activities for this Project will include grading of the Centerville Substation site; foundation, structure, equipment, and wire installations; and the subsequent rehabilitation of all areas disturbed during construction. Further, the Company will complete all required environmental compliance permits and studies.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.

APCo Exhibit No. ___
Witness: XL

DIRECT TESTIMONY OF
XIN LIU, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

APCo Exhibit No. ___
Witness: XL

SUMMARY OF DIRECT TESTIMONY OF XIN LIU, P.E.

My direct testimony supports Appalachian's Application and Response to Guidelines in connection with the Reusens to Roanoke 138 kV Rebuild Project ("Project"). I sponsor Section IV of the Response to Guidelines.

The Project's proposed rebuild consists of approximately 43 miles of 138 kV double-circuit transmission line between the Company's Reusens and Roanoke Substations. The Company will be using double-circuit lattice steel towers and steel monopole structures. The maximum electric and magnetic field ("EMF") levels expected to occur at the right-of-way ("ROW") edge of the Project's proposed double-circuit 138 kV transmission line are 0.23 kV/m and 28.39 mG, respectively (assuming a 100-foot-wide ROW).

The maximum EMF levels at the edge of the ROW for the existing double-circuit transmission line are 0.17 kV/m and 26.97 mG, respectively. These maximum EMF levels for the proposed transmission line are typical and expected results for such transmission lines and are well within the limits specified in IEEE Standard C95.6™-2002, which sets the safety levels with respect to human exposure to electromagnetic fields.

Appalachian considered the presence and proximity of dwellings, schools, hospitals, and other community facilities as features to avoid wherever practical during its route selection process to minimize EMF exposure. No significant adverse health effects will result from the construction and operation of the Project. Section IV of the Response to Guidelines provides further documentation and detail regarding the absence of adverse health effects from the construction and operation of the Project.

DIRECT TESTIMONY OF
XIN LIU, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

Q: PLEASE STATE YOUR NAME, PRESENT POSITION AND BUSINESS ADDRESS.

A: My name is Xin Liu. I am the Manager of System Performance Analysis for American Electric Power Service Corporation ("AEPSC"). AEPSC is a subsidiary of American Electric Power Company, Inc. ("AEP") that provides corporate support services to the operating subsidiaries of AEP, including Appalachian Power Company ("APCo," Appalachian, or "Company"). My business address is 8500 Smiths Mill Road, New Albany, OH 43054.

Q: PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A: I received a Master of Science degree and a Ph.D. degree, both in Electrical Engineering, from The Ohio State University. I am a senior member of the Institute of Electrical and Electronics Engineers ("IEEE") and a licensed professional engineer in the State of Ohio. I joined AEPSC in 2006 as an Engineer; was promoted to Senior Engineer in 2008; was promoted to Principal Engineer in 2012; and promoted to Manager, System Performance Analysis in 2016.

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A: The purpose of my testimony is to support certain aspects of Appalachian's Application to this Commission for approval and certification of the Reusens to Roanoke 138 kV

Rebuild Project (the "Project"), which involves the rebuild of approximately 43 miles of a double-circuit 138 kV transmission line asset.

Q: WHICH SPECIFIC MATERIALS INCLUDED IN THE APPLICATION ARE YOU SPONSORING?

A: I am sponsoring Section IV, Health Aspects of EMF of the Response to Guidelines filed by the Company in response to the Commission Staff's "Guidelines for Transmission Line Applications Filed under Title 56 of the Code of Virginia."

Q: WERE THE PORTIONS OF THE FILING THAT YOU ARE SPONSORING PREPARED BY YOU OR UNDER YOUR SUPERVISION AND DIRECTION?

A: Yes.

Q: WHAT IS EMF?

A: EMF is an acronym for electric and magnetic fields, which exist wherever there is a flow of electricity. Electric transmission and distribution lines, electrical wiring in homes, and electric appliances all have electric and magnetic fields associated with their use. Electric fields are produced by the voltage gradient between a power line and ground; their strength is dependent upon the voltage difference of the energized line to ground, the physical characteristics of the line, and the distance from the line to the observation point at which the field strength is measured. The electric field strength is commonly measured in kilovolts per meter ("kV/m"). Magnetic fields are created by the flow of electric current in a conductor. The magnetic field density generated by a transmission line varies with the load current of the line, the physical characteristics of the line, and the distance from the line to the observation point at which the magnetic field density is measured. The magnetic field density is measured in units known as gauss, or milligauss ("mG").

The electric and magnetic fields associated with power lines and electric appliances in the United States have a frequency of 60 Hz, or 60 cycles per second.

Q: PLEASE DETAIL FOR THE COMMISSION YOUR EXPERIENCE IN CALCULATING AND ANALYZING EMF.

A: I have over 16 years of experience conducting, managing and directing the calculation and analysis of a variety of issues in power systems for safe, reliable, economic, and environmentally compatible operation of power equipment and transmission lines, for high-voltage grid development, for system voltage coordination, for power quality, and for development and implementation of advanced technologies. I have been a teaching assistant at the High Voltage Lab at The Ohio State University for four years while conducting and teaching EMF-related experiments. I also have extensive experience measuring the EMF under a transmission line through many research projects at The Ohio State University, as well as field testing at AEP.

Q: MS. LIU, WHAT ARE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED TRANSMISSION LINE IN THIS PROJECT?

A: As set forth in Section IV.A of the Response to Guidelines, the maximum electric and magnetic field levels expected to occur at the ROW edge of the Project's proposed double-circuit line are 0.23 kV/m and 28.39 mG, respectively.

The maximum electric and magnetic field levels for the existing double-circuit line are 0.17 kV/m and 26.97 mG, respectively.

Q: ARE THE CALCULATED MAXIMUM EMF LEVELS FOR THE PROPOSED TRANSMISSION LINE EXTRAORDINARY?

A: No. The calculations are typical and expected results for such transmission lines. Both electric and magnetic field levels drop sharply from the centerline to the edge of the ROW and will continue to drop with distance from the ROW edge. These field levels are well within the limits specified in IEEE Standard C95.6™-2002, which sets the safety levels with respect to human exposure to electromagnetic fields.

Q: IS THE PROPOSED LINE CONFIGURATION FOR THE PROJECT A PRUDENT CHOICE TO REDUCE EMF LEVELS?

A: Yes. From an EMF perspective, the Company's proposed configuration is a prudent choice and consistent with the intent of both the Virginia Department of Health and World Health Organization, which promote public safety relative to EMF.

Q: WERE PRUDENT AVOIDANCE MEASURES UTILIZED DURING THE ROUTE SELECTION PROCESS TO MINIMIZE EMF EXPOSURE?

A: Yes. The presence and proximity of dwellings, schools, hospitals, and other community facilities were considered throughout the route selection process as features to avoid, to the extent practical, as described in the direct testimony of Company witness Fraser.

Q: DOES THE COMPANY HAVE AN OPINION ON WHETHER ANY SIGNIFICANT ADVERSE HEALTH EFFECTS WILL RESULT FROM THE CONSTRUCTION AND OPERATION OF THE PROJECT?

A: Based upon the Company's ongoing review of the scientific literature on EMF, the Company's experience with its existing 138 kV transmission lines, and the fact that the calculated maximum EMF levels at the edges of the ROW for the proposed line are well

within the limits specified in IEEE Standard C95.6™-2002, the Company is of the opinion that no significant adverse health effects will result from the construction and operation of the Project. This position is consistent with the conclusions expressed in the final report to the Virginia General Assembly, dated October 31, 2000, by Vickie L. O'Dell and Khizar Wasti, Ph.D. of the Virginia Department of Health, in association with this Commission, entitled "Monitoring of Ongoing Research on the Health Effects of High Voltage Transmission Lines (Final Report)," and subsequent assessments as listed in Section IV of the Response to Guidelines.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.

APCo Exhibit No. ____
Witness: DF

DIRECT TESTIMONY OF
DANIEL FRASER, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

APCo Exhibit No. ____
Witness: DF

SUMMARY OF DIRECT TESTIMONY OF DANIEL FRASER, P.E.

My direct testimony supports the route development and environmental analysis aspects of Appalachian Power Company's ("Appalachian" or "the Company") Application and Response to Guidelines for the Reusens to Roanoke 138 kV Rebuild Project ("Project"). Specifically, I sponsor:

- Sections II.A.2, 3, and 9 and Section III of the Response to Guidelines
- Exhibit 1: Project Area Map
- Exhibit 4: GIS Constraints Map
- Exhibit 14: Visual Simulations
- Exhibit 15: Open House Photos
- Exhibit 16: Public Notice Map
- The entirety of Volume 2 of the Application, which includes the Reusens to Roanoke 138 kV Rebuild Project Siting Study (the "Siting Study") and Virginia Department of Environmental Quality Supplement (the "VDEQ Supplement") with their respective attachments, figures, and tables.

The Company retained POWER Engineers, Inc. ("POWER") to evaluate the existing Reusens – Roanoke 138 kV Transmission Line and conduct a route development review for the transmission line to be rebuilt between the existing Reusens and Roanoke Substations. My testimony describes the process followed by the siting team, which included representatives from the Company and POWER, to identify the Proposed Route for the Project.

The siting team used a traditional siting methodology that identified constraints and opportunities, evaluated the feasibility of rebuilding the transmission line within the existing right-of-way ("ROW"), gathered and incorporated feedback from stakeholders and landowners, conducted analysis and field reviews, and selected a Proposed Route. The Siting Study shows that the Proposed Route for the Project is the most suitable and avoids or minimizes overall human and natural environment impacts by largely rebuilding within or near the existing ROW. The siting team considered rebuilding the transmission line entirely within the existing ROW; however, due to encroachments into the existing ROW and the number and duration of electrical outages that would be needed during construction, rebuilding parallel or near portions of the existing ROW is necessary. Due to residential development and/or restrictive conservation easements, building portions in the existing ROW is also necessary.

The Company considered feedback from federal, state, and local agencies and/or officials and undertook public outreach efforts to promote meaningful engagement from each community affected by the Project. The Project is not anticipated to have a disproportionately high or adverse impact on environmental justice or fenceline communities and the Company will continue to engage with all affected landowners. Finally, I describe the Proposed Route and the corridor within which the Company proposes to engineer, construct, operate, and maintain the Project.

DIRECT TESTIMONY OF
DANIEL FRASER, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2022-00163

Q: PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A: My name is Daniel Fraser. My business address is 6641 West Broad Street, Suite 405, Richmond, Virginia 23230.

Q: BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

A: I am employed by POWER Engineers, Inc. ("POWER") where I serve as a Project Manager for routing and siting projects in the Environmental Division.

Q: DOES POWER HAVE EXPERIENCE IN ENVIRONMENTAL ANALYSIS AND ROUTING TRANSMISSION LINES?

A: Yes. POWER is an engineering and environmental consulting firm with more than 3,000 employees across North America specializing in integrated solutions for clients in the power delivery, power generation, food & beverage, government, renewables and storage, campus energy, and oil and gas industries. POWER was founded in 1976 and has successfully sited and/or permitted hundreds of transmission line projects covering thousands of miles of high voltage transmission lines and associated facilities. POWER has previously supported or provided written testimony to this Commission for seven Company projects, including the Fieldale to Ridgeway 138 kV Rebuild Project (SCC Case No. PUR-2021-00219), Reusens to New London 138 kV Rebuild Project (SCC Case No. PUR-2021-00049), Central Virginia Transmission Reliability Project (SCC Case No. PUR-2021-00001), Glendale Area Improvements 138 kV Transmission Project (SCC Case No. PUR-2018-00188), South Abingdon 138 kV Extension Transmission

Line Project (SCC Case No. PUE-2016-00011), the Huntington Court – Roanoke 138 kV Transmission Line Project (SCC Case No. PUE-2008-00096), and the Matt Funk 138 kV Transmission Line Project (SCC Case No. PUE-2008-00079).

Q: HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A: No; however, I have supported the development of three of the Company's previous filings to the Commission: the Fieldale to Ridgeway 138 kV Rebuild Project, Glendale Area Improvements 138 kV Transmission Project, and South Abingdon 138 kV Extension Transmission Line Project.

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A: The purpose of my testimony is to support the route development process and environmental analysis completed for the Project as part of the Company's Application to the Commission.

Q: WHICH SPECIFIC MATERIALS ARE YOU SPONSORING?

A: In Volume 1 of the Application, I am sponsoring:

- Sections II.A.2, 3, and 9 and Section III of the Response to Guidelines.
- Exhibit 1: Project Area Map
- Exhibit 4: GIS Constraints Map
- Exhibit 14: Visual Simulations
- Exhibit 15: Open House Photos
- Exhibit 16: Public Notice Map

I am also sponsoring the entirety of Volume 2 of the Application, which includes the Reusens to Roanoke 138 kV Rebuild Siting Study (the "Siting Study") and the

Virginia Department of Environmental Quality Supplement (the "VDEQ Supplement"), and their respective attachments, figures, and tables.

Q: WERE THE PORTIONS OF APPALACHIAN POWER'S FILING THAT YOU ARE SPONSORING PREPARED BY YOU OR UNDER YOUR SUPERVISION AND DIRECTION?

A: Yes.

Q: PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A: I received a Bachelor of Science degree in Civil Engineering from Clemson University. I am a licensed professional engineer in the State of South Carolina. In 2016, I joined POWER as a transmission line engineer and have held various roles in transmission line engineering, environmental planning, and project management. In these roles, I have supported electric transmission projects in Virginia, West Virginia, Kentucky, Ohio, Indiana, Texas, and Florida. In my current position, which I have held since 2021, I oversee the work of POWER's technical staff members who are responsible for routing and siting transmission lines and substations, documenting the routing and siting process, and engaging stakeholders and landowners.

Q: SPECIFICALLY, HOW IS THIS PRIOR EXPERIENCE APPLICABLE TO THE CURRENT PROJECT?

A: My experience engineering and siting electric transmission facilities has equipped me to determine the information and analyses necessary to develop a transmission line route that minimizes impacts to the natural and human environments. I have an understanding of the opportunities and constraints, such as existing infrastructure, existing and future

land uses, visual, recreational, and cultural resources, and constructability, that are common within the Project area. I have executed routing and siting studies for projects that crossed various land use types, including developed (densely populated or planned for development) and undeveloped (agricultural, forested, or mountainous) areas. I have applied this experience to the Project which crosses both developed and undeveloped areas near various visual and cultural resources.

Q: PLEASE DESCRIBE FOR THE COMMISSION YOUR PRIMARY DUTIES AS RELATED TO THE PROPOSED PROJECT.

A: POWER was retained by the Company to evaluate the existing Reusens – Roanoke 138 kV Line, complete a Siting Study, and develop a Proposed Route for the transmission line to be rebuilt between the existing Reusens and Roanoke Substations. As the routing and siting Project Manager for the Project, I led the siting team by planning and overseeing the following general activities:

- identifying constraints and opportunities within the Project area;
- evaluating the feasibility of rebuilding the transmission line entirely within the existing ROW;
- incorporating feedback received from stakeholders and landowners within the Project area;
- conducting field reviews and comparative analysis of study segments; and
- selecting a Proposed Route that reasonably avoids or minimizes adverse impacts on the community, historic and visual resources, and natural environment in the Project area, and is consistent with general routing guidelines, technical criteria, and the Company's operational outage restrictions.

Q: WHO WAS ON THE SITING TEAM?

A: The siting team for the Project consists of a multi-disciplinary team, including employees from the Company, POWER, and other consultants retained by or on behalf of the Company, who supported the route development and public involvement process. Members of the siting team represented transmission line, substation, and distribution engineering, ROW, public outreach, environmental, outage planning, and construction management. The siting team members have extensive experience in transmission line siting and impact assessment for natural resources, land uses, and constructability.

Q: PLEASE DESCRIBE FOR THE COMMISSION THE PURPOSE OF THE SITING STUDY FOR THE PROJECT.

A: The primary purpose of the Siting Study is to document the transmission line route development process and the rationale for the Proposed Route. The Siting Study identifies the study area, which encompasses the area within 0.5 mile of the existing Reusens – Roanoke 138 kV Transmission Line, summarizes the siting methodology used to evaluate constraints and opportunities within the study area, documents public engagement activities undertaken by the siting team, and provides a quantitative and qualitative analysis of the Project. Finally, the Siting Study identifies the Proposed Route for the Project that the Company seeks to use to engineer, construct, operate, and maintain the transmission line. The Siting Study is included in Volume 2 of the Application.

Q: DID THE SITING TEAM CONSIDER ANY GENERAL OR TECHNICAL CRITERIA FOR THE EXISTING LINE TO BE REBUILT?

A: Yes. The siting team considered various siting and technical guidelines during the route development process for the transmission line to be rebuilt. Rebuilding transmission lines within existing Company ROWs is preferred and, when using the existing ROW is not a practical solution due to constraints, paralleling the existing ROW is a preferred alternative. Using or paralleling existing ROWs generally minimizes impacts on the natural and human environments. Other criteria considered by the siting team included avoiding residences, businesses, and community centers, minimizing tree clearing, avoiding new crossings of visual, natural, and cultural resources, minimizing the total transmission line length, minimizing crossings of the existing centerline and other transmission lines, avoiding large line angles, and considering the terrain which impacts structure and access road design. Additionally, impacts on environmental justice ("EJ") communities, namely communities of color and low-income communities, crossed by the existing transmission line were evaluated. The siting team considered these criteria in addition to stakeholder and landowner input received about the Project.

Q: PLEASE DESCRIBE THE CONSTRAINTS AND OPPORTUNITIES ANALYSIS USED BY THE SITING TEAM.

A: Using the best available public data and the Company's routing and technical criteria, the siting team identified constraints and opportunities within the Project study area. Constraints are specific areas that should be avoided to the extent practical during the route development process and opportunities are existing features of similar use that can be paralleled. The primary constraints for the Project included development, historic resources, natural and recreational resources, and state and federal conservation easements. The main opportunity features to parallel within the study area were electric

transmission line ROWs such as the existing Reusens – Roanoke 138 kV Transmission Line and parcel boundaries.

Q: PLEASE DESCRIBE THE SITING METHODOLOGY EMPLOYED FOR THE PROJECT.

A: After identifying the constraints and opportunities within the study area, the siting team's methodology began with a review of the existing ROW and outage requirements with the Company's planners as summarized in Section II.A.9 of the Response to Guidelines to determine the feasibility of rebuilding the transmission line entirely within the existing ROW. Because the duration of double-circuit electrical outages should be minimized (see Company witness Koehler's testimony), rebuilding the Reusens – Roanoke 138 kV Transmission Line entirely within the existing ROW is not a feasible solution for the Project. The Company determined the portions of the Project to be rebuilt within the existing ROW should be limited to short sections, such as through residential areas or conservation easements where no viable alternatives exist; so, the siting team developed study segments parallel to or near the existing ROW that minimized new impacts to the natural and human environments and met the specific siting criteria for the Project. The Company engaged stakeholders, including local officials, and the communities crossed by the Project to gather feedback on the Project and study segments. Based on the feedback received and field reconnaissance, the siting team refined the study segments, which when combined, formed the Proposed Route for the Project.

Q: WAS THE SITING METHODOLOGY CONSISTENTLY EMPLOYED FOR THE PROJECT?

A: Yes. The siting team's siting methodology evaluated constraint and opportunity areas along the entire existing transmission line ROW, which crosses developed residential communities in the cities of Lynchburg and Roanoke and the Town of Vinton, as well as open agricultural fields, farmland, and forested areas with scattered residential and commercial development in Bedford and Roanoke Counties. The siting team considered the constraints within the study area and the feedback received from the community to determine where it was most practicable to rebuild the transmission line within, parallel to, or near the existing ROW.

Q: ARE THERE AREAS WHERE THE TRANSMISSION LINE CAN BE REBUILT WITHIN THE EXISTING ROW?

A: Yes. In total, approximately 18 miles of the Project is proposed to be rebuilt within the existing Reusens – Roanoke 138 kV Transmission Line ROW.

There are two rebuild sections, as described in the Siting Study, where the Company and siting team determined the transmission line can be rebuilt almost entirely within the existing ROW. Between the Reusens and Coffee Substations (the "Reusens to Coffee Rebuild Section"), the transmission line crosses through residential developments in the City of Lynchburg and opportunities to acquire new ROW and parallel the existing transmission line are limited. Due to the limited alternatives, the Company's outage planners and engineers determined rebuilding the transmission line within the existing ROW in the Reusens to Coffee Rebuild Section is feasible. Except for a study segment that was developed to cross U.S. Route 501 (Boonsboro Road) and avoid an apartment building and residence that have encroached on the existing ROW, the six-mile-long

Reusens to Coffee Rebuild Section of the Project will generally be rebuilt within the existing ROW.

Between the Vinton and Roanoke Substations (the "Vinton to Roanoke Rebuild Section"), the existing transmission line is located in the Town of Vinton and City of Roanoke and few opportunities exist to rebuild the transmission line in new ROW. The siting team identified one study segment in the approximately three-mile-long Vinton to Roanoke Rebuild Section that parallels the existing ROW across the Roanoke River and avoids an encroachment in the existing ROW; however, the remainder of the rebuild section will be rebuilt largely within the existing ROW.

Additionally, the existing transmission line to be rebuilt crosses five existing easements and one proposed easement held by the Virginia Outdoors Foundation ("VOF"), several residential communities, a state scenic byway, and the Blue Ridge Parkway. Because the siting team did not identify practical alternatives to avoid crossing the VOF easements, residential communities, scenic byway, or the Blue Ridge Parkway, the transmission line will be rebuilt within the existing ROW in these areas to minimize potential impacts (see Section 5.0 of the Siting Study).

Q: PLEASE DESCRIBE THE PORTIONS OF THE TRANSMISSION LINE THAT WILL BE REBUILT PARALLEL TO THE EXISTING ROW.

A: A total of approximately 25 miles of the Proposed Route for the Project is parallel to or near the existing transmission line in new ROW to minimize the duration of the double-circuit electrical outages that would be needed to rebuild the transmission line in the existing ROW. Between the Coffee and Vinton Substations, the Project largely crosses fields and forested land with scattered development in Bedford and Roanoke Counties.

Except where conservation easements and existing development exist, the siting team identified opportunities to parallel the existing transmission line in new ROW and approximately 24 miles of the Proposed Route will parallel one side of the existing transmission line to minimize impacts.

Q: PLEASE DESCRIBE THE PORTION OF THE PROPOSED ROUTE THAT DEVIATES FROM THE EXISTING TRANSMISSION LINE CORRIDOR.

Approximately one mile of the Proposed Route near the U.S. Route 460 (W. Lynchburg Salem Turnpike) crossing will deviate from the existing ROW to avoid development that is adjacent to the existing transmission line. After crossing U.S. Route 460 (W. Lynchburg Salem Turnpike), the Proposed Route turns south for approximately 1,500 feet and then turns west back toward the existing transmission line ROW. The deviation minimizes impacts to residences, commercial buildings, and a place of worship that are adjacent to the existing transmission line ROW and avoids crossing directly over the Bedford Moose Lodge baseball fields by paralleling parcel boundaries south of the developed area. The sections of the Project to be rebuilt in new ROW are shown in Exhibit 4 and described further in the Siting Study in Volume 2.

Q: DID THE COMPANY CONSIDER STAKEHOLDER AND PUBLIC INPUT DURING THE ROUTE DEVELOPMENT AND DATA COLLECTION PROCESS?

A: Yes. Stakeholder input and public participation is an important component of the siting process that the Company uses to gather information, develop routes, and inform decisions. The siting team obtained information from or contacted various federal, state, and local agencies and/or officials to inform them of the Project and request input for the

route development process. The Company introduced the Project to Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the towns of Bedford and Vinton in late 2021. The siting team met virtually with local officials from Bedford and Roanoke Counties, the City of Roanoke, and the towns of Bedford and Vinton on December 1, 2021. Next, in January 2022, the siting team contacted 31 state and federal agency officials as part of the data collection effort and 17 responses were received. Copies of the agency letters, contact list, and correspondence are included in Attachment F to the Siting Study in Volume 2 of this Application. Then, on January 25, 2022, the Company announced the Project to the public and invited landowners to attend one of three in-person open houses in the Project area or to view the virtual open house on the Project website. Notifications and invitations were sent to 1,440 landowner addresses within a 1,000-foot corridor (500 feet on either side of each study segment and the existing centerline) and comments were received from 107 landowners. Lastly, the siting team corresponded with affected landowners throughout 2022 to gather additional feedback and provide updates on the status of the Project.

Q: PLEASE DESCRIBE THE PUBLIC ENGAGEMENT ACTIVITIES THE COMPANY HAS COMPLETED TO INTRODUCE THE PROJECT AND SOLICIT FEEDBACK.

A: Given the scale of the Project, the siting team hosted three in-person open houses across the study area to gather landowner and community feedback. The open houses were held on February 7, 8, and 9, 2022 from 5:00 pm to 7:30 pm at William Byrd Middle School, Montvale Elementary School, and Boonsboro Elementary School, respectively (see Exhibit 15). At the open houses, the study segments were presented and representatives

from the siting team provided information about the Project and were available to answer questions and collect comments. Additionally, the public was invited to review project information and comment electronically through a virtual open house on the Project website. The majority of comments received from the public were related to how the rebuilt transmission line will differ from the existing transmission line. Several landowners requested specific information about the effect of the Project on their property and provided input on the placement of the proposed structures.

Q: REGARDING THE VIRGINIA ENVIRONMENTAL JUSTICE ACT (§ 2.2-234 *ET SEQ.* OF THE CODE OF VIRGINIA), DID THE SITING TEAM RESEARCH THE DEMOGRAPHICS OF THE COMMUNITIES SURROUNDING THE PROJECT?

A: Yes. The siting team used the EJSCREEN (2021) tool, developed by the United States Environmental Protection Agency ("USEPA"), and referenced data from the United States Census Bureau-American Community Survey ("ACS"). Per the available EJSCREEN and ACS data, there are 46 Census Block Groups ("CBGs") within one mile of the Project. Applicable demographic data for the 46 CBGs are provided in Attachment G of the Siting Study. Of these CBGs, six meet or exceed the Commonwealth's threshold of an EJ community, namely communities of color and low-income communities, and are crossed by the existing transmission line and Proposed Route for the Project. It is the Company's standard practice in its route development processes to avoid or reasonably minimize impacts to the human environment, which includes EJ and fenceline communities. The Project will largely be rebuilt within or near the existing transmission line ROW within these communities. Relocating the Project from its current location

would result in crossing other similar EJ communities and was not considered a feasible alternative for the Project. The Project is not anticipated to have a disproportionately high or adverse impact on EJ communities, as defined in the Virginia Environmental Justice Act (§ 2.2-234 *et seq.* of the Code of Virginia).

Q: HAS THE COMPANY ENGAGED, AND WILL IT CONTINUE TO ENGAGE, THE ENVIRONMENTAL JUSTICE COMMUNITIES AND OTHERS AFFECTED BY THE PROPOSED REBUILD PROJECT IN A MANNER THAT ALLOWS THEM TO MEANINGFULLY PARTICIPATE IN THE PROJECT?

A: Yes. The siting team undertook multiple activities to encourage the meaningful engagement of all communities affected by the Project, including EJ communities. Two separate mailings were sent to properties within 500 feet of the Project, including 125 public housing or rental units in the City of Roanoke that are adjacent to the existing transmission line. Additionally, location-targeted Facebook advertisements were circulated between January 31 and February 25, 2022. The Company will continue to engage all community members affected by the Project throughout detailed engineering and construction of the Project.

Q: HOW DID THE COMPANY USE PUBLIC INPUT DURING THE ROUTE DEVELOPMENT PROCESS?

A: Stakeholder and community feedback the Company collected informed the route development process by refining study segments to minimize impacts to affected landowners and avoid additional constraints identified by stakeholders and landowners.

Q: HOW DID THE COMPANY USE FIELD REVIEWS DURING THE ROUTE DEVELOPMENT PROCESS?

A: On multiple occasions, I reviewed accessible portions of the existing transmission line ROW with members of the siting team to evaluate the feasibility of rebuilding the line in or near the existing ROW. During these field reviews, the siting team confirmed the desktop constraint and opportunity data, evaluated potential structure locations, and reviewed specific locations of interest identified by the public.

Q: PLEASE DESCRIBE THE PROPOSED ROUTE.

A: The Proposed Route for the Project is approximately 43 miles long between the Company's Reusens Substation in the City of Lynchburg and Roanoke Substation in the City of Roanoke. The Proposed Route is largely within or parallel to the existing transmission line ROW with minor deviations to minimize impacts to the human and natural environments as well as outage durations. Approximately 18 miles of the Proposed Route will be built within the existing ROW due to residential and commercial development and conservation easements that limit the ability to build in new ROW. The remaining 25 miles of the Proposed Route is parallel to or near the existing ROW to minimize outage risk and land use impacts. The Proposed Route is further described in Section 6.0 of the Siting Study and depicted in Exhibit 16, the Public Notice Map.

Q: WHY DID THE COMPANY NOT DEVELOP ALTERNATIVE ROUTES FOR THE PROJECT?

A: Based on the stakeholder and landowner feedback received, the siting team determined that study segments within or near the existing ROW would minimize impacts to the natural and human environments and are feasible for construction. Therefore, complete alternative routes requiring new ROW, not near the existing ROW, were not developed for the Project. Any alternative routes would require additional, new ROW further from

the existing transmission line and would not be consistent with the siting criteria. Alternative routes would result in increased impacts to newly affected resources. Using or paralleling existing ROWs is consistent with Sections 56-46.1 and 56-259 of the Code of Virginia. Therefore, the siting team determined that abandoning the existing ROW corridor for a completely new greenfield route is neither practical nor necessary.

Q: PLEASE DESCRIBE THE VOF CONSERVATION EASEMENTS, AS IT PERTAINS TO SECTIONS 10.1-1009 – 1016 OR 10.1-1700 – 1705 OF THE CODE, WHICH ARE CROSSED BY THE PROJECT.

A: The existing ROW crosses five existing VOF conservation easements and one proposed VOF conservation easement, as shown in Exhibit 4, the GIS Constraints Map. The Company requested input on the Project from the VOF as part of the initial data collection effort and learned of the proposed VOF easement in Bedford County at that time. The siting team met virtually with VOF staff and continued to coordinate and share information as the Project developed. The existing and proposed VOF and Company easements were compared and discussed. After a review of the current transmission line easements, which grant the right to build, operate, and maintain the existing transmission line, the siting team determined rebuilding the transmission line within the existing ROW across the existing and proposed VOF easements minimized impacts to the VOF conservation easements.

Q: PLEASE DESCRIBE THE SCENIC BYWAYS THAT ARE CROSSED BY THE PROJECT.

A: The existing transmission line crosses State Route 43 (Peaks Road), which is a state scenic byway, and the Blue Ridge Parkway, which is a federal scenic byway. Near the

State Route 43 (Peaks Road) crossing, the Proposed Route is generally within the existing ROW except where the Company intends to avoid potential conflicts with a gas transmission pipeline and accommodate construction needs. Where the Proposed Route crosses the Blue Ridge Parkway, the Company anticipates it will construct, operate, and maintain the Project within the existing 100-foot-wide ROW (see Company witness McMillen's testimony for transmission line design details across the Blue Ridge Parkway). The siting team expects that potential visual impacts to the state and federal scenic byways crossed by the Project will be minimal as the line will cross the roads in the existing locations and be similar in character to the existing facilities.

Q. IS IT ANTICIPATED THE PROJECT WILL AFFECT ANY FEDERALLY OR STATE PROTECTED SPECIES?

A. No. As discussed in the VDEQ Supplement, habitat studies or species-specific surveys will be conducted prior to construction to identify, avoid, and/or mitigate to the extent practical potential impacts to protected species.

Q: PLEASE DESCRIBE TO THE COMMISSION THE FILING CORRIDOR USED FOR THE PROPOSED ROUTE?

A: An approximately 100-foot-wide ROW will be sited within an approximately 200-to 300-foot-wide corridor. Based on the preliminary engineering analysis to date, the Company believes that the Proposed Route is the most suitable alignment; however, the Company needs the flexibility to shift the centerline no more than 50 feet in either direction where the Proposed Route is largely within the existing ROW, and 100 feet in either direction where the Proposed Route is parallel to the existing ROW. Because engineering is preliminary and field surveys have not yet been completed, the filing corridor is

expanded in one location near the U.S. Route 460 (W. Lynchburg Salem Turnpike) crossing to include the existing ROW. Final line routes and structure locations will be determined during detailed engineering and after additional studies including, but not limited to, ground surveys, geotechnical and environmental studies, and additional interviews with landowners are completed. The filing corridor for the Project is depicted in Exhibit 4, the GIS Constraints Map.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes.

SECTION I. NECESSITY FOR THE PROPOSED PROJECT

A. State the primary justification for the proposed project (for example, the most critical contingency violation including the first year and season in which the violation occurs). In addition, identify each transmission planning standard(s) (of the Applicant, regional transmission organization ("RTO"), or North American Electric Reliability Corporation) projected to be violated absent construction of the facility.

Response:

The proposed Reusens to Roanoke 138 kV Rebuild Project (the "Project") involves rebuilding approximately 43 miles of an existing 138-kilovolt ("kV") transmission line, owned by Appalachian Power Company ("Appalachian" or "Company"), due to the condition, performance, and risk associated with the asset, including its inability to meet current National Electric Safety Code ("NESC") standards. The transmission line to be rebuilt is over 90 years old, exhibits deterioration of structures and associated equipment throughout the asset, and does not comply with current NESC Grade B loading criteria and current American Society of Civil Engineers ("ASCE") structural strength criteria. The transmission line to be rebuilt has experienced poor operational performance due to multiple momentary and permanent outages, has outage risk to customers served at substations connected to the associated circuits, and has risk of future outages associated with the degraded condition of the pre-1930's equipment.

The purpose of the Project is to address the combination of condition, performance, and risk of the infrastructure to maintain reliability of the existing transmission network that serves customers in the region. The Project is located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, all of which are in the northeastern part of Appalachian's Virginia service territory. A map of the Project and surrounding area transmission system is shown in Figure I-1 below and a Project Area Map can be found as Exhibit 1. The area encompasses industrial, commercial, and residential load. Due to the limited amount of generation within the northeastern portion of Appalachian's Virginia service territory, customers in the Project area depend on the reliability of the transmission system that transfers power from generating facilities located farther away on the transmission system.

Figure I-1
Project Area and Surrounding Transmission System

American Electric Power Company, Inc. ("AEP")'s transmission system consists of approximately 40,000 miles of transmission lines, 3,600 stations, 5,000 power transformers, 8,000 circuit breakers, and operating voltages between 23 kV and 765 kV in three different RTOs, connecting over 30 different electric utilities while providing service to approximately 5.5 million customers in 11 different states. AEP's interconnected transmission system was established in 1911 and is comprised of a large and diverse combination of line, station, and telecommunication assets. AEP is obligated to manage and maintain this diverse set of assets to provide for a safe, adequate, reliable, flexible, efficient, cost-effective, and resilient transmission system that meets the needs of all customers while complying with federal, state, RTO, and industry standards. This requires that AEP determine when the useful life of these transmission assets is coming to an end so that appropriate improvements can be deployed. AEP identifies these needs through the criteria and guidelines set forth in a document entitled *AEP Transmission Planning Criteria and Guidelines for End-Of-Life and Other Asset Management Needs*, a current copy of which is included as Exhibit 2. This document constitutes the transmission planning criteria and guidelines for End-of-Life and other asset management needs as required in the Federal Energy Regulatory Commission ("FERC")-approved Attachment M-3 to the PJM Interconnection, LLC ("PJM") Tariff.

Annually, AEP identifies and addresses transmission asset condition, performance, and risk through a three-step process.

Step one is Needs Identification. AEP gathers information from internal and external data sources to identify assets with various needs. Internal sources include inspection reports on asset conditions, reports of outages resulting from equipment failures or inadequate lightning protection, and reports on abnormal conditions. External sources include stakeholder input, customer feedback, and RTO or Independent System Operator issued notices. AEP also reviews assets for compliance with industry standards and

guidelines for design, safety, and other issues. These inputs are reviewed and analyzed to identify the transmission assets that are exhibiting unacceptable condition, performance, and risk.

AEP's Needs Identification methodology considers factors including severity of the asset condition and overall system impacts. In assessing the condition of transmission line assets, AEP considers factors such as age, structure type (wood, steel, lattice), conductor type, static wire type, shielding and grounding design criteria, and NESC standards compliance (*e.g.*, structural strength, clearances). AEP also considers the physical condition, such as the open conditions on the transmission line assets. Needs Identification assesses the historical performance of the asset in question, including outage rates, outage durations, customer minutes of interruption, number of customers interrupted, and system average interruption indices. AEP also determines the asset's level of risk by reviewing the severity of the reported condition of the asset and the possible impact to customers and to the AEP transmission system from an outage. AEP keeps in mind certain equipment that has resulted in operational, restoration, environmental, or safety issues in the past that cannot be directly quantified, but that remain as acknowledged risks. These include things such as wood pole construction, poor lightning and grounding performance, and radial facilities.

Step two is Solution Development. AEP applies appropriate industry standards, engineering judgment, and good utility practices to develop solution options. AEP solicits customer and external stakeholder input on potential solutions through stakeholder summits and the PJM Project Submission process. Solution options consider many factors such as environmental condition, community impacts, land availability, permitting requirements, customer needs, system needs, and asset conditions in ultimately identifying the best solution to the identified need. Selected solutions are then reviewed to determine if the proposed solution does not adversely impact or create baseline planning criteria violations on other parts of the system. AEP then considers the existing portfolio of baseline planning criteria driven projects to see if there can be a combination of projects into a more efficient and cost-effective solution.

Step three is Solution Scheduling. Solution Scheduling depends on factors such as severity of the asset condition, overall system impacts, outage availability, siting requirements, availability of labor and material, constructability, and available capital funding. AEP uses its discretion and engineering judgment to determine suitable timelines for project execution.

Following the application of the above criteria, the Company determined that the Reusens – Roanoke 138 kV Transmission Line needs to be rebuilt due to the combination of condition, performance, and risk of the infrastructure. The line asset subject to this Application was constructed as a double-circuit transmission line in 1926, primarily using lattice steel towers and 397,500 circular mils ("cmil") Aluminum Conductor Steel Reinforced ("ACSR") 30/7 "Lark" conductors, which are now over 90 years old.

The typical steel lattice tower structures used during the time of construction in the 1920s fail to comply with current NESC Grade B loading criteria and fail to comply with

current ASCE structural strength criteria. As shown below in Section I.L, typical structural degradation includes severe ovalization of holes at hanger bar connections, severe crossarm rusting, severe hanger rusting, steel corrosion at joints and on lattice steel members, and uniform corrosion, pitting, and deformation of steel members below grade. There are also open conditions related to shield wires and conductors with broken strands.

The line shielding angle on the typical tangent structure is inadequate and is measured at 47 degrees. Current AEP shielding angle requirements call for angles no greater than 30 degrees. These poor shielding angles, combined with the documented broken shield wire strands, have likely contributed to the poor circuit performance. The subject line asset carries portions of four electrical circuits: (1) Cloverdale (AP) – Reusens 138 kV; (2) Cloverdale (AP) – Roanoke 138 kV; (3) Moseley – Roanoke 138 kV; and (4) Moseley – Reusens 138 kV. As shown below in Section I.K, 36 of the 63 outages recorded in the past five years (2017-2021) were attributed to lightning, including one of the five permanent outages. Permanent outages are defined as outages lasting more than five minutes (0.083 hour).

The customer risk associated with the Project circuits is a combined peak load of approximately 130 megavolt amperes ("MVA"). AEP presented the risks posed by the expected structural degradation associated with lines built prior to 1930, such as this asset, as part of the PJM Attachment M-3 process in December 2019. A portion of the *AEP Eastern System Pre-1930s Era Lattice Tower and Transmission Line System* presentation is included as Exhibit 3. This line, as described above and below in Section I.L, exhibits the expected degradation of an asset built prior to 1930 that is depicted in Exhibit 3. The documented condition and performance of the line, discussed herein, further raises the risk of future outage impacts associated with this line.

If approved, the Project would enable the Company to maintain the overall long-term reliability of its transmission system. The Company proposes the following improvements with the rebuild of the Reusens – Roanoke 138 kV double-circuit line asset. The improvements associated with the submittal of this Application and for which the Company is seeking approval include:

- Rebuild the Reusens – Roanoke 138 kV Transmission Line asset consisting of approximately 43 miles of double-circuit 138 kV line between the Company's Reusens and Roanoke Substations.

- Reconfigure approximately 250 feet of the Roanoke – Cloverdale 138 kV Transmission Line asset between the rebuilt Reusens – Roanoke 138 kV Transmission Line and existing structure 48-175/1.

- Expand and replace equipment at Centerville Substation.

In addition to the Project improvements listed above, the Company intends to complete ordinary improvements concurrently with the Project to provide construction efficiencies. This work includes replacing equipment within the existing Roanoke Substation, replacing relaying equipment at the existing Campbell Avenue and Walnut Avenue

substations, rebuilding approximately 0.2 mile of the existing Campbell Avenue – Roanoke 34 kV Transmission Line, and relocating approximately 150 feet of the existing Roanoke – Walnut Avenue 69 kV Transmission Line.

AEP is a member of PJM, the regional transmission organization that operates a large portion of the eastern United States ("U.S."). PJM oversees the ongoing Regional Transmission Expansion Plan ("RTEP") process to ensure that the regional transmission system owned by its members can reliably meet the projected demand of the customers served by that system.

Outcomes of the RTEP process include three types of transmission system upgrades or projects: (i) baseline upgrades are those that address planning criteria violations caused by network load; (ii) network upgrades are those that address planning criteria violations caused by proposed generation, merchant transmission, or long-term firm transmission service requests; and (iii) supplemental projects are those that are initiated by the transmission owner in order to interconnect new customer load, address degraded equipment performance, improve operational flexibility and efficiency, and increase infrastructure resilience.

Supplemental projects are planned subject to the Attachment M-3 process wherein Transmission Owners review assumptions, needs, and solutions with PJM stakeholders through the regional and sub-regional RTEP meetings to solicit input and feedback from stakeholders. PJM then performs do-no-harm analysis for all supplemental solutions to ensure that proposed solutions do not cause any reliability violations before those projects are submitted for inclusion into the Local Plan and integration into the RTEP. The components of the Project (as outlined above) have been presented to PJM stakeholders through the Attachment M-3 process. PJM has completed the do-no-harm analysis and assigned project number s2469 to the Project. The Company developed the Project as a comprehensive solution to address the identified asset renewal needs and is seeking approval to complete this work.

B. Detail the engineering justifications for the proposed project (for example, provide narrative to support whether the proposed project is necessary to upgrade or replace an existing facility, to significantly increase system reliability, to connect a new generating station to the Applicant's system, etc.). Describe any known future project(s), including but not limited to generation, transmission, delivery point or retail customer projects, that require the proposed project to be constructed. Verify that the planning studies used to justify the need for the proposed project considered all other generation and transmission facilities impacting the affected load area, including generation and transmission facilities that have not yet been placed into service. Provide a list of those facilities that are not yet in service.

Response:

(1) Engineering Justification for Project

The Project pertains to an existing 138 kV transmission line asset, which is over 90 years old. The subject line asset needs to be rebuilt due to the condition, performance, and risk associated with the asset. For a detailed description of the engineering justification of the proposed Project, see Section I.A.

(2) Known Future Projects
There are no known future projects that require the Project to be constructed. The Project is required by AEP's asset renewal criteria as described in Section I.A and is required to continue to provide reliable service to the existing customers served at the Company's Vinton, Bonsack, Lake Forest, Moseley, Centerville, Ivy Hill, and Coffee Substations. PJM completed do-no-harm analysis as part of the submittal of the Project, which considers all known future generation and transmission facilities in the area. PJM found no reliability issues with the Project and assigned supplemental project number s2469.

(3) Planning Studies
See Section I.D.

(4) Facilities List
Not applicable.

C. Describe the present system and detail how the proposed project will effectively satisfy present and projected future electrical load demand requirements. Provide pertinent load growth data (at least five years of historical summer and winter peak demands and ten years of projected summer and winter peak loads where applicable). Provide all assumptions inherent within the projected data and describe why the existing system cannot adequately serve the needs of the Applicant (if that is the case). Indicate the date by which the existing system is projected to be inadequate.

Response:
The Reusens – Roanoke 138 kV double-circuit transmission line to be rebuilt serves customers at the Vinton, Bonsack, Lake Forest, Moseley, Centerville, Ivy Hill, and Coffee Substations, which are located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, Virginia (see Figure I-2).

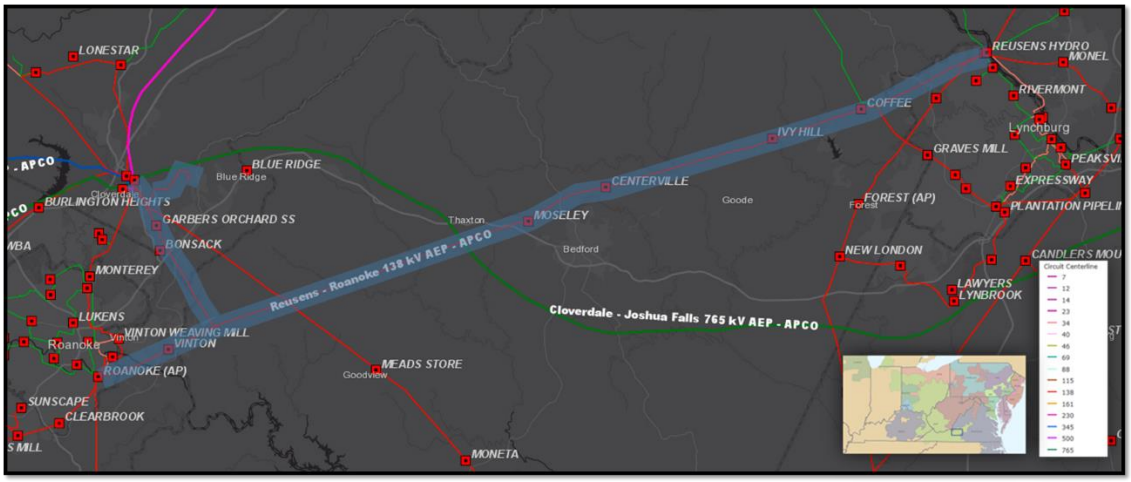


Figure I-2
Load Area
(Vinton, Bonsack, Lake Forest, Moseley, Centerville, Ivy Hill, and Coffee Substations)

AEP developed a load forecast for the Project Load Area using an econometric model that forecasts peak demand. This model had explanatory variables for the real personal income for the Roanoke Metropolitan Statistical Area, the combined, minimum and maximum temperatures on the day of the peak and binary variables. The Project Load Area is winter peaking. The model used historical data for the period from the winter of 2012/13 through summer of 2022. Real personal income forecast data were obtained from Moody's Analytics. AEP developed forecasts of maximum and minimum temperatures on the day of the peak from an average of historical temperatures.

Tables I-1 and I-2 and Figures I-3 and I-4 show historical and projected summer and winter peak loads for the Project Load Area. These figures show the actual summer and winter peak loads for the previous 10 years and the projected summer and winter peak loads for the next 10 years.

Roanoke-Reusens Load Area

	Actual Peak Load (MW)										Projected Peak Load (MW)									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Summer Peak	82.0	83.6	82.2	80.8	87.8	82.9	85.7	90.0	82.7	77.8	86.2	86.8	87.3	87.9	88.5	89.0	89.6	90.1	90.6	91.1

Table I-1
Historical and Forecasted Summer Peak Load Data

Roanoke-Reusens Load Area

	Actual Peak Load (MW)										Projected Peak Load (MW)									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Winter Peak	107.8	108.0	128.6	110.4	111.7	132.8	130.0	115.9	114.6	118.0	119.9	120.6	121.1	121.6	122.3	122.8	123.3	123.8	124.3	124.9

Table I-2
Historical and Forecasted Winter Peak Load Data

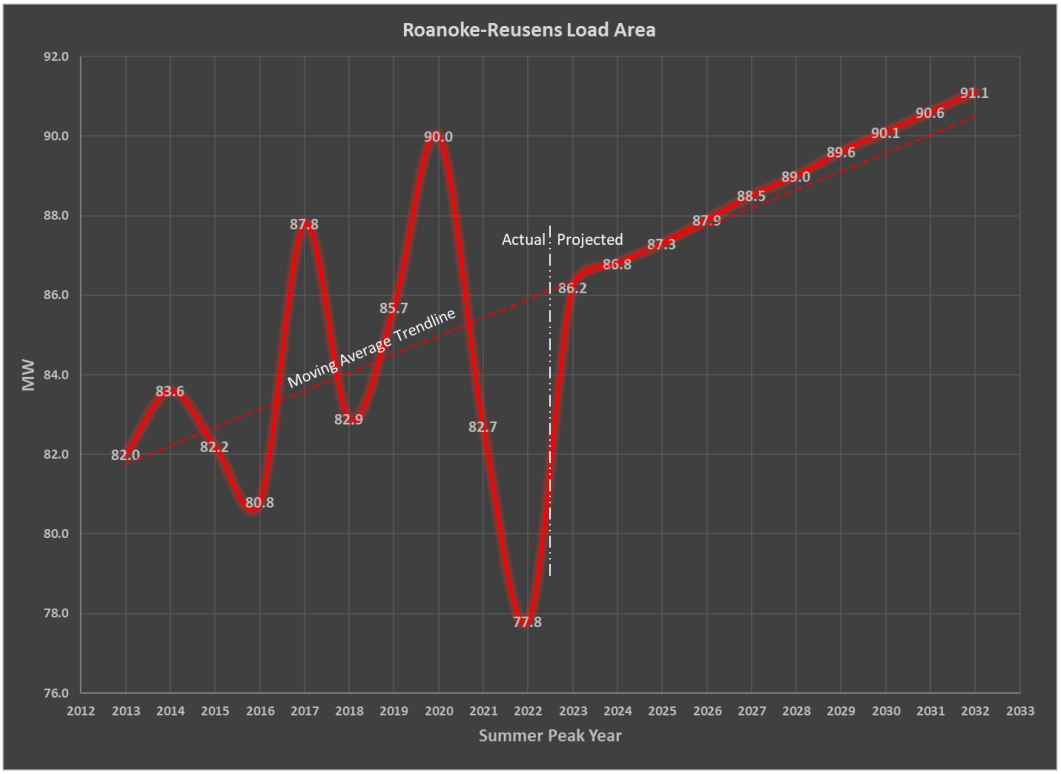


Figure I-3
Project Load Area
Historical and Forecasted Summer Peak Load Data

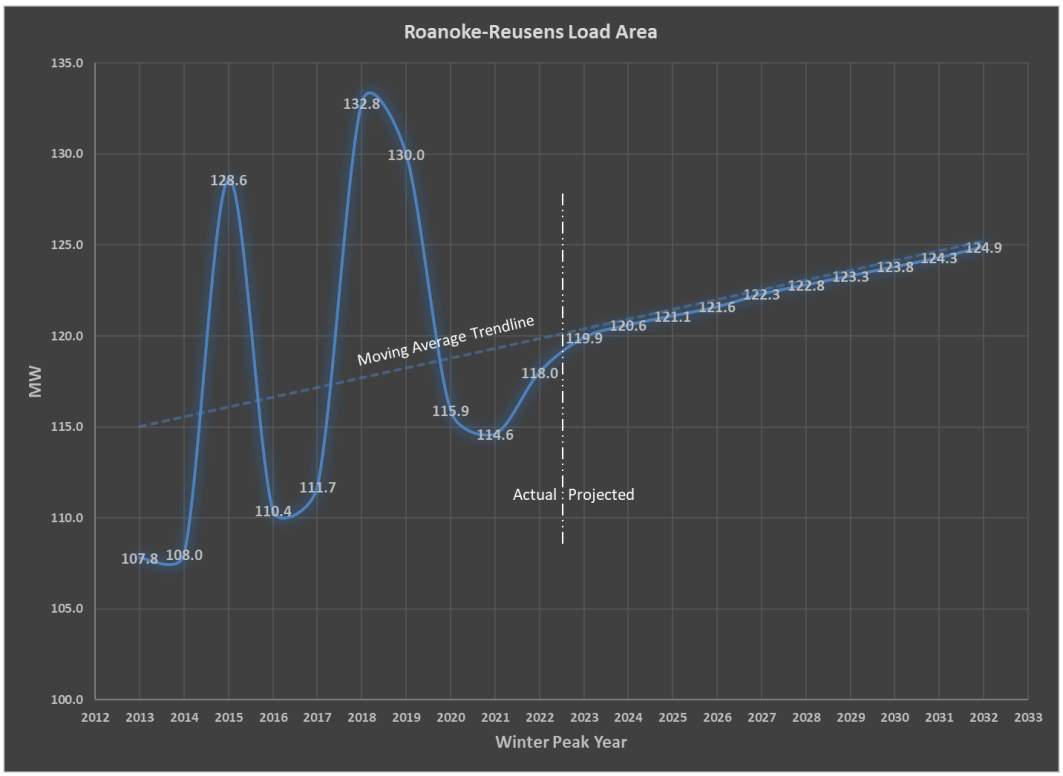


Figure I-4
Project Load Area
Historical and Forecasted Winter Peak Load Data

The Project Load Area summer and winter peak demand are anticipated to grow at an average annual rate of approximately 0.6% over the course of the next 10 years, beginning in 2023.

The existing Reusens – Roanoke 138-kV Transmission Line cannot continue to adequately serve the needs of the Company and its customers because of the infrastructure's inability to meet current NESC Grade B loading criteria and current ASCE structural strength criteria, and because of the deterioration of structures and associated equipment, as discussed in Sections I.A and I.L. Completing the Project will support the Company's continued reliable electric service to support the future overall growth in Virginia's Roanoke and Bedford Counties, cities of Roanoke and Lynchburg, Town of Vinton, and the surrounding area.

D. If power flow modeling indicates that the existing system is, or will at some future time be, inadequate under certain contingency situations, provide a list of all these contingencies and the associated violations. Describe the critical contingencies including the affected elements and the year and season when the violation(s) is first noted in the planning studies. Provide the applicable computer screenshots of single-line diagrams from power flow simulations depicting the circuits and substations experiencing thermal overloads and voltage violations during the critical contingencies described above.

Response:
Not applicable, as the Project is not a baseline project.

E. Describe the feasible project alternatives, if any, considered for meeting the identified need including any associated studies conducted by the Applicant or analysis provided to the RTO. Explain why each alternative was rejected.

Response:
The proposed Project is to be built on approximately 18 miles of existing right-of-way ("ROW") and approximately 24 miles will be built parallel to the existing line in new ROW. Approximately one mile will be built in new ROW but not adjacent to the existing line. No feasible alternatives were identified that would address the condition, performance, and risk of the existing transmission line while continuing to serve the needs of the Company's customers and substations. The Project team considered rebuilding the entire Project in existing ROW; however, due to outage constraints, this was not a feasible solution. An in-the-clear alternative deviating significantly from the existing ROW was also considered unfeasible for this Project due to the additional impact and risk associated with acquisition of new ROW. In addition, this alternative was not chosen, as rebuilding within or parallel to the existing ROW was possible for the majority of the line.

Retirement of the line is not practical due to the location of the existing substations serving customers along this line.

F. Describe any lines or facilities that will be removed, replaced, or taken out of service upon completion of the proposed project, including the number of circuits and normal and emergency ratings of the facilities.

Response:
The Project involves the removal and replacement of existing facilities on the Reusens – Roanoke 138 kV transmission line asset, as described above. There will be no lines permanently taken out of service as part of the proposed Project.

The proposed rebuild of the Reusens – Roanoke 138 kV transmission line asset is comprised of the following four electrical circuits: (1) Cloverdale (AP) – Reusens 138 kV, (2) Cloverdale (AP) – Roanoke 138 kV, (3) Moseley – Roanoke 138 kV, and (4) Moseley – Reusens 138 kV.

The resulting Summer Normal/Summer Emergency/Winter Normal/Winter Emergency ("SN"/"SE"/"WN"/"WE") ratings in MVA after the rebuild are:

(1) Cloverdale (AP) – Reusens 138 kV Circuit (51.9 miles)
- 221/278/279/322 (MVA)
- Limited by 795 ACSR (45/7) station conductor at Ivy Hill Substation

(2) Cloverdale (AP) – Roanoke 138 kV Circuit (14.3 miles)
- 226/286/286/331 (MVA)
- Limited by 795 ACSR (26/7) station conductor at Vinton Substation

(3) Moseley – Roanoke 138 kV Circuit (29.9 miles)
- 219/255/277/303 (MVA).
- Limited by 795 AAC station conductor at Moseley Substation

(4) Moseley – Reusens 138 kV Circuit (22.2 miles)
- 219/255/277/303 (MVA)
- Limited by 795 AAC station conductor at Moseley Substation

G. Provide a system map, in color and of suitable scale, showing the location and voltage of the Applicant's transmission lines, substations, generating facilities, etc., that would affect or be affected by the new transmission line and are relevant to the necessity for the proposed line. Clearly label on this map all points referenced in the necessity statement.

Response:
See Exhibit 1, Project Area Map.

H. Provide the desired in-service date of the proposed project and the estimated construction time.

Response:
The desired in-service date is December 2030 with an estimated engineering and construction time of approximately seven years. A detailed description of the construction sequence and duration is provided in Section II.B.10 of the Response to Guidelines and Exhibit 11.

I. Provide the estimated total cost of the project as well as total transmission-related costs and total substation-related costs. Provide the total estimated cost for each feasible alternative considered. Identify and describe the cost classification (e.g. "conceptual cost," "detailed cost," etc.) for each cost provided.

Response:
Functional estimated substation related cost is approximately $8.0 M.
Functional estimated transmission line related cost is approximately $210.2 M.
Functional estimated total cost of the Project is approximately $218.2 M.

Functional estimates are based on project scopes developed by AEP engineering using information obtained from tabletop studies and design criteria.

J. If the proposed project has been approved by the RTO, provide the line number, regional transmission expansion plan number, cost responsibility assignments, and cost allocation methodology. State whether the proposed project is considered to be a baseline or supplemental project.

Response:
The proposed Project is supplemental and has been assigned PJM project number s2469.

K. If the need for the proposed project is due in part to reliability issues and the proposed project is a rebuild of an existing transmission line(s), provide five years of outage history for the line(s), including for each outage the cause, duration and number of customers affected. Include a summary of the average annual number and duration of outages. Provide the average annual number and duration of outages on all Applicant circuits of the same voltage, as well as the total number of such circuits. In addition to outage history, provide five years of maintenance history on the line(s) to be rebuilt including a description of the work performed as well as the cost to complete the maintenance. Describe any system work already undertaken to address this outage history.

Response:
See Tables I-3 through I-9.

Circuit Outage Cause Summary

Cloverdale (AP) – Reusens 138kV Circuit (01/01/2017 – 12/31/2021)

Date	Cause	Duration (Hours)	CI	Date	Cause	Duration (Hours)	CI
3/6/17	Unknown	0	0	7/21/19	Weather - Lightning/Tstorm	0	0
6/13/17	Weather - Lightning/Tstorm	0	0	8/16/19	Weather - Lightning/Tstorm	0	0
7/5/17	Weather - Lightning/Tstorm	0	0	9/12/19	Unknown	0	0
7/22/17	Weather - Lightning/Tstorm	0	0	10/17/19	Weather – Wind	0	0
8/1/17	Unknown	0	0	8/5/20	Weather - Lightning/Tstorm	0	0
8/9/17	Unknown	0	0	9/9/20	Unknown	0	0
10/31/17	Unknown	0	0	10/9/20	Unknown	0	0
4/11/18	Weather - Lightning/Tstorm	0	0	10/25/20	Relay Misoperation	0	0
5/22/18	Weather - Lightning/Tstorm	0	0	11/3/20	Relay Misoperation	0	0
7/22/18	Weather - Lightning/Tstorm	0	0	7/28/21	Weather - Lightning/Tstorm	0	0
9/17/18	Weather - Lightning/Tstorm	0	0	8/10/21	Weather - Lightning/Tstorm	0	0
6/29/19	Weather - Lightning/Tstorm	0	0	8/11/21	Weather - Lightning/Tstorm	0	0
7/6/19	Weather - Lightning/Tstorm	0	0	8/13/21	Weather - Lightning/Tstorm	0	0
7/6/19	Weather - Lightning/Tstorm	0	0	10/4/21	Unknown	0	0
7/6/19	Weather - Lightning/Tstorm	0	0				

Table I-3
Cloverdale (AP) – Reusens 138 kV Circuit Outage History

Circuit Outage Cause Summary			
Cloverdale (AP) – Roanoke 138kV Circuit (01/01/2017 – 12/31/2021)			
Date	**Cause**	**Duration (Hours)**	**CI**
7/2/17	Station - Animal Contact	0.02	0
4/11/18	Distribution	0	0
6/29/19	Weather - Lightning/Tstorm	0	0
7/6/19	Relay Misoperation	0	0
7/6/19	Relay Misoperation	0	0
7/21/19	Weather - Lightning/Tstorm	0	0
10/31/19	Weather – Wind	0.02	0
8/11/21	Weather - Lightning/Tstorm	0	0

Table I-4
Cloverdale (AP) – Roanoke 138 kV Circuit Outage History

Circuit Outage Cause Summary			
Moseley – Roanoke 138kV Circuit (01/01/2017 – 12/31/2021)			
Date	**Cause**	**Duration (Hours)**	**CI**
7/5/17	Weather - Lightning/Tstorm	0	0
4/11/18	Relay Misoperation	0	0
6/28/18	Distribution	0	0
6/28/18	Distribution	0	0
6/27/19	Unknown	0	0
7/16/19	Unknown	0	0
9/22/20	Distribution	0.32	0
8/11/21	Weather - Lightning/Tstorm	0	0
10/4/21	Vegetation Fall-In (Outside R/W)	0	0
10/26/21	Vegetation Fall-In (Outside R/W)	26.82	0

Table I-5
Moseley – Roanoke 138 kV Circuit Outage History

Circuit Outage Cause Summary							
Moseley – Reusens 138kV Circuit (01/01/2017 – 12/31/2021)							
Date	Cause	Duration (Hours)	CI	Date	Cause	Duration (Hours)	CI
5/1/17	Weather - Lightning/Tstorm	4.28	0	7/6/19	Weather - Lightning/Tstorm	0	0
6/13/17	Weather - Lightning/Tstorm	0	0	8/16/19	Weather - Lightning/Tstorm	0	0
6/22/17	Error – Field	2.78	0	10/17/19	Weather – Wind	0	0
12/5/17	Weather - Lightning/Tstorm	0	0	9/22/20	Distribution	0.32	0
7/22/18	Weather - Lightning/Tstorm	0	0	7/28/21	Weather - Lightning/Tstorm	0	0
8/2/18	Weather - Lightning/Tstorm	0	0	8/11/21	Weather - Lightning/Tstorm	0	0
7/6/19	Weather - Lightning/Tstorm	0	0	8/13/21	Weather - Lightning/Tstorm	0	0
7/6/19	Weather - Lightning/Tstorm	0	0	8/29/21	Weather - Lightning/Tstorm	0	0

Table I-6
Moseley – Reusens 138 kV Circuit Outage History

Appalachian (VA) 138kV Circuits Annual Outage Averages		
5 Years (2017 - 2021)		
# of 138kV Circuits	Frequency	Duration (Hours)
116	1.40	0.10

Table I-7
Appalachian (VA) 138 kV Circuit Outages

Circuit Annual Outage Averages		
5 Years (2017 - 2021)		
Circuit Name	Frequency	Duration (Hours)
Cloverdale (AP) - Reusens 138kV	5.80	0
Cloverdale (AP) - Roanoke 138kV	1.60	<0.01
Moseley - Roanoke 138kV	2.00	1.85
Moseley - Reusens 138kV	3.20	0.42

Table I-8
Project Circuits' Outage Averages

Line Maintenance History		
5 Years (2017-2021)		
Year	Work Performed	Cost ($)
2017	Open Condition Remediation	8,522.92
2019	ROW Widening	38,775.18
2020	ROW Widening	23,984.68
2020	Removal of Hazard Trees	18,592.51
2021	Forestry Maintenance	45,358.45

Table I-9
5 Year Line Maintenance History

L. If the need for the proposed project is due in part to deterioration of structures and associated equipment, provide representative photographs and inspection records detailing their condition.

Response:
The approximately 43-mile long Reusens – Roanoke 138-kV Transmission Line is being rebuilt to address the deterioration of structures and associated equipment. Based on the most recent Reusens – Roanoke 138-kV Transmission Line inspection report (updated on November 24, 2020), there are 12 structures with at least one open shield wire or conductor condition, which is 6% of the structures on this line. On those 12 structures, there are 12 unique open conditions which include: eight shield wires with broken strands, three conductors with broken strands, and one low sagging conductor. Any condition found during an inspection requiring immediate stabilization or repair, to keep the public safe and to keep the Company's operations reliable, are performed as emergency work. The conditions listed here did not meet that emergency level criteria and can be reasonably expected to remain in service until permanent repairs can be performed as part of scheduled work, which the Project proposes.

As part of the Needs Identification step outlined above in Section I.A, a representative sample of 10 structures on the line were assessed and current conditions noted. The following condition description and representative pictures in Figures I-5 through I-16 come from this representative sample. The representative lattice steel towers that were observed exhibit severe ovalization of holes at hanger bar connections and severe crossarm and hanger rusting. Ferrous clamps are present on this line asset; these types of clamps can cause accelerated degradation of the conductor at connection points due to excess heat generated, which can occur when operated at acceptable, rated levels. Evidence of steel corrosion at joints and on upper steel members was documented. Uniform corrosion, pitting, and deformation of steel members below grade is prevalent among the representative structures. These conditions align with the expected degradation of an asset built prior to 1930, as outlined in the *AEP Eastern System Pre-1930s Era Lattice Tower and Transmission Line System* presentation, a portion of which is included as Exhibit 3.

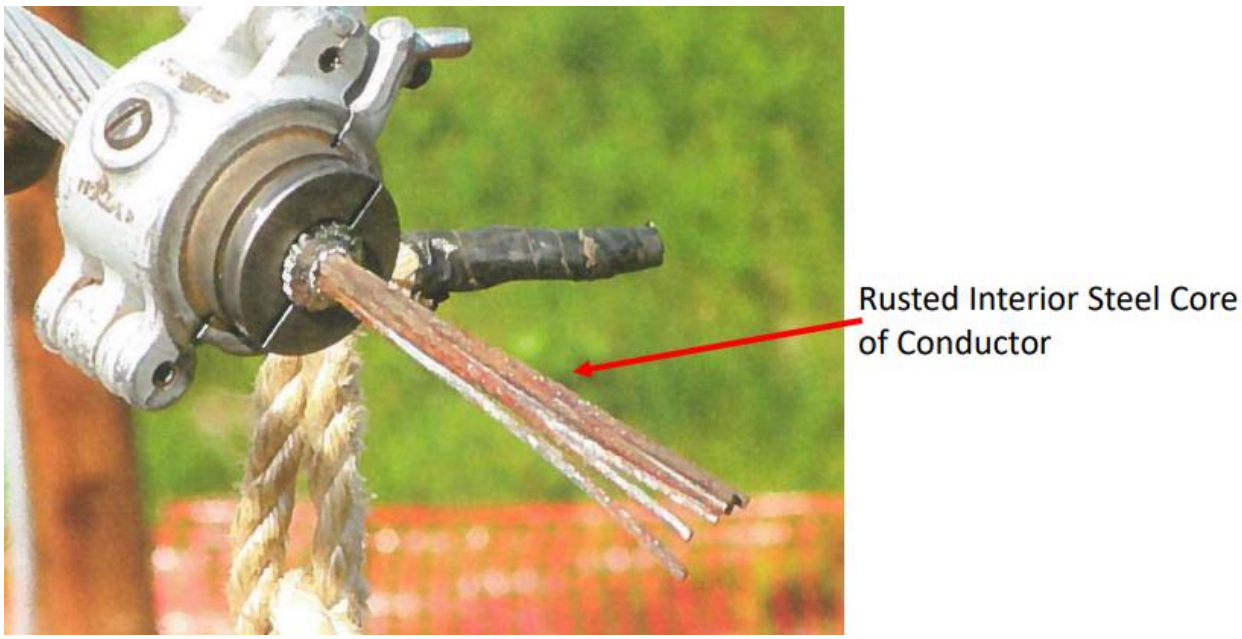


Figure I-5
Cross-Section of Removed Conductor Segment from Reusens – Roanoke 138 kV Transmission Line

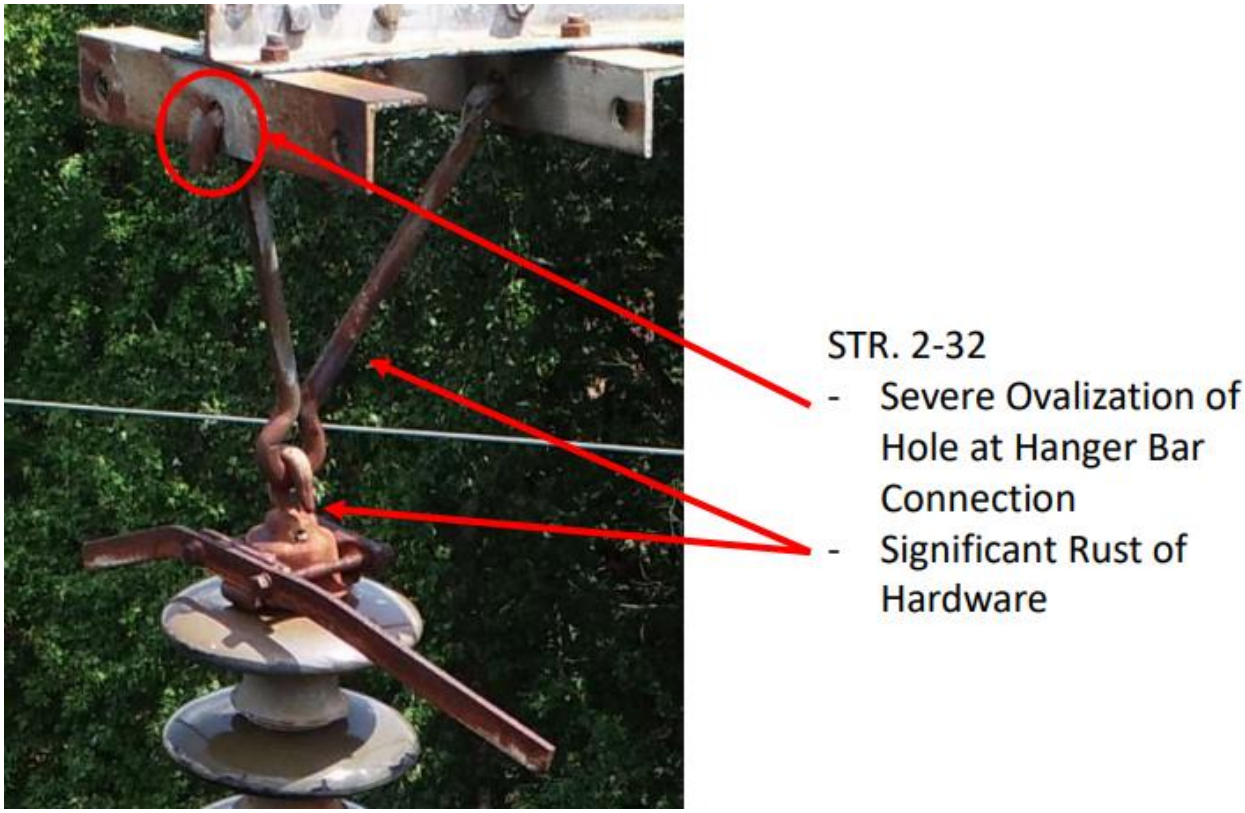


Figure I-6
Structure 2-32: Ovalization of Attachment Hole and Hardware Rusting

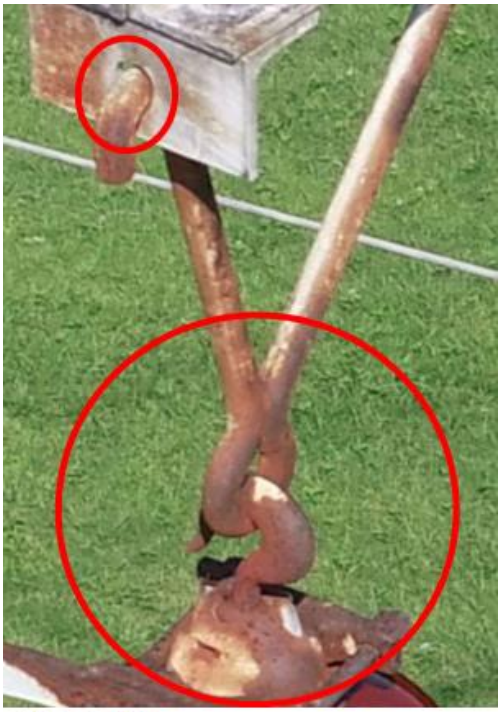
Figure I-7
Structure 2-44: Uniform Corrosion and Pitting 13 inches Below Grade

Figure I-8
Structure 2-59: Ovalization of Attachment Hole, Steel Member Rusting, and Hardware Rusting

Figure I-9
Structure 2-60: Below Grade Pitting

Figures I-10 and I-11
Structure 2-95A: Uniform Corrosion and Pitting at and below Grade

Figure I-12
Structure 2-162: Uniform Corrosion and Pitting at and below Grade



STR. 2-163
- Ovalization of Hole at Hanger Bar Connection
- Significant Rust of Hardware

Figure I-13
Structure 2-163: Ovalization of Attachment Hole and Hardware Rusting

Figure I-14
Structure 2-175: Rust at Joints and on Steel Members

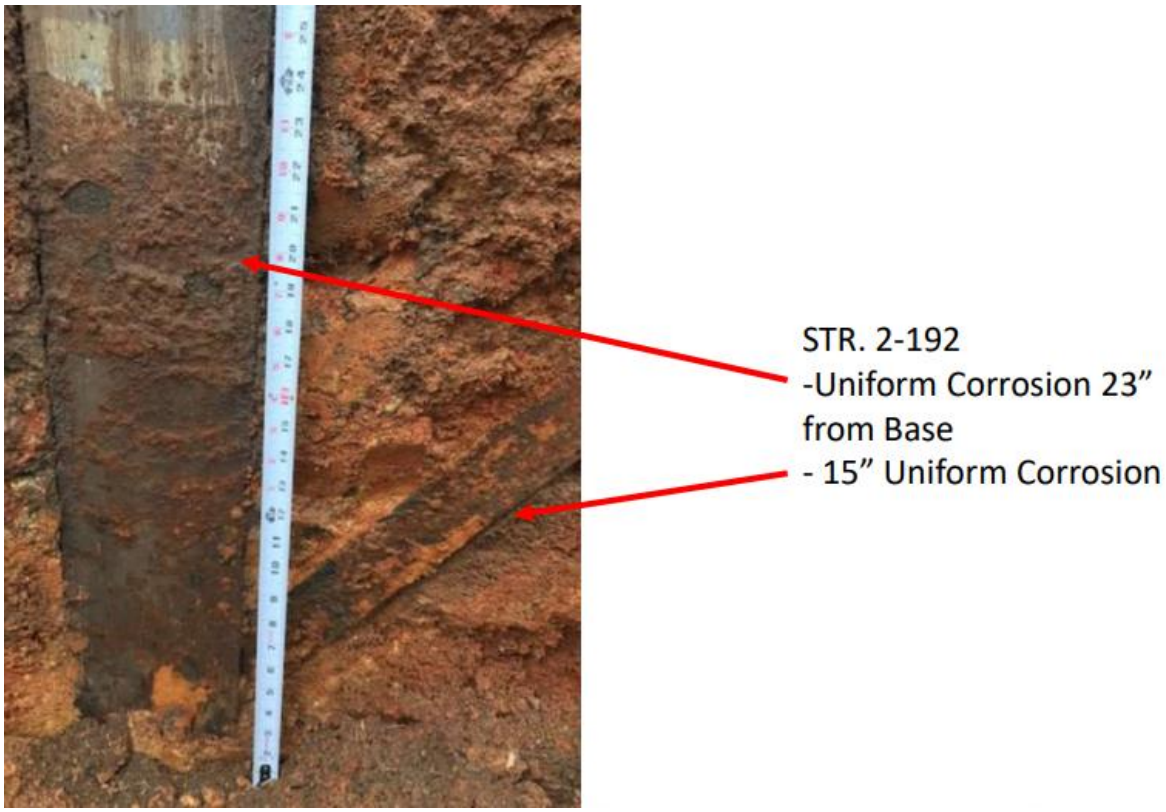


Figure I-15
Structure 2-192: Uniform Below Grade Corrosion

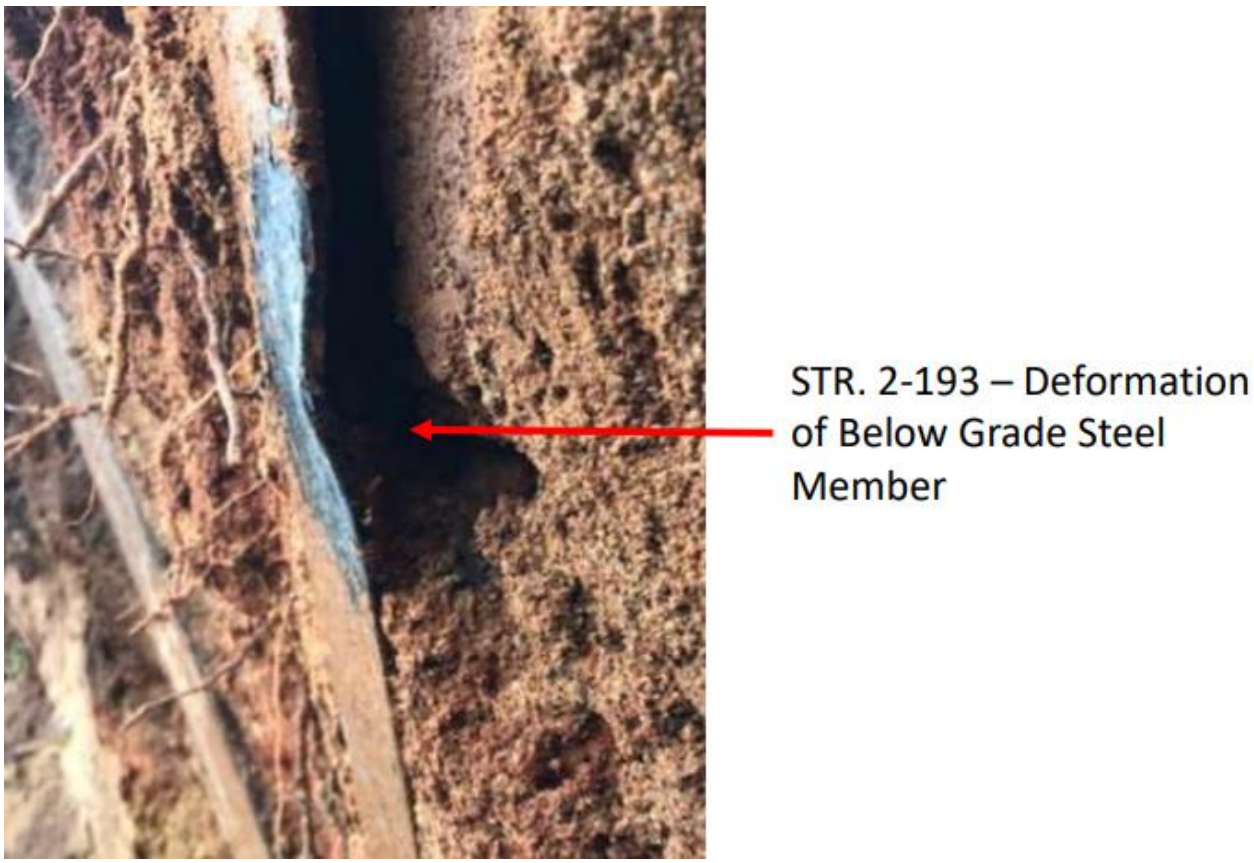


Figure I-16
Structure 2-193: Deformation of Below Grade Steel Member

M. In addition to all other information required by these guidelines, applications for approval to construct facilities and transmission lines inter-connecting a Non-Utility Generator ("NUG") and a utility shall include the following information.

1. The full name of the NUG as it appears in its contract with the utility and the dates of the initial contract and any amendments;

2. A description of the arrangements for financing the facilities, including information on the allocation of costs between the utility and the NUG;

3. a. For Qualifying Facilities ("QFs") certificated by FERC order, provide the QF or docket number, the dates of all certification or recertification orders, and the citation to FERC Reports, if available;

b. For self-certified QFs, provide a copy of the notice filed with the FERC;

4. In addition to the information required in 3a or 3b, provide the project number and project name used by the FERC in licensing hydro-electric projects, also provide the dates of all orders and citations to FERC Reports, if available; and

5. **If the name provided in 1 above differs from the name provided in 3 above, give a full explanation.**

Response:
Not applicable.

N. Describe the proposed and existing generating sources, distribution circuits or load centers planned to be served by all new substations, switching stations and other ground facilities associated with the proposed project.

Response:
No new substations, switching stations, or other facilities are being proposed as part of this Project.

SECTION II. DESCRIPTION OF THE PROPOSED PROJECT

A. Right-of-Way ("ROW")

1. Provide the length of the proposed corridor and viable alternatives.

Response:
The Proposed Route for the Project is approximately 43 miles long between the Company's Reusens Substation in the City of Lynchburg and the Roanoke Substation in the City of Roanoke. The Project will rebuild the transmission line primarily within or parallel to the existing transmission line ROW, as described in Section II.A.9 and in the *Reusens to Roanoke 138 kV Rebuild Siting Study* (the "Siting Study") in Volume 2 of the Application. No viable alternatives were identified that would address the condition, performance, and risk of the existing transmission line while continuing to serve the needs of the Company's customers and substations.

2. Provide color maps of suitable scale (including both general location mapping and more detailed geographic information system ("GIS")-based constraints mapping) showing the route of the proposed line and its relation to: the facilities of other public utilities that could influence the route selection, highways, streets, parks and recreational areas, scenic and historic areas, open space and conservation easements, schools, convalescent centers, churches, hospitals, burial grounds/cemeteries, airports and other notable structures close to the proposed project. Indicate the existing linear utility facilities that the line is proposed to parallel, such as electric transmission lines, natural gas transmission lines, pipelines, highways, and railroads. Indicate any existing transmission ROW sections that are to be quitclaimed or otherwise relinquished. Additionally, identify the manner in which the Applicant will make available to interested persons, including state and local governmental entities, the digital GIS shape file for the route of the proposed line.

Response:
A Project Area Map is attached as Exhibit 1. Detailed GIS constraints mapping illustrating the Project in relation to existing facilities, various resources, and sensitive features is attached as Exhibit 4. Furthermore, the Siting Study includes additional GIS maps and descriptions of the Project area. A shapefile of the Proposed Route will be provided electronically to the Commission along with the Application.

In locations where the Project will be rebuilt in new ROW, it is anticipated that the unused portion of the existing ROW will be quitclaimed or otherwise relinquished as part of a supplemental agreement with the landowner.

3. **Provide a separate color map of a suitable scale showing all the Applicant's transmission line ROWs, either existing or proposed, in the vicinity of the proposed project.**

   Response:
   See Exhibit 1, Project Area Map.

4. **To the extent the proposed route is not entirely within existing ROW, explain why existing ROW cannot adequately service the needs of the Applicant.**

   Response:
   The Project team investigated the feasibility of rebuilding the Project entirely within the existing transmission line ROW; however, double-circuit electrical outages would be required for the entire construction duration significantly increasing the outage time needed to construct the Project and resulting in thousands of residential, commercial, industrial, and wholesale customers being placed on radial feeds, which is not a feasible solution for this Project. The existing Reusens – Roanoke 138-kV Transmission Line can only be taken out of service for limited durations during spring and fall outage windows. The construction plan for this Project includes building the portions of the line that are off-centerline during times when outages are unavailable.

   Approximately 18 miles of the Project will be rebuilt within the existing ROW to minimize new impacts to residential development and to parcels with conservation easements. Approximately one mile of the Proposed Route for the Project diverts from the existing ROW to avoid existing residential, commercial, and community buildings that have been constructed adjacent to the existing transmission line. The remaining approximately 24 miles of the Project will be constructed in new ROW parallel to the existing transmission line to minimize the duration of circuit outages.

5. **Provide drawings of the ROW cross section showing typical transmission line structure placements referenced to the edge of the ROW. These drawings should include:**

   a) ***ROW width for each cross section drawing;***

   b) ***Lateral distance between the conductors and edge of ROW;***

   c) ***Existing utility facilities on the ROW; and***

   d) ***For lines being rebuilt in existing ROW, provide all of the above (i) as it currently exists, and (ii) as it will exist at the conclusion of the proposed project.***

   Response:
   (a-c) See Exhibits 5 – 6 for the typical existing ROW cross sections.
   (d) See Exhibits 7 – 10 for the proposed ROW cross sections.

6. Detail what portions of the ROW are subject to existing easements and over what portions new easements will be needed.

Response:
Areas where the transmission line will be rebuilt within the existing ROW (approximately 18 miles) are subject to existing easements, dating from the 1920s and 1930s. Some of the existing easement agreements contain special provisions, such as those limiting the type of the structures permitted (*e.g.*, wood vs. steel), and the Company intends to address these provisions as needed through the acquisition of supplemental easements. Based upon the results of geotechnical and environmental surveys, landowner input, ROW negotiations, and final line design, there may also be minor deviations from the existing ROW or widening of the ROW width for conductor sway that may be addressed by acquiring supplemental easements.

Approximately 25 miles of the Project will be constructed in new ROW parallel to or near the existing ROW to minimize outage risk and land use impacts. In these areas, the Company plans to supplement the existing easements or obtain new easements unless the existing easements allow for the relocation of the transmission line.

The ROW for the Project will generally be 100 feet wide in areas of new, supplemental, or existing easements. In some locations, the ROW width will be increased as needed to comply with safety requirements. This typically occurs where long span conductors are displaced beyond the typical ROW width during extreme weather conditions.

The portions of the Proposed Route that are subject to existing easements and those where new easements will be required are depicted in Exhibit 4.

7. Detail the proposed ROW clearing methods to be used and the ROW restoration and maintenance practices planned for the proposed project.

Response:
The following are the Company's typical transmission line ROW clearing, restoration, and maintenance practices. Case-by-case exceptions are considered to address sensitive environmental areas/features and/or property owner requests while maintaining the Company and NESC safety clearances.

<u>ROW Clearing</u>

a. In areas with 100 feet or more vertical conductor-to-ground design clearance, the ROW is typically not cleared, except in the following instances:
    - Trees with less than 25 feet clearance from the conductor (at maximum sag conditions) will be removed.
    - Where a conductor stringing path is specified.
    - Where wire setup areas and other work areas are required.

b. In locations with less than 100-foot vertical clearance from conductor (at maximum sag conditions) to ground, all woody stemmed vegetation will be removed to the appropriate ROW width, leaving the cleared area of the ROW populated with grasses and herbaceous growth.

c. Cutting vegetation will be done by either manual or mechanical methods. Worker safety is first and foremost in determining a method; land use and landowner preference may influence the method utilized. Factors influencing safety include terrain, access, tree height, etc. Manual clearing involves the use of contract personnel using chain saws to cut vegetation. Mechanical clearing includes mowers, feller-bunchers, and other heavy operator-run equipment. Mechanical pruning operations employ a variety of configurations of boom-mounted saws mounted on vehicles capable of traversing the ROW. In very difficult terrain or inaccessible areas (high safety risk areas), an aerial saw may be employed for side trimming the ROW.

d. Where reasonable and practical, the Company will utilize selective clearing methods to retain low-growth shrubs and other compatible vegetation within:

   - 50 feet of all year-round streams, ponds, or wetlands and will undertake erosion control measures where necessary;
   - 50 feet of road crossings; and
   - 25 feet of karst features and outcrops of limestone or dolomite rock.

e. Trees will be felled in a manner to minimize damage to crops, fences, and other facilities.

f. Where tree pruning is required, best management practices and standards established by the International Society of Arboriculture, the American Standards Institute, and the Tree Care Industry Association will be used together with best management practices.

g. Logs, including fallen timber, may be left in tree lengths, log lengths or as otherwise designated by the property owner. The property owner will retain ownership of all logs and may dispose of them by commercial sale, use them as firewood or provide them for use as firewood by others. If the property owner does not want to retain ownership and wants the logs removed, the Company will dispose of them in a suitable location.

h. The disposal by the Company of all trees, brush, and slash will, where possible, be consistent with property owner preferences, wildlife values, and particular site conditions. Typical disposal methods consist of one or more of the following:

   - Windrowing — the cut material will be laid in parallel rows along either or both sides of the ROW. This is the preferred method where slopes are 30% or less.
   - Chipping — woody vegetation will be chipped and either scattered over the ROW area or disposed of in a suitable location. Logs will be windrowed (i.e., laid in parallel rows) on either or both sides of the ROW, as designated. The ROW must be accessible to chipping equipment for this option to be viable.

- Let Lie — the cut material will be left in a scattered manner over the ROW area. This is recommended where slopes exceed 30% to reduce erosion and otherwise minimize impact on soils. All woody vegetation will be lopped and scattered so that it lays as close to the ground as practical, but not to exceed two feet in height. This will accelerate the decomposition of this material and will improve the aesthetic impact by allowing more rapid vegetation coverage of the cut material.

i. All clearing debris will be kept out of streams, ponds, and other water areas, wetlands, pastures, and fields.

ROW Restoration

a. Where stream banks are disturbed, they will be restored (*i.e.*, by planting of low-growing species, where necessary) to prevent bank erosion.
b. The Company will take measures to drain and stabilize the surfaces of all construction roads both during construction and during future line maintenance phases.
c. Restoration, including temporary and permanent seeding, will be coordinated with the construction activities to ensure that revegetation and soil stabilization are achieved at the earliest practical time. Following construction, all structure sites, construction sites and access roads will be seeded with a suitable grass seed mixture.
d. Revegetation techniques will, where possible, seek to enhance the ROW for wildlife food and habitat.
e. Qualified personnel will perform all permanent reseeding and revegetation.
f. After restoration is complete, the Company will periodically inspect the ROW to discover areas of erosion, sedimentation and inadequate revegetation conditions. Upon discovery of such conditions, prompt efforts will be taken to correct them.
g. Fences and gates will be kept in sufficient state of repair to confine livestock satisfactorily and gates will be kept closed when not in immediate use. All fences cut or damaged will be restored to a condition as good as, or better than, the condition as found. Where frequent access is required, gates will be installed at no cost to the property owner.

ROW Maintenance

a. All herbicides used will be applied in accordance with applicable state and federal laws and regulations.
b. All herbicides used shall be registered with the Environmental Protection Agency and with the Virginia Department of Agriculture and Consumer Services. Herbicides will be used in accordance with label and manufacturer directions.
c. All herbicide applications will be performed under the direct supervision of certified applicators.
d. Regarding herbicide applications:

- Herbicides will not be applied when rainfall is imminent, during rainfall or within one day of large rain events (usually greater than 1.0 centimeter) that result in soil moisture capacity occurring above field capacity.
- Buffer zones will be maintained and used in accordance with herbicide label and manufacturer directions around streams, ponds, springs, wetlands, water supply wells, channelized drainage ways (*e.g.*, perennial or intermittent), and karst features.

Long-term ROW Maintenance Plan

The Company will periodically inspect the ROW for areas of erosion, sedimentation and inadequate revegetation conditions. Upon discovery of such conditions, prompt efforts will be taken to correct them. Any property owner concerns will also be investigated. Additionally, the Company will implement a comprehensive vegetation management program designed to ensure that vegetation along each transmission line is managed at the proper time, and in the most cost-effective, environmentally sound manner. The plan will be reviewed periodically to ensure that the goals and objectives are being addressed.

8. Indicate the permitted uses of the proposed ROW by the easement landowner and the Applicant.

Response:
Under the existing, new, and/or supplemental transmission line easements, the property owner will generally have the right to use the easement area for uses such as grazing, pasture lands, gardens, cultivated fields, driveways, parking, and bike and walking paths, or any other use that is not inconsistent with the Company's right to construct, operate, maintain, or remove its electric transmission line. The Company retains the right to clear and keep the easement clear of buildings and/or other obstructions together with the right to clear any woody vegetation within the ROW or which is adjacent to the ROW, but which may endanger the safe operation of the electric transmission line.

9. Describe the Applicant's route selection procedures. Detail the feasible alternative routes considered. For each such route, provide the estimated cost and identify and describe the cost classification (e.g., "conceptual cost," "detailed cost"). Describe the Applicant's efforts in considering these feasible alternatives. Detail why the proposed route was selected and other feasible alternatives were rejected. In the event that the proposed route crosses, or one of the feasible routes was rejected in part due to the need to cross, land managed by federal, state, or local agencies or conservation easements or open space easements qualifying under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code), describe the Applicant's efforts to secure the necessary ROW.

Response:
In general, the Company's route selection process for transmission line rebuild projects begins with a review of the existing ROW. Using the existing ROW generally minimizes impacts on the natural and human environments. Specifically, this approach is consistent with Sections 56-46.1 and 56-259 of the Code, which provide that existing ROWs should be given priority when adding new transmission facilities, and which promote the use of existing ROW for new transmission facilities. The Company's engineers simultaneously reviewed the operational constraints in the Project Load Area and determined that the Reusens – Roanoke 138-kV Transmission Line can only be taken out of service for limited durations during spring and fall outage windows. The limited outage windows restrict the length of line that can reasonably be rebuilt within the existing ROW. Considering these constraints, the Project will largely be rebuilt within or parallel to the existing ROW. The Project team considered and selected one larger diversion from the existing transmission line ROW to avoid existing residential, commercial, and community buildings that have been constructed adjacent to the existing transmission line. Given the availability of existing ROW, the statutory preference to use or parallel existing ROW, as well as the additional natural and human environmental impacts associated with the acquisition of and construction on new ROW, the Company did not develop complete alternative routes for the Project. The Company's route selection procedures for the Project are discussed in detail in the Siting Study in Volume 2 of this Application.

There are five existing Virginia Outdoors Foundation ("VOF") conservation easements crossed by the existing ROW, which qualify under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code). The Proposed Route crosses each of these VOF easements within the existing ROW. Additionally, there is one proposed VOF easement crossed by the existing transmission line and the Proposed Route. The Project team communicated with VOF staff to document the Proposed Route for the rebuild, which will be within the existing ROW across the proposed easement.

There is one Virginia Department of Historic Resources ("VDHR") conservation easement crossed by the Project. The Elk Hill state conservation easement is also listed on the National Register of Historic Places ("NRHP") and Virginia Landmarks Register and is discussed in more detail in Section III of these Response to Guidelines and in the Virginia Department of Environmental Quality ("VDEQ") Supplement in Volume 2 of this Application. The Company requested input from VDHR concerning the Project, as described in the Siting Study, but did not receive feedback on the Study Segments developed. To minimize the duration of the circuit outages and avoid new tree clearing near Elk Creek, which runs parallel to the north side of the transmission line ROW, the Proposed Route is parallel to the south side of the existing transmission line and will require new ROW. Approximately one mile of the Proposed Route will require new ROW on the Elk Hill conservation easement, which must be approved by both the landowner and VDHR. The Company will continue to coordinate with the landowner and agency throughout detailed design to acquire a new easement for the Project.

Finally, the Project crosses the Blue Ridge Parkway ("Parkway"), which is a National Parkway managed by the National Park Service ("NPS"). The Proposed Route crosses the Parkway property for approximately 0.2 mile within the existing ROW. Final structure locations will be determined following field surveys, agency coordination, and detailed engineering; however, the Company expects to replace one structure that is currently on NPS property in generally the same location of the existing structure and add one additional structure to the west of the NPS property line (on private property) to minimize the sway of the conductor and avoid the need for additional ROW across the Parkway.

Based on the best information available, the Proposed Route does not cross any other land managed by federal, state, or local agencies or conservation easements or open space easements qualifying under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code).

10. Describe the Applicant's construction plans for the project, including how the Applicant will minimize service disruption to the affected load area. Include requested and approved line outage schedules for affected lines as appropriate.

Response:

Project construction activities include the installation and maintenance of soil erosion and sedimentation control measures; access road construction; removal of the existing transmission line wire, structures, and foundations; foundation, structure, and wire installation; and the subsequent rehabilitation of all areas disturbed during construction. All required environmental compliance permits and studies will be completed, and a stormwater pollution prevention plan will be developed and implemented under the state's "General Permit for Discharges of Stormwater from Construction Activities."

The Company estimates that it will take approximately three years to engineer, procure material, and build the first section of the Project and an additional four years to complete the Project in its entirety after a final order authorizing the Project is entered, due to the size of the Project and availability of circuit outages, totaling seven years to construct the entire Project.

Where the Proposed Route is located within the existing ROW, circuit outages are needed on the Cloverdale (AP) – Reusens, Cloverdale (AP) – Roanoke, Roanoke – Moseley, and Moseley – Reusens 138 kV circuits to remove and rebuild the transmission line. Circuit outages are also required to construct any portion of the Proposed Route that crosses the existing 138 kV transmission line. Additionally, circuit outages will be required on the Company's Cloverdale (AP) – Smith Mountain 138 kV Circuit and Dominion Energy Virginia's Line 30 115 kV Circuit as safety clearances during construction. Outages to completely remove and rebuild the Reusens – Roanoke 138 kV Transmission Line within the existing ROW are not feasible due to reliability concerns as the existing transmission line would need to be removed and rebuilt in short sections to minimize disruptions to the Project Load

Area. The Cloverdale (AP) – Reusens 138 kV and Moseley – Roanoke 138 kV circuits serve the Town of Bedford's electrical system.

The Company generally plans to construct the Project in sections in the following order, as shown in Exhibit 11:

1. An approximately 4.0-mile-long section from Moseley Substation to Centerville Substation.
2. The approximately 8.0-mile-long section from Centerville Substation to Ivy Hill Substation, to be done in coordination with substation construction at Centerville Substation.
3. The approximately 4.0-mile-long section from Ivy Hill Substation to Coffee Substation.
4. The approximately 6.0-mile-long section from Coffee Substation to Reusens Substation.
5. The approximately 15.5-mile-long section from Moseley Substation to the Roanoke – Cloverdale 138 kV Transmission Line tap location near existing structure 2-175.
6. The section from the Roanoke – Cloverdale 138 kV Transmission Line tap location near existing structure 2-175 to the Vinton Substation, which is approximately 2.5 miles in length.
7. The approximately 3.0-mile-long section from Vinton Substation to Roanoke Substation.

Portions of the line that are in new ROW will be constructed "in the clear" prior to beginning the circuit outage in each section ("in the clear" work is work that can be safely completed without an outage on an existing transmission circuit). Following the Commission's approval of the Project, engineering, RTO outage approvals, and ROW acquisition, the estimated construction sequence can be summarized briefly as follows:

1. Begin the work between Moseley and Centerville substations, any in the clear work will be done prior to the outage.
2. Start the in the clear work between Ivy Hill and Centerville substations.
3. Take an outage on the Cloverdale (AP) – Reusens 138 kV Circuit (section between Lake Forest and Ivy Hill) and the Moseley – Reusens 138 kV Circuit to rebuild between Moseley and Centerville substations in coordination with substation work.
4. Energize the rebuild section between Moseley and Centerville substations and a portion of Centerville Substation.
5. Continue the outage on the Moseley – Reusens 138 kV Circuit and take an outage on the Cloverdale (AP) – Reusens 138 kV Circuit (section between Lake Forest and Ivy Hill) to rebuild the circuit section between Centerville Substation and Ivy Hill Substation, along with outages to complete the Centerville Substation construction.

6. Start any in the clear work between Coffee and Ivy Hill Substations.
7. Energize the rebuild section between the Centerville and Ivy Hill Substations.
8. Take an outage on the new Centerville – Reusens 138 kV Circuit (section between Ivy Hill and Coffee) and rebuild the circuit section between Ivy Hill and Coffee substations.
9. Energize the circuit section between Ivy Hill and Coffee Substations.
10. Take an outage on the Centerville – Reusens 138 kV Circuit (section between Reusens and Coffee) and on the Moseley – Reusens 138 kV Circuit to rebuild the circuit section between Coffee and Reusens Substations.
11. Energize the rebuild section between Coffee and Reusens Substations.
12. Start any in the clear work between Moseley Substation and the Roanoke – Cloverdale 138 kV Transmission Line tap location near existing structure 2-175.
13. Take an outage on the Centerville – Cloverdale (AP) 138 kV Circuit (section between Lake Forest and Centerville) and the Moseley – Roanoke 138 kV Circuit. Rebuild approximately half of this line section during the available spring or fall outage window.
14. Energize between Moseley Substation and the Roanoke – Cloverdale (AP) 138 kV Transmission Line tap location near existing structure 2-175 during summer months due to outage constraints on circuits during peak time frame.
15. Take an outage on the Centerville – Cloverdale (AP) 138 kV Circuit (section between Lake Forest and Centerville) and the Moseley – Roanoke 138 kV Circuit. Rebuild the remaining half of this line section during the available spring or fall outage window.
16. Energize the rebuild section between Moseley Substation and the Roanoke – Cloverdale Tap location.
17. Take an outage on the Cloverdale (AP) – Roanoke 138 kV Circuit (section between Bonsack and Vinton) and on the Moseley – Reusens 138 kV Circuit to rebuild the circuit section between Vinton Substation and the Roanoke – Cloverdale Tap location near existing Structure 2-175.
18. Energize the rebuild section between Vinton Substation and the Roanoke – Cloverdale 138 kV Transmission Line tap location near existing Structure 2-175.
19. Take an outage on the Cloverdale (AP) – Roanoke 138 kV Circuit (section between Roanoke and Vinton) and on the Moseley – Reusens 138-kV Circuit to rebuild the circuit section between Roanoke Substation and Vinton Substation.
20. Energize the rebuild section between Roanoke Substation and Vinton Substation.

11. Indicate how the construction of this transmission line follows the provisions discussed in Attachment 1 of these Guidelines.

Response:
Protecting environmental resources such as natural, historic, scenic, and recreational values is of high importance to the Company. The siting and construction phases of the Project will generally follow the above-referenced guidelines to the extent practical. For a detailed discussion of the attention given to environmental resources and siting process used for this Project, see the Siting Study and the VDEQ Supplement prepared by the Siting Team, included in Volume 2 of this Application. Additionally, see Section III of this Response to Guidelines.

12. a. Detail counties and localities through which the line will pass. If any portion of the line will be located outside of the Applicant's certificated service area: (1) identify each electric utility affected; (2) state whether any affected electric utility objects to such construction; and (3) identify the length of line(s) proposed to be located in the service area of an electric utility other than the Applicant; and

Response:
The Project is located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, all of which are in the northeastern part of Appalachian's Virginia service territory. Although the Project does not cross the Town of Bedford, approximately 0.1 mile of the Proposed Route is located within the Town of Bedford's certificated service territory. The Town of Bedford is not opposed to the Project through the Town of Bedford's service territory.

b. Provide three (3) color copies of the Virginia Department of Transportation ("VDOT") "General Highway Map" for each county and city through which the line will pass. On the maps show the proposed line and all previously approved and certificated facilities of the Applicant. Also, where the line will be located outside of the Applicant's certificated service area, show the boundaries between the Applicant and each affected electric utility. On each map where the proposed line would be outside of the Applicant's certificated service area, the map must include a signature of an appropriate representative of the affected electric utility indicating that the affected utility is not opposed to the proposed construction within its service area.

Response:
The Company will provide digital copies of the VDOT General Highway Map for Bedford, Campbell, and Roanoke Counties, which include inserts of the cities of Lynchburg and Roanoke, to the Commission Staff with this Application in lieu of providing three hardcopies. A reduced copy of these maps are included as Exhibit 12 to this Application. These maps include the Proposed Project and the Company's existing high-voltage transmission facilities.

B. Line Design and Operational Features

1. Detail the number of circuits and their design voltage, initial operational voltage, any anticipated voltage upgrade, and transfer capabilities.

Response:
The proposed rebuild of the Reusens – Roanoke 138 kV Line will be a double-circuit transmission line, with each circuit comprised of a three-phase design with a nominal phase-to-phase voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability of the new overhead conductor is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating). The overall ratings for each line section are provided in Section I of this Response to Guidelines.

2. Detail the number, size(s), type(s), coating and typical configurations of conductors. Provide the rationale for the type(s) of conductor(s) to be used.

Response:
The proposed three-phase 138 kV circuits will consist of 795,000 cmil ACSR "Drake" conductors with 26/7 stranding (1.108-inch diameter). One conductor will be installed per phase. The circuit will typically be arranged in a vertical configuration with one circuit on each side of the structure.

The proposed double-circuit transmission line section will typically use one Alumoweld ground wire (0.385-inch diameter) and one 0.646-inch diameter Optical Ground Wire ("OPGW") for lightning protection. The OPGW is composed of aluminum clad steel strands surrounding a stainless-steel tube containing fiber optic strands used for utility operations and communication.

The proposed conductors and ground wires were selected to meet the electrical requirements of the Project including load capacity, system stability, and efficiency. The mechanical strength and impacts on constructability are also considered in the selection process. The proposed conductors and ground wires will have a non-specular finish.

3. With regard to the proposed supporting structures over each portion of the ROW for the preferred route, provide diagrams (including foundation reveal) and descriptions of all the structure types, to include:

a) mapping that identifies each portion of the preferred route;

b) the rationale for the selection of the structure type;

c) the number of each type of structure and the length of each portion of the ROW;

d) the structure material and rationale for the selection of such material;

e) the foundation material;

f) the average width at cross arms;

g) the average width at the base;

h) the maximum, minimum and average structure heights;

i) the average span length; and

j) the minimum conductor-to-ground clearances under maximum operating conditions.

Response:
Final structure types will be determined during final engineering, which includes ground surveys and geotechnical studies. Nevertheless, based on preliminary engineering, the Company anticipates primarily using double-circuit lattice steel towers and steel monopole structures for the rebuilt 138 kV transmission line. The Company plans to remove 195 lattice steel towers and five monopole structures and replace them with structures as shown in the table below. Two existing lattice steel towers near the Company's Coffee and Ivy Hill Substations will not be replaced as part of the Project because they were installed in 2009 and 1994, respectively. All values and figures in Table II-1 below are approximations based on best available data until a detailed design has been finalized.

Structure Type	 **138 kV Lattice Tower** See Exhibit 7	 **138 kV Tangent Davit Arm Monopole** See Exhibit 8	 **138 kV Tangent Braced-Post Monopole** See Exhibit 9	 **138 kV Three-Pole Deadend Tap** See Exhibit 10
a. mapping that identifies each portion of the preferred route.	See Exhibit 4	See Exhibit 4	See Exhibit 4	See Exhibit 4
b. rationale for the selection of the structure type.	The proposed 138 kV lattice tower structure is best suited for medium-to-long spans.	The proposed 138 kV tangent davit arm monopole structure is best suited for medium-to-long spans.	The proposed 138 kV braced-post monopole structure is best suited for short-to-medium spans and narrow rights-of-way.	The proposed 138 kV three-pole deadend tap structure is best suited for taps into substations, heavy line angle locations, and breaking wire tension.
c-1. estimated number of each type of structure.	144	63	15	2
c-2. estimated length of each portion of the ROW.	29.8 miles	11.2 miles	2.0 mile	0.2 mile
d-1. structure material.	Darkened galvanized steel	Dulled galvanized steel	Dulled galvanized steel	Dulled galvanized steel

Structure Type	 **138 kV Lattice Tower** See Exhibit 7	 **138 kV Tangent Davit Arm Monopole** See Exhibit 8	 **138 kV Tangent Braced-Post Monopole** See Exhibit 9	 **138 kV Three-Pole Deadend Tap** See Exhibit 10
d-2. rationale for the selection of such material.	Galvanized steel was chosen for its durability and proven reliability in this region. A darkened finish was selected to minimize visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. A dulled finish was selected to minimize visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. A dulled finish was selected to minimize visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. A dulled finish was selected to minimize visual impacts.
e. foundation material.	Four earth grillages will be installed per structure to an average depth of 12' or four drilled concrete piers per structure to an average depth of 20'.	Drilled concrete pier with an average depth of 30'. The typical concrete pier reveal height will be 1' above grade.	Drilled concrete pier with an average depth of 30'. The typical concrete pier reveal height will be 1' above grade.	Drilled concrete pier with an average depth of 30'. The typical concrete pier reveal height will be 1' above grade.
f. average width at cross arms.	33'	31'	12'	40' between poles
g. average width at the base.	35' Tower Width 4' Diameter Concrete Pier if earth grillages are not used	5' Diameter Pole 6' Diameter Concrete Pier[1]	5' Diameter Pole 6' Diameter Concrete Pier	6' Diameter Pole 7' Diameter Concrete Pier

Structure Type	 **138 kV Lattice Tower** See Exhibit 7	 **138 kV Tangent Davit Arm Monopole** See Exhibit 8	 **138 kV Tangent Braced-Post Monopole** See Exhibit 9	 **138 kV Three-Pole Deadend Tap** See Exhibit 10
h-1. approximate average height of structures (above ground).	130'	130'	100'	135'
h-2. approximate typical structure height range (above ground).	95' to 160' [1]	95' to 160' [1]	75' to 130'	135'
i. average span length.	1,150'	1,150'	750'	500'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22'-7"	22'-7"	22'-7"	22'-7"

Table II-1
Proposed Structures

Note:
[1] Collocation poles for cellular antennas may be larger in diameter and taller to accommodate cellular antenna requirements (see Company witness McMillen's testimony). Existing structures 2-15, 2-24, 2-34, 2-53, 2-176, 2-178, 2-181, 2-184, and 2-185 are collocation sites for cellular antennae (see Exhibit 4, GIS Constraints Map).

4. **With regard to the proposed supporting structures for all feasible alternate routes, provide the maximum, minimum and average structure heights with respect to the whole route.**

   Response:
   The anticipated heights of the proposed structures on the Project range between 75 and 160 feet, with an average structure height of 125 feet tall.

5. **For lines being rebuilt, provide mapping showing existing and proposed structure heights for each individual structure within the ROW, as proposed in the application.**

   Response:
   See Exhibit 4, the GIS Constraints Map.

6. **Provide photographs for typical existing facilities to be removed, comparable photographs or representations for proposed structures, and visual simulations showing the appearance of all planned transmission structures at identified historic locations within one mile of the proposed centerline and in key locations identified by the Applicant.**

   Response:
   See Exhibits 5 and 6 for photographs of existing structures, Exhibits 7 – 10 for representations of proposed structures, and Exhibit 14 for visual simulations representing the final condition following the completion of the Project. For visual simulations showing the appearance of all planned transmission structures at identified historic locations within one mile of the proposed centerline, see the VDEQ Supplement in Volume 2 of this Application.

C. Describe and furnish plan drawings of all new substations, switching stations, and other ground facilities associated with the proposed project. Include size, acreage, and bus configurations. Describe substation expansion capability and plans. Provide one-line diagrams for each.

Response:
As part of the Project, the Company proposes expansion of the Centerville Substation. The proposed substation work at the Centerville Substation is described in more detail as follows. The one-line for the substation can be found in Volume I, Confidential Appendix.

Appalachian's Centerville Substation contains two different transmission voltages: 138 kV and 69 kV with a 12 kV bus for local distribution. The 138 kV portion currently consists of a "flip-flop" scheme in which there are two 138 kV sources tied to the Centerville 138 kV bus; however, only one circuit can be in-service at any given time. The Project will install a single breaker, single bus 138 kV configuration. Both the existing and proposed 69 kV configuration are a single breaker, single bus.

The existing Centerville Substation will be expanded with the addition of a new fenced yard adjacent to the existing 225- by 175-foot fenced yard. The expansion area will be approximately 165 by 153 feet and will be constructed in a 0.6-acre area pending purchase of the property from the owner, Wright Bros Farms, Inc.

The Centerville Substation expansion includes the following:

- Replacing 138 kV "flip-flop" configuration with a single breaker, single bus configuration including two new circuit breakers.
- Refeeding 138 kV to two existing transformers.
- Replacing the existing 69 kV circuit breaker and metering equipment currently feeding a 69 kV customer delivery point.
- Installing all associated bus work, structures, and cable trenching required for the work described above.

See Exhibit 13 for the substation location, layout, and photograph.

In addition to the improvements at Centerville Substation, the Company intends to complete ordinary improvements concurrently with the Project at Roanoke Substation, Campbell Avenue Substation, and Walnut Avenue Substation.

SECTION III. IMPACT OF LINE ON SCENIC, ENVIRONMENTAL, AND HISTORIC FEATURES

The Siting Study and the VDEQ Supplement included in Volume 2 of this Application address scenic, environmental, and historic features associated with the Project. Brief responses to the Section III guideline questions are provided below, but for in-depth discussion of these issues, please refer to the Siting Study and the VDEQ Supplement. A Project area map is included as Exhibit 1 and a more detailed GIS constraints map, which illustrates the various resources and sensitive features relative to the proposed Project, is included as Exhibit 4. Furthermore, the Siting Study (included in Volume 2 of the Application) includes additional Project maps describing the route development process.

A. Describe the character of the area that will be traversed by this line, including land use, wetlands, etc. Provide the number of dwellings within 500 feet, 250 feet and 100 feet of the centerline, and within the ROW for each route considered. Provide the estimated amount of farmland and forestland within the ROW that the proposed project would impact.

Response:

The Project will rebuild an approximately 43-mile-long 138 kV transmission line between the Company's Reusens Substation in the City of Lynchburg and Roanoke Substation in the City of Roanoke, Virginia. The Proposed Route for the Project is largely within or parallel to the existing transmission line ROW. The Project area is characterized by rolling terrain at the foothills of the Blue Ridge Mountains with steeper terrain near the City of Roanoke. The eastern and western extents of the Project area consist primarily of residential development in the cities of Lynchburg and Roanoke, while the central portion of the Project area consists of open agricultural fields, farmland, and forested areas with scattered residential and commercial uses along public roads.

The Project must cross the Roanoke River, but the Proposed Route crosses the river in a ROW adjacent to the existing transmission line to minimize impacts. Impacts to wetlands and streams are expected to be minimal given that the Proposed Route is largely within or parallel to the existing ROW and wetlands and streams within the ROW can be spanned in most instances.

The estimates provided below of the residences, farmland and forestland for the Proposed Route are based on the typical 100-foot-wide ROW centered on the Proposed Route and consider Light Detection and Ranging ("LiDAR") survey and National Land Cover Database ("NLCD") data. There are 646 single- and multi-family dwellings located within 500 feet, 324 single- and multi-family dwellings within 250 feet, and 89 single- and multi-family dwellings within 100 feet of the Proposed Route centerline. Ten residences are within the ROW of the Proposed Route. Based on preliminary engineering analysis, the Company expects the Project can be designed and constructed to keep seven of those residences outside of the conductor zone. The remaining residences within the ROW are in the conductor zone of the Proposed Route and, subject to completion of final engineering and ROW negotiations with affected landowners, the Company expects that three residences will need to be removed to accommodate the rebuilt transmission line.

Approximately 39 acres of either prime and unique farmland or farmland of statewide importance are located within the typical 100-foot-wide ROW of the Proposed Route based on United States Department of Agriculture's Natural Resources Conservation Service ("NRCS") Soil Survey Geographic Database ("SSURGO"). There are approximately 17 acres of pasture/rangeland or cropland within the typical ROW of the Proposed Route, according to the NLCD data. The Proposed Route crosses agricultural areas within or near the existing ROW and therefore is not expected to permanently impact farmland. Based on digitized aerial imagery, approximately 161 acres of forested land are within the ROW of the Proposed Route. The Proposed Route largely uses or parallels the existing ROW to minimize potential impacts to farmland and forestland.

B. Describe any public meetings the Applicant has had with neighborhood associations and/or officials of local, state or federal governments that would have an interest or responsibility with respect to the affected area or areas.

Response:

As described in the Siting Study, the Siting Team obtained information from or contacted various federal, state, and local agencies and/or official to inform them of the Project and request input for the route development process. The Company met virtually with local officials from Roanoke and Bedford Counties, the City of Roanoke, and the towns of Bedford and Vinton on December 1, 2021, to introduce the Project and obtain information to aid the route planning process. Input from the local officials supported rebuilding close to the existing transmission line and confirmed that no active development plans were in place in the Project area. After meeting with local officials, letters, and maps regarding the Project were sent to 31 state and federal representatives on January 28, 2022, and 17 responses were received from this coordination effort. A full list of agencies receiving a letter and map and the responses received as of August 1, 2022, are included in Attachment F of the Siting Study in Volume 2 of the Application. The Company met with representatives from the National Park Service ("NPS") on May 25, 2022, to introduce the Project and discuss rebuilding the transmission line across the Blue Ridge Parkway within the existing ROW. The Company will continue coordination with all applicable federal and state organizations during the Project's environmental studies.

The Project was publicly announced with a news release and launch of a Project-specific website on January 25, 2022. Mailings, including a postcard, letter, Project fact sheet, and comment card with a prepaid postage return envelope, were sent to 1,440 landowner addresses on January 25 and 31, 2022, to announce the Project, request feedback from the public, and invite landowners to attend an in-person open house. The Company hosted three in-person open houses to gather landowner and community feedback on February 8, 9, and 10, 2022, at public schools in Vinton, Montvale, and Lynchburg. A total of 80 people attended the in-person open houses and 107 comments were returned to the Company as of August 1, 2022, via comment cards, emails, or phone calls. All comments were reviewed by the Siting Team, entered into the Project database, and generally related to how the rebuilt transmission line would differ from the existing line. Several landowners requested specific information about the effect of the line on their property and provided input on the placement of structures. The public involvement process is described in Section 4.0 of the Siting Study located in Volume 2 of the Application.

C. Detail the nature, location, and ownership of each building that would have to be demolished or relocated if the project is built as proposed.

Response:

Fifteen residences, an office building, and a fire station encroach on the existing 100-foot-wide transmission line ROW of the Reusens – Roanoke 138 kV Transmission Line. Based on preliminary engineering analysis, the Company expects the Project can be designed and constructed to keep 12 of the residences, the office building, and the fire station outside of the conductor zone of the rebuilt transmission line. Accordingly, and subject to completion of final engineering and negotiations with affected landowners, the Company expects that the remaining three residences within the ROW of the Proposed Route will need to be removed to accommodate the Project. The Company has discussed the Project and the need to relocate the residences with two of the affected landowners, and it has attempted to reach the owner of the third residence, which is uninhabited. The Company will continue to coordinate with the landowners during final engineering.

An uninhabited residence on State Route 673 (Benchmark Lane) in Bedford County is adjacent to the existing transmission line but is within the ROW and conductor zone of the Proposed Route. The Company investigated routes to avoid the residence, but three additional line angles and an additional circuit outage would be required to avoid the residence.

Two residences on Crestwood Drive in Bedford County encroach on the existing transmission line ROW. As discussed in the Siting Study in Volume 2 of the Application, the Company investigated multiple route options to avoid both encroachments; however, additional line angles, circuit outages, and/or clearing of new ROW on landowners not affected by the existing ROW would be required. Therefore, the Proposed Route remains parallel to the existing transmission line and one residence is within the conductor zone and will need to be removed.

One residence on Village Drive in Bedford County encroaches on the existing ROW of the Reusens – Roanoke 138 kV Transmission Line, is within the conductor zone of the Proposed Route, and will need to be removed to accommodate the Project. As discussed in Section 3.5 of the Siting Study, no feasible route alternatives were identified to avoid the residence.

Based on available aerial imagery and LiDAR survey, there are 44 secondary structures such as barns, outbuildings, sheds, and garages that are within the typical 100-foot-wide ROW of the Proposed Route. Additional field work, engineering, and discussions with landowners are needed to determine if these secondary structures will need to be removed to construct the Project. These building locations are identified in Exhibit 4.

D. Identify existing physical facilities that the line will parallel, if any, such as existing transmission lines, railroad tracks, highways, pipelines, etc. Describe the current use and physical appearance and characteristics of the existing ROW that would be paralleled, as well as the length of time the transmission ROW has been in use.

Response:
The Project will largely use or parallel the existing ROW of the Reusens – Roanoke 138 kV Transmission Line. Approximately 24 miles of the Proposed Route parallels the existing ROW to minimize the duration of circuit outages. The existing transmission line ROW has been in use for over 90 years and is typically 100 feet wide. Between the Company's Reusens and Moseley substations, the Proposed Route is generally parallel to a Colonial Pipeline Company ROW in multiple locations for 7.0 miles total (see Exhibit 4). The transmission line to be rebuilt pre-dates the pipeline ROW. As the Project progresses, the Company will continue discussions with Colonial Pipeline Company to determine final centerline and structure locations within the filing corridor. Paralleling roads, highways, and/or railroads was not considered practicable as an existing transmission line ROW was available to use and parallel.

E. Indicate whether the Applicant has investigated land use plans in the areas of the proposed route and indicate how the building of the proposed line would affect any proposed land use.

Response:
The Siting Team considers potential impacts to existing and future land uses that may not be compatible with transmission facilities. The Project is located in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, Virginia. The Company considered the various land use plans adopted in each of those localities. At the start of the route development process, the Company introduced the Project to local officials from Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the towns of Bedford and Vinton. The Siting Team discussed existing and future land use plans in the Project area with the local officials and no potential conflicts between the Project and any specific land use plans were identified. The existing Reusens – Roanoke 138 kV Transmission Line has been in service for over 90 years, the Project will largely be rebuilt within or parallel to the existing ROW, and therefore is not anticipated to affect any proposed land uses.

F. Government Bodies

1. Indicate if the Applicant determined from the governing bodies of each county, city and town in which the proposed facilities will be located whether those bodies have designated the important farmlands within their jurisdictions, as required by § 3.2-205 B of the Code.

Response:
The Siting Team's review of available planning documents and input from local officials determined the ROW of the Proposed Route does not cross any designated important farmlands in Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, or the Town of Vinton, as determined by § 3.2-205 B of the Code.

2. If so, and if any portion of the proposed facilities will be located on any such important farmland:

a. Include maps and other evidence showing the nature and extent of the impact on such farmlands;

Response:
Not applicable.

b. Describe what alternatives exist to locating the proposed facilities on the affected farmlands, and why those alternatives are not suitable; and

Response:
Not applicable.

c. Describe the Applicant's proposals to minimize the impact of the facilities on the affected farmland.

Response:
Not applicable.

G. Identify the following that lie within or adjacent to the proposed ROW:

Per the *Guidelines for Assessing Impacts of Proposed Electric Facilities on Historic Resources in the Commonwealth of Virginia* (2008) (the "Guidelines"), issued by the Virginia Department of Historic Resources ("VDHR"), the Company contracted POWER Engineers, Inc. ("POWER") and Dutton + Associates, LLC ("D+A") to complete a Pre-Application Analysis for the proposed Project (see Attachment 2.H.1 to the VDEQ Supplement included in Volume 2 of the Application).

1. Any district, site, building, structure, or other object included in the National Register of Historic Places maintained by the U.S. Secretary of the Interior;

Response:
No National Historic Landmark ("NHL") resources are located within 1.5 miles of the Proposed Route. The following 13 NRHP-listed resources are located within one mile of the Project:

- Old Rectory (VDHR# 009-0056)
- Bowling Eldridge House (VDHR# 009-5283)
- Buena Vista (VDHR# 128-0001)
- Mill Mountain Star (VDHR# 128-0352)
- Riverland Historic District (VDHR# 128-5476)
- Otterburn (VDHR# 009-0024)
- Three Otters (VDHR# 009-0031)
- Virginia Episcopal School (VDHR# 118-0224)

- Presbyterian Orphans Home (VDHR# 118-5240)
- American Viscose Plant Historic District (VDHR# 128-0238)
- Elk Hill (VDHR# 009-0006)
- Cifax Rural Historic District (VDHR# 009-0254)
- Locust Grove (VDHR# 118-0219)

Please see below for a brief description of each resource listed above and the associated impact the Project may have on the resource.

It is anticipated the Project may have up to a moderate impact on the following resources:

The **Old Rectory** (VDHR# 009-0056) is located approximately 0.5 mile south of the Project atop a knoll. The existing transmission line structures are visible above the vegetation from the property and additional structures may become visible due to the increased height of the proposed structures.

The **Three Otters** (VDHR# 009-0031) property is located approximately 0.2 mile south of the Proposed Route. The existing transmission line is mostly screened from view by vegetation; however, the proposed structures will increase in height and be placed slightly closer to the house, resulting in a change in setting and viewshed of and from the property.

Accordingly, it is anticipated the Project may have up to a moderate impact on the NRHP-listed Old Rectory and Three Otters properties.

It is anticipated the Project may have up to a minimal impact on the following resources:

The NRHP-listed **Otterburn** (VDHR# 009-0024) site is about 0.5 mile from the Project, south of the Company's Centerville Substation. There is extensive modern development around the site and the Project is screened from the resource by vegetation.

The **Virginia Episcopal School** (VDHR# 118-0224) property is approximately 0.5 mile from the Project, northeast of the existing Reusens Substation. Improvements within the property and thick vegetation between the Project and the resource block all except one existing transmission line structure, which may become more visible due to the increased structure height.

The **American Viscose Plant Historic District** (VDHR# 128-0238) is approximately 0.1 mile from the Project at its nearest point and approximately 0.2 mile from the existing Roanoke Substation. Several transmission lines are visible from the historic district, including the transmission line to be rebuilt. The proposed structures will increase in height; however, they will not result in a compromise to the setting or viewshed that is industrial in nature and includes other infrastructure.

The **Elk Hill** (VDHR# 009-0006) property is listed on the NRHP and under a Preservation Easement held by the VDHR. The property is directly crossed by five

existing transmission line structures and the Proposed Route for the Project; however, due to mature vegetation and the rolling topography, views of the Project are limited and no substantial change in the viewshed or setting is anticipated.

The **Cifax Rural Historic District** (VDHR# 009-0254) is about 0.25 mile north of the Project at its closest point. Inspection from a variety of vantage points throughout the district found that the existing transmission line is generally screened and not visible and any views of the Project will be blocked by development and vegetation.

The **Locust Grove** (VDHR# 118-0219) property is directly crossed by the Project and two existing and proposed structures are within the property boundaries. The proposed structures on the property will be taller than the existing structures; however, the existing dense vegetation on the property is expected to continue blocking views of the Project.

Therefore, the Project is expected to have no more than a minimal impact on these six NRHP-listed resources.

It is anticipated the Project will have no impact on the following resources:

The NRHP-listed **Bowling Eldridge House** (VDHR# 009-5283) was moved to its current location approximately 0.8 mile from the Project in 2002. Because the house was moved, the current setting of the property is not considered an aspect of its significance.

The **Buena Vista** (VDHR# 128-0001) site is about 0.8 mile from the Project and is bordered on all sides by residential development in the City of Roanoke, which blocks any view of the Project.

The **Mill Mountain Star** (VDHR# 128-0352) is located at the top of Mill Mountain and approximately 0.7 mile from the Project. The existing transmission line is located to the east of the star and blocked by vegetation. It is anticipated that the proposed structures will continue to be screened by the topography of the mountain and dense vegetation.

The nearest point of the **Riverland Historic District** (VDHR# 128-5476) is about 0.6-mile northwest of the Project and views of the Project from the district are blocked by homes and vegetation.

The **Presbyterian Orphans Home** (VDHR# 118-5240) is approximately 0.3 mile from the Project. Based on field inspection, the Project is not visible from property.

As a result, no impact is anticipated to these five NRHP-listed resources.

Further, all 13 NRHP-listed resources are discussed in the Pre-Application Analysis in the VDEQ Supplement, located in Volume 2 of the Application. No more than a moderate impact is anticipated on the NRHP-listed resources located within one mile of the Project.

2. **Any historic architectural, archeological, and cultural resources, such as historic landmarks, battlefields, sites, buildings, structures, districts or objects listed or determined eligible by the Virginia Department of Historic Resources ("VDHR");**

Response:
The following 11 NRHP-eligible resources are located within 0.5 mile of the Project:

- Hopkins House (VDHR# 009-5234)
- Wright Farm (VDHR# 009-5352)
- Hurt Barn (VDHR# 009-5362)
- Early-Wheat Farm (VDHR# 009-5030)
- Reusens Dam (VDHR# 118-0218)
- CSX Railroad (VDHR# 118-5546)
- Norfolk Southern Railway (VDHR# 128-6160)
- Southeast Neighborhood Historic District (VDHR# 128-5865)
- Redlands Farm (VDHR# 009-0187)
- Blue Ridge Parkway Historic District (VDHR# 080-5161)
- Cobbs-Metcalfe-Overstreet House (VDHR# 118-5184)

Please see below for a brief description of each resource listed above and the associated impact the Project may have on the resource.

It is anticipated the Project may have up to a moderate impact on the following resources:

The NRHP-eligible **Hopkins House** (VDHR# 009-5234) is located 0.5 mile north of the Project on top of a knoll with open fields on all sides. The Company's existing Moseley Substation and the existing transmission line structures are visible above the vegetation from the homesite. The greater height of the proposed structures may increase the visibility of structures that can already be seen from the property and introduce views of structures that are currently screened by vegetation.

Redlands Farm (VDHR# 009-0187) is directly crossed by the Project along its northwestern property boundary. Inspection from publicly available access points revealed nearly unobstructed views of an existing transmission line structure, but it is expected that views toward the Project from the home are screened by vegetation. The proposed structures on the property will increase in height and be placed slightly closer to the house, resulting in a slight change in the visibility of the Project from the property.

For these reasons, the Project may have up to a moderate impact on the NRHP-eligible Hopkins House and Redland Farm properties.

It is anticipated the Project may have up to a minimal impact on the following resources:

The **Wright Farm** (VDHR# 009-5352) property is about 0.2 mile south of the Proposed Route with wide views of the existing transmission line that will not be significantly changed by the Project.

The **Hurt Barn** (VDHR# 009-5362) is an NRHP-eligible property located about 0.4 mile north of the Project. A modern home and vegetation provide some screening; however, the Project is visible from the road and the visible structures will increase in height.

The **Early-Wheat Farm** (VDHR# 009-5030) site is about 0.1 mile north of the Project, but the topography and vegetation generally screen views of the Project from the homesite.

The **Norfolk Southern Railway** (VDHR# 128-6160) property is approximately 0.4 mile north of the Company's Roanoke Substation and views of the Project are limited by industrial development.

The **Southeast Neighborhood Historic District** (VDHR# 128-5865) is a large area just north of the Roanoke Substation and ranging up to 1.3 miles away from the Project in the City of Roanoke. Inspection from multiple viewpoints found that the Project is generally not visible from the district.

The NRHP-eligible **Blue Ridge Parkway Historic District** (VDHR# 080-5161) is directly crossed by the existing transmission line and the Proposed Route. Despite the increased height of the proposed structures, it is anticipated that visibility of the Project from the Blue Ridge Parkway will remain similar to the existing conditions.

The **Cobbs-Metcalfe-Overstreet House** (VDHR# 118-5184) is directly crossed by the Project with one existing and one proposed structure within the property boundaries. The structure on the property is visible from most of the homesite and is anticipated to increase in height.

Therefore, the Project is expected to have no more than a minimal impact on these seven NRHP-eligible resources.

It is anticipated the Project will have no impact on the following resources:

The **Reusens Dam** (VDHR# 118-0218) and **CSX Railroad** (VDHR# 118-5546) are located about 0.1 mile from Reusens Substation at the northern end of the Project. The Project is not visible from either NRHP-eligible resource, so no impact is anticipated.

Further, these 11 NRHP-eligible resources are discussed in the Pre-Application Analysis in the VDEQ Supplement, located in Volume 2 of the Application. No more than a moderate impact is anticipated on the NRHP-eligible resources located within 0.5 mile of the Project.

3. **Any historic district designated by the governing body of any city or county;**

   Response:
   None.

4. **Any state archaeological site or zone designated by the Director of the VDHR, or its predecessor, and any site designated by a local archaeological commission, or similar body;**

   Response:
   Two previously recorded archaeological sites are located within the ROW of the Proposed Route.

   - VDHR# 44RN0005
   - VDHR# 44RN0220

   These are both prehistoric occupation sites and are discussed in the Pre-Application Analysis in the VDEQ Supplement, located in Volume 2 of the Application. VDHR# 44RN0005 has not been evaluated, and VDHR# 44RN0220 has been determined eligible for listing in the NRHP.

5. **Any underwater historic assets designated by the VDHR, or predecessor agency or board;**

   Response:
   None.

6. **Any National Natural Landmark designated by the U.S. Secretary of the Interior;**

   Response:
   None.

7. **Any area or feature included in the Virginia Registry of Natural Areas maintained by the Virginia Department of Conservation and Recreation ("VDCR");**

   Response:
   None.

8. **Any area accepted by the Director of the VDCR for the Virginia Natural Area Preserves System;**

   Response:
   None.

9. **Any conservation easement or open space easement qualifying under §§ 10.1-1009 – 1016, or §§ 10.1-1700 – 1705, of the Code (or a comparable prior or subsequent provision of the Code);**

Response:
There are five existing VOF conservation easements crossed by the existing ROW, which qualify under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code). The Proposed Route crosses each of these VOF easements within the existing ROW. Additionally, there is one proposed VOF easement crossed by the existing transmission line and the Proposed Route. The Project team communicated with VOF staff to document the Proposed Route for the rebuild, which will be within the existing ROW across the proposed easement.

There is one VDHR conservation easement crossed by the existing ROW and Proposed Route, which qualifies under §§ 10.1-1009 – 1016 or §§ 10.1-1700 – 1705 of the Code (or a comparable prior or subsequent provision of the Code). The Elk Hill conservation easement is discussed in Response III.G.1 above and in the VDEQ Supplement in Volume 2 of the Application. To minimize the duration of the circuit outages required for construction and avoid new tree clearing near Elk Creek, which runs parallel to the north side of the transmission line ROW, the Proposed Route is parallel to the south side of the existing transmission line and will require approximately one mile of new ROW on the Elk Hill conservation easement.

10. Any state scenic river;

Response:
None. However, approximately two miles east of the Company's Roanoke Substation, the Proposed Route crosses a section of the Roanoke River that is a qualified scenic river.

11. Any lands owned by a municipality or school district; and

Response:
Two parcels owned by a municipality or school district are crossed by the Proposed Route. One parcel owned by the Town of Bedford is the site of the Company's Centerville Substation, and one parcel owned by the City of Roanoke is crossed by the Proposed Route within the existing transmission line ROW.

12. Any federal, state or local battlefield, park, forest, game or wildlife preserve, recreational area, or similar facility. Features, sites, and the like listed in 1 through 11 above need not be identified again.

Response:
The Blue Ridge Parkway is crossed by the Proposed Route, as discussed above.

H. List any registered aeronautical facilities (airports, helipads) where the proposed route would place a structure or conductor within the federally-defined airspace of the facilities. Advise of contacts, and results of contacts, made with appropriate officials regarding the effect on the facilities' operations.

Response:
No public use airport is located within 20,000 linear feet of the Project.

A private airport and two hospital helipads are within the vicinity of the Project. The Robinson Private Airport (VG25) is approximately 0.3 mile south of the existing transmission line and Proposed Route. The Centra Bedford Memorial Hospital helipad is approximately 1.3 miles south of the Proposed Route and the Carilion Roanoke Memorial Hospital heliport is approximately 1.3 miles west of the Roanoke Substation. The Company will include the private airport and helipads in its Federal Aviation Administration analysis and mitigate, if necessary.

I. Advise of any scenic byways that are in proximity to or that will be crossed by the proposed transmission line and describe what steps will be taken to mitigate any visual impacts on such byways. Describe typical mitigation techniques for other highways' crossings.

Response:
The Project unavoidably crosses State Route 43 (Peaks Road) which is a state scenic byway and the Blue Ridge Parkway, which is a federal scenic byway. East of the State Route 43 (Peaks Road) crossing, the Proposed Route is south of the existing transmission line to avoid potential conflicts with a gas transmission pipeline within the existing ROW but returns to the existing ROW near the road crossing. The proposed structures near the road crossing will be installed in generally the same location as the existing structures. The Proposed Route is within the existing ROW across the Blue Ridge Parkway and the Company will continue to maintain the existing 100-foot-wide ROW following construction of the Project. One existing structure is on NPS property approximately 225 feet east of the Blue Ridge Parkway and will be replaced with a similar structure in generally the same location. Visual impacts to State Route 43 (Peaks Road) and the Blue Ridge Parkway are expected to be minimal as the line will cross the roads in the existing locations and be similar in character to the existing facilities.

J. Identify coordination with appropriate municipal, state, and federal agencies.

Response:
The Company coordinated with various federal, state, and local agencies and/or officials early in the route development process to inform them of the Project and receive feedback. A list of the agencies contacted, the letter and map provided, and associated responses for the Project are included as Attachment F to the Siting Study found in Volume 2 of the Application.

K. Identify coordination with any non-governmental organizations or private citizen groups.

Response:
Coordination with known non-governmental organizations and/or private citizen groups was made early and throughout the route development process to inform them of the Project and receive feedback. The Company solicited input from landowners and invited the general

public to review the Project information and submit comments during the open houses. The input received on the Project was used in the route planning process and is summarized in the Siting Study in Volume 2 of the Application.

L. Identify any environmental permits or special permissions anticipated to be needed.

Response:
The following is a list of environmental permits or special permissions that are anticipated to be needed for the Project:

- A general Virginia Pollutant Discharge Elimination System Permit for Discharges of Stormwater from Construction Activities from VDEQ.
- Surveys and coordination with the United States Fish and Wildlife Service and the Virginia Department of Wildlife Resources will be conducted for potential occurrence of federally and state-protected species.
- The United States Army Corps of Engineers ("USACE") Section 10 Permit in compliance with Section 404 of the Clean Water Act will apply to the Project.
- If impacts to cultural resources occur, compliance with Section 106 of the National Historic and Preservation Act of 1966 and coordination with VDHR will be required.

SECTION IV. HEALTH ASPECTS OF EMF

A. State the calculated maximum electric and magnetic field ("EMF") levels that are expected to occur at the edge of the right-of-way. If the new transmission line is to be constructed on an existing electric transmission line right-of-way, provide the present EMF levels as well as the maximum levels calculated at the edge of right-of-way after the new line is operational.

Response:
The following is an analysis of EMF associated with the transmission line components of the Project.

The Project will rebuild an approximately 43-mile-long double-circuit 138 kV transmission line. Final structure types will be determined during final engineering, which includes ground surveys and geotechnical studies. Nevertheless, the Company anticipates that the transmission line will be rebuilt to 138 kV standards primarily using double-circuit lattice steel towers and steel monopole structures with an optimal phase configuration known as a "superbundle" (3-2-1/3-2-1, top-to-bottom).

EMF levels were computed at the ROW edges of the existing and proposed line configurations at the point of minimum ground clearance, where EMF is the highest. Lower EMF levels are expected beyond the ROW edges, as levels decline with distance.

Factors that affect EMF include the ROW width, operating voltage, current flow and direction, electrical unbalance, line configuration, conductor height above ground, and other nearby objects. Nominal voltages and balanced conditions are assumed, with maximum current levels and directions expected during normal system operation. No trees, shrubs, buildings or other objects that can block EMF are assumed in proximity to the existing and proposed lines.

Normal maximum loading levels, representing peak load conditions, were assumed in the analysis to maximize the calculated magnetic fields. These loading levels are based on winter 2027-2028 projected system conditions. Daily/hourly loads will fluctuate below these levels. All calculations were obtained at the height of 3.28 feet (one meter) above ground using the Electric Power Research Institute ("EPRI") EMF Workstation computer program.

Based on the foregoing, the maximum electric and magnetic field levels expected to occur at the ROW edge of the proposed double-circuit transmission line are 0.23 kilovolts per meter ("kV/m") and 28.39 milligause ("mG"), respectively.

The maximum existing electric and magnetic field levels for the existing double-circuit transmission line are 0.17 kV/m and 26.97 mG, respectively.

B. If Company is of the opinion that no significant health effects will result from the construction and operation of the line, describe in detail the reasons for that opinion and provide references or citations to supporting documentation.

Response:

EMF occurs naturally in the environment. An electric field is present between the earth and its atmosphere and can discharge as lightning during thunderstorms. The earth also has a magnetic field, which provides an operating basis for the magnetic compass. EMF exists wherever there is a flow of electricity, including electrical appliances and power equipment.

Electric fields are produced by voltage or electric charge. A lamp cord that is plugged in produces an electric field even if the lamp is turned off. These fields commonly are measured in kV/m; the higher the voltage, the greater the electric field. Magnetic fields are created by the flow of current in a wire. As current increases, the magnetic field strength also increases; these fields are measured in units known as gauss, or mG.

Electric fields are blocked by trees, shrubs, buildings, and other objects. Magnetic fields are not easily blocked and can pass through most objects. The strength of these fields decreases rapidly with distance from the source.

EMF associated with power lines and household appliances oscillate at the power frequency (60 Hertz ["Hz"] in the U.S.). When people are exposed to these fields, small electric currents are produced in their bodies. These currents are weaker than natural electric currents in the heart and nervous system.

Possible health effects from exposure to EMF have been studied for several decades. Initial research, focused on electric fields, found no evidence of biologic changes that could lead to adverse health effects. Subsequently, a large number of epidemiologic studies examined the possible role of magnetic fields in the development of cancer and other diseases in adults and children. While some studies have suggested an association between magnetic fields and certain types of cancer, researchers have been unable to consistently replicate those results in other studies. Similarly, inconclusive or inconsistent results have been reported in laboratory studies of animals exposed to magnetic fields that are representative of common human exposures. A summary of such exposures, found in residential settings, is provided in Table IV-1 below.

Appliance Type	Number of Devices	Magnetic Field (mG)		
		1.2" (0.1 feet)	12" (1.0 feet)	User Distance
AC Adapters	3	1.4 – 863	0 - 7.5	0 - 0.8
Blood Pressure Monitors	4	4.2 - 39.6	0 - 0.3	0 – 0.2
Bluetooth Headsets	3	0	0	0
Coffee Grinders	3	60.9 – 779	0.3 – 6.5	0.8 - 40.9
Compact Fluorescent Bulbs	15	0 – 32.8	0 - 0.1	0 - 0.6
Compact Fluorescent Bulb Ballast	1	8.5 – 23.5[1]	0 – 0.1[1]	0 - 0.1[1]
Computers, Desktop	3	3.8 – 68.9	0 -1.1	0.1 – 0.5
Computers, Laptop	4	0 – 5.1	0	0 – 0.1
Digital Cameras	3	0	0	0
Digital Photo Frames	5	0	0	0
Digital Video Recorders	4	0 – 29.6	0 – 0.2	0
Dimmer Switches	4	11.5 – 32.1	0 – 0.8	0 – 0.8
DVD Players	5	0 – 28.9	0 – 0.5	0
Electric Lawn Mower	1	1939	156	14.1
Electric Leaf Blowers	4	272 – 4642	17.1 – 155	28.3 – 61.5
Electric Toothbrushes	5	3.6 - 742	0 – 4.8	3.6 – 742
Electric Toothbrush Chargers	5	0 – 4.2	0	0
External Hard Drives	4	0.6 – 1.7	0	0
Gaming Consoles	10	0 – 215	0 – 0.5	0 – 0.6
GPS, Handheld	5	0 – 0.1	0	0
Hobby Tools	2	126 – 438	1.4 – 2.4	1.4 - 438
Hot Glue Guns	3	0 – 0.9	0	0
LCD Computer Monitors	4	0 – 4.5	0	0
LCD Televisions	4	1.1 – 3.9	0 – 2.5	0 – 0.6
Massagers/Massage Chairs	3	81.9 – 500	0.6 – 2.3	21.4 - 500
MP3 Players	5	0	0	0
Noise Cancellation Headphones	1	0	0	0
Paper Shredders	4	11.0 – 4841	0.5 – 102	0.5 – 33.4
Plasma Televisions	2	45.1 – 73.6	1.4 – 2.2	0 – 0.1
Power Tools – Corded	3	784 – 982	8.8 – 31.3	46.8 - 123
Power Tools – Cordless	6	9.0 – 227	0 – 2.2	0 – 13.7
Printers	5	0.1 – 6.2	0 – 0.3	0 – 0.3
Scanners	3	0.6 – 6.7	0 – 0.3	0
Security System Panels	3	0 – 0.3	0	0
Tankless Hot Water Heater	1	10.1 – 21.9[2]	1.2	0.2
Track Lighting	5	0.2 – 4.0	0 – 0.3	0
Vacuum Cleaners, Personal/Car	3	75.5 – 2226	0.6 – 23.3	0.1 – 23.1
Wireless Game Controllers	11	0	0	0
Wireless Routers	4	0 – 0.5	0	0-0.3

Table IV-1
Magnetic Fields from Household Electrical Appliances and Devices
Source: Electric Power Research Institute [1]

As part of the Energy Policy Act of 1992, U.S. Congress enacted the Electric and Magnetic Fields Research and Public Information Dissemination ("EMF RAPID") program. The National Institute of Environmental Health Sciences ("NIEHS") was charged with overseeing the health research and conducting an EMF risk evaluation. In its final report to Congress, issued in 1999, NIEHS concluded that power-frequency "EMF exposure cannot be recognized at this time as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard." Nonetheless, the report stated that "this finding is insufficient to warrant aggressive regulatory concern." [2]

In 2001, the Standing Committee on Epidemiology of the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") wrote in its review of the epidemiologic

literature on EMF and health that "given the methodological uncertainties and in many cases inconsistencies of the existing epidemiologic literature, there is no chronic disease outcome for which an etiological [causal] relation to EMF exposure can be regarded as established." [3]

Also, in 2001, International Agency for Research on Cancer ("IARC") published the results of an EMF health risk evaluation conducted by an expert scientific working group, which concluded that power-frequency "magnetic fields are 'possibly carcinogenic to humans,' based on consistent statistical associations of high level residential magnetic fields with a doubling of risk of childhood leukemia." [4] IARC assigns its "possibly carcinogenic to humans" classification (Group 2B) if there is "limited evidence" of carcinogenicity in both humans and experimental animals, or if there is "sufficient evidence" in animals, but "inadequate evidence" in humans. Group 2B includes some 288 "agents" such as coffee, pickled vegetables, carpentry, textile manufacturing and gasoline, among others (last update: October 26, 2015).

A comprehensive assessment of the EMF health risks was published by the World Health Organization ("WHO") in 2007. In its assessment, WHO wrote: "Scientific evidence suggesting that every day, chronic, low-intensity (above 0.3-0.4 μT) [3-4 mG] power-frequency magnetic field exposure poses a possible health risk is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukemia." [5] It added, however, that "virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF [extremely low frequency] magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern."

Regarding acute effects, WHO noted, "Acute biological effects have been established for exposure to ELF electric and magnetic fields in the frequency range up to 100 kHz that may have adverse consequences on health. Therefore, exposure limits are needed. International guidelines exist that have addressed this issue. Compliance with these guidelines provides adequate protection for acute effects." [5]

In summary, some studies have reported an association between long-term magnetic field exposure and particular types of health effects, while other studies have not. The nature of the reported association remains uncertain as no known mechanism or laboratory animal data exists to support the cause-and-effect relationship.

In view of the scientific evidence, the Institute of Electrical and Electronics Engineers ("IEEE") and other organizations have established guidelines limiting EMF exposure for workers in a controlled environment and for the general public. These guidelines focus on prevention of acute neural stimulation. No limits have been established to address potential long-term EMF effects, as the guideline organizations consider the scientific evidence insufficient to form the basis for such action. For power-frequency EMF, IEEE Standard C95.6™-2002 [6] recommends the following limits:

	General Public	Controlled Environment
Electric Field Limit (kV/m)	5.0	20.0*
Magnetic Field Limit (mG)	9040	27,100

*10.0 kV/m within power line ROW.

To address public concerns about EMF, the Government of Canada in 2012 updated its website with the latest knowledge on the subject. It contains the following statements on the EMF health-related risks: "Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors." [7]

Similarly, in 2013, the updated website of the World Health Organization concluded: "to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health." [8]

Most recently, in its January 2015 report, the Scientific Committee on Emerging and Newly Identified Health Risks ("SCENIHR"), an independent advisory body to the European Commission on Public Health, issued the following opinion: "Overall, existing studies do not provide convincing evidence for a causal relationship between ELF MF [extremely low frequency magnetic field] exposure and self-reported symptoms." [9]

AEP has been following the EMF scientific developments worldwide, participating in and sponsoring EMF studies, and communicating with customers and employees on the subject. Also, AEP is a member of Electric Power Research Institute, an independent, non-profit organization sponsoring and coordinating EMF epidemiological, laboratory and exposure studies.

The transmission line rebuild construction proposed in this Project will be compliant with the EMF limits specified in IEEE Standard C95.6™-2002.

C. Describe any research studies the Company is aware of that meet the following criteria:

1. Became available for consideration since the completion of the Virginia Department of Health's most recent review of studies on EMF and its subsequent report to the Virginia General Assembly in compliance with 1985 Senate Joint Resolution No. 126;

2. Include findings regarding EMF that have not previously been reported and/or provide substantial additional insight into previous findings; and

3. Have been subjected to peer review.

Response:
In its report to the Virginia General Assembly, issued on October 31, 2000, the Virginia Department of Health stated the following: "the Virginia Department of Health is of the opinion that there is no conclusive and convincing evidence that exposure to extremely low frequency electromagnetic fields emanated from nearby high voltage transmission lines is causally associated with an increased incidence of cancer or other detrimental health effects in humans." [10]

Key publications on the subject, which became available after that report, are included below as references to the discussion contained in Section IV.B and C of this Response to Guidelines.

Section IV References

[1] "Magnetic Fields from Electrical Appliances and Devices," Electric Power Research Institute, Product ID 1021221, September 28, 2010.

[2] "NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields," National Institute of Environmental Health Sciences, National Institutes of Health, NIH Publication No. 99-4493, May 4, 1999 (http://www.niehs.nih.gov/about/materials/niehs-report.pdf).

[3] "Review of the Epidemiologic Literature on EMF and Health," International Commission for Non-Ionizing Radiation Protection (ICNIRP) Standing Committee on Epidemiology, Environmental Health Perspectives, Volume 109, Supplement 6, December 2001 (http://www.icnirp.de/documents/epireview1.pdf).

[4] "IARC Finds Limited Evidence that Residential Magnetic Fields Increase Risk of Childhood Leukemia," International Agency for Research on Cancer, Press Release No 136, June 27, 2001 (http://www.iarc.fr/en/media-centre/pr/2001/pr136.html).

[5] "Extremely Low Frequency Field (Environmental Health Criteria 238)," World Health Organization, June 1, 2007 (http://www.who.int/peh-emf/publications/Complet_DEC_2007.pdf).

[6] "C95.6™ IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz," IEEE Standards Coordinating Committee 28, October 23, 2002.

[7] "Electric and Magnetic Fields from Power Lines and Electrical Appliances," Healthy Canadians, November 7, 2012 (http://www.healthycanadians.gc.ca/environment-environnement/home-maison/emf-cem-eng.php).

[8] "What are Electromagnetic Fields? Summary of Health Effects," World Health Organization, 2013, (http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html)

[9] "Opinion on Potential Health Effects of Exposure to Electromagnetic Fields (EMF)," Scientific Committee on Emerging and Newly Identified Health Risks, SCENIHR, January 27, 2015 (http://ec.europa.eu/health/scientific_committees/emerging/docs/scenihr_o_041.pdf).

[10] "Monitoring of Ongoing Research on the Health Effects of High Voltage Transmission Lines (Final Report)," Virginia Department of Health, October 31, 2000 (http://www.vdh.state.va.us/Epidemiology/DEE/publichealthtoxicology/documents/pdf/highfinal.PDF).

SECTION V. NOTICE

A. Furnish a proposed route description to be used for public notice purposes. Provide a map of suitable scale showing the route of the proposed project. For all routes that the Applicant proposes to be noticed, provide minimum, maximum and average structure heights.

Response:
A description of the Proposed Route is provided below. The requested public notice map is included as Exhibit 16.

The Proposed Route begins at the Company's existing Reusens Substation (200 Old Trents Ferry Road) in the City of Lynchburg, west of the James River. The Proposed Route uses the existing ROW for 3.0 miles from Reusens Substation to United States Route 501 (Boonsboro Road) and crosses Old Trents Ferry Road, State Route 645 (Trents Ferry Road), Locksview Road, Inglewood Road, Clearview Drive, Royal Oaks Way, Royal Oak Drive, Meriwether Road, and Country Club Drive. The Proposed Route deviates slightly from the existing ROW to cross United States Route 501 (Boonsboro Road) and avoid a residential building within the existing ROW and then is within the existing ROW for approximately 3.0 miles to the Company's existing Coffee Substation (2121 Old Farm Road) in Bedford County, crossing Two Creek Drive and State Route 659 (Hawkins Mill Road).

Continuing southwest from the Coffee Substation, the Proposed Route is located within the existing ROW for about 1.0 mile and crosses State Route 660 (Old Farm Road). Just before crossing State Route 621 (Cottontown Road), the Proposed Route shifts to parallel the south side of the existing transmission line for 1.5 miles, then uses the existing ROW for about 0.7 mile to cross State Route 663 (Perrowville Road), and shifts back to the south side of the existing transmission line to parallel the existing ROW for about 1.0 mile to the existing Ivy Hill Substation (2523 White Road).

From the Ivy Hill Substation, the Proposed Route parallels the north side of the existing transmission line ROW for about 1.5 miles crossing State Route 665 (White Road) and Heavens View Drive, then uses the existing ROW to cross State Route 643 (Cifax Road), and parallels the north side of the existing transmission line ROW for another 1.0 mile crossing Deer Track Meadows Lane and State Route 670 (Roaring Run Road). West of State Route 670 (Roaring Run Road), the Proposed Route is within the existing ROW for about 1.5 miles and then parallel to the south side of the existing ROW for about 3.0 miles across State Route 637 (Hawkins Ridge Road), State Route 673 (Benchmark Lane), and Lankford Mill Road. The Proposed Route returns to the existing ROW for approximately 1.0 mile to cross State Route 644 (Lankford Mill Road) and State Route 122 (Big Island Highway). Near the Company's Centerville Substation (1134 Fancy Farm Road), the existing double circuit transmission line will split into two single circuit lines that cross State Route 644 (Fancy Farm Road) to accommodate the expansion of the substation.

West of the Centerville Substation, the Proposed Route parallels the existing ROW for about 2.0 miles, starting on the north side and then switching to the south side of the existing

transmission line as the Proposed Route turns southwest near Birdwatcher Lane. The Proposed Route crosses State Route 43 (Peaks Road) and then is located within the existing ROW for about 0.5 mile as it crosses State Route 678 (Parker Road) and Chelsea Place. The Proposed Route continues southwest from Chelsea Place parallel to the south side of the existing transmission line for about 1.5 miles to the Company's Moseley Substation (1529 Patterson Mill Road).

After the Moseley Substation, the Proposed Route is generally within the existing ROW for about 1.0 mile across N Fork Road, State Route 680 (Patterson Mill Road), a Norfolk Southern Railway Company railroad, and United States Route 460 (W Lynchburg Salem Turnpike). Southwest of the highway crossing, the Proposed Route deviates from the existing transmission line for about 1.0 mile to be just south of Mountain View Church and the Bedford Moose Lodge baseball fields. The Proposed Route parallels the south side of the existing transmission line for 1.0 mile across State Route 681 (Magnolia Drive), is within the existing ROW for about 1.0 mile across State Route 684 (Rocky Ford Road), and then parallels the north side of the existing transmission line for about 6.0 miles to cross State Routes 689 (Johnson School Road), 691 (Thaxton Mountain Road), and 755 (Union Church Road), Leftwich Lane, Crestwood Drive, and Saunders Road.

The Proposed Route is located within the existing ROW for 0.5 mile to cross State Route 700 (Bee Hollow Road) and then parallel to the north side of the existing line for about 1.0 mile to cross Grays Lane and State Route 619 (Jordantown Road). Southwest of State Route 619 (Jordantown Road), the Proposed Route uses the existing ROW to cross State Routes 839 (Atkinson Hollow Road), 1320 (Mountain Meadow Drive), 1460 (Village Drive), 1462 (Windy Way), and 1465 (Courtland Drive), Browning Road, and Sunnydale Court. As it crosses State Route 635 (Jeters Chapel Road), the Proposed Route crosses to the south side of the existing transmission line for approximately 0.5 mile and then crosses to the north side of the existing transmission line across State Route 701 (Mountain Valley Road). The Proposed Route parallels the north side of the existing ROW for about 2.0 miles across State Route 759 (Jeters Mill Road) and Haldren Lane to an existing Appalachian Power transmission line near British Way. After the junction with the existing transmission line, the Proposed Route continues southwest across British Way to the Company's Vinton Substation (1820 Temple Drive) in Roanoke County and is within the existing ROW for about 2.5 miles as it crosses Chittum Lane, State Routes 24 (Stewartsville Road), 635 (Beagle Club Road), and 1628 (Timberline Trail), the Blue Ridge Parkway approximately 0.2 mile south of mile marker 113, Feather Road, and Feather Garden Circle.

The Proposed Route continues within the existing ROW for about 1.0 mile and crosses State Route 634 (Hardy Road), Finney Drive, and Halifax Circle before shifting to parallel the north side of the existing transmission line for 1.0 mile across the Roanoke River. Southwest of the Roanoke River, the Proposed Route is located within the existing transmission line ROW for about 2.0 miles across Highland Road, Eastland Road SE, Ridge Road SE, Plateau Road SE, King Charles Avenue SE, and Bennington Road SE, ending at the Company's existing Roanoke Substation (1246 Riverland Road) in the City of Roanoke, northeast of Mill Mountain Park.

Final structure types will be determined during final engineering, which includes ground surveys and geotechnical studies. Based on preliminary engineering, the Company anticipates primarily using galvanized steel double-circuit lattice steel towers and steel monopole structures with a low-reflective finish for the Project. The proposed structure heights are anticipated to range from 75 to 160 feet. The average height of the proposed structures is 125 feet, which is approximately 25 feet taller than the average height of the existing structures to meet current design standards. The proposed structures will generally be constructed near their existing locations within or close to the existing ROW.

B. List Applicant offices where members of the public may inspect the application. If applicable, provide a link to website(s) where the application may be found.

Response:
This Application and all exhibits, tables, and maps made a part hereof will be available for inspection at the following locations:

Lynchburg Public Library
2315 Memorial Ave.
Lynchburg, VA 24501

Bedford Public Library
321 N. Bridge St.
Bedford, VA 24523

Vinton Library
300 S. Pollard St.
Vinton, VA 24179

Roanoke Public Library
706 S. Jefferson St.
Roanoke, VA 24016

This Application, exhibits, and maps are also digitally available on the Project website: www.AppalachianPower.com/Reusens-Roanoke.

C. List all federal, state, and local agencies and/or officials that may reasonably be expected to have an interest in the proposed construction and to whom the Applicant has furnished or will furnish a copy of the application.

Response:
Federal
United States Army Corps of Engineers, Norfolk District, Western Virginia Regulatory Section
United States Department of Agriculture, Natural Resources Conservation Service
United States Department of Transportation, Federal Highway Administration, Virginia Division
United States Environmental Protection Agency, Region 3

United States Fish and Wildlife Service, Virginia Field Office
United States House of Representatives, 5th District (Bob Good)*
United States House of Representatives, 6th District (Ben Cline)*

State
Virginia Department of Agriculture and Consumer Services
Virginia Department of Aviation
Virginia Department of Conservation and Recreation
Virginia Department of Energy
Virginia Department of Environmental Quality*
Virginia Department of Forestry
Virginia Department of Health, Office of Drinking Water
Virginia Department of Historic Resources
Virginia Department of Transportation, Lynchburg District
Virginia Department of Transportation, Salem District
Virginia Department of Wildlife Resources
Virginia Marine Resources Commission
Virginia Outdoors Foundation
Senate of Virginia, 19th District (David R. Suetterlein)*
Senate of Virginia, 21st District (John S. Edwards)*
Senate of Virginia, 22nd District (Mark J. Peake)*
Senate of Virginia, 23rd District (Stephen D. Newman)*
Virginia House of Delegates, District 23 (Wendell S. Walker)*
Virginia House of Delegates, District 16 (Leslie R. Adams)*
Virginia House of Delegates, District 17 (Christopher T. Head)*

Local
Bedford County, Board of Supervisors (John Sharp, Board Chair)
Bedford County, Board of Supervisors (Charla Bansley, Vice Chair)
Bedford County, Administrator (Robert Hiss)**
Bedford County, Attorney (Patrick Skelley II)

Roanoke County, Board of Supervisors (Paul M. Mahoney, Board Chair)
Roanoke County, Board of Supervisors (P. Jason Peters, Vice Chair)
Roanoke County, Administrator (Richard L. Caywood)**
Roanoke County, Attorney (Peter Lubeck)

City of Lynchburg, Mayor (MaryJane Dolan)
City of Lynchburg, City Manager (Wynter Benda)**
City of Lynchburg, Attorney (Matthew Freedman)
City of Lynchburg, Acting City Planner (Rachel Frischeisen)
City of Lynchburg, Environmental Planner (Kate Miller)

City of Roanoke, Mayor (Sherman P. Lea, Sr.)
City of Roanoke, City Manager (Bob Cowell)**
City of Roanoke, Attorney (Tim Spencer)
City of Roanoke, City Planner (Brittany Gardner)

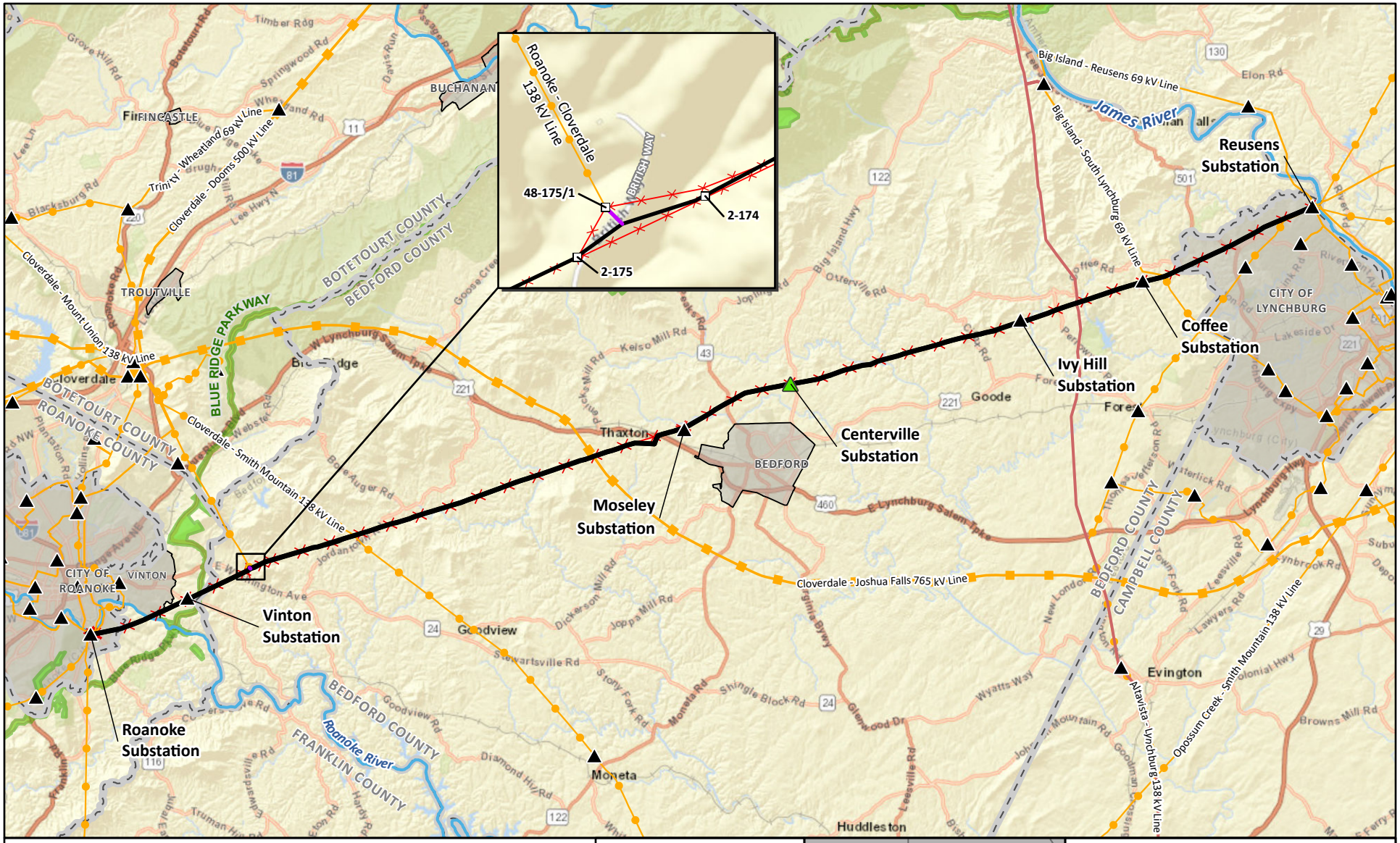
Town of Vinton, Mayor (Bradley E. Grose)
Town of Vinton, Town Manager (Richard Peters)**
Town of Vinton, Planning and Zoning Director (Anita McMillan)

* The Company will provide access to an electronic copy of the Application and related materials to these officials or agencies.
** The Company will distribute a hard copy of the Application and related materials to these officials.

D. If the application is for a transmission line with a voltage of 138 kV or greater, provide a statement and any associated correspondence indicating that prior to the filing of the application with the SCC the Applicant has notified the chief administrative officer of every locality in which it plans to undertake construction of the proposed line of its intention to file such an application, and that the Applicant gave the locality a reasonable opportunity for consultation about the proposed line (similar to the requirements of § 15.2-2202 of the Code for electric transmission lines of 150 kV or more).

Response:
As detailed in Section III.B, the Company introduced the Project to the localities crossed by the Project (Roanoke and Bedford Counties, the cities of Roanoke and Lynchburg, and the Town of Vinton, Virginia). In addition, the Company met virtually with local officials from Roanoke and Bedford Counties, the City of Roanoke, and the towns of Bedford and Vinton on December 1, 2021, to obtain information to aid the route planning process. The local officials were advised at that time of the Company's plans to file an application with the SCC for approval of the Project and will be notified when the Proposed Route is announced to the public.

EXHIBIT 1: PROJECT AREA MAP



- Existing APCo Structure
- Existing APCo Substation to be Expanded
- Existing APCo Substation
- Existing APCo Transmission Line to be Reconfigured
- Reusens - Roanoke 138 kV Line Proposed Route
- Existing Non-APCo Transmission Line
- Existing APCo Transmission Line (69 kV or lower)
- Existing APCo Transmission Line (115-238 kV)
- Existing APCo Transmission Line (345 kV +)
- Existing APCo Transmission Line to be Retired
- River (NHD)
- County Boundary
- Blue Ridge Parkway National Park
- Municipality

Cities of Lynchburg & Roanoke, Bedford & Roanoke Counties, Town of Vinton, Virginia

Author: ckunde
Project: 162806

NAD 1983 State Plane Virginia South FIPS 4502 Feet
Lambert Conformal Conic

October 26, 2022

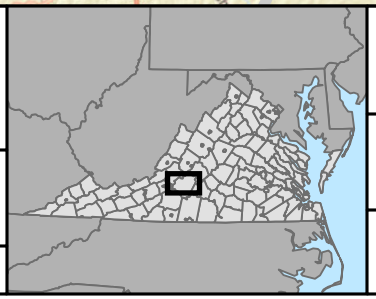


Exhibit 1: Project Overview

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

Reusens - Roanoke 138 kV Rebuild Project

0 2 4 6 8
Miles

EXHIBIT 2: AEP TRANSMISSION PLANNING CRITERIA AND GUIDELINES FOR END-OF-LIFE AND OTHER ASSET MANAGEMENT NEEDS

AEP Transmission Planning Criteria and Guidelines for End-Of-Life and Other Asset Management Needs

December 2020

Document Control

Document Review and Approval

Action	Name(s)	Title
Prepared by:	Jomar M. Perez	Manager, Asset Performance and Renewal
Approved by:	Nicolas Koehler	Director, East Transmission Planning
Approved by:	Wayman L. Smith	Director, West Transmission Planning
Approved by:	Kamran Ali	Managing Director, Transmission Planning

Review Cycle

Quarterly	Semi-annual	Annual	As Needed
			X

Revision History

Version	Revision Date	Changes	Comments
1.0	01/04/2017	N/A	1st Release
2.0	1/18/2018	Format Update	2nd Release
3.0	11/09/2018	Content Additions	3rd Release
4.0	12/14/2020	End-Of-Life Criteria	4th Release

Table of Contents

1.0 Introduction

The American Electric Power (AEP) transmission system consists today of approximately 40,000 miles of transmission lines, 3,600 stations, 5,000 power transformers, 8,000 circuit breakers, and operating voltages between 23 kV and 765 kV in three different RTOs – the Electric Reliability Council of Texas (ERCOT), the PJM Interconnection (PJM), and the Southwest Power Pool (SPP), connecting over 30 different electric utilities while providing service to over 5.4 million customers in 11 different states.

AEP's interconnected transmission system was established in 1911 and is comprised of a very large and diverse combination of line, station, and telecommunication assets, each with its own unique installation date, design specifications, and operating history. As the transmission owner, it is AEP's obligation and responsibility to manage and maintain this diverse set of assets to provide for a safe, adequate, reliable, flexible, efficient, cost-effective and resilient transmission system that meets the needs of all customers while complying with Federal, State, RTO and industry standards. This requires, among other considerations, that AEP determine when the useful life of these transmission assets is coming to an end and when the capability of those assets no longer meets current needs, so that appropriate improvements can be deployed. AEP refers to these issues as transmission owner identified needs that address condition, performance and risk. AEP identifies these needs through the transmission planning criteria and guidelines outlined in this document. Specifically, this document constitutes the AEP transmission planning criteria and guidelines for End-Of-Life and other asset management needs as required in the FERC-approved Attachment M-3 to the PJM Tariff. AEP does not address any End-Of-Life or other asset management needs through the baseline planning criteria AEP files with its FERC Form 715.

AEP's transmission owner identified needs must be addressed to achieve AEP's obligations and responsibilities. Meeting these obligations requires that AEP ensures the transmission system can deliver electricity to all points of consumption in the quantity and quality expected by customers, while reducing the magnitude and duration of disruptive events. Given these considerations, criteria and guidelines are necessary to identify and quantify needs associated with transmission facilities comprising AEP's system. AEP identifies the needs and the solutions necessary to address those needs on a continuous basis using an in-depth understanding of the condition of its assets, and their

associated operational performance and risk, while exercising engineering judgment coupled with Good Utility Practices [1].

Whereas the End-Of-Life needs, as defined in the FERC-approved Attachment M-3 to the PJM Tariff, are limited to transmission facilities rated above 100 kV, these criteria and guidelines apply to all transmission voltages that comprise the AEP transmission system, including those defined as End-Of-Life needs in the FERC-approved Attachment M-3 to the PJM Tariff. In addition, projections of candidate End-Of-Life needs that result from the process outlined in these AEP criteria and guidelines will be provided to PJM in accordance with the provisions in the FERC-approved Attachment M-3 to the PJM Tariff. Current End-Of-Life and other asset management needs will be vetted with stakeholders in accordance with the provisions in the FERC-approved Attachment M-3 to the PJM Tariff.

Addressing these owner identified transmission system asset management needs, as they pertain to condition, performance and risk, will result in the following benefits to customers:

- Safe operation of the electric grid.
- Reduction in frequency of outage interruptions.
- Reduction in duration of outage interruptions.
- Improvement in service reliability and adequacy to customers.
- Reduction of risk of service disruptions (improved resilience) associated with man-made and environmental threats.
- Proactive correction of reliability constraints that stem from asset failures.
- Effective utilization of resources to provide efficient and cost-effective service to customers.

2.0 Process Overview

AEP's transmission owner needs identification criteria and guidelines are used for projects that address equipment material conditions, performance, and risk. AEP uses the three-step process shown in Figure 1 and discussed in detail in this document to determine the best solutions to address the transmission owner identified needs and meet AEP's obligations and responsibilities. This process is completed on an annual basis. In developing the most efficient and cost-effective solutions, AEP's long-term strategy is to pursue holistic transmission solutions in order to reduce the overall AEP transmission system needs.

Figure 1 – AEP Process for Identifying and Addressing Transmission Asset Condition, Performance and Risk Needs

3.0 Step 1: Needs Identification

Needs Identification is the first step in the process of determining system and asset improvements that help meet AEP's obligations and responsibilities. AEP gathers information from many internal and external sources to identify assets with needs. A collective evaluation of these inputs is conducted and considered, and thus, individual thresholds do not apply. In addition, factors can change over time. A sampling of the inputs and data sources is listed below in Table 1.

Table 1 – Inputs Considered by AEP to Identify Transmission System Needs

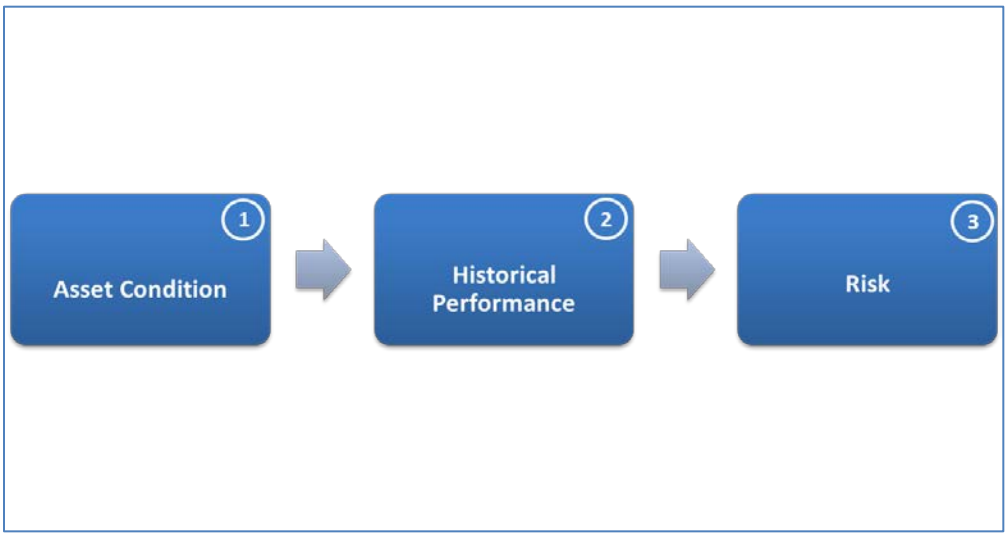
Internal, External, or Both	Inputs	Examples
Internal	Reports on asset conditions	Transmission line and station equipment deterioration identified during routine inspections (pole rot, steel rusting or cracking)
	Capabilities and abnormal conditions	Relay misoperations; Voltage unbalance
	Legacy system configurations	Ground switch protection schemes for transformers;; Transmission Line Taps without switches (hard taps); Equipment without vendor support
	Outage duration and frequency	Outages resulting from equipment failures, misoperations, or inadequate lightning protection
	Operations and maintenance costs	Costs to operate and maintain equipment
External	Regional Transmission Operator (RTO) or Independent System Operator (ISO) issued notices	Post Contingency Local Load Relief Warnings (PCLLRWs) issued by the RTO that can lead to customer load impacts
	Stakeholder input	Input received through stakeholder meetings, such as PJM's Sub Regional RTEP Committee (SRRTEP) meetings or through the AEP hosted Annual Stakeholder Summits
	Customer feedback	Voltage sag issues to customer delivery points due to poor sectionalizing; frequent outages to facilities directly affecting customers
	State and Federal policies, standards, or guidelines	NERC standards for dynamic disturbance recording
Both	Environmental and community impacts	Equipment oil/gas leaks; facilities currently installed at or near national parks, national forests, or metropolitan areas
	Standards and Guidelines	Minimum Design Standards, Radial Lines, Three Terminal Lines, Overlapping Zones of Protection
	Safety risks and concerns	Station and Line equipment that does not meet ground clearances; Facilities identified as being in flood zones; New Occupational Safety and Hazards Administration (OSHA) regulations

These inputs are reviewed and analyzed to identify the transmission assets that are exhibiting unacceptable condition, performance and risk, and thus, must be addressed through the FERC-approved Attachment M-3 planning process.

3.1 Methodology and Process Overview

The AEP transmission system is composed of a very large number of assets that provide specific functionality and must work in conjunction with each other in the operation of the grid. These assets have been deployed over a long period of time using engineering principles, design standards, safety codes, and Good Utility Practices that were applicable at the time of installation and have been exposed to varying operating conditions over their life. The Needs Identification methodology is shown below in Figure 2. AEP addresses the identified needs considering factors including severity of the asset condition and overall system impacts. These are subsequently evaluated versus constraints such as outage availability, siting requirements, availability of labor and material, constructability, and available capital funding in determining the timing and scope of mitigation.

Figure 2 – Needs Identification Methodology



It is AEP's strategy and goal to develop and provide the more efficient, cost-effective, safe, reliable, resilient, and holistic long-term solutions for the identified needs.

3.2 Asset Condition (Factor 1)

The Asset Condition assessment gathers a standard set of physical characteristics associated with an asset or a group of assets. The set of data points recorded is determined based on the asset type and class. Information assembled during the Asset Condition assessment is used to show the historical

deterioration, current condition, and future expectation of the asset or group of assets on the AEP system.

AEP annually assembles a list of reported condition issues for all of its assets in its system. A detailed follow-up review is conducted to determine if a transmission asset is in need of upgrade and/or replacement. Additionally, this Asset Condition review is used to determine an adequate scope of work required to mitigate the risk associated with a facility's performance and its identified issues. This level of risk is determined through the Future Risk assessment (Factor 3).

Beyond physical condition, AEP's ability to restore the asset in case of a failure is also considered. This is referred to as the future probability of failure adder. Typically, assets that are no longer supported by manufacturers or lack available spare parts are assigned a higher probability of failure adder.

To perform condition assessments, AEP classifies its Transmission assets in two main categories: Transmission Lines and Substations.

3.2.1 Transmission Line Considerations

Design Portion

A. Age (Original Installation Date)
B. Structure Type (Wood, Steel, Lattice)
C. Conductor Type (Size, Material & Stranding)
D. Static Wire Type (Size & Material)
E. Foundation Type (Grillage, Direct Embed, Caisson, Guyed V, Drilled Pier etc.)
F. Insulator Type (Material)
G. Shielding and Grounding Design Criteria (Ground Rod, Counterpoise, "Butt Wrap" etc.)
H. Electrical Configuration
    a. Three Terminal Lines
    b. Radial Facilities
I. NESC Standards Compliance
    a. Structural Strength (NESC 250B, 250C & 250D Compliance)
    b. Clearances (TLES-047 Compliance)

J. Easement Adequacy (Width, Encroachments, Type; etc.)

Physical Condition

A. Open Conditions (existing and unaddressed physical conditions associated with a Transmission Line component)
B. Closed Conditions (previously addressed physical conditions associated with a Transmission Line component)
C. Emergency Fixes (History of emergency fixes)
D. Accessibility (Identified areas of difficult access)

3.2.2 Substation Considerations

A. Transformers
    a. Manufacturer
    b. Manufacturing Date
    c. In Service Date
    d. Load Tap Changer Type & Operation History (if applicable)
    e. Dissolved Gas Analysis
    f. Bushing Power Factor
    g. Through Fault Events (Duval Triangles)
    h. Moisture Content (Oil)
    i. Oil Interfacial Tension
    j. Dielectric Strength
    k. Maintenance History
    l. Malfunction Records

B. Circuit Breakers
    a. Manufacturer & Type
    b. Manufacturing Date
    c. In Service Date
    d. Interrupting Medium
    e. Fault Operations
    f. Switched Operations

g. Spare Part Availability
h. Maintenance History
i. Malfunction Records
j. Breaker Type Population

C. Secondary/Auxiliary Substation Equipment*

a. Station Batteries
b. Control House
c. Station Security
d. Station Structures
e. Capacitor Banks
f. Bus, Cable and Insulators
g. Disconnect Switches
h. Station Configuration
i. Station Service
j. Relay Types
k. RTU Types
l. Voltage Sensing Devices

**AEP substation inspections include assessments of secondary/ancillary equipment. If needed, upgrades to these components are typically included in the scope of projects addressing major equipment and may not necessarily drive stand-alone projects.*

3.3 Historical Performance (Factor 2)

AEP's Historical Performance assessment quantifies how an asset or a group of assets has historically impacted the Transmission system's reliability and Transmission connected customers, helps identify the primary contributing factors to a facility's performance, and baselines the outage probability used in our Future Risk analysis. The metrics used as part of this historical performance assessment include:

A. Forced Outage Rates
B. Manual Outage Rates
C. Outage Durations (Forced Outage Duration in Hours)
D. System Average Interruption Indices (T-SAIDI, T-SAIFI, T-SAIFI-S, T-MAIFI)

E. Customer Minutes of Interruption (CMI)

F. Customer Average Interruption Indices (IEEE SAIDI, CAIDI & SAIFI)

G. Number of Customers Interrupted (CI)

AEP utilizes this standard set of metrics as a means to quantify the historical performance of an asset. These historical performance metrics allow AEP to further investigate assets that have historically impacted customers the most.

Due to the vast size of the AEP operating territory covering 11 states, AEP segments its needs into seven distinct operating company regions and six voltage classes. This segmentation ensures that variations in geography with respect to vegetation, weather patterns, and terrain can be accounted for within the process of identifying needs for each operating company area. In addition to customers of AEP operating companies, consideration for retail customers that are served at non-AEP wholesale customer service points is also included. In order to account for customers served behind wholesale meter points, AEP gathers information from the parent wholesale provider or in its absence, applies a surrogate customers per MW ratio to estimate the number of customers served by a wholesale power provider's delivery point. This customer count is used to calculate the individual metrics above.

AEP's standard approach is to annually review the historical performance of its assets based on a rolling three-year average, but in some cases AEP may extend the review period beyond three years. AEP classifies all transmission asset outage causes into the following five categories to conduct this review: Transmission Line Component Failure, Substation Component Failure, Vegetation (AEP), Vegetation (Non-AEP), and External Factors. Each transmission asset and its associated performance is quantified and compared against corresponding system totals to determine its percentage contribution to aggregated system performance. An evaluation of outage rates is also performed for Transmission line assets. The observed performance of the assets in any of these categories can point to a need that may need to be addressed.

3.4 Future Risk (Factor 3)

AEP reviews the associated risk exposure (future risk) inherent with each identified asset to determine an asset's level of risk. This risk exposure is quantified assuming the probability of an outage scenario

and is based on the reported condition of the asset and the severity of that condition and what the impact could be to customers or to the operation of AEP's Transmission system. Some of the key items to assess these impacts included in the risk criteria are:

A. Number of Customers Served
B. Load Served
C. Operational Risks
    a. Post Contingency Load Loss Relief Warnings (PCLLRW's)
    b. History of Load Shed Events
    c. Stations in Black Start Paths

In addition to the future risk calculation performed through this process, AEP is systematically reviewing its system to identify and remediate equipment and practices that have resulted in operational, restoration, environmental, or safety issues in the past that cannot be directly quantified, but that remain as acknowledged risks in the AEP Transmission system. These include:

A. Wood pole construction
B. Pilot wire protection schemes
C. Oil circuit breakers
D. Air Blast circuit breakers
E. Pipe type oil filled cables
F. Electromechanical relays
G. Legacy system configurations
    a. Missing or inadequate line switches (e.g., hard-taps)
    b. Missing or inadequate transformer/bus protection
    c. Three-terminal lines
    d. Overlapping zones of protection
H. Non-Standard Voltage Classes
I. Poor Lightning & Grounding Performance
J. Radial Facilities
K. Public vulnerability

These items as described above are reviewed on a case by case basis and considered when holistic system solutions are being developed.

4.0 Step 2: Solution Development

The development of solutions for the identified needs considers a holistic view of all of the needs in which several solution options are developed and scoped. AEP applies the appropriate industry standards, engineering judgment, and Good Utility Practices to develop these solution options. AEP solicits customer and external stakeholder input on potential solutions through the Annual Stakeholder Summits hosted by AEP and also through the PJM Project Submission process. This ensures that input from external stakeholders on identified needs can be received and considered as part of the solution development process.

Solution options consider many factors including, but not limited to, environmental conditions, community impacts, land availability, permitting requirements, customer needs, system needs, and asset conditions in ultimately identifying the best solution to address the identified need. Once the selected solution for a need or group of needs is defined, it is reviewed using the current RTO provided power-flow, short circuit, and stability system models (as needed) to ensure that the proposed solution does not adversely impact or create baseline planning criteria violations on the transmission grid. Finally, AEP reviews its existing portfolio of baseline planning criteria driven reliability projects and evaluates opportunities to combine or complement existing baseline planning criteria driven reliability projects with the transmission owner needs driven solutions developed through this process. This step ultimately results in the implementation of the more efficient, cost-effective, and holistic long-term solutions. Stand-alone projects are created to implement the proposed solution where transmission owner needs driven solutions cannot be integrated into existing projects.

5.0 Step 3: Solution Scheduling

Once solutions are developed to address the identified needs, the scheduling of the solutions will take place. As mentioned in the previous section, if opportunities exist to combine or complement existing baseline planning criteria driven reliability projects with the needs driven solutions developed

through this process, the scheduling will be aligned to the extent possible. In all other situations, AEP will schedule the implementation of the identified solutions in consideration of various factors including severity of the asset condition, overall system impacts, outage availability, siting requirements, availability of labor and material, constructability, and available capital funding. AEP uses its discretion and engineering judgment to determine suitable timelines for project execution.

6.0 Conclusion

This document outlines AEP's criteria and guidelines for transmission owner identified needs that address equipment material conditions, performance, and risk. It outlines the sources and methods considered by AEP to identify assets with needs on a continuous basis and it outlines how solutions are developed and scheduled. AEP will review and modify these criteria and guidelines as appropriate based upon our continuing experience with the methodology, acquisition of data sources, deployment of improved performance statistics and the receipt of stakeholder input in order to provide a safe, adequate, reliable, flexible, efficient, cost-effective and resilient transmission system that meets the evolving needs of all of the customers it serves.

7.0 References

[1] FERC Pro Forma Open Access Transmission Tariff, Section 1.14, Definition of "Good Utility Practice". Link: https://www.ferc.gov/legal/maj-ord-reg/land-docs/rm95-8-0aa.txt

[2] AEP Transmission Planning Documents and Transmission Guidelines. Link: http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/

EXHIBIT 3: A PORTION OF THE AEP EASTERN SYSTEM PRE-1930S ERA LATTICE TOWER AND TRANSMISSION LINE SYSTEM PRESENTATION

AEP TRANSMISSION℠
An AEP Company
BOUNDLESS ENERGY℠

AEP Eastern System
Pre-1930s Era Lattice Tower and Transmission Line System

SRRTEP-Western Committee

AEP TRANSMISSION
An AEP Company
BOUNDLESS ENERGY

Condition & Impacts of the Degraded Pre-1930s Era System

- These transmission line assets are clearly in the accelerated deterioration phase of their life

- Significant deterioration results in loss of strength and performance posing a significant risk of failure under conditions the assets should be able to withstand
  - May cause frequent and extended outages
  - May create significant economic losses
  - May endanger public safety

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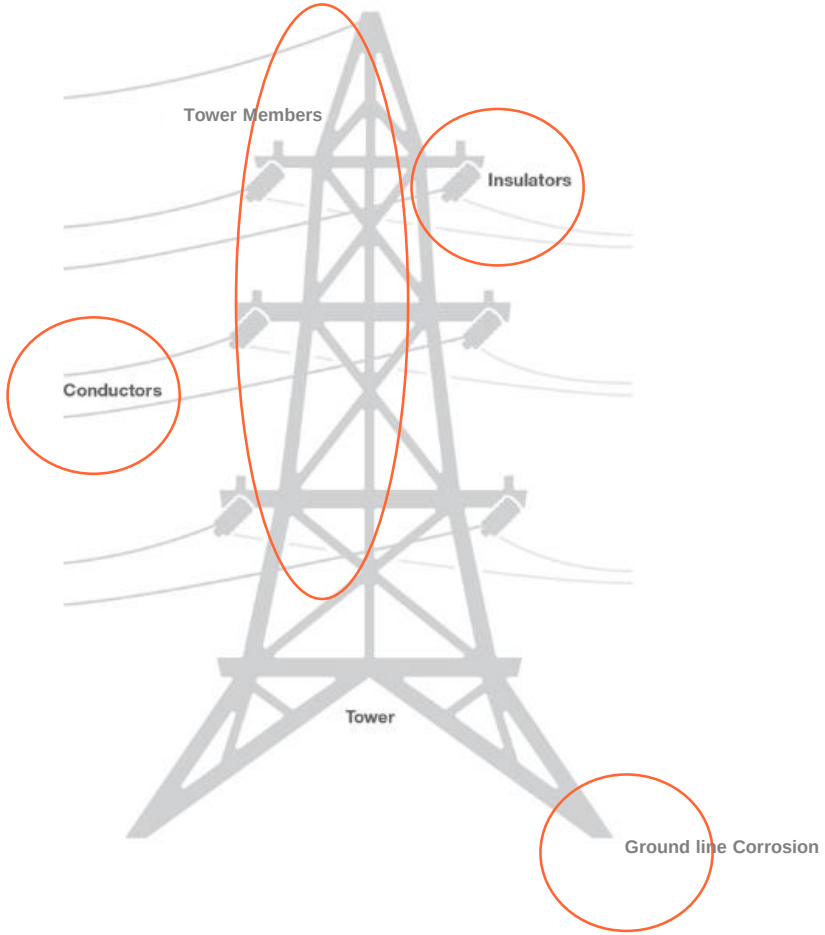
An AEP Company
BOUNDLESS ENERGY™

Conditions of System



- The system is evaluated holistically, including an assessment of insulators, conductors, ground line corrosion and tower members
- The next 8 slides include photos of lattice tower components that represent the condition prevalent across AEP's pre-1930s era lattice transmission line network

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Tower Conditions

- The towers consist of galvanized steel
- Conditions vary with environmental exposure
- Typical life of galvanizing is 70 years
- The towers are all supported by steel grillage foundations buried in the ground
- The tower leg is subject to significant risk of corrosion where it enters the ground

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An AEP Company
BOUNDLESS ENERGY™

Ground Line Corrosion

- Tower legs have lost greater than 50% of section due to corrosion
- Subject to collapse

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An AEP Company
BOUNDLESS ENERGY™

Insulator & Hardware Corrosion

- **Section Loss:** The connecting elements including the tower attachment hole and the insulator hook have experienced serious section loss due to corrosion and wear. This loss of metal cross-section significantly reduces the capacity of the connection

- **Corrosion:** The insulator caps and connecting hardware have experienced heavy to complete loss of galvanizing. When the protective galvanized coating is gone or significantly compromised the bare steel corrodes at an accelerated rate

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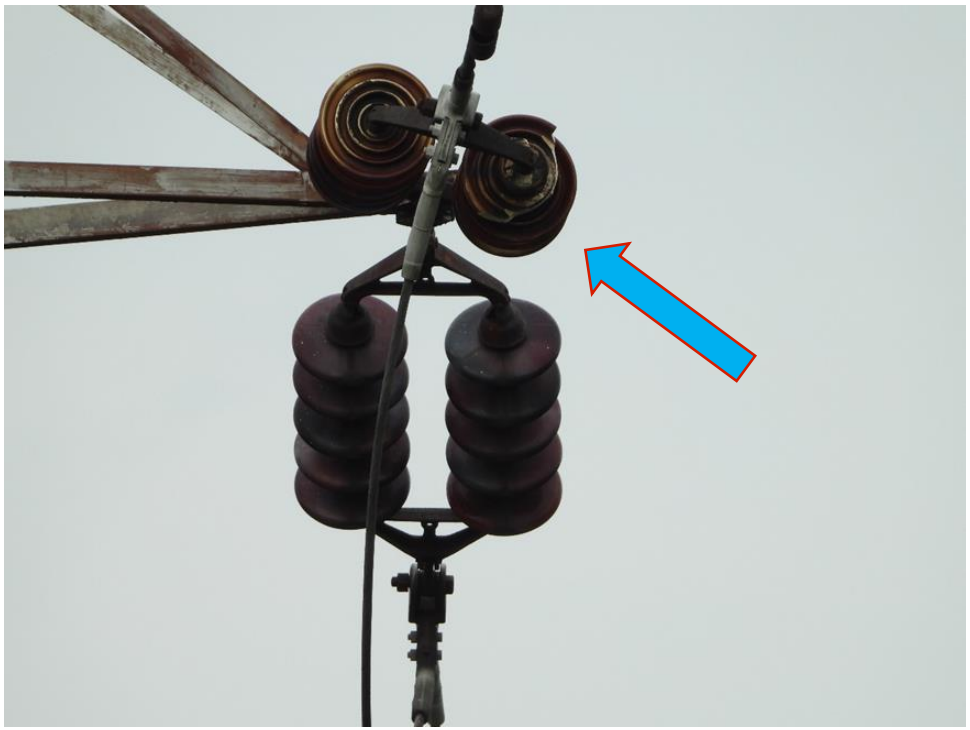
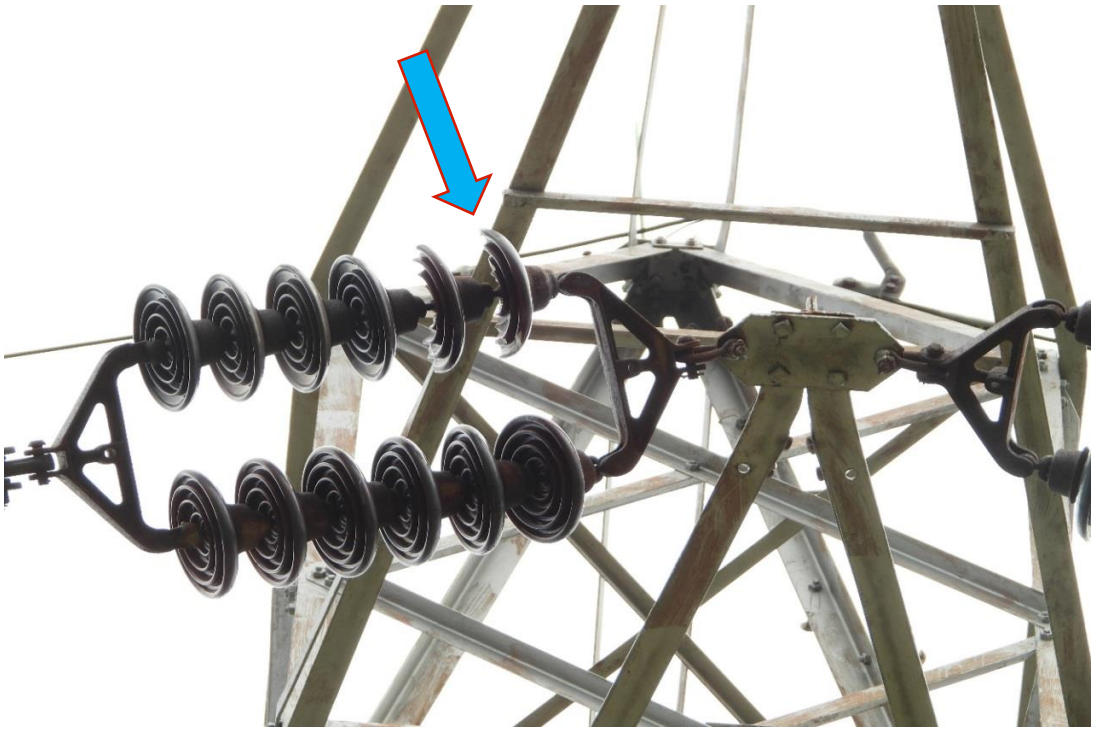
An AEP Company
BOUNDLESS ENERGY™

Broken Insulators





- Broken, cracked and otherwise damaged insulators lead to premature flashover causing permanent outages
- When the insulator assembly breaks, the wire falls to the ground potentially damaging other conductors, and present an increased public safety concern

AEP TRANSMISSION
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Typical 1930s Lattice Line

- Pitting and deterioration of base steel
- Corroded connecting pins will drop conductor when they fail

AEP TRANSMISSION
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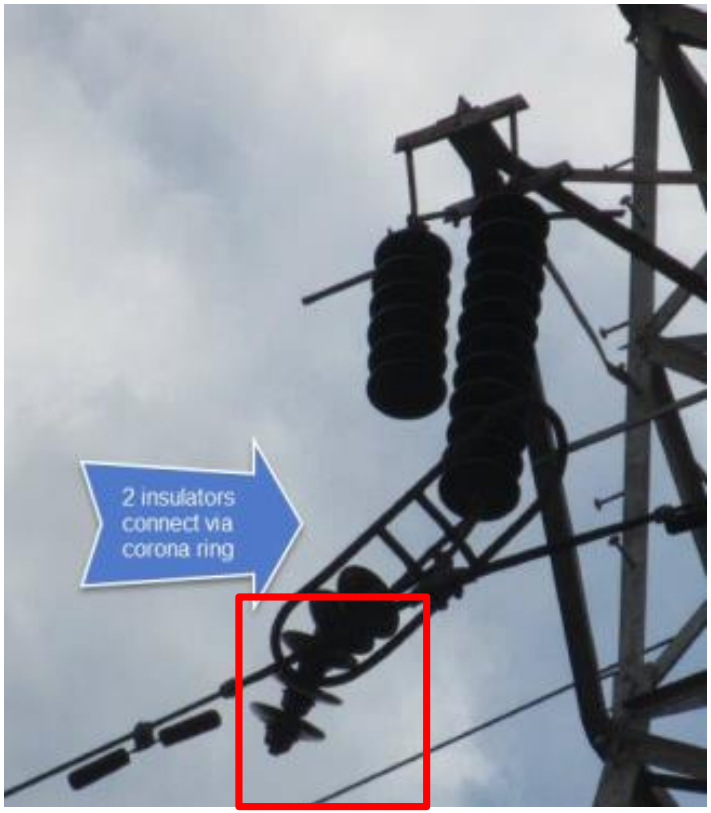
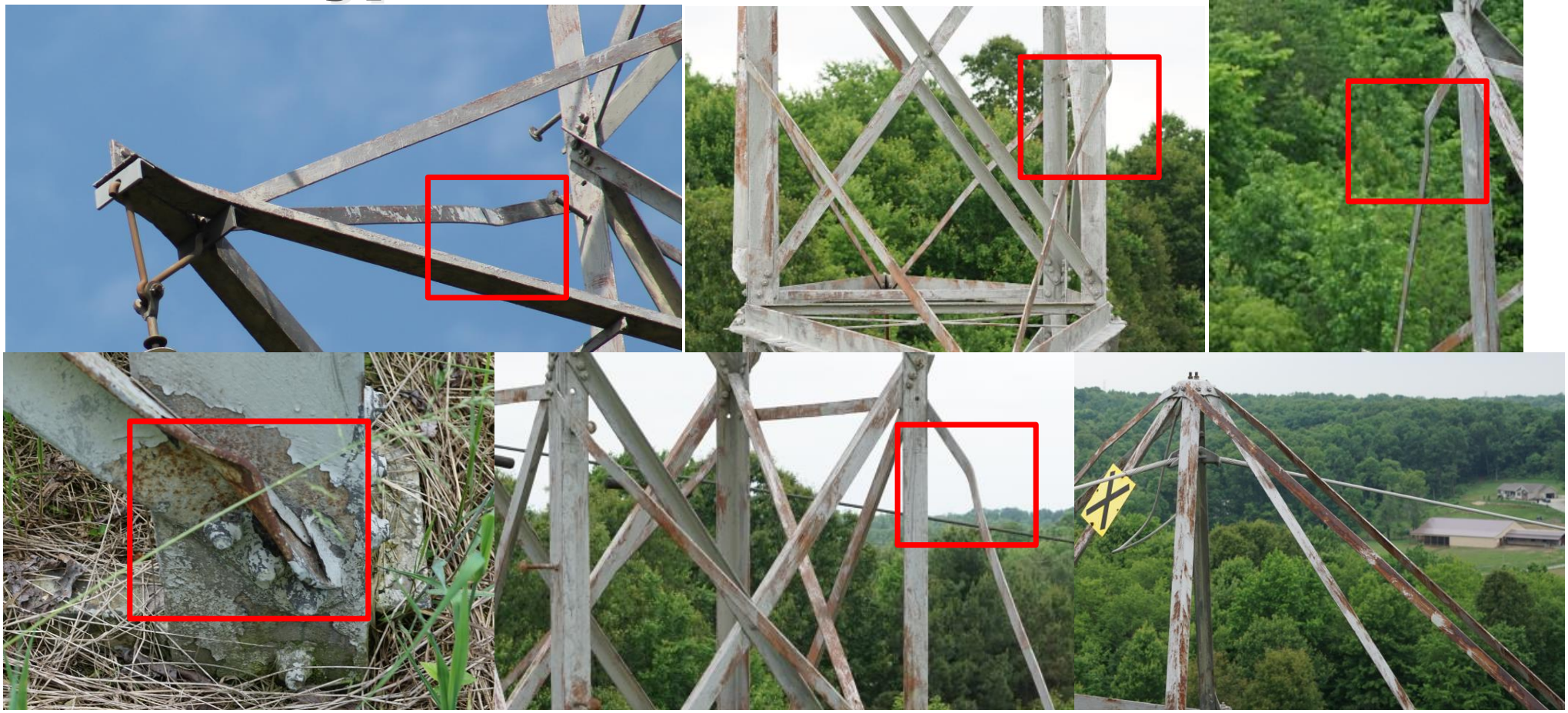
Typical 1930s Lattice Line



- Insulator failure due to corrosion and wear of connecting element
- Close up views of connections showing corrosion and loss of section

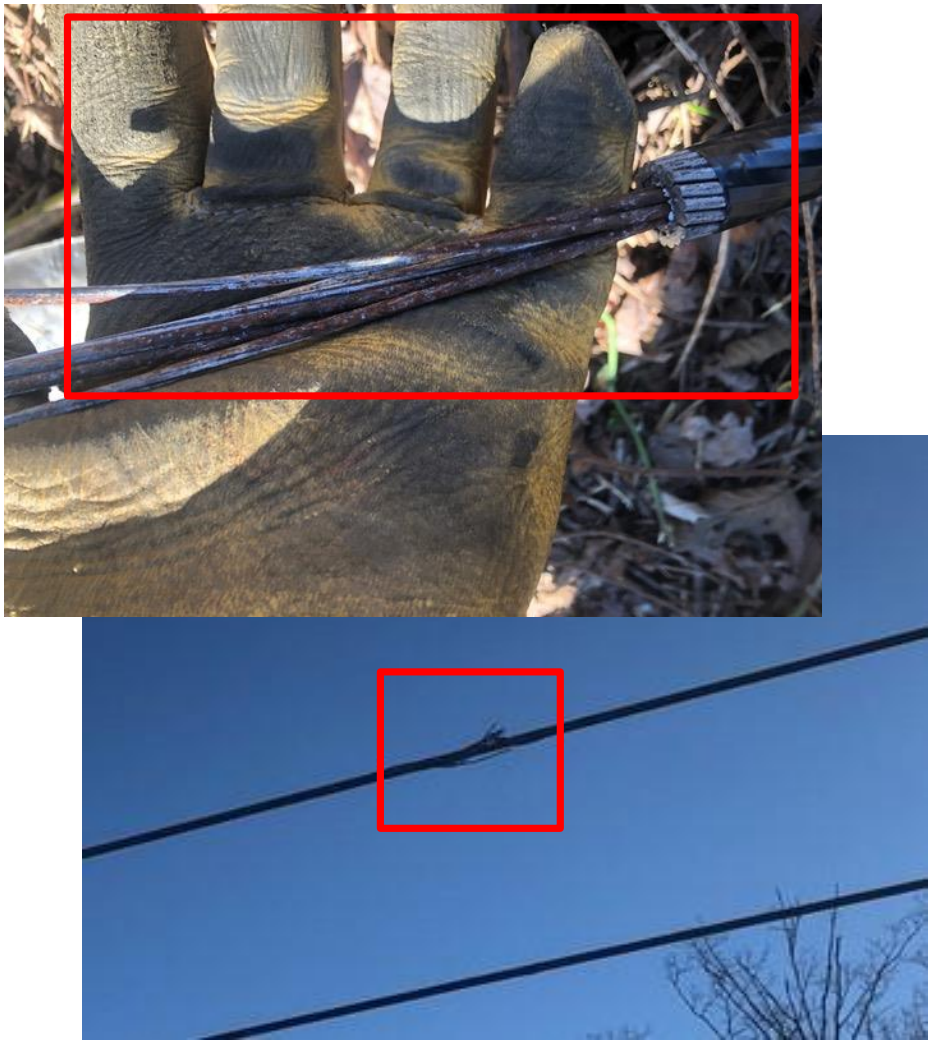
AEP TRANSMISSION
An AEP Company
BOUNDLESS ENERGY

Typical 1930's Lattice Tower



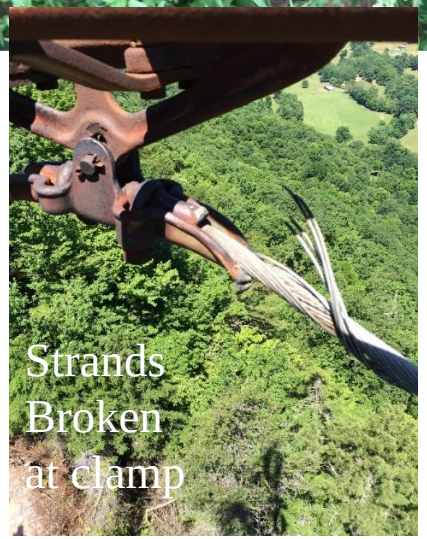
- Tower members with corrosion and damage. Lattice tower structures have little structural redundancy. A failure of one member of the structure will impact the integrity of the structure and may cause the entire tower to collapse.

Typical 1930s Era Steel Core Conductor



- Significant deterioration exists
- Aluminum Conductor Steel Reinforced (ACSR) conductor consists of aluminum strands wrapped around a core of galvanized steel strands. The steel provides the structural strength. Like other steel elements the strands of the core have also lost the galvanized coating and steel section
- The degraded state results in significant loss of tensile strength and potential risk to the public if the conductor was to fail and fall to the ground

Typical 1930s Era Steel Core Conductor

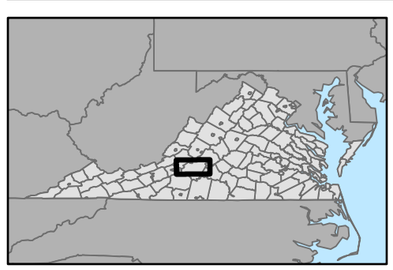


- Conductor damage is usually not visible in a field inspection
- Specific conductor samples, from the belly of the sag (lowest point) and/or inside the clamps at the insulators, have confirmed significant corrosion
- During the restoration or construction activities, conductors often break at adjacent locations due to handling, introducing a potential safety risk and increase public safety concern

EXHIBIT 4: GIS CONSTRAINTS MAP

Note 1: An approximately 100-foot-wide ROW will generally be sited within an approximately 200- or 300-foot-wide corridor. Based on its preliminary engineering analysis to date, the Company believes that the Proposed Route is the most suitable centerline for the Project. However, the Company needs the flexibility to shift the centerline no more than 50 feet in either direction where the Proposed Route is generally in the existing ROW (in the cities of Lynchburg and Roanoke), and 100 feet in either direction where the Proposed Route is generally parallel to the existing transmission line in new ROW (in Bedford County). Near the U.S. Route 221/460 crossing, the corridor is expanded to avoid a residential, commercial, and recreational area crossed by the existing line. Across the Roanoke River, the corridor is expanded to allow for further discussions with affected landowners, additional surveys and engineering, and the increased ROW width needed to cross the river. The final line route and structure locations will be determined during final engineering and after additional studies including, but not limited to, ground surveys, geotechnical and environmental studies, and additional discussions with landowners are completed.

Note 2: The parcel boundaries depicted on these maps were obtained from Bedford County, the City of Lynchburg, and the City of Roanoke (2021), and are not based on ground survey and should not be construed or used as exact descriptions of legal boundaries.



- Map Tile
- Existing APCo Substation to be Expanded
- Existing APCo Substation
- Proposed Route
- Existing Non-APCo Transmission Line
- Existing APCo Transmission Line (69 kV or lower)
- Existing APCo Transmission Line (115-238 kV)
- Existing APCo Transmission Line (345 kV +)
- Existing APCo Transmission Line to be Retired
- Airport
- Natural Gas Pipeline
- Railroad
- River (NHD)
- Architectural Resource (VDHR)
- Historic District (VDHR)
- State Easement
- VOF Easement
- Federal Conservation Lands
- County Boundary

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 3 6
Miles

1" = 3 miles

INDEX

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-1
Prop. Height 130'

Exist. Str. 2-2
Exist. Height 95.4'

Prop. Str. 2-2A
Prop. Height 160'

Exist. Str. 2-3
Exist. Height 116.2'

Prop. Str. 2-3A
Prop. Height 150'

Exist. Str. 2-4
Exist. Height 114.6'

Prop. Str. 2-4A
Prop. Height 145'

Exist. Str. 2-5
Exist. Height 114.6'

Prop. Str. 2-5A
Prop. Height 130'

Prop. Str. 2-6A
Prop. Height 130'

Prop. Str. 2-7
Prop. Height 135'

Exist. Str. 2-6
Exist. Height 92.8'

Exist. Str. 2-7A
Exist. Height 117.7'

Reusens - Altavista 138 kV Line

Reusens - Scottsville - Bremo Bluff 138 kV Line

Blackwater - Reusens No. 1 34 kV Line

Big Island - Reusens 69 kV Line

Colonial Pipeline

Reusens Substation

Dearington - Reusens 69 kV Line

Doyle Ter

Alclif Dr

Heritage Dr

Running Cedar Way

Bell Tavern Rd

Tockview Rd

Trents Ferry Rd

Old Trents Ferry Rd

John Scott Dr

Anchor St

Harbor St

James River

Hydro St

VES Rd

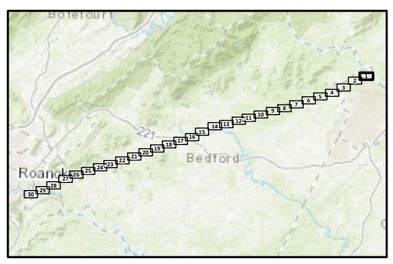
Rothowood Rd

Williams Rd

MAP 2

CITY OF LYNCHBURG
AMHERST COUNTY

Existing Structures: 2-2 to 2-7A
Proposed Structures: 2-1 to 2-7



- Existing APCo Substation
- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (69 kV or lower)
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Road
- Railroad
- Natural Gas Pipeline
- River (NHD)
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 1 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-7
Prop. Height 135'

Prop. Str. 2-8A
Prop. Height 135'

Prop. Str. 2-9A
Prop. Height 130'

Prop. Str. 2-10A
Prop. Height 120'

Prop. Str. 2-12A
Prop. Height 130'

Prop. Str. 2-13
Prop. Height 160'

Exist. Str. 2-7A
Exist. Height 117.7'

Exist. Str. 2-8
Exist. Height 103.8'

Exist. Str. 2-9
Exist. Height 98.9'

Exist. Str. 2-10
Exist. Height 96.7'

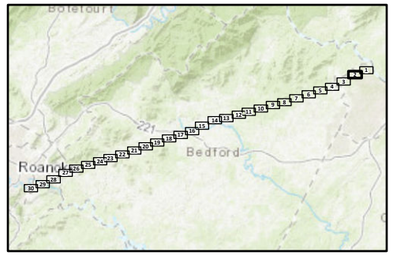
Prop. Str. 2-11A
Prop. Height 110'

Exist. Str. 2-11
Exist. Height 92.9'

Exist. Str. 2-12
Exist. Height 93.4'

Exist. Str. 2-13A
Exist. Height 140'

Existing Structures: 2-7A to 2-13A
Proposed Structures: 2-7 to 2-13



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Place of Worship
- Highway
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 2 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Exist. Str. 2-14
Exist. Height 103.3'

Exist. Str. 2-15
Exist. Height 105.6'

Exist. Str. 2-16A
Exist. Height 140'

Exist. Str. 2-17
Exist. Height 92.5'

Exist. Str. 2-18
Exist. Height 94.3'

Exist. Str. 2-19
Exist. Height 93.3'

Exist. Str. 2-20
Exist. Height 89.7'

Exist. Str. 2-21
Exist. Height 92.8'

Prop. Str. 2-14A
Prop. Height 155'

Prop. Str. 2-15A
Prop. Height 120'

Prop. Str. 2-15B
Prop. Height 110'

Prop. Str. 2-16
Prop. Height 115'

Prop. Str. 2-16B
Prop. Height 105'

Prop. Str. 2-17A
Prop. Height 125'

Prop. Str. 2-18A
Prop. Height 135'

Prop. Str. 2-19A
Prop. Height 100'

Prop. Str. 2-20A
Prop. Height 125'

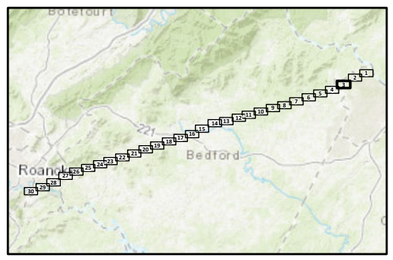
Prop. Str. 2-21A
Prop. Height 95'

MAP 2

MAP 4

Warfield Rd
Marvin Pl
Boonsboro Dr
Woodland Dr
Abbey Ct
Jameson Ct
Country Club Dr
Boonsboro Rd
Malden Pl
Hillcrest Ave
Irvington St
Northwest Expy
Colonial Pipeline
Overstreet Ln
Two Creek Dr
Cheese Creek
Trinity Ct
Bethel Park Dr
Ravenstone Ct
Whitley Way
Waterton Dr
Fairlea Ct

Existing Structures: 2-14 to 2-21
Proposed Structures: 2-14A to 2-21A



- Proposed Structure
- Existing APCo Structure to be Removed
- Existing APCo Collocation Tower
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Highway
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 3 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-21A
Prop. Height 95'

Prop. Str. 2-22A
Prop. Height 110'

Exist. Str. 2-23
Exist. Height 92.2'

Exist. Str. 2-21
Exist. Height 92.8'

Exist. Str. 2-22
Exist. Height 93.2'

Exist. Str. 2-24
Exist. Height 95.1'

Prop. Str. 2-23A
Prop. Height 125'

Prop. Str. 2-24A
Prop. Height 115'

Exist. Str. 2-25
Exist. Height 94.8'

Prop. Str. 2-25A
Prop. Height 115'

Exist. Str. 2-26
Exist. Height 92.9'

Exist. Str. 2-27
Exist. Height 99.'

Exist. Str. 2-28
Exist. Height 90.9'

Prop. Str. 2-26A
Prop. Height 105'

Prop. Str. 2-27A
Prop. Height 120'

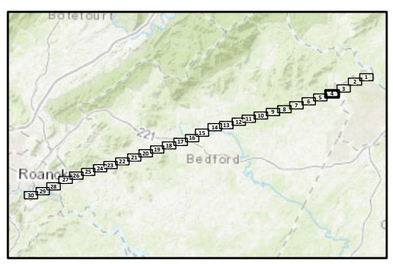
Exist. Str. 2-29
Exist. Height 92.6'

Prop. Str. 2-28A
Prop. Height 100'

Prop. Str. 2-29A
Prop. Height 125'

Existing Structures: 2-21 to 2-29
Proposed Structures: 2-21A to 2-29A

Coffee Rd
Alydar Pl
Two Creek Dr
Two Creek Dr
MAP 3
Wiggington Rd
BEDFORD COUNTY
CITY OF LYNCHBURG
Doulton Cir
Glenbrooke Dr
Hawkins Mill Rd
Coolidge Dr
Big Island - South Lynchburg 69 kV Line
MAP 5
Colonial Pipeline
Glasgow Ct



- Proposed Structure
- Existing APCo Structure to be Removed
- Existing APCo Collocation Tower
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (69 kV or lower)
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Cemetery
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 4 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Big Island - South Lynchburg 69 kV Line

Coffee Substation

Exist. Str. 2-29
Exist. Height 92.6'

Exist. Str. 2-30
Exist. Height 110.2'

Exist. Str. 2-30A
Exist. Height 101.0'

Exist. Str. 2-31
Exist. Height 114.5'

Prop. Str. 2-29A
Prop. Height 125'

Prop. Str. 2-29B
Prop. Height 135'

Prop. Str. 2-31A
Prop. Height 115'

Prop. Str. 2-31B
Prop. Height 145'

Prop. Str. 2-32A
Prop. Height 160'

Exist. Str. 2-32
Exist. Height 90.9'

Exist. Str. 2-33
Exist. Height 93.3'

Exist. Str. 2-34
Exist. Height 93.6'

Exist. Str. 2-35
Exist. Height 97.8'

Prop. Str. 2-33A
Prop. Height 125'

Prop. Str. 2-34A
Prop. Height 135'

Prop. Str. 2-35A
Prop. Height 150'

Altha Grove Church

Highland Oaks Dr

Ottontown Rd

Tabernacle Ln

MAP 6

MAP 4

Old Farm Rd

Glasgow Ct

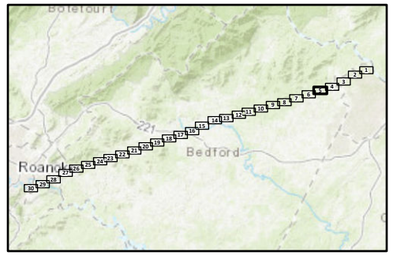
Colonial Pipeline

Radfords Mill Rd

Hawkins Farm Rd

Pokeys Creek Rd

Existing Structures: 2-29 to 2-35
Proposed Structures: 2-29A to 2-35A



- Existing APCo Substation
- Proposed Structure
- Existing APCo Structure to be Removed
- Existing APCo Collocation Tower
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (69 kV or lower)
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Place of Worship
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 5 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Note 3: The Proposed VOF Easement depicted was provided to the Company in response to a request for input on the Project. The Company coordinated with the VOF and landowner during the route development process to minimize new impacts to the property.

Exist. Str. 2-42
Exist. Height 92.6'

Exist. Str. 2-41
Exist. Height 96.3'

Exist. Str. 2-40
Exist. Height 88.7'

Exist. Str. 2-39
Exist. Height 92.7'

Exist. Str. 2-38
Exist. Height 92'

Exist. Str. 2-37
Exist. Height 91.8'

Exist. Str. 2-36
Exist. Height 95.6'

Exist. Str. 2-35
Exist. Height 97.8'

Prop. Str. 2-42A
Prop. Height 150'

Prop. Str. 2-41A
Prop. Height 160'

Prop. Str. 2-40A
Prop. Height 95'

Prop. Str. 2-39A
Prop. Height 125'

Prop. Str. 2-38A
Prop. Height 120'

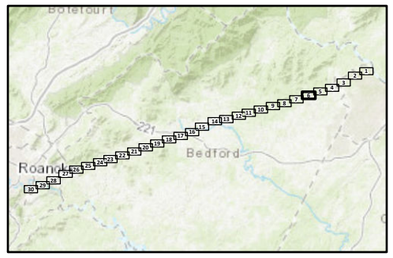
Prop. Str. 2-37A
Prop. Height 120'

Prop. Str. 2-36A
Prop. Height 120'

Prop. Str. 2-35A
Prop. Height 150'

Existing Structures: 2-35 to 2-42
Proposed Structures: 2-35A to 2-42A

Coffee Rd
Ivy Creek
Tabernacle Ln
Cottontown Rd
Colonial Pipeline
MAP 5
MAP 7
Radfords Mill Rd
Otelia Ct
Equestrian Ridge Cir
Smartview Ln
Weatherhill Rd
Levequepl
Eastway Ln
Irenes Petite Ct
Meadowgate Dr
Quail Ridge Dr
Garden Cir
Gilfield Dr
Green Way Trl
Deer Track Dr
State Rte 1455
Halfmoon Ct
Lake Pointe Dr
Line 30 (Dominion Energy Virginia)



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing Non-APCo Transmission Line
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- VOF Easement
- Proposed VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 6 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Note 3: The Proposed VOF Easement depicted was provided to the Company in response to a request for input on the Project. The Company coordinated with the VOF and landowner during the route development process to minimize new impacts to the property.

Exist. Str. 2-42
Exist. Height 92.6'

Exist. Str. 2-43
Exist. Height 93.1'

Exist. Str. 2-44
Exist. Height 99.6'

Exist. Str. 2-45
Exist. Height 94.4'

Exist. Str. 2-46
Exist. Height 92.3'

Exist. Str. 2-47
Exist. Height 113.1'

Exist. Str. 2-48
Exist. Height 113.1'

Prop. Str. 2-42A
Prop. Height 150'

Prop. Str. 2-43A
Prop. Height 100'

Prop. Str. 2-44A
Prop. Height 125'

Prop. Str. 2-45A
Prop. Height 140'

Prop. Str. 2-46A
Prop. Height 110'

Prop. Str. 2-47A
Prop. Height 120'

Prop. Str. 2-47B
Prop. Height 120'

Prop. Str. 2-48A
Prop. Height 110'

Elk Creek

Colonial Pipeline

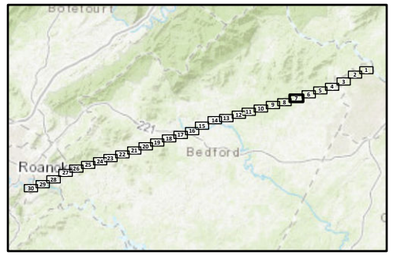
Elk Hill Ln

Perrowville Rd

MAP 6

MAP 8

Existing Structures: 2-42 to 2-48
Proposed Structures: 2-42A to 2-48A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- State Easement
- Proposed VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 7 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Ivy Hill Substation

Exist. Str. 2-48
Exist. Height 113.1'

Exist. Str. 2-49
Exist. Height 113.1'

Prop. Str. 2-48A
Prop. Height 110'

Prop. Str. 2-49
Prop. Height 135'

Prop. Str. 2-50A
Prop. Height 150'

Exist. Str. 2-50
Exist. Height 93.3'

Prop. Str. 2-51A
Prop. Height 125'

Exist. Str. 2-51
Exist. Height 92.1'

Prop. Str. 2-52A
Prop. Height 120'

Exist. Str. 2-52
Exist. Height 95.5'

Prop. Str. 2-53A
Prop. Height 130'

Exist. Str. 2-53
Exist. Height 93.1'

Prop. Str. 2-54A
Prop. Height 120'

Exist. Str. 2-54
Exist. Height 92.5'

MAP 9

MAP 7

Heavens View Dr

White Rd

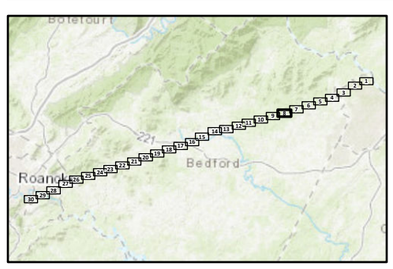
Elk Creek

Hawks Farm Rd

Colonial Pipeline

Falcons Nest Ln

Existing Structures: 2-48 to 2-54
Proposed Structures: 2-48A to 2-54A



- Existing APCo Substation
- Proposed Structure
- Existing APCo Structure to be Removed
- Existing APCo Collocation Tower
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- State Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 8 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-60A
Prop. Height 125'

Exist. Str. 2-60
Exist. Height 93.1'

Prop. Str. 2-59A
Prop. Height 150'

Exist. Str. 2-59
Exist. Height 94.7'

Prop. Str. 2-58A
Prop. Height 150'

Exist. Str. 2-58
Exist. Height 93.5'

Prop. Str. 2-57A
Prop. Height 95'

Exist. Str. 2-57
Exist. Height 108.3'

Exist. Str. 2-56
Exist. Height 103.5'

Prop. Str. 2-56A
Prop. Height 115'

Exist. Str. 2-55
Exist. Height 91.2'

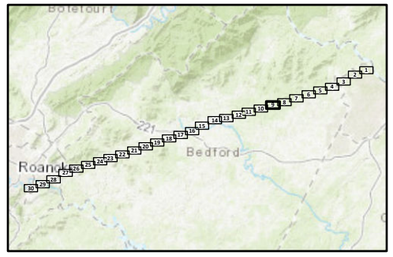
Prop. Str. 2-55A
Prop. Height 120'

Prop. Str. 2-54A
Prop. Height 120'

Exist. Str. 2-54
Exist. Height 92.5'

Falcons Roost Rd
Deer Track Meadows Ln
Roaring Run Rd
Glenn Haven Ter
Blessed Mountain Rd
Chestnut Branch
Kings Grant Dr
Queens Ct
Cifax Rd
Colonial Pipeline
MAP 10
MAP 8

Existing Structures: 2-54 to 2-60
Proposed Structures: 2-54A to 2-60A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Historic District (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 9 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Hawkins Ridge Rd

Calhoun Ln

Roaring Run Rd

MAP 11

MAP 9

Colonial Pipeline

Roaring Run

Prop. Str. 2-60A
Prop. Height 125'

Exist. Str. 2-60
Exist. Height 93.1'

Prop. Str. 2-61A
Prop. Height 145'

Exist. Str. 2-61
Exist. Height 112.5'

Prop. Str. 2-62A
Prop. Height 145'

Exist. Str. 2-62
Exist. Height 113.8'

Prop. Str. 2-63A
Prop. Height 115'

Exist. Str. 2-63
Exist. Height 94.3'

Prop. Str. 2-64A
Prop. Height 120'

Exist. Str. 2-64
Exist. Height 93.4'

Prop. Str. 2-64B
Prop. Height 125'

Exist. Str. 2-65
Exist. Height 106'

Prop. Str. 2-65B
Prop. Height 120'

Exist. Str. 2-65A
Exist. Height 120'

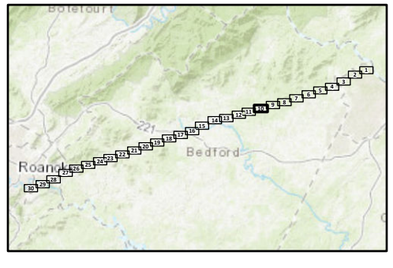
Prop. Str. 2-66A
Prop. Height 100'

Exist. Str. 2-66
Exist. Height 93.8'

Exist. Str. 2-67
Exist. Height 93.9'

Prop. Str. 2-67A
Prop. Height 105'

Existing Structures: 2-60 to 2-67
Proposed Structures: 2-60A to 2-67A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 10 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Lankford Mill Rd
Standstill Ln
North Otter Creek
Sycamore Creek
Hawkins Ridge Rd
Jersey Hills Rd
MAP 10
MAP 12
Big Otter River
Colonial Pipeline
Screechum Hollow Rd

Exist. Str. 2-67
Exist. Height 93.9'

Exist. Str. 2-68
Exist. Height 100.8'

Exist. Str. 2-69
Exist. Height 94.3'

Exist. Str. 2-70
Exist. Height 94.1'

Exist. Str. 2-71
Exist. Height 98.9'

Exist. Str. 2-72
Exist. Height 92.2'

Exist. Str. 2-73
Exist. Height 93.5'

Prop. Str. 2-67A
Prop. Height 105'

Prop. Str. 2-68A
Prop. Height 115'

Prop. Str. 2-69A
Prop. Height 160'

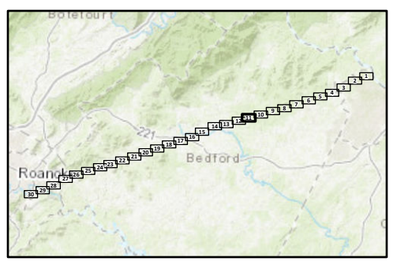
Prop. Str. 2-70A
Prop. Height 145'

Prop. Str. 2-71A
Prop. Height 130'

Prop. Str. 2-72A
Prop. Height 150'

Prop. Str. 2-73A
Prop. Height 105'

Existing Structures: 2-67 to 2-73
Proposed Structures: 2-67A to 2-73A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 11 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Rushes Ridge Rd

Big Otter River

Benchmark Ln

Lankford Mill Rd

Lankford Mill Rd

Exist. Str. 2-72
Exist. Height 92.2'

Exist. Str. 2-73
Exist. Height 93.5'

Exist. Str. 2-74
Exist. Height 92.3'

Prop. Str. 2-74A
Prop. Height 130'

Exist. Str. 2-75
Exist. Height 91.7'

Exist. Str. 2-76
Exist. Height 97.3'

Prop. Str. 2-72A
Prop. Height 150'

Prop. Str. 2-73A
Prop. Height 105'

Exist. Str. 2-77
Exist. Height 93'

Prop. Str. 2-75A
Prop. Height 115'

Colonial Pipeline

Exist. Str. 2-78
Exist. Height 110.3'

Prop. Str. 2-76A
Prop. Height 105'

MAP 11

Exist. Str. 2-79
Exist. Height 112.2'

Prop. Str. 2-77A
Prop. Height 105'

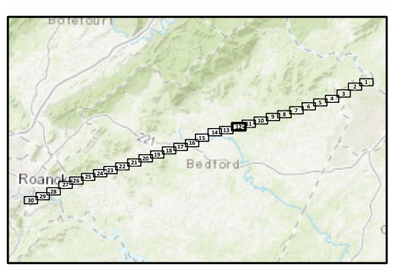
MAP 13

Hughes Mill Rd

Prop. Str. 2-78A
Prop. Height 150'

Prop. Str. 2-79A
Prop. Height 120'

Existing Structures: 2-72 to 2-79
Proposed Structures: 2-72A to 2-79A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within proposed 100' ROW)
- Residential Structure (within Filing Corridor)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 12 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Rush Mountain Trl

122

Dancing Hill Rd

Fancy Farm Rd

Carters Knoll Ln

Colonial Pipeline

Centerville Substation

MAP 14

MAP 12

Prop. Str. 2-84B
Prop. Height 100'

Prop. Str. 2-84
Prop. Height 125'

Prop. Str. 2-82
Prop. Height 145'

Exist. Str. 2-82A
Exist. Height 114'

Exist. Str. 2-80
Exist. Height 95.3'

Exist. Str. 2-81A
Exist. Height 92.75'

Prop. Str. 2-80A
Prop. Height 125'

Prop. Str. 2-81
Prop. Height 140'

Prop. Str. 2-86
Prop. Height 150'

Prop. Str. 2-83
Prop. Height 145'

Exist. Str. 2-83A
Exist. Height 114.9'

Lankford Mill Rd

Centerville Rd

Big Island Hwy

Prop. Str. 2-85
Prop. Height 140'

Exist. Str. 2-84A
Exist. Height 103.3'

Exist. Str. 2-86B
Exist. Height 115'

Exist. Str. 2-85A
Exist. Height 92'

Liberty High School

Otterburn Cir

Dove Meadows Dr

Otterburn Cir

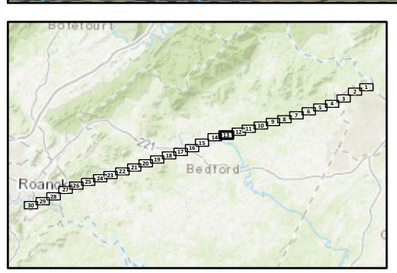
Wright Farm Rd

122

Liberty Middle School

Liberty Minutemen Dr

Existing Structures: 2-80 to 2-86B
Proposed Structures: 2-80A to 2-86



- Existing APCo Substation to be Expanded
- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Cemetery
- Highway
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 13 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Fancy Farm Rd

Simpkins Lake Rd

Fancy Farm Rd

Prop. Str. 2-86
Prop. Height 150'

Prop. Str. 2-87
Prop. Height 130'

Prop. Str. 2-88
Prop. Height 110'

Prop. Str. 2-89
Prop. Height 125'

Prop. Str. 2-90
Prop. Height 135'

Prop. Str. 2-91
Prop. Height 125'

Exist. Str. 2-92A
Exist. Height 99.4'

Exist. Str. 2-93A
Exist. Height 92.8'

Exist. Str. 2-86B
Exist. Height 115'

Exist. Str. 2-87A
Exist. Height 92.9'

Exist. Str. 2-88A
Exist. Height 94.5'

Exist. Str. 2-89A
Exist. Height 92.5'

Exist. Str. 2-90A
Exist. Height 92.3'

Exist. Str. 2-91A
Exist. Height 93.2'

Prop. Str. 2-92
Prop. Height 100'

Prop. Str. 2-93
Prop. Height 115'

Colonial Pipeline

Bird Watcher Ln

MAP 15

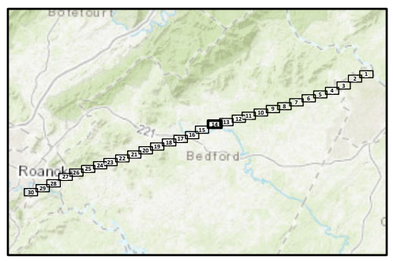
MAP 13

Charolais Farm Rd

N Branch Rd

Little Otter River

Existing Structures: 2-86B to 2-93A
Proposed Structures: 2-86 to 2-93



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Non-Residential Structure (within Filing Corridor)
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 14 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Exist. Str. 2-94A
Exist. Height 103.8'

Prop. Str. 2-94
Prop. Height 130'

Exist. Str. 2-95A
Exist. Height 114.1'

Prop. Str. 2-95
Prop. Height 155'

Exist. Str. 2-96A
Exist. Height 92.4'

Prop. Str. 2-96
Prop. Height 110'

Exist. Str. 2-97A
Exist. Height 93.5'

Prop. Str. 2-97
Prop. Height 120'

Exist. Str. 2-98A
Exist. Height 102.8'

Prop. Str. 2-98
Prop. Height 115'

Exist. Str. 2-99A
Exist. Height 95.5'

Prop. Str. 2-99
Prop. Height 155'

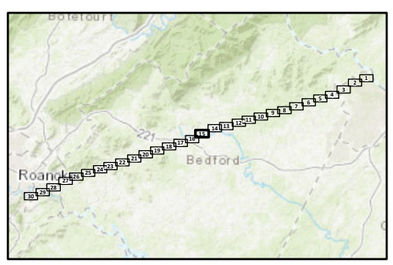
Exist. Str. 2-100A
Exist. Height 95.1'

Prop. Str. 2-100
Prop. Height 145'

Exist. Str. 2-101A
Exist. Height 103'

Prop. Str. 2-101
Prop. Height 120'

Existing Structures: 2-94A-2-101A
Proposed Structures: 2-94 to 2-101



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Highway
- Road
- Natural Gas Pipeline
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 15 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Exist. Str. 2-100A
Exist. Height 95.1'

Little Otter River

Exist. Str. 2-101A
Exist. Height 103'

Prop. Str. 2-101
Prop. Height 120'

Prop. Str. 2-100
Prop. Height 145'

MAP 15

Exist. Str. 2-102A
Exist. Height 91.1'

Three Otters Rd

Prop. Str. 2-103A/B/C
Prop. Height 135'

Prop. Str. 2-102
Prop. Height 130'

Prop. Str. 2-104A
Prop. Height 80'

Prop. Str. 2-105A
Prop. Height 80'

Prop. Str. 2-106A
Prop. Height 90'

Patterson Mill Rd

N Fork Rd

Exist. Str. 2-103
Exist. Height 118.8'

Prop. Str. 2-103D
Prop. Height 105'

Moseley
Substation

Exist. Str. 2-104
Exist. Height 94.2'

Prop. Str. 2-104B
Prop. Height 80'

Prop. Str. 2-107A
Prop. Height 105'

Prop. Str. 2-107B
Prop. Height 125'

MAP 17

Exist. Str. 2-105
Exist. Height 94.4'

State Rte 838

Prop. Str. 2-106B
Prop. Height 100'

Exist. Str. 2-106
Exist. Height 94.6'

Bishops Way

Candle Ln

Candle Ln

Exist. Str. 2-107
Exist. Height 133.6'

Bowman Ln

W Lynchburg Salem Tpke

W Lynchburg Salem Tpke

Middle Fork Little Otter Creek

Aviary Ln

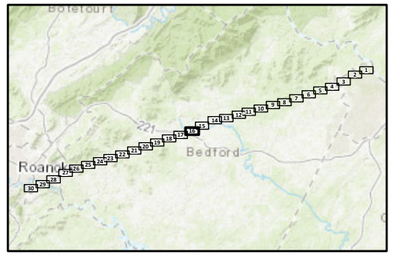
Aviary Ln

Prop. Str. 2-107C
Prop. Height 110'

Prop. Str. 2-107D
Prop. Height 115'

Haven Heights Dr

Existing Structures: 2-100A to 2-107
Proposed Structures: 2-100 to 2-107D



- Existing APCo Substation
- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Highway
- Road
- Railroad
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 16 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Note 4: The expanded corridor will afford the Company the flexibility for further discussions with affected landowners and additional surveys and engineering to minimize potential impacts of the route diversion.

Exist. Str. 2-114
Exist. Height 111.8'

Exist. Str. 2-113
Exist. Height 115.4'

Exist. Str. 2-112
Exist. Height 92.7'

Exist. Str. 2-111
Exist. Height 93'

Exist. Str. 2-110A
Exist. Height 130'

Exist. Str. 2-109
Exist. Height 94.4'

Exist. Str. 2-108
Exist. Height 95.9'

Prop. Str. 2-114A
Prop. Height 150'

Prop. Str. 2-113A
Prop. Height 145'

Prop. Str. 2-112A
Prop. Height 120'

Prop. Str. 2-111A
Prop. Height 125'

Prop. Str. 2-110
Prop. Height 115'

Prop. Str. 2-109A
Prop. Height 135'

Prop. Str. 2-108A
Prop. Height 120'

Prop. Str. 2-107E
Prop. Height 105'

Prop. Str. 2-107D
Prop. Height 115'

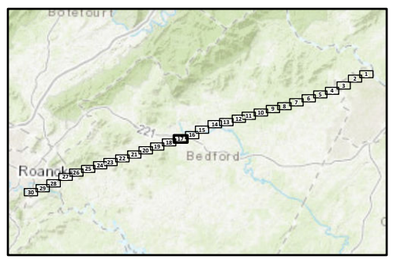
Prop. Str. 2-107C
Prop. Height 110'

Prop. Str. 2-107B
Prop. Height 125'

See Note 4

Shadowland Rd
Jacobs Roost Ln
Edwards Dr
Candy Ln
W Lynchburg Salem Tpke
Miller Ln
Greenview Dr
Pearsall Dr
Candle Ln
MAP 16
MAP 18
Magnolia Dr
Wolf Creek
Bradley Dr
Mountain View Church

Existing Structures: 2-108 to 2-114
Proposed Structures: 2-107B to 2-114A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within Filing Corridor)
- Place of Worship
- Highway
- Road
- Railroad
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 17 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Rocky Ford Rd

Rocky Ford Rd

Cloverdale - Joshua Falls 765 kV line

Johnson School Rd

Wolf Creek Rd

MAP 19

MAP 17

Magnolia Dr

Exist. Str. 2-114
Exist. Height 111.8'

Exist. Str. 2-115
Exist. Height 91.8'

Prop. Str. 2-115A
Prop. Height 140'

Prop. Str. 2-114A
Prop. Height 150'

Prop. Str. 2-117A
Prop. Height 105'

Prop. Str. 2-118A
Prop. Height 105'

Exist. Str. 2-116
Exist. Height 94.2'

Prop. Str. 2-116A
Prop. Height 125'

Prop. Str. 2-119A
Prop. Height 115'

Exist. Str. 2-117
Exist. Height 94.5'

Prop. Str. 2-120A
Prop. Height 140'

Exist. Str. 2-118
Exist. Height 95.1'

Prop. Str. 2-121A
Prop. Height 130'

Exist. Str. 2-119
Exist. Height 94.7'

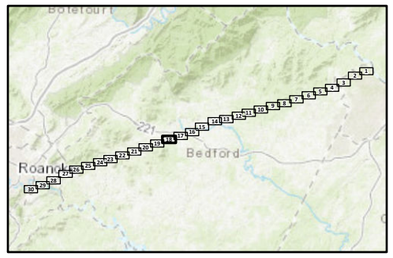
Prop. Str. 2-122A
Prop. Height 145'

Exist. Str. 2-120
Exist. Height 91.5'

Exist. Str. 2-121
Exist. Height 93.7'

Exist. Str. 2-122
Exist. Height 113.2'

Existing Structures: 2-114 to 2-122
Proposed Structures: 2-114A to 2-122A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (345 kV +)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- VOF Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 18 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-128A
Prop. Height 145'

Prop. Str. 2-127A
Prop. Height 120'

Prop. Str. 2-126A
Prop. Height 110'

Prop. Str. 2-125A
Prop. Height 115'

Prop. Str. 2-124A
Prop. Height 160'

Prop. Str. 2-123A
Prop. Height 160'

Prop. Str. 2-122A
Prop. Height 145'

Exist. Str. 2-128
Exist. Height 92.9'

Exist. Str. 2-127
Exist. Height 93.7'

Exist. Str. 2-126
Exist. Height 92.5'

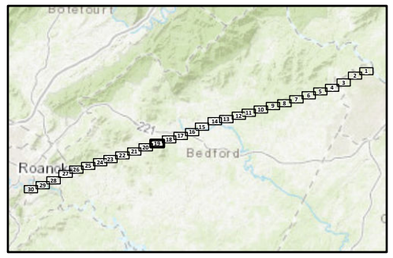
Exist. Str. 2-125
Exist. Height 92.8'

Exist. Str. 2-124
Exist. Height 113.5'

Exist. Str. 2-123
Exist. Height 115.1'

Exist. Str. 2-122
Exist. Height 113.2'

Existing Structures: 2-122 to 2-128
Proposed Structures: 2-122A to 2-128A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 19 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-128A
Prop. Height 145'

Prop. Str. 2-129A
Prop. Height 130'

Prop. Str. 2-130A
Prop. Height 150'

Prop. Str. 2-131A
Prop. Height 125'

Prop. Str. 2-132A
Prop. Height 125'

Prop. Str. 2-133A
Prop. Height 145'

Prop. Str. 2-134A
Prop. Height 140'

Exist. Str. 2-128
Exist. Height 92.9'

Exist. Str. 2-129
Exist. Height 93.3'

Exist. Str. 2-130
Exist. Height 95.1'

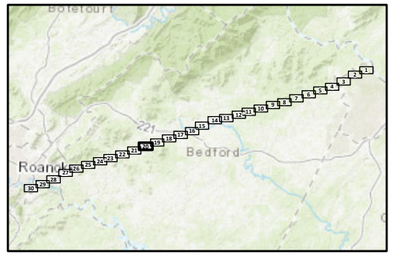
Exist. Str. 2-131
Exist. Height 105.4'

Exist. Str. 2-132
Exist. Height 93.6'

Exist. Str. 2-133
Exist. Height 95.1'

Exist. Str. 2-134
Exist. Height 110.7'

Existing Structures: 2-128 to 2-134
Proposed Structures: 2-128A to 2-134A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within proposed 100' ROW)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Place of Worship
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Federal Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 20 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-140A
Prop. Height 140'

Exist. Str. 2-140
Exist. Height 114.8'

Prop. Str. 2-139A
Prop. Height 160'

Exist. Str. 2-139
Exist. Height 118.4'

Prop. Str. 2-138A
Prop. Height 95'

Exist. Str. 2-138
Exist. Height 94.7'

Prop. Str. 2-137A
Prop. Height 105'

Exist. Str. 2-137
Exist. Height 93.2'

Prop. Str. 2-136A
Prop. Height 110'

Exist. Str. 2-136
Exist. Height 91.6'

Prop. Str. 2-135A
Prop. Height 120'

Exist. Str. 2-135
Exist. Height 93.4'

Prop. Str. 2-134A
Prop. Height 140'

Exist. Str. 2-134
Exist. Height 110.7'

MAP 22

MAP 20

Shepherds Ridge Ln

Rabbit Dr

Kenneth Rd

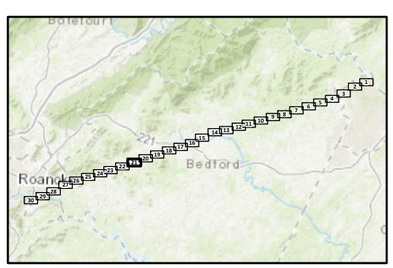
Country Ln

Stockton Creek

Woodcrest Ln

Simmons Mill Rd

Existing Structures: 2-134 to 2-140
Proposed Structures: 2-134A to 2-140A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Federal Easement
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 21 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-140A
Prop. Height 140'

Exist. Str. 2-140
Exist. Height 114.8'

Prop. Str. 2-141A
Prop. Height 125'

Exist. Str. 2-141
Exist. Height 101.8'

Prop. Str. 2-142A
Prop. Height 135'

Exist. Str. 2-142
Exist. Height 91.6'

Prop. Str. 2-143A
Prop. Height 110'

Exist. Str. 2-143
Exist. Height 93.1'

Prop. Str. 2-144A
Prop. Height 145'

Exist. Str. 2-144
Exist. Height 103.0'

Prop. Str. 2-145A
Prop. Height 105'

Exist. Str. 2-145
Exist. Height 91.8'

Prop. Str. 2-146A
Prop. Height 100'

Exist. Str. 2-146
Exist. Height 94.1'

Prop. Str. 2-147A
Prop. Height 95'

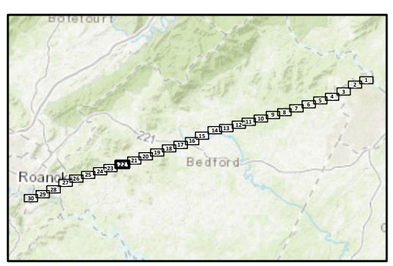
Exist. Str. 2-147
Exist. Height 92.3'

Prop. Str. 2-148A
Prop. Height 100'

Exist. Str. 2-148
Exist. Height 90.4'

Piney Branch Rd
Jordantown Rd
Bore Auger Creek
Crest Ct
Shady Cir
Shady Grove Dr
Saunders Rd
MAP 21
MAP 23

Existing Structures: 2-140 to 2-148
Proposed Structures: 2-140A to 2-148A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 22 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Garner Rd
Forest Ridge Dr
Jordantown Rd
Bee Hollow Rd
Grays Ln
Soloman Rd
MAP 24
MAP 22
Highland Acres Rd
Frog Ln
Atkinson Hollow Rd
Beaverdam Creek
State Rte 700

Prop. Str. 2-148A
Prop. Height 100'

Prop. Str. 2-149A
Prop. Height 140'

Prop. Str. 2-150A
Prop. Height 120'

Prop. Str. 2-151A
Prop. Height 110'

Prop. Str. 2-152A
Prop. Height 140'

Prop. Str. 2-153A
Prop. Height 155'

Prop. Str. 2-154A
Prop. Height 130'

Prop. Str. 2-155A
Prop. Height 125'

Exist. Str. 2-148
Exist. Height 90.4'

Exist. Str. 2-149
Exist. Height 92.9'

Exist. Str. 2-150
Exist. Height 91.2'

Exist. Str. 2-151
Exist. Height 93.2'

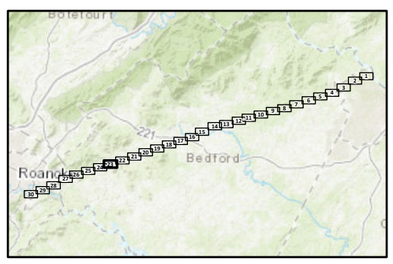
Exist. Str. 2-152
Exist. Height 116.1'

Exist. Str. 2-153
Exist. Height 114.7'

Exist. Str. 2-154
Exist. Height 92.8'

Exist. Str. 2-155
Exist. Height 93.4'

Existing Structures: 2-148 to 2-155
Proposed Structures: 2-148A to 2-155A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Cemetery
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 23 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-154A
Prop. Height 130'

Prop. Str. 2-155A
Prop. Height 125'

Prop. Str. 2-156A
Prop. Height 95'

Prop. Str. 2-157A
Prop. Height 130'

Prop. Str. 2-158A
Prop. Height 130'

Prop. Str. 2-158B
Prop. Height 100'

Prop. Str. 2-159A
Prop. Height 120'

Prop. Str. 2-160A
Prop. Height 120'

Prop. Str. 2-161A
Prop. Height 160'

Exist. Str. 2-154
Exist. Height 92.8'

Exist. Str. 2-155
Exist. Height 93.4'

Exist. Str. 2-156
Exist. Height 94.8'

Exist. Str. 2-157
Exist. Height 92.4'

Exist. Str. 2-158
Exist. Height 115.1'

Exist. Str. 2-159
Exist. Height 92.5'

Exist. Str. 2-160
Exist. Height 118.9'

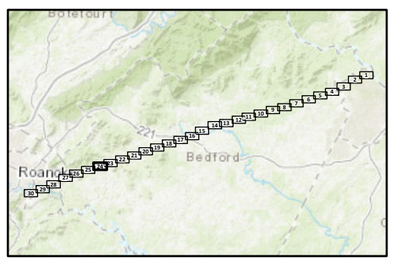
Exist. Str. 2-161
Exist. Height 110.8'

Cloverdale–Smith Mountain 138 kV Line

MAP 25

MAP 23

Existing Structures: 2-154 to 2-161
Proposed Structures: 2-154A to 2-161A



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Existing APCo Transmission Line (115-238 kV)
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within proposed 100' ROW)
- Residential Structure (within Filing Corridor)
- Non-Residential Structure (within proposed 100' ROW)
- Cemetery
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 10/26/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 24 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project

See Notes 1 and 2 on the Index Map.

Prop. Str. 2-167A
Prop. Height 120'

Prop. Str. 2-166A
Prop. Height 115'

Prop. Str. 2-165A
Prop. Height 135'

Prop. Str. 2-164A
Prop. Height 140'

Prop. Str. 2-163A
Prop. Height 120'

Prop. Str. 2-162A
Prop. Height 160'

Prop. Str. 2-161A
Prop. Height 160'

Exist. Str. 2-167
Exist. Height 91.9'

Exist. Str. 2-166
Exist. Height 93.5'

Exist. Str. 2-165
Exist. Height 94.4'

Exist. Str. 2-164
Exist. Height 94.8'

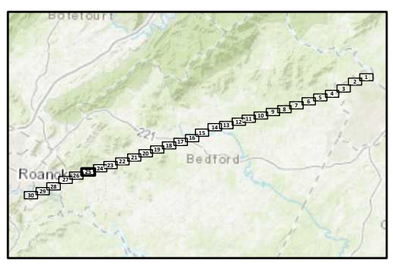
Exist. Str. 2-163
Exist. Height 93.9'

Exist. Str. 2-162
Exist. Height 99.4'

Exist. Str. 2-161
Exist. Height 110.8'

Existing Structures: 2-161 to 2-167
Proposed Structures: 2-161A to 2-167A

Hutz Hollow Rd
Potters Rd
Ole Clark Ln
Gaston Rd
Curby Branch
Henry Dr
Croker Ln
MAP 24
Jeters Chapel Rd
Jeters Mill Rd
MAP 26
Haldren Ln
Mill Branch
Wells Fargo Rd
Mountain Valley Rd
Cool Rock Rd
Jordantown Rd



- Proposed Structure
- Existing APCo Structure to be Removed
- Reusens - Roanoke 138 kV Line Proposed Route (in existing ROW)
- Reusens - Roanoke 138 kV Line Proposed Route (in new ROW)
- Existing APCo Transmission Line to be Retired
- Proposed Right-of-Way (100')
- Filing Corridor (See Note 1)
- Residential Structure (within Filing Corridor)
- Cemetery
- Road
- Stream (NHD)
- Parcel Boundary (within Filing Corridor)
- Architectural Resource (VDHR)
- Map Tile

Bedford & Roanoke Counties,
Cities of Lynchburg & Roanoke,
Town of Vinton,
Virginia

Date: 11/4/2022; Author: ckunde; Project: 159298

0 500 1,000
Feet

1" = 500'

Map 25 of 30

Exhibit 4:
GIS Constraints Map

APPALACHIAN POWER
An AEP Company

Reusens - Roanoke
138 kV Transmission Line
Rebuild Project