APPALACHIAN POWER COMPANY
BEFORE THE
VIRGINIA STATE CORPORATION COMMISSION
CASE NO. PUR-2023-00024

APPLICATION FOR APPROVAL AND CERTIFICATION OF ELECTRICAL TRANSMISSION LINE

Stuart Area 138-kV Transmission Improvements Project

VOLUME 1 OF 4
PART 1 OF 2

Application, Testimony, Response to Guidelines, and Exhibits 1 through 7

July 2023

VOLUME 2 – Siting Studies

VOLUME 3 – VDEQ Supplements and Agency Correspondence

VOLUME 4 – Confidential Appendix

VOLUME 1, PART 1 OF 2

EXHIBITS

VOLUME 1, PART 2 OF 2

VOLUME 2

VOLUME 3, PART 1 OF 2

VOLUME 3, PART 2 OF 2

VOLUME 4 CONFIDENTIAL APPENDIX

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
Alternative Routes	Assemblage of Study Segments that form routes for analysis and comparison.
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.
BMP	Best Management Practice
ca.	circa
CBG	Census Block Group
CCVT	Coupling Capacitor Voltage Transformers
CIR	Color Infrared
Code	Code of Virginia
Company	Appalachian Power Company (a unit of AEP)
Components	Project Components 1, 2, and 3, collectively
Component 1	Mayo River (Stuart) to Willis Gap Transmission Improvements Component
Component 1 Proposed Route	Alignments for the Mayo River – Willis Gap 138-kV Transmission Line
Component 2	Mayo River (Stuart) to Floyd Transmission Improvements Component
Component 2 Proposed Route	Alignments for the Mayo River – Floyd 138-kV Transmission Line
Component 3	Mayo River (Stuart) to Bassett Area Transmission Improvements Component
Component 3 Proposed Route	Alignments for the Mayo River (Stuart) to Bassett Area Transmission Improvements
Conceptual Routes	Initial routes for the Project that adhere to a series of general siting and technical guidelines.
Conductor sway	The distance from the overhead conductor at rest to the physical location of the conductor when displaced by wind.
Constraints	Specific areas that should be avoided to the extent reasonably practical during the route development and site selection process.
CPCN	Certificate of Public Convenience and Necessity
CEII	Critical Energy Infrastructure Information
Diversion	A minor adjustment to the existing route where no other alternative is considered.
EJ	Environmental Justice
EMF	Electric and Magnetic Fields or Electromagnetic Fields
EMF RAPID	Electric and Magnetic Fields Research and Public Information Dissemination
Encroachment	Any structure or activity within an existing right-of-way that could interfere with the safe, reliable operation of transmission facilities is called an encroachment and is prohibited under the terms of a right-of-way.
Endpoints	The project starting and ending point(s) (“Project Endpoints”), which may include substations, switch stations, tap points, or other locations defined by the Company’s planners and engineers.

Environmental Justice ("EJ")	The fair treatment and meaningful involvement of every person, regardless of race, color, national origin, income, faith, or disability, regarding the development, implementation, or enforcement of any environmental law, regulation, or policy (VA Code § 2.2-234).
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Focus Area	Areas along the existing route where rebuilding may not be feasible due to the presence of constraints.
GIS	Geographic Information System
GPR	Ground-penetrating radar
Greenfield	New transmission line route or substation site constructed in an area or along a route where no previous substation or transmission line route existed.
Guidelines	VDHR *Guidelines for Assessing Impacts of Proposed Electric Facilities on Historic Resources in the Commonwealth of Virginia* (2008)
HUC	Hydrologic Unit Code
Hz	hertz
IARC	International Agency for Research on Cancer
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
IPaC	Information for Planning and Consultation
Incompatible Use	Any structure or activity in close proximity to a transmission line that could interfere with the safe, reliable operation of transmission facilities.
kHz	kilohertz
kV	kilovolt (1,000 volts)
kV/m	kilovolt/meter (a unit of measurement for electric fields)
Land Use	Describes the human use of the land and activities at a given location such as agricultural, residential, industrial, mining, commercial, and recreational uses. It differs from land cover which only describes the physical characteristics (summarized from EPA.gov).
LiDAR	Light Detection and Ranging imagery
mG	milligauss (a unit of measurement for magnetic fields)
MOAB	Motor Operated Air Break
MVA	megavolt ampere
MW	megawatts
NCED	National Conservation Easement Database
NESC	National Electrical Safety Code
NERC	North American Electric Reliability Corporation
NFHL	National Flood Hazard Layer
NHD	National Hydrography Dataset
NIEHS	National Institute of Environmental Health Services
NLCD	National Land Cover Database
NPL	National Priority List (maintained by USEPA)
NPS	National Park Service
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
Opportunity Feature(s)	Areas or existing linear features along which the transmission line may have less disruption to area land uses and the natural and cultural environment.
Parkway	Blue Ridge Parkway
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	Stuart Area 138-kV Transmission Improvements Project
Project Alternative	An alternative solution the Company's planners reviewed to address the asset renewal needs but dismissed early at the conceptual stage since it was less comprehensive electrically and less cost effective compared to the Proposed Project (see Section I.E of the Response to Guidelines).
Proposed Route(s)	The alignment on which the applicant/Siting Team proposes to construct a transmission line. The Proposed Route (1) reasonably minimizes adverse impacts on area land uses and the natural and cultural environment; (2) minimizes special design requirements and unreasonable costs; and (3) can be constructed and operated in a safe, timely, and reliable manner.
PSS	Palustrine Scrub-shrub Wetland
PTS	Permissions to survey
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"
Routing Concepts	Initial routes for the project that adhere to a series of general siting and technical guidelines.
ROW(s)	Right(s)-of-Way
RTEP	Regional Transmission Expansion Plan
RTO	Regional Transmission Organization
SCC	Virginia State Corporation Commission
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks
Segment Endpoint	The intersection of two or more Study Segments.
Siting Study	This Siting Study describes the route development process and rationale for the proposed route selection.
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.
SR	State Route
SSURGO	Soil Survey Geographic Database
Stuart Area	Carroll, Patrick, Floyd, and Henry Counties
Stuart Project	Stuart Area 138-kV Transmission Improvements Project
Study Area	The territory in which line route alternatives can be sited to feasibly meet the Project's functional requirements and, at the same time, minimize environmental impacts and Project costs.
Study Segments	Study Segments are partial alignments that when combined form a complete route.
Study Segment Network	The assemblage of study segments between project endpoints.

Substation or Station	Substations or stations are facilities that transform bulk electric voltage down to distribution levels and/or provide protection and controls for the transmission electric grid. Typical equipment includes switches, circuit breakers, buses, and transformers.
Switching Station	A particular type of substation without transformers and cannot increase or reduce the voltage.
Tap Point	The location where power is tapped from an existing transmission line to source a substation or customer.
Transmission Line	An electric line that operates at 69 kilovolts and/or above and has the purpose of moving power from a generation facility to a substation or between substations.
Transmission Line Extension	An electric transmission line from a tap point on an existing transmission line to a substation or customer.
TRI	Toxics Release Inventory (maintained by USEPA)
U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VBMP	Virginia Base Mapping Program
VCRIS	Virginia Cultural Resources Information System
VDA	Virginia Department of Aviation
VDACS	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDEQ Supplement	The analysis included in Volume 3 of this Application, which addresses the environmental and historic features associated with the Project
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VDOF	Virginia Department of Forestry
VDOT	Virginia Department of Transportation
VDWR	Virginia Department of Wildlife Resources
VGIN	Virginia Geographic Information Network
VLR	Virginia Landmarks Register
VMRC	Virginia Marine Resources Commission
VOF	Virginia Outdoors Foundation
VPDES	Virginia Pollutant Discharge Elimination System
VRP	Voluntary Remediation Program
WERMS	Wildlife Environmental Review Map Service
WHO	World Health Organization

Executive Summary

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 Stuart Area 138-kV Transmission Improvements Project (the "Project"). The Project addresses asset renewal issues by converting the existing, deteriorating 69-kilovolt ("kV") and 138-kV transmission system in Carroll, Patrick, Floyd, and Henry Counties (the "Stuart Area") to a more reliable, resilient 138-kV system. It also provides a new transmission source to the existing, radially served Willis Gap 138-kV Substation and the new Mayo River 138-kV Substation to be located near Stuart, Virginia. The Project consists of the rebuild/upgrade of 47.5 miles of transmission line; the construction of four new 138-kV substations; and the construction of 24.5 miles of new single-circuit 138-kV transmission line from Willis Gap to Mayo River Substations. Once the Project is in service, the retirements of four substations, one switch station, and approximately 32 miles of existing transmission line will be completed as separate ordinary extensions. See **Exhibit 3** for a map of the Project area.

The Project consists of three proposed components ("Components"), which generally follow the Project construction sequence:

a. **Component 1 (Mayo River (Stuart) to Willis Gap Transmission Improvements)**: a new approximately 24.5-mile Mayo River-Willis Gap 138-kV Transmission Line between the new Mayo River Substation in Patrick County and the existing Willis Gap Substation in Carroll County, as well as the construction of the new Mayo River and Claudville Substations and upgrades to the existing Willis Gap and Huffman Substations.

b. **Component 2 (Mayo River (Stuart) to Floyd Transmission Improvements)**: an approximately 11.0-mile rebuild between the new Mayo River Substation and the existing Woolwine Substation in Patrick County; and an approximately 11.0-mile rebuild between the existing Woolwine Substation in Patrick County and the existing Floyd Substation in Floyd County, all from 69 kV to 138 kV, as well as expansion and/or conversion of the existing Woolwine 69-kVand Floyd 69/138-kV Substations.

c. **Component 3 (Mayo River (Stuart) to Bassett Transmission Improvements)**: an approximately 9.5-mile rebuild between a point north of the new Mayo River Substation in Patrick County and the Patrick Henry Substation in Henry County; an approximately 7.5-mile rebuild between the Patrick Henry Substation and the new Stoneleigh Tap Structure in Henry County; an approximately 4.0-mile rebuild between the new Stoneleigh Tap Structure and the new Smith River Substation in Henry County; an approximately 2.0-mile rebuild between the new Smith River Substation and existing Structure No. 1365-4, near the existing Philpott 138-kV Switch Station in Henry County; an approximately 2.0-mile rebuild between the new Stoneleigh Tap Structure and the existing Fieldale Substation in Henry County, all to 138 kV, as well construction of a new approximately 0.5-mile Stoneleigh Extension 138-kV Transmission Line between the new Stoneleigh Tap Structure and the new Stoneleigh Substation, the new Stoneleigh and Smith River Substations, and conversion and upgrades at the Patrick Henry and Fieldale Substations.

This Project will require construction within both new and existing rights-of-way ("ROWs"), as all existing ROWs have already been acquired by the Company. The Mayo River-Willis Gap and the Stoneleigh Extension 138-kV transmission lines will be constructed on new ROWs that are typically 100 feet wide. The ROWs for the existing transmission line rebuilds typically will be 100 feet wide, primarily following the centerline of the existing 69-kV or 138-kV ROWs, with minor deviations from the existing centerline to accommodate routing constraints. The Company developed a detailed plan and construction sequencing schedule, to the extent practical, to facilitate safely rebuilding the necessary facilities "in-the-clear" and to minimize service disruptions. See **Exhibit 5** for the estimated construction sequence.

The predominant structure type anticipated for this Project will be single circuit 138-kV H-frame structures ranging in height from approximately 55 feet to 115 feet, with an average height of approximately 80 feet. Other structures will be used, including single-circuit monopoles with braced posts (ranging from 65 feet to 100 feet, average height of approximately 80 feet) and double-circuit 138-kV monopoles with davit arms (ranging from 75 feet to 145 feet, average height of approximately 100 feet). The proposed structures on Component 2 are typically 35 feet taller on average than the existing structures with the largest height difference being approximately 65 feet. The proposed structures on Component 3 are typically 45 feet taller on average than the existing structures with the largest height difference being 70 feet. The height changes for the proposed structures for the rebuild portions are necessary to meet current electrical clearance requirements and to utilize longer span lengths. In limited circumstances, lattice towers (ranging from 80 feet to 120 feet, average height of approximately 105 feet) may be used to support longer spans. However, a significant decrease (approximately 40%) in the total number of transmission line structures in or near the existing ROW is expected because of the taller and more efficient proposed structures, as well as consolidating multiple lines into one corridor in the Bassett area.

Appalachian retained POWER Engineers, Inc. ("POWER") to assist with the route development and selection process for the transmission line components and to identify and evaluate substation sites for the proposed Mayo River, Claudville, Stoneleigh, and Smith River Substations. Following extensive outreach, public input and analysis, the Siting Team selected a proposed route for each of the transmission lines (a "Proposed Route" and collectively, the "Proposed Routes") that reasonably minimizes adverse impact on environmental resources and is consistent with the Project's technical requirements. The Company supports the Siting Team's conclusions that the Proposed Routes for the Project are preferrable compared to the alternative route options.

The total estimated functional cost of the proposed Project is approximately $423.5 million, which includes approximately $319.5 million for transmission-related costs, $101.5 million for substation-related costs, and $2.5 million for telecom-related costs. The proposed in-service date for the Project is December 2029. If the Commission approves the Project, the Company estimates that it will need approximately five years for engineering, design, ROW acquisition, permitting, material procurement, and construction to place the entire Project in service.

COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

APPLICATION OF
APPALACHIAN POWER COMPANY **CASE NO. PUR-2023-00024**

for Approval and Certification of the
Stuart Area 138-kV Transmission Improvements
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 maintain and improve the reliability of electric service to customers in its service territory, the Company is seeking permission for the Stuart Area 138-kV Transmission Improvements Project (the "Project"). The Project addresses asset renewal issues by converting the existing, deteriorating 69-kilovolt ("kV") and 138-kV transmission system in Carroll, Patrick, Floyd, and Henry Counties (the "Stuart Area") to a more reliable, resilient 138-kV system. It also provides a new transmission source to the existing, radially served Willis Gap 138-kV Substation and the new Mayo River 138-kV Substation to be located near Stuart, Virginia. The Project consists of the rebuild/upgrade of 47.5 miles of transmission line; the construction of four new 138-kV substations; and the construction of 24.5 miles of new single-circuit 138-kV transmission line from Willis Gap to Mayo River Substations. Once the Project is in service, the retirements of four substations, one switch station, and approximately 32 miles of existing transmission line will be completed as separate ordinary extensions.

3. The Project consists of three proposed components ("Components"), which generally follow the Project construction sequence:

a. **Component 1 (Mayo River (Stuart) to Willis Gap Transmission Improvements)**: a new approximately 24.5-mile Mayo River-Willis Gap 138-kV Transmission Line between the new Mayo River Substation in Patrick County and the existing Willis Gap Substation in Carroll County, as well as the construction of the new Mayo River and Claudville Substations and upgrades to the existing Willis Gap and Huffman Substations;

b. **Component 2 (Mayo River (Stuart) to Floyd Transmission Improvements)**: an approximately 11.0-mile rebuild between the new Mayo River Substation and the existing Woolwine Substation in Patrick County; and an approximately 11.0-mile rebuild between the existing Woolwine Substation in Patrick County and the existing Floyd Substation in Floyd County, all from 69 kV to 138 kV, as well as expansion and/or conversion of the existing Woolwine 69-kV and Floyd 69/138-kV Substations; and

c. **Component 3 (Mayo River (Stuart) to Bassett Transmission Improvements)**: an approximately 9.5-mile rebuild between a point north of the new Mayo River Substation in Patrick County and the Patrick Henry Substation in Henry County; an approximately 7.5-mile rebuild between the Patrick Henry Substation and the new Stoneleigh Tap Structure in Henry County; an approximately 4.0-mile rebuild between the new Stoneleigh Tap Structure and the new Smith River Substation in Henry County; an approximately 2.0- mile rebuild between the new Smith River Substation and existing Structure No. 1365-4, near the existing Philpott 138-kV Switch Station in Henry County; an approximately 2.0-mile rebuild between the new Stoneleigh Tap Structure and the existing Fieldale Substation in Henry County, all to 138 kV; as well as construction of a new approximately 0.5-mile Stoneleigh Extension

138-kV Transmission Line between the new Stoneleigh Tap Structure and the new Stoneleigh Substation, the new Stoneleigh and Smith River Substations, and conversion and upgrades at the Patrick Henry and Fieldale Substations.

All Components of this Project are described further in Section I of the Company's Response to Guidelines filed with this Application.

4. This Project will require construction within both new and existing rights-of-way ("ROWs"), as all existing ROWs have already been acquired by the Company. The Mayo River-Willis Gap and the Stoneleigh Extension 138-kV transmission lines will be constructed on new ROWs that are typically 100 feet wide. The ROWs for the Mayo River-Woolwine, Floyd-Woolwine, Mayo River-Smith River, Philpott Dam-Smith River and the Fieldale Extension 138-kV transmission line rebuilds typically will be 100 feet wide, primarily following the centerline of the existing 69-kV or 138-kV ROWs, with minor deviations from the existing centerline to accommodate routing constraints. Because the Project is complex and includes many Components, the Company developed a detailed plan and construction sequencing schedule, to the extent practical, to facilitate safely rebuilding the necessary facilities "in-the-clear" and to minimize service disruptions. See Section I, Exhibit 5, of the Company's Response to Guidelines for the estimated construction sequence.

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

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

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. Anastacia Santos, as to route development 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 for each of the three Components (three Siting Studies total) and a Virginia Department of Environmental Quality ("VDEQ") Supplement for each of the three Components (three VDEQ Supplements total) prepared by the Company's siting and environmental consultant, POWER Engineers, Inc.; and (c) related tables, exhibits, attachments and maps (including digital geographic information system ("GIS") constraints maps and GIS shapefiles of the Project and the VDOT General Highway Maps and existing transmission facilities via electronic filing).

7. The Company's testimony, Response to Guidelines, Siting Studies, VDEQ Supplements 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 routes for the Project reasonably minimize adverse impact on the scenic assets, historic districts, and environment of the area in which the Project will be located; and

c. The Project is essential to ensure continued reliable electric service in the Stuart Area.

8. The proposed in-service date for the Project is December 2029. If the Commission approves the Project, the Company estimates that it will need approximately five 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 56-265.2, that (1) the Project is needed and the public convenience and necessity require the construction by Appalachian of the Project; and (2) the proposed routes for the transmission lines included in the Project reasonably minimize 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

By: ________________________________
Of Counsel

Matthew P. Pritts, Esq. (VSB # 34628)
WOODS ROGERS VANDEVENTER BLACK PLC
Wells Fargo Tower, Suite 1800
P. O. Box 14125
Roanoke, VA 24038-4125
(540) 983-7600
matthew.pritts@wrvblaw.com

April M. Jones, Esq. (VSB # 94346)
WOODS ROGERS VANDEVENTER BLACK PLC
Riverfront Plaza, West Tower
901 East Byrd Street, Suite 1550
Richmond, Virginia 23219
(804) 956-2057
april.jones@wrvblaw.com

James G. Ritter, Esq. (VSB # 82572)
AMERICAN ELECTRIC POWER SERVICE CORPORATION
1051 East Cary Street, Suite 1100
Richmond, Virginia 23219
(804) 698-5535
jritter@aep.com

Hector Garcia, Esq.
AMERICAN ELECTRIC POWER SERVICE CORPORATION
1 Riverside Plaza
P.O. Box 16631
Columbus, Ohio 73125
(614) 716-3410
hgarcia1@aep.com

Counsel for Appalachian Power Company

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the foregoing was served by electronic mail or by hand on this 20th day of July 2023 to:

William H. Chambliss, Esq.
Office of General Counsel
State Corporation Commission
Tyler Building – 10th Floor
1300 East Main Street
Richmond, VA 23219

C. Meade Browder, Jr., Esq.
Senior Assistant Attorney General
Division of Consumer Counsel
Office of the Attorney General
202 N. 9th Street
Richmond, VA 23219

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 2023-00024

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 Stuart Area 138-kV Transmission Improvements Project (the "Project"). I am sponsoring Section I of the Response to Guidelines (Necessity for the Project), including the associated figures and tables, and Exhibits 1, 3, 4, and 6.

Appalachian proposes this Project to address identified asset renewal issues by converting the existing, deteriorating 69-kV and 138-kV transmission system in the Stuart Area to a more reliable, resilient 138-kV system. It also provides a new transmission source to the existing, radially served Willis Gap 138-kV Substation and the new Mayo River 138-kV Substation to be located near Stuart, Virginia. The Project generally consists of the rebuild/upgrade of 47.5 miles of transmission line; the construction of four new 138-kV substations; and the construction of 24.5 miles of new single-circuit 138-kV transmission line from Willis Gap to Mayo River. Once the Project is in service, the retirements of four substations, one switch station, and approximately 32 miles of existing transmission line will be completed as separate ordinary extensions ("Ordinary Extensions").

Section I of the Company's Response to Guidelines filed with this Application fully describes the construction of the three proposed components ("Components"), which generally follow the Project construction sequence. Those three Components consist of:

- **Component 1:** Mayo River to Willis Gap Transmission Improvements,
- **Component 2:** Mayo River to Floyd Transmission Improvements**,** and
- **Component 3**: Mayo River to Bassett Area Transmission Improvements.

Project Components 1 through 3 address long-term reliability of the transmission system by establishing additional connectivity between the existing 138-kV transmission system in the Fieldale and Galax areas. This solution is efficient and cost-effective. The existing transmission lines cannot continue to adequately serve the needs of the Company and its customers because of the existing deteriorating infrastructure exhibiting unacceptable condition, performance, and risk. Completing the Project will support the Company's continued reliable electric service and also support the future overall growth in the surrounding area.

Additionally, my testimony describes how the Company chose to retire approximately 32 miles of transmission line because they are no longer required due to the reconfiguration of the local transmission system once the Project is in service. I also summarize how the proposed Project compares to the Project Alternative, where I detail how the proposed Project's 69-kV to 138-kV conversion is the most comprehensive, cost-effective, and long-term solution.

Lastly, the proposed in-service date for the Project is December 2029. The total estimated cost of the Project is approximately $423.5 million, which includes substation-related costs, telecom-related costs and transmission line-related costs.

DIRECT TESTIMONY OF
NICOLAS C. KOEHLER
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2023-00024

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 (the "Application") to this Commission for approval and certification of the proposed Stuart Area 138-kV Transmission Improvements Project (the "Project"), to be located in Carroll, Patrick, Floyd, and Henry Counties (the "Stuart Area"). This area encompasses transmission and distribution facilities of the Company serving industrial, commercial, and residential loads in the Stuart Area.

Specifically, the Project addresses asset renewal issues by converting the existing, deteriorating 69-kV and 138-kV transmission system in the Stuart Area to a more reliable, resilient 138-kV system. It also provides a new transmission source to the existing, radially served Willis Gap 138-kV Substation and the new Mayo River 138-kV Substation to be located near Stuart, Virginia. The Project generally consists of the rebuild/upgrade of 47.5 miles of transmission line; the construction of four new 138-kV substations; and the construction of 24.5 miles of new single-circuit 138-kV transmission line from Willis Gap to Mayo River. Once the Project is in service, the retirements of four substations, one switch station, and approximately 32 miles of existing transmission line will be completed as separate ordinary extensions. An overview map of the Project is found at Exhibit 3. Section I of the Company's Response to Guidelines filed with this Application fully describes the construction of the three proposed components ("Components"), which generally follow the Project construction sequence. Those three

Components consist of:

- **Component 1:** Mayo River to Willis Gap Transmission Improvements,
- **Component 2:** Mayo River to Floyd Transmission Improvements, and
- **Component 3**: Mayo River to Bassett Area Transmission Improvements.

Q: MR. KOEHLER, FOR WHAT SPECIFIC PROPOSED IMPROVEMENTS IS THE COMPANY SEEKING COMMISSION APPROVAL AND CERTIFICATION?

A: The Company is seeking approval for the work described in Section I.A of the Company’s Response to Guidelines, except for the work described therein as Ordinary Extensions or as separate, existing, future, and conceptual work in the Project area, for which the Company is not seeking approval. The Company developed the Project as a comprehensive solution to address the identified operational and asset renewal needs and is seeking approval to complete this work. The Components of the Project (as outlined in Section I) have been presented to PJM stakeholders, as a supplemental project, through the Attachment M-3 process. PJM has completed the do-no-harm analysis and assigned the project number s2179 to the proposed Project.

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, including the associated figures and tables and Confidential Figures 3-C and 4-C and Confidential Exhibit 6-C (included in Volume 4, the Confidential Appendix). I am sponsoring Exhibits 1, 3, 4, and 6 and 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 DESCRIBE THE "STUART AREA" EXISTING TRANSMISSION SYSTEM.

A: The Stuart Area is an approximate 50-mile by 70-mile geographic area in southcentral Virginia with approximately 400 MVA of load (see Exhibit 1). It is generally rural and mountainous with scattered residential, commercial, and industrial customers. The eastern portion (Floyd to Stuart to Fieldale) is currently served by an existing 69-kV and 138-kV transmission system that was built between 60 and 100 years ago. It is in deteriorating condition with identified asset-renewal needs as described in Section I of the Application. The western portion of the Stuart area from Willis Gap to Huffman to Galax is sourced from Jacksons Ferry, and the Willis Gap 138-kV Substation is radially-fed (14.5 miles) with needs described in Section I. See Confidential Figure 3-C for the existing One-Line drawing in confidential Volume 4 and Confidential Exhibit 6-C for the existing Transmission Line Circuit Configuration in confidential Volume 4.

Q: PLEASE DESCRIBE THE "STUART AREA" PROPOSED TRANSMISSION SYSTEM.

A: The Project rebuilds the existing, deteriorating 69-kV and 138-kV transmission system in the eastern portion of the Stuart Area with a modern, robust 138-kV system and connects it to the existing western 138-kV system with the proposed Willis Gap to Mayo River 138-kV Transmission Line, resulting in new sources between the east and west systems (see Exhibit 3 of the Application). See Confidential Figure 4-C for proposed One-Line drawings in confidential Volume 4 and Confidential Exhibit 6-C for the proposed Transmission Line Circuit Configuration in confidential Volume 4.

Q: PLEASE SUMMARIZE THE NEED FOR THE PROJECT.

A: This Project consists generally of a number of related transmission improvements that will address transmission asset renewal and customer reliability needs, all as listed and more fully described in Section I of the Company's Response to Guidelines filed with this Application. The Project will address asset renewal concerns in the area by rebuilding a total of 47.5 miles of transmission line and constructing 24.5 miles of greenfield line, allowing for the retirement of deteriorated lines. The Project will also strengthen the reliability of the transmission and distribution system in the area by (a) establishing two-way service to the existing 14.5 mile radially served Willis Gap 138-kV Substation, (b) providing an additional 138-kV source to the proposed Mayo River 138-kV Substation, and (c) establishing a new distribution substation that will sectionalize and decrease exposure on a total of 441 miles of existing distribution circuits.

Project Components 1 through 3 address long-term reliability of the transmission system by establishing additional connectivity between the existing 138-kV transmission system in the Fieldale and Galax areas. This solution is efficient and cost-effective. The existing transmission lines cannot continue to adequately serve the needs of the Company and its customers because of the existing deteriorating infrastructure exhibiting unacceptable condition, performance, and risk as discussed in Section I.A of the Response to Guidelines. Completing the Project will support the Company's continued reliable electric service and also support the future overall growth in the Stuart Area.

Q: WHY DID THE COMPANY CHOOSE TO RETIRE APPROXIMATELY 32 MILES OF TRANSMISSION LINE?

A: As described in Section I of the Response to Guidelines, the Company proposes to make ordinary extension retirements for which the Company is not seeking Commission approval in this Application. Specifically, the Company chose to retire approximately 32 miles of the existing transmission line because those retired lines are no longer required due to the reconfiguration of the local transmission system once the Project is in service.

Typically, as federal and state siting guidelines recommend, the Company attempts to use existing rights-of-way, to the extent possible. However, in this situation, by rebuilding the entire Project to 138 kV, with some new portions, the Company is able to retire this approximately 32 miles of line that would otherwise need to be rebuilt due to identified asset condition, performance, and risk. I will discuss the project alternative (the "Project Alternative") later in my testimony, which would rebuild the entire existing 69-kV and 138-kV system including this 32 miles of line.

Q: WHY IS THE TRANSMISSION LINE BETWEEN FLOYD AND WEST BASSETT NO LONGER NECESSARY?

A: The existing 138-kV line between Floyd and West Basset is no longer required due to the conversion of the Floyd-Stuart 69-kV Circuit to Floyd-Mayo River 138-kV, which will continue to provide Floyd Substation with two-way, 138-kV service. See Confidential Exhibit 6-C, the Existing and Proposed Transmission Circuit Configurations located in confidential Volume 4.

Q: CAN YOU FURTHER DESCRIBE SOME OF THE BENEFITS PROVIDED BY THE PROJECT?

A: The Project is replacing facilities and equipment that are over 60 years old, that are continuing to deteriorate, and could result in more outages to customers served via those facilities. By constructing the Project as proposed, the Company is providing looped service to the customers currently served at Willis Gap Substation who are currently served from a 14.5-mile-long radial line. Radial lines are difficult to maintain as any outage on the line, whether forced or planned for maintenance activities, results in an outage to the customers served via the radial. Additionally, the new substation to be constructed for Claudville will help relieve customer reliability concerns from the 441 miles of distribution circuit-miles. By splitting up these distribution sources, the Company is better able to respond to outages and can provide better backup sources to the distribution network in the case of outages on the system.

The addition of a new 138-kV line between Mayo River and Willis Gap, conversion of local 69-kV lines to 138 kV, improved automated sectionalizing, and increased system capacity created by this Project will improve the ability to serve future economic development in the area. See Section I.A-3 of the Response to Guidelines for a complete list of Project Benefits.

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

A: The desired in-service date for the Project is December 2029, with an estimated design, ROW acquisition, and construction time of approximately five years to complete the Project. Refer to Section II.A.10 of the Response to Guidelines and Company witness McMillen's direct testimony for additional detail on the proposed construction sequence and schedule, which are designed to minimize service disruptions to extent possible.

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

A: The total proposed Project cost is $423.5 million. Out of the total estimated, $319.5 million is transmission-related costs, $101.5 million is substation-related costs, and $2.5 million is telecom-related costs. These are detailed-level estimates based on Project scopes developed by AEP engineering using information obtained from tabletop studies and design criteria.

Q: CAN YOU BRIEFLY SUMMARIZE HOW THE PROPOSED PROJECT COMPARES TO THE PROJECT ALTERNATIVE DESCRIBED IN SECTION I.E OF THE COMPANY'S RESPONSE TO GUIDELINES?

A: The Company reviewed a project alternative (the "Project Alternative") to address the asset renewal needs by rebuilding all the existing Stuart Area 69-kV transmission lines of concern on or near existing ROW to current 69-kV standards, rebuilding all the existing 138-kV transmission lines of concern on or near existing ROW to current 138-kV standards, and replacing the identified substations' 138-kV and 69-kV equipment in need of replacement. This would require rebuilding approximately 54 miles of existing 69-kV transmission line and 26 miles of existing 138-kV transmission line, totaling 80 miles of existing line rebuild. The proposed Project consolidates the 69-kV circuits by converting them to 138-kV, reducing the overall line mileage requiring a rebuild. The Project Alternative is approximately 20% more expensive than the proposed Project primarily because the Project Alternative would require that the Company build or rebuild approximately 32 miles of additional transmission line. In addition, the proposed Project's 138-kV configuration provides greater thermal line capacity in anticipation of future load growth, planned and unplanned outage events and system transfers. In summary, the proposed Project's 69-kV to 138-kV conversion is the most comprehensive, cost-effective, and long-term solution; therefore, the Project Alternative was dismissed early at the conceptual stage. Please see Section I.E of the Response to Guidelines for additional information on why the Company chose the proposed Project over the Project Alternative.

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-2023-00024

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 Power Company's ("Appalachian") Application and Response to Guidelines in connection with the Stuart Area 138-kV Transmission Improvements Project (the "Project"). Specifically, I sponsor: (i) the description of the transmission lines and other transmission line engineering components of the Project in Sections II (excluding Sections II.A.2, 3 and 9 and Section II.C), and Section III.C of the Response to Guidelines; (ii) Exhibit 5, the construction sequence drawings; (iii) Exhibits 10 to 20, which include the transmission line structure exhibits; (iv) the 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; and (v) Confidential Exhibit 38-C, which are copies of the Virginia Department of Transportation ("VDOT") Highway Maps and Existing Transmission Facilities for Carroll, Floyd, Henry, and Patrick Counties, along with a digital copy of the VDOT Highway Maps.

The transmission line components of the Project include the following work:

(a) A new approximately 24.5-mile Mayo River-Willis Gap 138-kV Transmission Line between the new Mayo River Substation in Patrick County, the new Claudville Substation in Patrick County, and the existing Willis Gap Substation in Carroll County.

(b) A 11.0-mile rebuild between the new Mayo River Substation and the existing Woolwine Substation in Patrick County, and an 11.0-mile rebuild between the existing Woolwine Substation in Patrick County and the existing Floyd Substation in Floyd County.

(c) A 9.5-mile rebuild between a point north of the new Mayo River Substation in Patrick County and the existing Patrick Henry Substation in Henry County; a 7.5-mile rebuild between the existing Patrick Henry Substation and the new Stoneleigh Tap Structure in Henry County; a 4.0-mile rebuild between the new Stoneleigh Tap Structure and the new Smith River Substation in Henry County; a 2.0-mile rebuild between the new Smith River Substation and existing Structure No. 1365-4 in Henry County; a 2.0-mile rebuild between the new Stoneleigh Tap Structure and the existing Fieldale Substation in Henry County; and a new 0.5-mile Stoneleigh Extension 138-kV Transmission Line between the Stoneleigh Tap structure and the new Stoneleigh Substation.

My testimony describes the number, types and height ranges of the structures planned to be used in the Project, as well as the Filing Corridors where the lines' rights-of-way ("ROWs") will be located. The Mayo River-Willis Gap and the Stoneleigh Extension 138-kV transmission lines will be constructed on new ROWs typically 100 feet wide. The ROW for the Mayo River-Woolwine, Floyd-Woolwine, Mayo River-Smith River, Philpott Dam-Smith River and the Fieldale Extension 138-kV transmission line rebuilds typically will be 100 feet wide, primarily following the centerline of the existing ROWs, with minor deviations from the existing centerline to accommodate routing constraints (including, *e.g.*, an approximate 3.5-mile in new ROW to integrate the proposed rebuilt transmission line into the new Mayo River 138-kV Substation; a 1.2-mile deviation from existing ROW between the existing Fieldale-Stuart 69-kV Line ROW and the Stoneleigh Tap structure to route the proposed transmission line in a direct manner). Upon approval of the Project, Appalachian estimates that it will need approximately five years for engineering, design, ROW acquisition, permitting, material procurement, outage coordination, and construction 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-2023-00024

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 ten 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 as manager in AEPSC in 2019. I am responsible for coordinating and directing the engineering for the AEP transmission system (including transmission lines operating at voltages from 34.5 kilovolts ("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 engineering aspects of Appalachian's Application (the "Application") to this Commission for approval and certification of the proposed Stuart Area 138-kV Transmission Improvements Project (the "Project"). The proposed Project is located in Carroll, Floyd, Henry, and Patrick Counties.

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 a Manager of Transmission Line Engineering at AEP, my primary duties involve the oversight of the engineering, logistical, 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 lines and other transmission line engineering components of the Project set forth in Section II (excluding Section II.A.2, 3 and 9 and Section II.C), and Section III.C of the Response to

Guidelines; (2) Exhibit 5 (construction sequence drawings); (3) Exhibits 10 to 20 (transmission line structure exhibits); (4) Confidential Exhibit 38-C, which is the VDOT highway maps and existing transmission facilities for Carroll, Floyd, Henry, and Patrick Counties; and (5) the GIS shapefiles of the Project which will be submitted electronically to the Commission with the Application, as will an electronic copy of the VDOT highway maps.

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 TRANSMISSION LINE COMPONENTS OF THE PROJECT.

A: The transmission line components of the Project consist generally of the following:

Component 1:

Construction of approximately 24.5 miles of new single-circuit 138-kV transmission line between the existing Willis Gap 138-kV Substation in Carroll County, the new Claudville 138-kV Substation in Patrick County, and a new Mayo River 138-kV Substation in Patrick County near Stuart, Virginia (the proposed "Mayo River – Willis Gap 138-kV Transmission Line").

Component 2:

Rebuild approximately 22.0 miles of the existing Floyd – Stuart 69-kV line to 138 kV between the new Mayo River 138-kV Substation, the existing Woolwine 69-kV

Substation (to be upgraded to 138 kV) in Patrick County, and the existing Floyd 69/138-kV Substation (to be upgraded) in Floyd County. The majority of the transmission line rebuild to 138 kV will be located in or near existing right-of-way (“ROW”), except for an approximate 3.5-mile portion of the line to be built in new ROW to integrate the proposed rebuilt transmission line into the new Mayo River 138-kV Substation and to avoid land use conflicts. Approximately 0.5 mile of the Floyd-Woolwine 138-kV line segment will be constructed in a double-circuit configuration to provide a future circuit position entrance to Floyd Substation across the Floyd Economic Development Authority properties. Approximately 1.0 mile will be double-circuit transmission line from Mayo River Substation to the intersection of the Mayo River – Woolwine 138-kV line and Mayo River – Smith River 138-kV line.

Component 3:

Rebuild approximately 25.5 miles of existing 69-kV and 138-kV transmission lines to 138 kV from north of the new Mayo River 138-kV Substation, to the Patrick Henry 138-kV Substation, to the new Stoneleigh 138-kV Substation, to the existing Fieldale 69/138-kV Substation, to the new Smith River 138-kV Substation, and to existing Structure No. 1365-4. The majority of the rebuild is in or near existing ROW, except for approximately 3 miles of transmission line to be built in new ROW to integrate the proposed rebuilt transmission lines into the new substations and system. Approximately 4.5 miles will be double-circuit transmission line and the remainder will be single-circuit. The double-circuit transmission line sections will be the Stoneleigh 138-

kV Extension and the Mayo River – Smith River 138-kV line between the new Stoneleigh Tap Structure and the new Smith River Substation.

The Project's transmission line components are shown on the Project Overview Map, which is Exhibit 3 to the Company's Response to Guidelines, and in detail on the GIS Constraints Mapping, which are Exhibits 7 to 9 to the Company's Response to Guidelines.

Q: WHAT STRUCTURE TYPES WILL BE USED IN CONNECTION WITH THE CONSTRUCTION OF THE PROPOSED TRANSMISSION LINES?

A: The Project requires multiple types of transmission line structures as described in Section II.B of the Response to Guidelines. Proposed structures will be made of dulled galvanized steel. Final structure types will be determined during final engineering, which includes ground survey and geotechnical studies. Nevertheless, based on preliminary engineering, the Company anticipates primarily using single-circuit steel H-frame and three-pole structures for the proposed single-circuit 138-kV transmission lines. In congested residential areas along Component 3's proposed Mayo River – Smith River 138-kV transmission line, the Company may use steel monopole structures with braced posts in place of H-frames. The Company will primarily use double-circuit steel monopoles with davit arms for the double-circuit transmission line sections. Lastly, the Company anticipates using a minimal number of 138-kV steel lattice structures in areas with steep terrain and long spans. The proposed structures are described in detail in Exhibits 10 to 20 and Confidential Exhibit 6-C describes the proposed transmission line circuit configurations.

Q: PLEASE DESCRIBE THE HEIGHTS OF THE PROPOSED STRUCTURES AND HOW THOSE HEIGHTS COMPARE TO THE EXISTING STRUCTURES.

A: Components 2 and 3 are generally rebuilds. The predominant structure type anticipated for the Project's rebuild will be single-circuit steel 138-kV H-frame structures ranging in height from approximately 55 feet to 115 feet, with an average height of approximately 80 feet. The anticipated heights for the single-circuit monopole structures with braced posts range from 65 feet to 100 feet, with an average height of approximately 80 feet. The anticipated heights for the double-circuit 138-kV monopole structures with davit arms range between approximately 75 feet and 145 feet (maximum height, which applies to only one structure with the next tallest structure being 120 feet), with an average height of approximately 100 feet. For more detail, see Exhibits 8 and 9 which show the proposed structure and existing structure heights and locations.

The proposed structures on Component 2 will typically be 35 feet taller on average than the existing structures with the largest height difference being approximately 65 feet. Specifically, proposed Structure No. 24 on the Mayo River – Woolwine 138-kV line and proposed Structure No. 29 on the Floyd – Woolwine 138-kV line are 65.5 feet taller than the adjacent existing structures, shown on Maps 6 and 20 of Exhibit 8, respectively. The proposed structures on Component 3 will typically be 45 feet taller on average than the existing structures with the largest height difference being 70 feet. Specifically, proposed Structure No. 127 on the Mayo River – Smith River 138-kV Transmission Line is 70 feet taller than the adjacent existing structure, shown on Map 15 of Exhibit 9. The proposed structures are taller than the existing structures to meet current electrical clearance requirements and to support longer spans. Where existing and proposed structure locations are not immediately adjacent, additional height may be needed to meet clearances in hilly and mountainous terrain. Using taller structures provides a significant decrease in the number of proposed Project structures and associated access roads and environmental impacts. This decrease in the total number of transmission line structures in or near the existing ROW, combined with the consolidation of multiple transmission lines into one corridor in the Bassett area, results in an approximate 40% reduction in the number of proposed structures compared to existing structures for the Project's rebuild components.

Q: APPROXIMATELY HOW MANY 138-KV STRUCTURES WILL THE PROJECT REQUIRE, AND HOW DOES THAT COMPARE TO THE NUMBER OF STRUCTURES ON THE EXISTING TRANSMISSION LINES?

A: The Company estimates that, overall, approximately 419 transmission line structures will be required for the entire Project. Specifically, approximately 137 transmission line structures will be required for Component 1; approximately 113 transmission line structures will be required for Component 2; and approximately 169 transmission line structures will be required for Component 3. Approximately 728 existing transmission line structures will be removed as part of the Project. The total structure count is a rough approximation based on preliminary engineering models developed using LiDAR data. The final number of structures will be determined during final engineering, which includes ground survey and geotechnical studies. The 40% decrease in the total number of transmission line structures located in or near the existing ROW is expected for the proposed rebuild segments compared to the existing structures is discussed in Section II.B.3 of the Response to Guidelines.

Q: WHY DID THE COMPANY CHOOSE DULLED GALVANIZED STEEL POLES FOR THE REBUILD STRUCTURES AS COMPARED TO THE WOOD USED ON THE EXISTING STRUCTURES?

A: The existing wood poles have woodpecker damage, which is typical for this area. Galvanized steel structures are a proven, durable, reliable, cost effective, and efficient structure in this area, and avoid woodpecker damage. A dulled finish is used to reduce the visual presence of the new structures.

Q: PLEASE DESCRIBE IN DETAIL THE CROSSING OVER THE BLUE RIDGE PARKWAY FOR THE FLOYD-WOOLWINE TRANSMISSION LINE REBUILD.

A: The proposed Floyd-Woolwine 69- to 138-kV transmission line rebuild crosses the Blue Ridge Parkway property for approximately 1,500 feet. The Company plans to cross the Blue Ridge Parkway at the same location as the existing 69-kV transmission line. The Company anticipates using single-circuit steel H-frame structures to support the 138-kV transmission line where it crosses the Blue Ridge Parkway. Steel H-frame structures are well-suited to support long conductor spans, have similar characteristics as the existing wood H-frames, and minimize the structure height required for the crossing. The proposed structure heights will range from 85 feet to 95 feet and are approximately 35 feet taller than the existing structures. These heights are necessary to meet the increased electrical clearance requirements, the longer span length, and the requirements of the terrain, at the Blue Ridge Parkway crossing. Nevertheless, the Company does not expect visual impacts on the Parkway to be significantly different from those impacts resulting from the maintenance, including vegetation clearing, on the existing transmission line. The Company will continue coordinating the design and construction of the crossing with the National Park Service.

Q: PLEASE DESCRIBE THE COMPANY'S ROLE IN THE ROUTE DEVELOPMENT PROCESS.

A: First, Appalachian retained POWER Engineers, Inc. ("POWER") to: (a) identify and evaluate substation sites for the proposed Mayo River, Claudville, Stoneleigh, and Smith River Substations; (b) develop and evaluate study segments and route alternatives for the transmission line components of the Project; and (c) select a proposed route for each of the new transmission lines (a "Proposed Route" and collectively, the "Proposed Routes") that reasonably minimizes adverse impact on environmental resources and is consistent with the Project's technical requirements. Second, the Company assisted the POWER team in developing the siting criteria listed in the Siting Studies included in Volume 2 of the Application (see also Section II.A.9 of the Response to Guidelines). Third, Company representatives participated in numerous stakeholder meetings with government officials, businesses, and landowners, which are described in the Siting Studies. Lastly, Company engineers conducted desktop reviews and field reviews of the Proposed Routes to validate feasibility from an engineering, constructability, and operational standpoint. For additional discussion of the route development process, please refer to the direct testimony of Company witness Santos.

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

A: Yes. Public participation and stakeholder input were very important to the Company during the route selection process. Appalachian held open houses for the Project in the affected communities and met one-on-one with numerous landowners. Additional open houses for the Project were held in a virtual format on the Project's website. Furthermore, the Company's ROW agents collected additional information in the process of obtaining permissions to survey ("PTS") from landowners along the proposed route. Public input is described further in Company witness Santos's direct testimony. The Siting Team carefully considered public and stakeholder input during route development for the Project, as described in the Siting Studies.

Q: HOW WIDE IS THE PROPOSED TRANSMISSION LINE ROW FOR THE MAYO RIVER-WILLIS GAP, MAYO RIVER-WOOLWINE, FLOYD-WOOLWINE, MAYO RIVER-SMITH RIVER, PHILPOTT DAM-SMITH RIVER, FIELDALE EXTENSION, AND STONELEIGH EXTENSION 138-kV TRANSMISSION LINES?

A: Typically for 138-kV transmission lines, the ROW will be 100 feet wide. However, the ROW could be more than 100 feet wide in some locations, as needed to ensure compliance with safety requirements such as clearance for conductor sway to avoid encroachments and vegetation in long spans or as needed for the guy wires to support certain structures. See Section II.A.6 of the Response to Guidelines for a detailed description. The precise location and extent of the places where the ROW would need to be more than 100 feet wide cannot be determined until completion of detailed ground surveys and final engineering.

Q: WHY IS THE COMPANY SEEKING APPROVAL OF A 600-FOOT-WIDE CORRIDOR ("FILING CORRIDOR") FOR THIS PROJECT, WITHIN WHICH A 100-FOOT ROW WILL BE LOCATED?

A: The Company needs flexibility to shift the centerline of the 100-foot ROW for the transmission lines up to 250 feet in either direction from the centerline shown in the Application (see the GIS Constraints Map, Exhibits 7 through 9), as necessary, to address issues that become evident only after completion of ground surveys, geotechnical and environmental studies, additional interviews with landowners, and final engineering. Nonetheless, the Company believes the centerline shown in the Application is the most suitable alignment based upon preliminary analysis. The Company will provide notice to potentially affected landowners within the corridor as required by the Commission and applicable law.

Q: WAS THE FILING CORRIDOR EXPANDED IN ANY AREAS, AND IF SO, WHY?

A: Yes. The Filing Corridor was expanded in four locations due to engineering and ROW considerations, three of which are along Component 1 of the Project and one of which is along Component 3 of the Project.

The first location on Component 1 where the Filing Corridor was expanded is near the existing Willis Gap Substation and west of Ahart Ridge Road (Route 676) near the Carroll County and Patrick County lines (see Exhibit 7, Maps 1 and 2). The Proposed Route traverses along the parcel boundary of a residence located to the west and a parcel to the east subject to a Patrick County conservation area forest/open space maintenance agreement. An expansion was added to the western side of the Filing Corridor to allow additional flexibility to work with the residence and to allow for the option of moving the proposed route to the west of the residence if needed. The expansion is approximately 490 feet wide, at its widest point, and approximately 0.3 mile long. The expansion does not affect any new landowners.

The second location on Component 1 where the Filing Corridor was expanded is near south of Ararat Highway (Route 773), west of Unity Church Road (Route 614) and southeast of Ararat, Virginia (see Exhibit 7, Map 7). The proposed Mayo River-Willis Gap 138-kV Transmission Line crosses a large property, and the landowner has requested to consider a shift to the north. This requested shift affects additional landowners. Therefore, an expansion has been added to the northern side of the Filing Corridor to allow additional flexibility to work with the landowners. The expansion is approximately 575 feet wide, at its widest point, and approximately 0.8 mile long.

The third location on Component 1 where the Filing Corridor was expanded is near the intersection of Salem Highway (Route 8) and Dry Pond Highway (Route 103) approximately 3.5 miles south of Stuart, Virginia (see Exhibit 7, Maps 15 and 16). The proposed Mayo River-Willis Gap 138-kV Transmission Line parallels the City of

Danville's Pinnacles-Hydro 69-kV Transmission Line in this area and crosses the existing transmission line before heading north to the proposed Mayo River Substation. The crossing location is proposed to be to the west of Collinstown Road (Route 662) but is subject to change with the completion of final engineering design and ROW negotiations with affected landowners. The Company will work with landowners to identify the most suitable route to minimize the adverse impacts on the community. An expansion has been added to the southern side of the Filing Corridor to allow additional flexibility to move the crossing of the existing City of Danville's transmission line to the west of Route 8 depending on ROW negotiations and final engineering. The expanded corridor is approximately 380 feet wide, at its widest point, and approximately 1.0 mile long.

On Component 3, the Filing Corridor was expanded north of Fairystone Park Highway (Route 57), near the proposed Smith River Substation, and west of the Smith River and northwest of Bassett, Virginia (see Exhibit 9, Map 18). The existing line and the proposed Philpott Dam-Smith River 138-kV Transmission Line cross parcels with Blue Ridge Land Conservancy conservation easements. The Company will continue collaborating with the landowner and easement holder regarding the proposed relocation of the existing transmission line ROW. An expansion has been added to the northern side of the Filing Corridor to allow additional flexibility to utilize the existing ROW of the Fieldale-West Bassett No. 2 69-kV Transmission Line, if necessary. The expansion is approximately 105 feet wide, at its widest point, and 615 feet long.

Q: MS. MCMILLEN, PLEASE DESCRIBE ANY ROW ACTIVITIES COMPLETED TO DATE.

A: The ROW team was involved with all siting and routing activities. Company ROW agents were present at the open houses and described the easement acquisition and supplemental easement acquisition process to attendees. Additionally, once a Proposed Route was identified, the ROW agents began contacting the affected landowners within the Filing Corridor to answer additional questions and at the same time seek PTS. As a result of these inquiries, the Siting Team made minor route adjustments where reasonable.

Q: WHY DOES THE COMPANY NEED PTS SO EARLY?

A: Obtaining PTS early gives the Company the ability to conduct further studies and explorations as needed. For example, the Company already began some field work to develop potential access road locations. Obtaining PTS early also allows the Company to conduct environmental studies and engineering studies at key locations.

Q: PLEASE DESCRIBE AND SUMMARIZE THE PTS STATUS.

A: As of February 2023, the Company had sent notice to all landowners within the Project's proposed Filing Corridor. Company ROW agents utilized county property records to ascertain the names and mailing addresses of the affected landowners. The Filing Corridor includes over 800 parcels owned by approximately 530 distinct landowners (some landowners own multiple parcels). As of June of 2023, PTS had been secured on 85% of the parcels located on Component 1, 98% of the parcels located on Component 2 and 71% of the parcels located on Component 3. The vast majority of the affected landowners located within the Project's proposed Filing Corridor have been contacted.

Q: ARE THERE ANY DWELLINGS IN COMPONENT 1's NEW AND PROPOSED ROW?

A: There are no dwellings within Component 1's new 100-foot ROW for the Mayo River-Willis Gap 138-kV Transmission Line.

Q: ARE THERE ANY DWELLINGS IN THE PROPOSED ROW FOR THE REBUILD COMPONENTS 2 AND 3?

A: Yes, Component 2 and 3's proposed 100-foot ROW, as shown on the GIS Constraints Mapping (Exhibits 8 and 9; the dwellings in the 100-foot ROW are highlighted) filed with the Application, contain a total of eight dwellings within the existing and proposed 100-foot ROW. There is one dwelling within the existing 100-foot ROW of Component 2's Mayo River-Woolwine 138-kV Transmission Line. There are seven dwellings within the existing 100-foot ROW of Component 3's Mayo River-Smith River 138-kV Transmission Line.

Q: CAN THE NUMBER OF DWELLINGS IN THE EXISTING ROW BE REDUCED?

A: Yes, the total of eight dwellings in the Project's 100-foot ROW is expected to be reduced to three by using a condensed transmission line design and reduced ROW width. Specifically, the existing line in Component 3 crosses through a congested residential area where numerous dwellings have built up along the edge of the existing ROW (see Exhibit 9). However, based on preliminary engineering review, a condensed transmission line design with shorter spans utilizing steel monopoles with braced posts is possible due to the flatter terrain and access. As a result, the ROW can be slightly reduced in width and the seven dwellings in Component 3's ROW can likely be reduced to two dwellings. A diversion out of the existing ROW into a new ROW was not reasonable due to the existing residential constraints. The one dwelling in Component 2's existing ROW cannot be reasonably avoided due to land use and terrain constraints. Accordingly, and subject to completion of final engineering and ROW negotiations with affected landowners, the Company will continue to collaborate with landowners to remove or relocate dwellings as needed. The Company has been in contact with the landowners of the three affected dwellings in the Project ROW.

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: WHAT MEANS DOES THE COMPANY PLAN TO EMPLOY TO IMPROVE THE AESTHETICS OF THE PROPOSED TRANSMISSION LINE?

A: As detailed in each Siting Study, POWER and the Company have carefully chosen the location for the Proposed Routes to avoid or minimize visual impacts as much as possible. Additionally, proposed transmission line structures will utilize low reflective steel and the conductors will have a low reflective finish. Further, the Project's proposed and primary transmission line structure is the H-Frame structure, which has a horizontal design (reducing overall height) and is comparable to the existing structures in the area (less contrast). The foregoing measures are a low-cost and effective means of improving the aesthetics of the proposed transmission lines.

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

A: Project construction activities will include the installation and maintenance of soil erosion and sedimentation control measures; temporary access road construction; minimal grading for foundation, structure, equipment, and wire installations; and the subsequent rehabilitation of all areas disturbed during construction. All required environmental compliance permits and studies will be completed, and a storm water pollution prevention plan will be developed and implemented under the state's "General Permit for Discharges of Stormwater from Construction Activities."

Q: IF THE COMMISSION GRANTS THE COMPANY'S APPLICATION TO CONSTRUCT AND OPERATE THE PROJECT, HOW LONG WILL IT TAKE TO COMPLETE AND PLACE IT IN SERVICE?

A: Upon Commission approval, the Company estimates that it will need approximately five years for engineering, design, ROW acquisition, permitting, material procurement, outage coordination and constraints, and construction to place the entire Project in service. The timeline is longer than normal due to Project size and complexity, inability to construct the three Project Components simultaneously, and the order of sequencing to avoid service disruptions and risks. The construction plans for the Project, including the proposed construction sequence, are detailed in Section II.A.10 of the Response to Guidelines and Exhibit 5.

Q: AFTER THE PROPOSED PROJECT IS COMPLETED, THE COMPANY'S APPLICATION INDICATES APPROXIMATELY 32 MILES OF EXISTING TRANSMISSION LINE WILL BE RETIRED AS ORDINARY EXTENSION WORK. WHAT HAPPENS TO THE EXISTING STRUCTURES AND ROW ON THIS 32 MILES OF EXISTING TRANSMISSION LINE THAT IS TO BE RETIRED?

A: The lines will be taken out of service once the Project is complete and most of the structures and conductors removed. The existing ROW does not have any reversion clauses; therefore, the Company will keep the existing ROW and evaluate for existing and future transmission, telecom or distribution use, where possible.

Q: ARE THERE ANY IMMEDIATE FUTURE PROJECTS THAT WILL USE THIS ROW OF THE RETIRED TRANSMISSION LINE?

A: As discussed in Section I of the Response to Guidelines and shown on Exhibit 3, from a location near Floyd Substation to the Patrick County line, approximately seven miles of the to-be-retired Claytor-Fieldale 138-kV Transmission Line ROW might be reused for a potential future distribution project.

Q: DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A: Yes.

APCo Exhibit No. ____
Witness: JKB

JAMES K. BLEDSOE, P.E.
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2023-00024

APCo Exhibit No. _____
Witness: JKB

Summary of Direct Testimony of J. Kelly Bledsoe, P.E.

My direct testimony supports Appalachian's Application and Response to Guidelines in connection with the Stuart Area 138-kV Transmission Improvements 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) Exhibits 21 through 36, and (3) Confidential Exhibits 21-C through 36-C in the Confidential Appendix located in Volume 4.

As part of the Project, the following substation work will be required:

- The proposed new Claudville, Mayo River, Smith River, and Stoneleigh 138-kV Substations.
- The retirement of the Stuart 69-kV Substation, West Bassett 69/138-kV Substation, Bassett 69-kV Substation, Stanleytown 69-kV Substation, and the Philpott 138-kV Switching Station.
- The 69-kV to 138-kV voltage conversion of the Patrick Henry Substation.
- The 69-kV to 138-kV upgrades at the existing Woolwine and Floyd Substations.
- Associated substation improvements within the existing fence at Willis Gap, Huffman, and Fieldale 138-kV Substations.

My testimony provides details regarding these substation constructions, retirements, or improvements.

In my testimony, I also explain why the Company chose not to expand or use the existing Stuart Substation, West Bassett Substation, Bassett Substation, or Stanleytown Substations in light of the existing constraints at these locations, and because the newly proposed substation facilities can be built "in the clear" at their proposed locations, which helps to minimize customer and equipment outage times. I further explain why the location of the proposed Smith River Substation location is the best location given its proximity to existing distribution circuits in the load center, which is near the transmission line source, and which thereby minimizes line exposure and reliability risks. Additionally, the seven-acre site is generally flat, cleared, and adjacent to an abandoned furniture warehouse on a former industrial site with sufficient space for the substation and mitigations.

DIRECT TESTIMONY OF JAMES K. BLEDSOE, P.E. FOR APPALACHIAN POWER COMPANY IN VIRGINIA S.C.C. CASE NO. PUR-2023-00024

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

A: My name is James K. Bledsoe. I am the Manager of Station (station and substation are used interchangeably in this testimony) 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 have over 30 years of transmission engineering experience. 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 transmission 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 Stuart Area 138-kV Transmission Improvements 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 the Manager of 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 SPECIFIC MATERIALS INCLUDED IN THE RESPONSE TO GUIDELINES 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, Sections II.C; (2) Exhibits 21 through 36; and (3) Confidential Exhibits 21-C through 36-C of the Confidential Appendix located in Volume 4.

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 station engineering components for the Project consists generally of the following:

- The proposed new Claudville, Mayo River, Smith River, and Stoneleigh 138-kV Substations.
- The retirement of the Stuart 69-kV Substation, West Bassett 69/138-kV Substation, Bassett 69-kV Substation, Stanleytown 69-kV Substation, and the Philpott 138-kV Switching Station.
- The 69-kV to 138-kV voltage conversion of the Patrick Henry Substation.
- The 69-kV to 138-kV upgrades at the existing Woolwine and Floyd Substations.
- Associated substation improvements within the existing fence at the Willis Gap, Huffman, and Fieldale 138-kV Substations.

These Project station-engineering components are shown on the Project Overview Map, which is Exhibit 3 to the Company's Response to Guidelines. Section I of the Response to Guidelines describes, in detail, the need and necessity of these station components.

Q: PLEASE DESCRIBE THE PROPOSED CLAUDVILLE SUBSTATION.

A: The proposed Claudville 138-kV Substation is located approximately one-half mile north of the community of Claudville in a rural area and will be buffered from any major roads or residences. The fenced portion of the proposed Claudville Substation is approximately 160 feet by 215 feet. The substation will be located on property already purchased by the Company. Section II.C of the Response to Guidelines describes the technical features of the new substation in further detail.

Q: PLEASE DESCRIBE THE PROPOSED MAYO RIVER SUBSTATION.

A: The proposed Mayo River 138-kV Substation replaces the existing Stuart 69-kV Substation and is located in a rural area approximately one mile east of the Town of Stuart. This location outside of town minimizes potential transmission line and station impacts to the existing commercial, industrial, and residential development near the existing Stuart Substation. The fenced portion of the proposed Mayo River Substation is approximately 330 feet by 300 feet. The proposed substation will be located on property already owned by the Company. The associated property holdings are strategically located to facilitate cost effective and least impact integration of the multitude of existing distribution circuits emanating from the existing Stuart Station. Section II.C of the Response to Guidelines describes the technical features of the new substation in further detail.

Q: PLEASE DESCRIBE THE PROPOSED SMITH RIVER SUBSTATION.

A: The proposed Smith River 138-kV Substation is located adjacent to a former furniture warehouse and a former assisted living center (which was permanently closed in May 2023) in a residential and commercial area on Fairystone Parkway Route 57, on the north side of the community of Bassett. The fenced portion of the proposed Smith River Substation is approximately 250 feet by 225 feet. The substation will be located on property already purchased by the Company. Section II.C of the Response to Guidelines describes the technical features of the new substation in further detail.

Q: PLEASE DESCRIBE THE PROPOSED STONELEIGH SUBSTATION.

A: The proposed Stoneleigh 138-kV Substation is located 1.25 miles south of Stanleytown adjacent to the Hordsville Enslaved/Freed African American Cemetery in a mixed rural, commercial and industrial area. The fenced portion of the proposed Stoneleigh Substation is approximately 150 feet by 225 feet. The substation will be located partially on property that has already been purchased by the Company and partially on property that is currently in purchase negotiations. Section II.C of the Response to Guidelines describes the technical features of the new substation in further detail.

Q: IS THERE ANY OTHER SUBSTATION WORK PROPOSED FOR THE PROJECT?

A: Yes. To accommodate the new 138-kV conversions and upgrades, there will be remote work required, within the existing fence(s), at the Patrick Henry Substation, Huffman Substation, Willis Gap Substation, Woolwine Substation, and Fieldale Substation. A substation expansion is required at Floyd Substation to accommodate these improvements. (See Section II.C of the Response to Guidelines for additional details).

Q: PLEASE DESCRIBE THE FACILITIES THAT WILL BE RETIRED AS PART OF THE PROJECT.

A: As a result of installing the newly proposed Claudville 138-kV Substation, Mayo River 138-kV Substation, Smith River 138-kV Substation, and Stoneleigh 138-kV Substation, the existing Stuart 69-kV Substation, West Bassett 69/138-kV Substation, Bassett 69-kV Substation, Stanleytown 69-kV Substation, and the Philpott 138-kV Switching Station will be retired.

Q: WHY DID THE COMPANY CHOOSE NOT TO EXPAND OR USE THE EXISTING STUART SUBSTATION, WEST BASSETT SUBSTATION, BASSETT SUBSTATION, OR STANLEYTOWN SUBSTATION?

A: It is the Company's practice to always attempt to use or expand existing facilities before constructing new facilities for transmission projects. However, due to existing constraints, the existing Stuart, Bassett, and Stanleytown 69-kV Substations and the West Basset 69/138-kV Substation cannot accommodate the proposed 138-kV conversions and upgrades, nor could they accommodate the improvements necessary for the Project Alternative described in Response to Guidelines I.E. These existing substations were built more than 50 years ago. They have very small footprints with little to no room for expansion. The surrounding development and terrain were additional limiting constraints that did not make expansion of the existing facilities feasible. Additionally, these newly proposed substation facilities can be built "in the clear" at their proposed locations, which helps to minimize customer and equipment outage times.

Q: PLEASE DESCRIBE THE EXISTING STUART SUBSTATION CONSTRAINTS.

A: The existing Stuart 69-kV Substation (see Exhibit 25), located in the Town of Stuart, is constrained by existing development, topography, and an existing major sewer line. Additionally, bringing the new 138-kV transmission line from Willis Gap into the Town of Stuart and rebuilding the two existing 69-kV transmission lines from Woolwine and Fieldale would have engineering challenges and land use and environmental impacts. Adjacent parcels were reviewed but dismissed due to size constraints. The proposed Mayo River site is generally flat, is located just outside of town and developed areas, has plenty of space and a buffer, and is adjacent to the existing distribution circuits. Additionally, the three 138-kV transmission line circuits can connect to the substation at this location without significant impacts.

Q: EXPLAIN WHY THE NEW SMITH RIVER SUBSTATION IS NECESSARY.

A: The Company evaluated the existing Bassett and West Bassett Substations and determined combining them into one new Smith River Substation was the most cost-effective electrical solution. The existing constraints also prevent expansion and upgrades on the existing Bassett and West Bassett Substations.

Q: PLEASE DESCRIBE THE EXISTING BASSETT SUBSTATION CONSTRAINTS.

A: The Bassett Substation is located on the bank of the Smith River, partially in the 100-year floodplain and has existing bank-erosion damage from the river (see Exhibit 33). Additionally, the substation is constrained by existing residences to the north and is located literally along the edge of pavement for Riverside Drive (the main highway entrance into the community of Bassett) to the south and west. Outage constraints further complicate the ability to upgrade the substation.

Q: PLEASE DESCRIBE THE WEST BASSETT SUBSTATION EXISTING CONSTRAINTS.

A: The West Bassett Substation is located in an area with steep terrain making road access improvements and expansion impractical because of development and environmental constraints (see Exhibit 34).

Q: EXPLAIN THE BENEFITS OF THE PROPOSED SMITH RIVER SUBSTATION LOCATION.

A: The location is electrically optimal between the existing Bassett and West Bassett Substations on the edge of the community of Bassett. The site is adjacent to the existing distribution circuits, in the load center, and near the transmission line source minimizing line exposure and reliability risks (see Exhibit 29). Additionally, the seven-acre site is generally flat and cleared and adjacent to a former assisted living center (which is permanently closed as of May 2023) and an abandoned furniture warehouse on a former industrial site with sufficient space for the substation and mitigations. Residences are located across the road on Fairystone Parkway Route 57. The Company has outreached and coordinated with local officials and the surrounding community (including the residences across the road) extensively concerning the proposed substation to develop visual mitigations. As a result, the Company plans to use a faux brick wall for screening mitigations. For further discussion of the methods used to select the new substation location, please see the direct testimony of Company witness Santos.

Q: PLEASE DESCRIBE THE CHALLENGES WITH UPGRADING AND REUSING THE EXISTING STANLEYTOWN SUBSTATION.

A: Upgrading the existing Stanleytown Substation would require the construction of an approximately 1.0-mile new double-circuit 138-kV transmission line. That line would have to cross a visually open area, over the primary roadway in and out of the Stanleytown community, and span the Smith River. Conversely, the proposed Stoneleigh Substation site is located adjacent to the proposed 138-kV rebuild line and avoids the need to span over the Smith River, has minimal impacts on the Stanleytown community, has developable space adjacent to an existing Appalachian Power Service Center building, and is located near the primary distribution circuits that serve a critical local industrial load.

Q: PLEASE DESCRIBE THE CONVERSION PLANS FOR THE PATRICK HENRY SUBSTATION.

A: The new Patrick Henry Substation is being built in 2024 and 2025 to address existing distribution issues and is a separate project. The distribution substation will initially operate at 69 kV but is designed to 138-kV standards. As a part of the Stuart Area upgrades, the Patrick Henry Substation will be converted to 138 kV on the high side with minimal cost and effort (see Section II.C Response to Guidelines for a description of the Company's work for this substation).

Q: PLEASE DESCRIBE ANY PROPOSED VISUAL MITIGATIONS CONCERNING THE NEW SUBSTATIONS.

A: The substations' visual impacts are expected to be low or will be minimized as feasible. With the exception of the Stoneleigh and Smith River Substations, the new greenfield sites are primarily located in rural areas and have some existing vegetated screening or are located further from main roads and developments within nearby communities than the existing substations. The Mayo River Substation is located east of the Town of Stuart, in an agricultural area, and the Smith River Substation is located in the community of Bassett. Additionally, the fence facing the main road at Smith River Substation will be constructed of an aesthetically pleasing faux brick wall as opposed to a standard chain link fence. At Floyd Substation, the fence facing the main road will be constructed of a slatted fence on a rock-patterned retaining wall. Also, the sites are located as close as possible to the existing 138-kV transmission lines and distribution lines, thereby minimizing transmission line lengths and visual impacts.

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

A: Project construction activities will include the installation and maintenance of soil erosion and sedimentation control measures; temporary access road construction;

minimal grading of the substation site; foundation, structure, equipment and wire installations; and the subsequent rehabilitation of all areas disturbed during construction. All required environmental compliance permits and studies will be completed, and a storm water pollution prevention plan will be developed and implemented under the state's "General Permit for Discharges of Stormwater from Construction Activities."

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-2023-00024

APCo Exhibit No. _____
Witness: XL

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

My direct testimony supports Appalachian Power Company's ("APCo," "Appalachian," or "Company") Application and Response to Guidelines. I sponsor Section IV of the Response to Guidelines.

The Stuart Area 138-kV Transmission Improvements Project (the "Project") proposes upgrades to the electrical systems in the service areas for Carroll, Patrick, Floyd, and Henry Counties. The Project consists of building new 138-kilovolt ("kV") circuits and upgrading 69-kV circuits to 138-kV circuits. Assuming a 100-foot-wide right-of-way ("ROW"), my testimony summarizes the maximum electric and magnetic field (or "electromagnetic fields," both "EMF") levels expected to occur at the ROW edge of each component of the Project's 138-kV transmission lines. The maximum expected EMF level at the edge of the ROW for this Project is 9.51 milligauss ("mG"), as described in the testimony.

The maximum EMF levels, detailed in Section IV of the Response to Guidelines, 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-2023-00024

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 APCo. My business address is 8500 Smiths Mill Road, New Albany, Ohio 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 Project, as they relate to EMF.

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 ("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 or electromagnetic 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 Hertz ("Hz"), or 60 cycles per second.

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

A: I have over 18 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 was 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 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 138-kV TRANSMISSION LINES IN THIS PROJECT?

A: As set forth in Section IV.A of the Response to Guidelines, this Project is organized into three components, generally following the Project construction sequence. Each component, in turn, has varying EMF levels associated with the respective transmission lines. For an illustration of the Transmission Line Circuit Configurations for this Project, see Confidential Exhibit 6-C in Volume 4.

Q: PLEASE DESCRIBE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED MAYO RIVER – WILLIS GAP 138-kV TRANSMISSION LINE (COMPONENT 1).

A. The proposed Mayo River – Willis Gap 138-kV Transmission Line is a single-circuit line from the new Mayo River Substation to the existing Willis Gap Substation, through the new Claudville Substation. Assuming a 100-foot-wide ROW, the maximum EMF levels expected to occur at the edge of the ROW for the proposed Mayo River – Willis Gap Transmission Line are 0.64 kV/m and 9.51 mG, respectively.

Q: CAN YOU DESCRIBE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED MAYO RIVER – WOOLWINE AND FLOYD - WOOLWINE 138-KV TRANSMISSION LINES (COMPONENT 2)?

A. Yes. Component 2 is generally a rebuild of an existing 69-kV transmission line to 138 kV. The proposed Mayo River – Woolwine 138-kV Transmission Line is primarily single-circuit from the new Mayo River Substation to the existing Woolwine Substation, with a 1.0 mile double-circuit section coming out of the new Mayo River Substation. The proposed Floyd – Woolwine 138-kV Transmission Line is primarily single-circuit from the existing Floyd Substation to the existing Woolwine Substation, with a 0.5 mile double-circuit section coming out of the existing Floyd Substation. The double-circuit section exiting Floyd Substation will carry the Floyd – Mayo River 138-kV circuit in a single-circuit, six-wired configuration for approximately 0.5 mile. Assuming a 100-foot-wide ROW, the maximum EMF levels expected to occur at the ROW edge of the proposed single circuit section are 0.62 kV/m and 6.12 mG, respectively. The maximum

EMF levels expected to occur at the ROW edge of the proposed double-circuit section are 0.15 kV/m and 8.54 mG, respectively.

The existing circuits in the existing ROW mainly consist of a single H-frame Floyd – Stuart 69-kV circuit. The maximum existing EMF levels for this section are 0.40 kV/m and 9.38 mG, respectively. The existing ROW also contains a section where the Floyd – Stuart 69-kV circuit is paralleled with the Claytor-West Bassett 138-kV transmission line. The maximum existing EMF levels for this section are 0.93 kV/m and 9.09 mG, respectively.

Q: PLEASE DESCRIBE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED MAYO RIVER – SMITH RIVER 138-KV TRANSMISSION LINE (COMPONENT 3).

A. Component 3 is generally a rebuild of 69 and 138-kV transmission lines to 138 kV. The proposed 138-kV transmission line splits from the Mayo River – Woolwine 138-kV line and goes to the new Smith River Substation through the existing Patrick Henry Substation. This proposed line is primarily single-circuit, with a double-circuit section from the Stoneleigh Tap Structure to the new Smith River Substation. Assuming a 100-foot-wide ROW, the maximum EMF levels expected to occur at the ROW edge of the proposed single-circuit section are 0.27 kV/m and 6.58 mG, respectively. The maximum EMF levels expected to occur at the ROW edge of the proposed double-circuit are 0.15 kV/m and 7.82 mG, respectively.

The existing maximum EMF levels at the edge of the ROW on the Fieldale – Stuart 69-kV circuit are 0.20 kV/m and 6.58 mG, respectively.

Q: NEXT, PLEASE DESCRIBE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED FIELDALE EXTENSION AND STONELEIGH EXTENSION 138-KV TRANSMISSION LINES (COMPONENT 3).

A. The proposed Fieldale Extension 138-kV line will be a single-circuit line from the Stoneleigh Tap structure to the existing Fieldale Substation. The proposed Stoneleigh Extension line will be a double-circuit line from the Stoneleigh Tap Structure to the new Stoneleigh Substation. The double-circuit section carries the Fieldale – Smith River circuit in and out of the Stoneleigh Substation. The maximum EMF levels expected to occur at the ROW edge of the proposed single-circuit are 0.62 kV/m and 6.12 mG, respectively.

The existing circuits in the existing ROW mainly consist of single H-frame Fieldale-West Bassett No. 2 69-kV circuit by itself with maximum EMF of 0.44 kV/m and 3.37 mG, respectively. The section includes the single H-frame Fieldale -West Bassett No. 2 69-kV circuit in parallel with Fieldale-West Bassett 138-kV single H-frame circuit. The maximum existing EMF levels of this section are 0.89 kV/m and 14.01 mG, respectively.

Q: LASTLY, CAN YOU DESCRIBE THE CALCULATED MAXIMUM EMF LEVELS ASSOCIATED WITH THE PROPOSED PHILPOTT DAM - SMITH RIVER 138-KV TRANSMISSION LINE (COMPONENT 3)?

A. Yes. The proposed Philpott Dam – Smith River 138-kV Transmission Line is a single-circuit line from existing Structure No. 1365-4, located near the existing Philpott 138-kV Switch Station (to be retired), to the new Smith River Substation. Assuming a 100-foot-wide ROW, the maximum EMF levels expected to occur at the ROW edge of this proposed circuit are 0.62 kV/m and 1.01 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. The maximum EMF levels for the proposed Project are 0.64 kV/m and 9.51 mG (assuming a 100-foot-wide ROW). 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: 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: AS

DIRECT TESTIMONY OF
ANASTACIA SANTOS
FOR APPALACHIAN POWER COMPANY
IN VIRGINIA S.C.C. CASE NO. PUR-2023-00024

APCo Exhibit No. ____
Witness: AS

SUMMARY OF DIRECT TESTIMONY OF ANASTACIA SANTOS

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 Stuart Area 138-kV Transmission Improvements Project ("Project"). Specifically, I sponsor:

- Sections II.A.1, 2, 3, and 9 of the Response to Guidelines
- Sections III and V of the Response to Guidelines (excluding Section III.C)
- Exhibit 2: Public Notice Map
- Exhibit 3: Project Overview Map
- Exhibit 7: Component 1 GIS Constraints Map
- Exhibit 8: Component 2 GIS Constraints Map
- Exhibit 9: Component 3 GIS Constraints Map
- Exhibit 37: Visual Simulations
- Siting Studies for Components 1, 2, and 3
- Virginia Department of Environmental Quality Supplements (the "VDEQ Supplements") for Components 1, 2, and 3

The Company retained POWER Engineers, Inc. ("POWER") to conduct route development studies for the transmission lines to be built and rebuilt as part of the Project. My testimony describes the process followed by the Siting Team, which included representatives from the Company and POWER, to identify the Proposed Routes for each component of the Project.

The Siting Team used a traditional siting methodology. For the Project's rebuild components, it began with reviewing outage requirements for the Project and ability to rebuild the Project on the existing centerline where feasible and the impacts of building new transmission line. The Siting Team's analysis shows that the Proposed Routes for the Project are the most suitable and minimize overall human and natural environment impacts by rebuilding within or parallel to the existing rights-of-way ("ROWs") where feasible or minimizing impacts to the natural and human environments where new transmission line and ROW are required. For the Project's new route components, the Siting Team mapped the study area's constraints, paralleled existing lines, and collected significant input to avoid and minimize impacts to the extent practical.

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 as defined in the Virginia Environmental Justice Act (Code of Virginia § 2.2-234 *et seq.* of the Code of Virginia) and the Company will continue to engage with all affected landowners. In addition, the Project is not anticipated to affect any federally or state-protected species, but habitat studies or species-specific surveys will be conducted prior to construction to ensure compliance with existing environmental regulations and laws. Finally, I describe the Proposed Routes and the corridor within which the Company proposes to engineer, construct, operate, and maintain the Project.

DIRECT TESTIMONY OF ANASTACIA SANTOS FOR APPALACHIAN POWER COMPANY IN VIRGINIA S.C.C. CASE NO. PUR-2023-00024

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

A: My name is Anastacia Santos and I am an Environmental Project Manager in the Environmental Division at POWER Engineers, Inc ("POWER"). My business address is 7600 North Capital of Texas Highway, Building B, Suite 320, Austin, Texas 78731.

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

A: Yes. POWER is a 100 precent employee-owned engineering and environmental consulting firm with more than 3,000 employees across North America including Richmond, Virginia. We specialize in integrated solutions for clients in the power delivery, power generation, food and 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 extensive transmission line siting experience in Virginia and has previously supported or provided written testimony to this Commission for eight Company projects, including:

- Reusens to Roanoke 138 kilovolt ("kV") Rebuild Project (SCC Case No. PUR-2022-00163)
- 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)
- Huntington Court – Roanoke 138 kV Transmission Line Project (SCC Case No. PUE-2008-00096)
- 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 submitted testimony on similar issues before the Public Utility Commission in Texas (Docket Nos. 52485, 51912, 50669, 47973, 47585, 46726, 46042, 45397, 45308, 44726 and 38877), the Public Utility Commission in Mississippi (Dockets Nos. 2021-UA-176, 2021-UA-026, 2019-UA-176, 2019-UA-133, 2019-UA-071, 2019-UA-069, 2015-UA-193, 2015-UA-166 and 2015-UA-10 098), and the Public Regulation Commission in New Mexico (Docket No. 17-00143-UT).

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 Stuart Area 138-kV Transmission Improvements Project ("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.1, 2, 3, and 9 of the Response to Guidelines
- Sections III of the Response to Guidelines (excluding Section III.C)
- Section V of the Response to Guidelines
- Exhibit 2: Public Notice Map
- Exhibit 3: Project Overview Map
- Exhibit 7: Component 1 GIS Constraints Map
- Exhibit 8: Component 2 GIS Constraints Map
- Exhibit 9: Component 3 GIS Constraints Map
- Exhibit 37: Visual Simulations
- Siting Studies
    - Component 1: Mayo River (Stuart) to Willis Gap Transmission Improvements Siting Study ("Component 1 Siting Study")
    - Component 2: Mayo River (Stuart) to Floyd Transmission Improvements Siting Study ("Component 2 Siting Study")
    - Component 3: Mayo River (Stuart) to Bassett Area Transmission Improvements Siting Study ("Component 3 Siting Study")
- Virginia Department of Environmental Quality Supplements (the "VDEQ Supplements")
    - Component 1 VDEQ Supplement
    - Component 2 VDEQ Supplement
    - Component 3 VDEQ Supplement

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 have a Bachelor of Science degree in Renewable Natural Resources from Texas A&M University, and a Bachelor of Arts degree in Mathematics from the University of Texas at Austin. I have been employed with POWER since 2012. I have managed multidisciplinary teams to license energy projects, including environmental and cultural field studies, siting and routing/alternatives evaluations, public scoping meetings/hearings, environmental permitting, and mitigation planning. Projects have included transmission lines, substation facilities, pipelines, natural gas storage facilities, and liquefied natural gas import terminals. I have managed over 40 routing and environmental impact analyses for electric transmission line projects. The projects I have managed range in size from 69 kV to 345 kV and have been as short as 1.0 mile to over 200 miles in length.

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

A: My experience siting electric transmission facilities and other linear utility corridors has equipped me to determine the information and analyses necessary to develop transmission line routes that avoid or minimize impacts to the visual, 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 environmental resources.

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

A: POWER was retained by the Company to develop and evaluate transmission line routes and associated substation sites for the Project. As POWER's Environmental Project Manager, I oversaw and directed the POWER team and worked closely with the Project's Siting Team. My primary duties involved planning, organizing, coordinating and controlling activities related to (a) evaluating and selecting the proposed substation sites; (b) collecting data and stakeholder input; (c) developing and evaluating study segments and alternative routes for the Project components; (d) developing routing, technical, and evaluation criteria with which to develop, compare, and analyze alternative routes; (e) selecting Proposed Routes for the transmission lines that reasonably minimize adverse impacts on the scenic assets, historic districts and environment of the Project area, and are consistent with Project routing and technical criteria; and (f) completing the Project's siting studies and environmental reports.

Q: PLEASE BRIEFLY DESCRIBE THE PROJECT AS IT RELATES TO THE SITING EFFORTS.

A: The Project siting effects generally consist of the following (see also the Project Overview Map, Exhibit 3, and Section I of the Application for a complete description of the Project components):

Component 1:

Approximately 24.5 miles of new 138-kV transmission line between the existing Willis Gap 138-kV Substation in Carroll County, the new Claudville 138-kV Substation in Patrick County, and a new Mayo River 138-kV Substation near Stuart, Virginia.

Component 2:

Approximately 22.0 miles of rebuild between the new Mayo River 138-kV Substation, the existing Woolwine 69-kV Substation, and the existing Floyd 69/138-kV Substation.

Component 3:

Approximately 25.5 miles of rebuild from north of the new Mayo River 138-kV Substation, to the existing Patrick Henry 69/138-kV Substation, to the new Stoneleigh 138-kV Substation, to the existing Fieldale 69/138-kV Substation, to the new Smith River 138-kV Substation, and to existing Structure No. 1365-4, which is near the existing Philpott 138-kV Switch Station.

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.

POWER was the siting and environmental lead. Members of the Siting Team represented transmission line, substation, and distribution engineering; siting; right-of-way ("ROW"); public outreach, environmental; outage planning; and construction management. The Siting Team members have extensive experience in transmission line siting.

Q. PLEASE DESCRIBE THE PURPOSE OF THE SITING STUDIES.

A. The primary purpose of the Siting Studies is to identify routes for the proposed transmission line that will enable the Company to acquire the required ROW, engineer, construct, operate, and maintain the line, while minimizing overall environmental and land use impacts to the extent practical. Consequently, the Siting Studies discuss the definition of a study area which encompasses the substation endpoints, review the existing ROW's condition, consider the environmental and land use constraints and opportunity features identified within a study area, document siting methodologies and guidelines, document public involvement, provide an evaluation of alternative routes, and aid in the selection of a Proposed Route for each component. The Siting Studies are included in Volume 2 of the Application.

Q. PLEASE DESCRIBE THE FIRST STEP IN THE METHODOLOGY EMPLOYED BY POWER TO CONDUCT THE ENVIRONMENTAL ANALYSIS AND ALTERNATIVE ROUTE DEVELOPMENT FOR THE PROJECT.

A. The methodology employed by POWER is summarized in Section II.A.9 of the Response to Guidelines and is described in detail in the Siting Studies (included in Volume 2 of the Application). The first step involved identifying route endpoints – which were generally existing or proposed substations. For the proposed new substation sites, the Siting Team analyzed multiple sites in an effort to avoid or minimize impacts. Environmental justice

("EJ"), land use, and environmental factors were also considered along with engineering requirements. See the direct testimony of Company witness Bledsoe for additional details regarding why new substation sites were necessary and the proposed substation locations for the Project. The Project's endpoints for each component are summarized below:

a) **Component 1** required identifying the proposed Mayo River Substation site to replace the existing Stuart Substation and the proposed Claudville Substation to address existing distribution issues (see Section I of the Response to Guidelines for more discussion on its necessity). The other endpoint was the existing Willis Gap Substation;

b) **Component 2's** proposed endpoints were the proposed Mayo River Substation, existing Woolwine Substation, and the existing Floyd Substation.

c) **Component 3** required identifying the proposed Stoneleigh Substation site to replace the existing Stanleytown Substation and the proposed Smith River Substation to replace the existing Bassett and West Bassett Substations. Component 3's proposed starting point is just north of the new Mayo River Substation on the Mayo River – Woolwine 138-kV transmission line and the endpoints are the existing Structure No. 1365-4 near the Philpott Switch Station and the existing Fieldale Substation.

Q. PLEASE DESCRIBE THE REMAINING ROUTE DEVELOPMENT STEPS.

A: After identifying the Project endpoints, POWER's route development methodology consisted of the following remaining steps:

(1) Establish routing and technical criteria (*e.g.*, maximize using existing ROW and avoid heavy angles);

(2) Study Area definition;

(3) Data collection, stakeholder input, field reviews, and constraint and opportunity mapping;

(4) Development of Routing Concepts, which adhere to a series of general siting and technical guidelines;

(5) For rebuilds (Components 2 and 3), the existing ROW was reviewed and reroute segments were developed as necessary (*e.g.*, due to existing land use constraints);

(6) Identification and development of a Study Segment Network, which includes refinements and modifications as a result of public and stakeholder input;

(7) Assembly of Alternative Routes;

(8) Evaluation and comparison of the Alternative Routes;

(9) Identification of the Proposed Route; and

(10) Additional refinements, where practical, after announcing the Proposed Route and contacting affected landowners.

Q. MS. SANTOS, IS THIS METHODOLOGY SIMILAR TO THAT EMPLOYED BY POWER IN OTHER SUCH STUDIES?

A. Yes. This is a traditional and accepted methodology employed by environmental consultants to identify optimal routes for new transmission lines, gas pipelines, and other linear utility corridors.

Q. WHAT SOURCES WERE REVIEWED TO AVOID OR MINIMIZE ADVERSE ENVIRONMENTAL IMPACTS?

A. A range of geographic information was acquired within each component study area, as described in the Siting Studies (Volume 2). Data was compiled from:

- Available published sources, aerial photographs, United States Geological Survey maps, and GIS data repositories [including data from local jurisdictions, the Virginia Base Mapping Program, and the Virginia Department of Historic Resources ("VDHR") database];
- Coordination with federal, state, and local regulatory agencies
- Environmental Justice data from EJSCREEN (2023) tool, developed by the United States Environmental Protection Agency ("USEPA"), and referenced data from the United States Census Bureau-American Community Survey ("ACS");
- Field reviews from public roads and other public access points; some private access for field reviews was obtained at key locations and where landowners invited the Siting Team;
- Light Detection and Ranging ("LiDAR") imagery to verify locations of buildings and dwellings; and

- Input from the public through public open house meetings, a Project website, and meetings with local landowners and stakeholders.

Q. WHAT FACTORS WERE ASSESSED IN CONNECTION WITH AVOIDING OR MINIMIZING HUMAN AND NATURAL ENVIRONMENTAL IMPACTS?

A. POWER assessed existing land use, including the presence and proximity of dwellings, schools, other community facilities, businesses, commercial structures, churches, etc. as applicable. Future land use plans for residential, industrial, and commercial development were also considered through existing planning documents, communications with county representatives, and public involvement. The presence and proximity of the following natural, visual, and cultural resources were also considered: geological features, wetlands, streams, forested areas, prime farmland and farmland of statewide importance, conservation lands and easements, previously documented architectural and archaeological resources, rare or endangered species, recreational and aesthetic resources, and scenic roadways. Public input and affected landowner preferences were considered during all phases, to the extent practical. Lastly, engineering and constructability factors were reviewed for each alternative route. The routing and technical criteria were developed at the start of the Project and considered for this effort are detailed in the Siting Studies (located in Volume 2 of this Application).

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

A. Using the available data collected and the routing and technical criteria, the Siting Team identified constraints and opportunities within the study area. Constraints are specific areas that should be avoided to the extent practical during the route development process.

Opportunities were identified in a study area as locations where the proposed transmission line might be located while reasonably minimizing adverse impacts.

Q. WHAT WERE THE CONSTRAINTS AND OPPORTUNITIES WITHIN THE PROJECT STUDY AREA?

A. **<u>Component 1</u>:**

The study area for Component 1 had various constraints that limited buildable space for a new transmission line ROW. The study area constraints included existing and future land use in and near the communities of Ararat, Claudville, and Stuart; mountainous terrain to the north and south of the Blue Ridge Parkway; the Ararat River, Dan River, and South Mayo River water resources; cultural resources; and existing infrastructure. Between Willis Gap and Claudville, the southern undeveloped portion of the study area was considered an opportunity. The existing City of Danville's Pinnacles – Hydro 69-kV Transmission Line was considered a paralleling opportunity and was preferred by the public and stakeholders between Claudville to Mayo River.

<u>Component 2</u>:

The existing transmission line ROW was considered a major opportunity and it was determined feasible for the rebuild for much of its length after engineering, ROW, and siting reviews. Major constraints include scattered residential areas near the towns of Stuart and Floyd, the Floyd historic district, Virginia Outdoors Foundation ("VOF") conservation easements, local recreational sites and parks, and the South Mayo River. Other constraints include some residential and commercial developments along major roadways and highways.

Component 3:

The existing transmission line ROW was considered a major opportunity and it was determined feasible for the rebuild for much of its length after engineering, ROW, and siting reviews. Major constraints include scattered residential clusters close to Component 3 such as near the communities of Fieldale and Bassett, including the historical significance and resources surrounding the Bassett community. Other constraints include the Smith River, North Mayo River, a VOF conservation easement, the Bassett historic district, local recreational sites and parks, steep terrain, and residential and commercial development concentrated along major roadways and highways.

Q. DID THE COMPANY CONSIDER PUBLIC AND STAKEHOLDER INPUT DURING ROUTE DEVELOPMENT?

A. Yes. Public participation and stakeholder input is very important to the Siting Team and was considered during all phases of the route development process, as practical. The information and stakeholder input that was collected informed the route development process by refining study segments, alternative routes, and the Proposed Route.

Q. PLEASE DESCRIBE THE PUBLIC INVOLVEMENT FOR THE PROJECT.

A Each Project component was introduced with an announcement to the public, which included an extensive public notification campaign that included a news release, a public advertisement, and mailings inviting landowners to public open houses to learn about the Project and provide their feedback. Additionally, a Project website went live for each component on the same day to further encourage attendance of the local community at the public open houses and to provide more information regarding the Project Component, including a public map showing the various study segment networks. The

Project websites included a virtual open house to allow landowners to provide input on the Project website. Content provided as part of the virtual open house was similar to that provided at in-person public open houses. The Company also hosted two virtual town halls for Component 1.

At the in-person public open houses, representatives of the Company and POWER provided information on the Project and were available to answer questions and collect comments. The public was also able to comment electronically and obtain additional information through the Project website after the public open houses. On October 3, 2022, in an effort to update landowners, mailings were sent to landowners within 1,000 feet of the Proposed Routes for each component, to notify them of the selected route.

Additional details regarding the open houses and the public involvement are included in the Siting Studies (Volume 2) and Section III Response to Guidelines (Volume 1).

Q. DID THE COMPANY RECEIVE ANY ADDITIONAL STAKEHOLDER INPUT BESIDES OPEN HOUSES?

A. Yes. In addition to soliciting input from landowners via the in-person and virtual open houses, the Siting Team met with numerous landowners at their request to review routes on their property and Company ROW agents contacted numerous landowners at key locations as necessary to collect additional information. Additionally, as described in the direct testimony of the Company witness McMillen in more detail, the Proposed Route was announced to the public and Company ROW agents contacted the vast majority of the 530 landowners in the Filing Corridor and further refinements to the route were addressed where reasonable. The Siting Team also reached out to residents near the proposed Smith River Substation location to solicit additional feedback on the substation. The Siting Team also obtained information from or contacted various federal, state, and local agencies and/or officials to inform them of the Project and request data for the route planning process. Letters were sent to 22 agencies on November 23, 2021, as part of the data collection effort and nine responses have been received to date. Copies of agency letters, contact list, and correspondence are included in Volume 3 of the Application. In addition, the Siting Team met with local government officials throughout the route development process (see Siting Studies in Volume 2 for meeting details).

Q. PLEASE DESCRIBE THE RESULTING ALTERNATIVE ROUTES FOR THE PROJECT.

A. **Component 1:**

Six Alternative Routes were considered for Component 1 of the Project; three between Willis Gap and Claudville Substations and three between Claudville and Mayo River Substations. These Alternative Routes A through F are described in detail in Sections 3.8 and 4.0 of the Component 1 Siting Study and are depicted in Maps 5 and 6 in Attachment B to the Component 1 Siting Study in Volume 2.

Component 2:

A majority of Component 2 can be rebuilt on existing centerline within the existing ROW with minor deviations to minimize potential impacts to the human environment or to optimize design. The Siting Team, however, identified one focus area (“Mayo River Focus Area”) where there were constraints due to residential and commercial development. The Siting Team developed two short Alternative Routes to connect the existing ROW to the new Mayo River Substation location and to avoid residential and commercial development and a planned hospital in and around the existing ROW near the Town of Stuart, Virginia. Alternative Routes A and B are described in detail in Sections 3.1 and 5.0 of the Component 2 Siting Study and are depicted in Maps 4 and 5 in Attachment B to the Component 2 Siting Study in Volume 2.

Component 3:

A majority of Component 3 can be rebuilt on existing centerline within the existing ROW; however, some small deviations from existing centerlines are necessary to avoid land use constraints or optimize the design. The Siting Team identified three Focus Areas (Circle Drive, Route 220 and Smith River), where rebuilding on the existing centerline may not be feasible. All of the focus areas are described in detail in Section 3.0 of the Component 3 Siting Study in Volume 2.

The Circle Drive Focus Area considers a Reroute Segment to avoid residential development that has occurred in and around the existing ROW (Volume 2, Component 3 Siting Study, Attachment B, Map 2).

The Route 220 Focus Area addresses an area west of Route 220 and the existing Fieldale Substation and Fieldale community where rebuilding on centerline was not as favorable as a greenfield (new ROW) option (Volume 2, Component 3 Siting Study, Attachment B, Map 3). The Siting Team identified a greenfield reroute segment that reduces the number of Route 220 crossings, reduces the length of double-circuit transmission line needed, and minimizes outage risks (according to Company engineers); therefore, the rebuild segment was dismissed.

The Smith River Focus Area considers an area near the community of Bassett to better evaluate existing siting opportunities (Component 3 Siting Study, Attachment B, Map 4). In the Smith River Focus Area the existing Claytor – Fieldale 138-kV Transmission Line and the existing Fieldale – West Bassett No. 2 69-kV Transmission Line parallel one another and are the primary siting opportunities. Rebuilding on either centerline was deemed feasible, and the Siting Team noted that rebuilding on the 69-kV centerline would minimize outages. Two rebuild segments, the Eastern 69-kV Rebuild Segment and the Western 138-kV Rebuild Segment, were developed. Each follows existing ROW and then connects to the proposed Smith River Substation.

Q. WHAT ARE THE PROPOSED ROUTES FOR THE PROJECT?

A. **<u>Component 1:</u>**

The Siting Team identified Alternative Routes C and E as the Proposed Route for Component 1 (Exhibit 3). The Proposed Route for Component 1 is approximately 24.5 miles long. See Exhibit 7: Component 1 GIS Constraints Map for detailed maps showing the Proposed Route for Component 1.

<u>Component 2:</u>

The Siting Team identified Alternative Route B and the Rebuild Route as the Proposed Route for Component 2 (Exhibit 3). The Proposed Route for Component 2 is approximately 22.0 miles long. See Exhibit 8: Component 2 GIS Constraints Map for detailed maps showing the Proposed Route for Component 2.

<u>Component 3:</u>

The Siting Team combined the refined existing centerline in the Circle Drive Focus Area, the Rebuild Route, the reroute segment in the Route 220 Focus Area, and the Eastern 69-kV Rebuild Segment in the Smith River Focus Area into the Proposed Route for Component 3 (Exhibit 3). The Proposed Route for Component 3 is approximately 25.5

miles long. See Exhibit 9: Component 3 GIS Constraints Map for detailed maps showing the Proposed Route for Component 3.

Q. WHAT IS THE BASIS FOR THE SITING TEAM'S SELECTION OF THE PROPOSED ROUTE?

A. **Component 1:**

Section 4.0 of the Component 1 Siting Study provides the qualitative and quantitative analysis for the six alternative routes considered based on potential impacts to the natural and human environment, land use and local communities, constructability, engineering considerations, and cultural resources. In summary, the Siting Team recommends Alternative Routes C (12.5 miles) and E (12.0 miles) as the Proposed Route (24.5 miles) because they minimize overall impact to the surrounding community, maximize paralleling an existing transmission line ROW and take landowner feedback into consideration to the extent practical (see Section 5.0, Component 1 Siting Study). Public stakeholder input strongly favored Alternative C since it was located away from the residential and more visually open areas, as well as provided the best option to minimize existing and future land use conflicts. Alternative E generally parallels the City of Danville's existing transmission line ROW, which was heavily favored by the public and follows federal and state guidelines to use or parallel existing ROWs. Alternative Route E minimizes new visual impacts by paralleling this existing line and remaining cohesive with the existing visual character of the area. Additionally, Alternative D crosses an unfragmented mountain area and would require more access roads resulting in associated visual and environmental impacts.

Component 2:

Section 5.0 of the Component 2 Siting Study provides the qualitative and quantitative analysis for the Rebuild Route and the two alternative routes considered based on potential impacts to the natural and human environment, land use and local communities, constructability, engineering considerations, and cultural resources. In summary, the Siting Team recommends Alternative Route B (3.5 miles) and the Rebuild Route (18.5 miles) as the Proposed Route (22.0 miles). The Proposed Route follows federal and state guidelines to use or parallel existing ROWs, thereby, minimizing new ROW and impacts to the natural and human environment. The Proposed Route's Alternative Route B also avoids land use and engineering conflicts with the Patrick County Hospital, minimizes proximity to residences, and minimizes crossings of the scenic South Mayo River (see Section 6.0, Component 2 Siting Study).

Component 3:

After the public open house meetings, multiple refinements were made to the study segments, including dismissal of the study segments in the Circle Drive Focus Area and the Smith River Focus Area (see Section 5.0, Component 3 Siting Study) based on landowner input, further engineering and siting analysis. Section 7.0 of the Component 3 Siting Study provides the qualitative and quantitative analysis for the Proposed Route based on potential impacts to the natural and human environment, land use and local communities, constructability, engineering considerations, and cultural resources. In summary, the Siting Team recommends the combination of the Rebuild Route, the refined existing centerline in Circle Drive Focus Area, the Reroute Segment in Route 220 Focus Area, and the Eastern 69-kV Rebuild Segment in the Smith River Focus Area as the Proposed Route as they minimize new ROW and impacts to the visual, human, and natural environments by primarily using the existing transmission line ROW for much of its length.

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 DURING ROUTE DEVELOPMENT?

A: Yes. The siting team used the EJSCREEN (2023) tool, developed by the USEPA, and referenced data from the United States Census Bureau-ACS. It is POWER's and 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.

Component 1:

The majority of Patrick County exceeds the threshold of a low-income EJ community as defined by the Act. Therefore, all six Component 1 Alternative Routes cross these communities and cannot avoid them. However, Alternative Routes E (Proposed Route) and F cross the edge of one additional EJ Census Block Group ("CBG") (see Map 6 of the Component 1 Siting Report) for approximately 6.0 miles. This is a result of Alternative Routes E and F paralleling an existing transmission line for most of its length located near scattered residential development, whereas, Alternative Route D crosses an undeveloped, mountainous area for a large portion of its length. Alternative Route E was preferred by the public, follows federal and state guidelines concerning paralleling existing ROWs, and avoids crossing an unfragmented, rugged mountainous area that would require more access roads resulting in more environmental impacts. As a result, the Siting Team had to weigh EJ impacts with public preference and overall impacts. The Siting Team concluded (i) Alternative Route E's EJ impacts can be mitigated by being adjacent to an existing transmission line and maximizing distance from the residences as practical and (ii) Alternative Route E is the most suitable route.

Components 2 and 3:

Components 2 and 3 will largely be rebuilt within or near the existing transmission line ROW within low-income EJ communities. However, Component 3's Proposed Route crosses one CBG that exceeds both state averages for percentage of low-income communities and communities of color west of Stanleytown. Component 3's Proposed Route is not anticipated to disproportionately impact these communities given that the transmission line is being rebuilt in existing ROW, is set back further away from residential areas, and is on the edge of the CBG. Relocating the Project from its current location would result in crossing other similar EJ communities and was not considered a reasonable alternative for the Project.

Overall, 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). The Company will continue to engage all affected landowners, including EJ Communities (as defined in the Act) throughout the duration of the Project. For more details regarding CBG data, see Component 1 Siting Study, Sections 4.1.2.5 and 4.2.2.5; Component 2 Siting Study, Section 5.3; and Component 3 Siting Study, Section 6.3.

Q. HAS THE COMPANY ENGAGED, AND WILL IT CONTINUE TO ENGAGE, ANY 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 (see the Siting Studies in Volume 2 for additional information regarding outreach efforts and EJ communities). Additionally, there was an adult assisted living center, Harmony Hall Assisted Living Facility, which is located adjacent to the proposed Smith River Substation as part of Component 3. The Siting Team has been coordinating with the facility since 2021. As of May 2023, however, the Company was informed that Harmony Hall is closing in perpetuity. In an effort to minimize impacts to adjacent residences (located across the road on Fairystone Parkway Route 57), a faux brick wall is planned around the proposed Smith River Substation. See the Component 3 Siting Report in Volume 2 of the Application for additional details. The Company will continue to engage all community members affected by the Project throughout detailed engineering and construction of the Project.

Q: DOES THE PROPOSED ROUTE CROSS ANY PARCELS SUBJECT TO CONSERVATION EASEMENTS?

A: The Proposed Route for Component 1 crosses one parcel subject to a conservation easement based on available data, but the Proposed Route is located across the northern panhandle of the parcel and the conservation easement areas are located along the southern and southeastern boundaries of the parcel, away from the Proposed Route. The

Rebuild Route portions of the Proposed Routes for Components 2 and 3 cross several parcels subject to VOF easements. However, the Company plans to stay in the existing ROW on these parcels. The Company has been in contact with VOF and will continue coordination.

The Rebuild Route in the Proposed Route for Component 3, just north of the proposed Smith River Substation, crosses several parcels subject to a conservation easement from the Blue Ridge Land Conservancy. The Company has been in contact with the land conservancy and property owner and will continue coordination as necessary. The Proposed Route for Component 2 crosses the Blue Ridge Parkway, a National Parkway, within the ROW of the existing transmission line. The Company has been in contact with the Blue Ridge Parkway and will continue coordination.

Q. PLEASE DESCRIBE ANY IMPACTS TO THE VIEWSHED OF THE BLUE RIDGE PARKWAY.

A. The impacts of the proposed Project will be similar to the impacts that will occur during routine ROW maintenance and vegetation clearing on the existing transmission line, which will need to be addressed soon. Therefore, low additional visual impacts are expected as a result of the Project. The Company will coordinate the existing line maintenance and rebuild construction with the Parkway. For a visual simulation, see Component 2 VDHR Pre-Application Analysis Attachment B located in Volume 3 of the Application.

Q: DOES THE PROJECT CROSS ANY SCENIC BYWAYS?

A: The Component 1 Proposed Route and Component 2 Proposed Route cross Route 8, a designated scenic road by Virginia Department of Transportation. The Component 2

Proposed Route will cross Route 8 in its current ROW location and the proposed structure locations will be near the existing structures. The Component 1 Proposed Route will introduce a new crossing of Route 8; however, the proposed structures will be offset from the road and the Component 1 Proposed Route parallels an existing and comparable 69-kV transmission line that crosses Route 8, thereby having minimal impacts on the existing visual character. The Component 3 Proposed Route does not cross any scenic byways.

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

A. No. Where applicable, habitat studies or species-specific surveys will be conducted prior to construction to ensure protected species impacts are avoided or mitigated to the extent practicable. Compliance with existing regulations and laws relating to protected species is of high importance to Appalachian Power and POWER.

Q. ANY OTHER POTENTIAL ENVIRONMENTAL ISSUES RELATED TO THE PROJECT THAT YOU WANT TO DISCUSS?

A. Our VDEQ Supplement and Siting Reports further discuss the environmental impacts in detail; however, the proposed Stoneleigh and Smith River Substation sites required early historical work and VDHR coordination beyond our typical due-diligence (e.g., wetland delineations and archaeological tests).

Q. PLEASE EXPLAIN THE ADDITIONAL HISTORICAL WORK AT STONELEIGH SUBSTATION.

A. The Hordsville Enslaved/Freed African American Cemetery[1], a small, historically black

[1] DHR IDs 044-5177 / 44HR0220

cemetery, is located between the proposed Stoneleigh Substation site and the Appalachian Power's existing service center to the north. Therefore, POWER and the Company (i) completed ground-penetrating-radar ("GPR") studies to delineate the cemetery extents, (ii) began coordination with VDHR, (iii) completed a Phase I VDHR Study, (iv) collected input from local stakeholders, (v) completed a preliminary site development design to check limits of construction, and (vi) plan to maintain a 25 to 50-foot buffer between the cemetery and substation construction limits. Based on this initial and on-going coordination, VDHR has recommended the cemetery for further study. POWER and the Company will continue coordination with local stakeholders and VDHR on further studies, but do not expect any unmitigable issues.

Q. PLEASE EXPLAIN THE ADDITIONAL HISTORICAL WORK AT SMITH RIVER SUBSTATION.

A. Smith River Substation site is located on an empty, cleared field which was previously the location of factory worker housing for Bassett Furniture Company's operations with potential historical value. Archaeological test pits revealed some housing artifacts. POWER and the Company has been coordinating with VDHR on further studies, but do not expect any unmitigable issues.

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:

A-1: PROPOSED PROJECT DESCRIPTION

Appalachian Power Company's ("Appalachian" or "Company") proposed Stuart Area 138-kV Transmission Improvements Project (the "Project") is a comprehensive solution which upgrades the 60 to 100-year-old-electrical system for a large area of Carroll, Patrick, Floyd, and Henry Counties (the "**Stuart Area**" as shown in the below **Figure 1**, or the enlarged version as **Exhibit 1**).

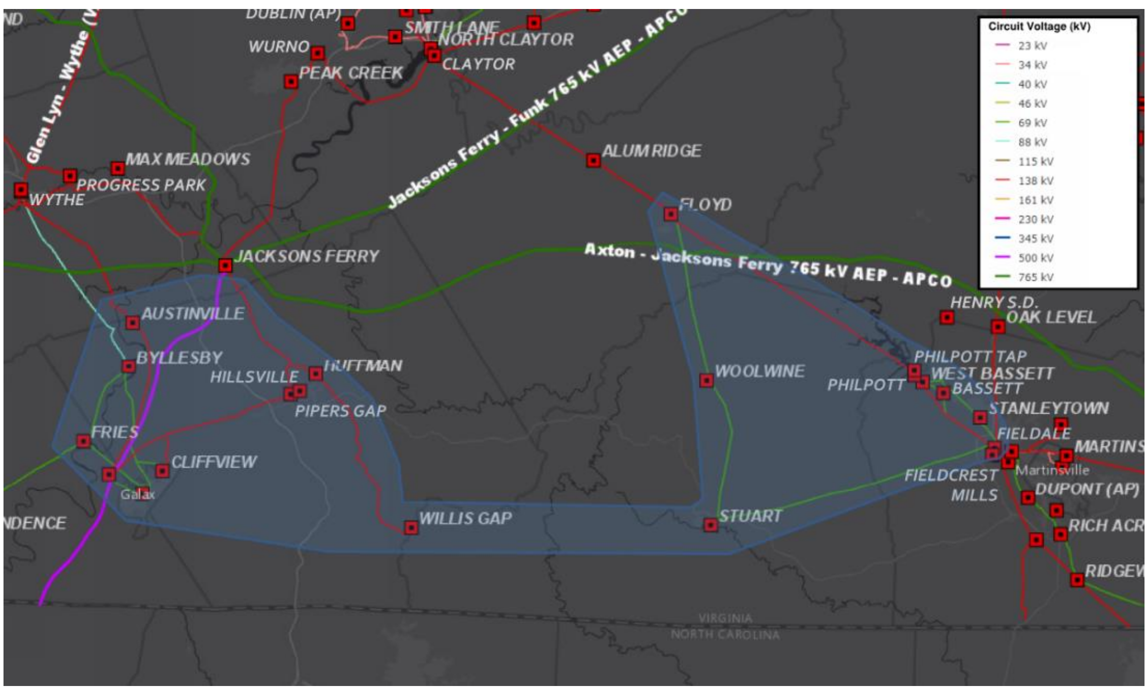


Figure 1: Stuart Area
(Enlarged version can be found at **Exhibit 1**)

The Project converts the existing, deteriorating 69-kV and 138-kV transmission system in the Stuart Area to a modern, robust 138-kV system and provides a new source to the existing Willis Gap 138-kV Substation and the new Mayo River 138-kV Substation located near Stuart, Virginia, which replaces the existing Stuart 69-kV Substation. As a result, aging equipment needs will be addressed and power delivery to the Stuart Area and reliability will be significantly improved. The Project generally consists of the rebuild of approximately 47.5 miles of transmission line; construction of four new 138-kV substations; and the construction of 24.5 miles of new single-circuit 138-kV transmission line from Willis Gap to Mayo River (see the Project Overview Map, **Figure 2** or the enlarged version as **Exhibit 3**). Once the Project is in service, the retirements of four substations, one switch station, and approximately 32 miles of existing transmission line will be completed as separate ordinary extensions.

The Project is organized into three components (see **Figure 2** below) for discussion purposes, and will be generally constructed in this sequential order to optimize concurrent construction activities and to minimize outages (see Section II.A.10 for construction plan description):

- **Component 1:** Mayo River (Stuart) to Willis Gap Transmission Improvements
- **Component 2:** Mayo River (Stuart) to Floyd Transmission Improvements
- **Component 3**: Mayo River (Stuart) to Bassett Area Transmission Improvements

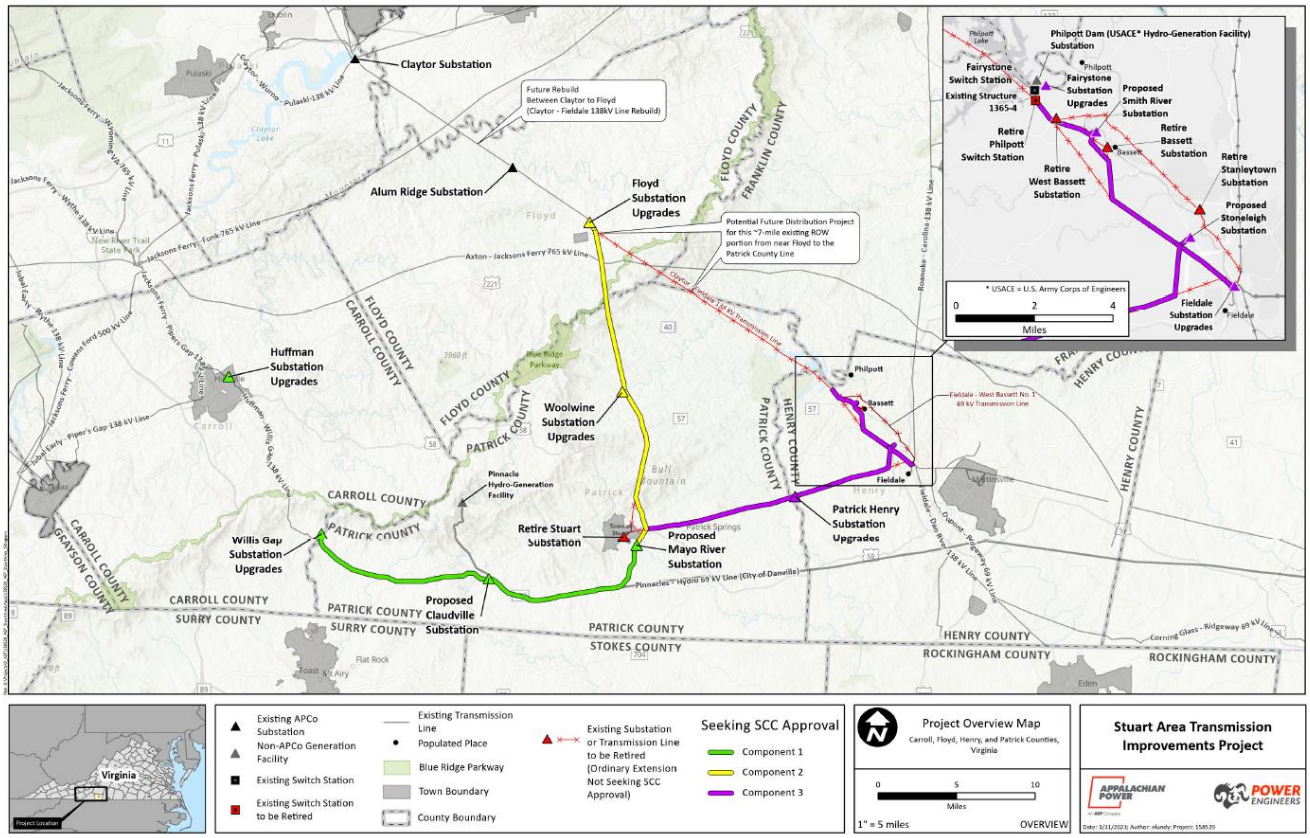


Figure 2: Project Overview Map
(Enlarged version can be found at **Exhibit 3**)

The Company proposes the following improvements (Components 1 through 3) for which it is seeking Virginia State Corporation Commission ("SCC") approval, as depicted on **Figure 2** above and **Exhibit 3** (Project Overview Map):[1]

<u>Component 1:</u>

1a. Construction of approximately 24.5 miles of new 138-kV transmission line between the existing Willis Gap 138-kV Substation in Carroll County and a new Mayo River 138-kV Substation near Stuart, Virginia (the proposed "Mayo River – Willis Gap 138-kV Transmission Line").

1b. Construction of a new Mayo River 138-kV Substation, which replaces the existing Stuart 69-kV Substation. It will include one 16-foot x 36-foot control building, six 138-kV circuit breakers, five 138-kV Motor Operated Air Break ("MOAB") switches, two 138-kV Circuit Switchers, one 14.4 megavolt ampere ("MVA") reactive cap bank, two 138/34.5-kV 30 MVA transformers, six 34.5-kV regulators, and eight 34.5-kV circuit breakers.

1c. Construction of a new Claudville 138-kV Substation approximately midway (11 miles east of Willis Gap) on the new Mayo River – Willis Gap 138-kV Transmission Line. It will include one 16-foot x 27-foot control building, two 138-kV circuit breakers, three 138-kV MOAB switches, three 138-kV three phase Coupling Capacitor Voltage Transformers ("CCVTs"), one 138-kV wave trap, one 138-kV double box bay structure, one 138/34.5-kV 30 MVA transformer, one 138-kV high side circuit switcher, one 34.5-kV box bay structure, three 34.5-kV regulators, and four 34.5-kV low side circuit breakers.

1d. Upgrades at the existing Willis Gap 138-kV Substation, which will include one 16-foot x 18-foot control building, two 138-kV load break switches, three 138-kV single phase CCVTs, one 138-kV wave trap, six 34.5-kV load break hook stick switches, three 34.5-kV Potential Transformers ("PT"), one 34.5-kV station service transformer, and a new 138-kV line position and dead-end that will be installed within the existing substation fence.

1e. Upgrades at the existing Huffman 138-kV Substation, which will include removal of the existing bypass switch at the line terminal to the Wills Gap substation and the installation of three new CCVTs and a wave trap to properly communicate with the new Claudville 138-kV Substation. The bus tie switch will be removed and jumpers installed in its place.

1f. Associated telecommunication upgrades.

<u>Component 2:</u>

2a. Rebuild approximately 22 miles of the existing Floyd – Stuart 69-kV line to 138 kV between the new Mayo River 138-kV Substation, the existing Woolwine 69-kV Substation (to be upgraded to 138 kV), and the existing Floyd 69/138-kV Substation (to be upgraded). The majority of the transmission line rebuild will be

[1] Additionally, see confidential **Exhibit 6-C** (Existing and Proposed Transmission Line Circuit Configurations) and confidential **Figures 3-C and 4-C** (Existing and Proposed One-Line Diagrams) for further information on the existing and proposed electrical systems.

located in or near existing right-of-way ("ROW"), with the exception of an approximate 3.5-mile portion of the line to be built in new ROW to integrate the proposed rebuilt transmission line(s) into the new Mayo River 138-kV Substation and to avoid land use conflicts.

2b. Conversion of the existing Woolwine 69-kV Substation to 138 kV, which includes replacement of the existing 69-kV bus structure with a new 138-kV bus structure built for in-and-out configuration with Auto-Sectionalizing MOAB. Additional equipment that will be installed includes three 138-kV MOAB switches, one 138-kV circuit switcher, 138/34.5-kV 30 MVA transformer, one 34.5-kV box bay structure, three 34.5-kV regulators, and one low side circuit breaker.

2c. Expansion and conversion of the existing Floyd 69/138-kV Substation, which includes removal of the existing 138-kV lattice structure, 138/69/34.5-kV transformer, 69-kV box bay structure, 34.5-kV box bay structure, and existing control building. New installation will include one 138-kV double box bay structure, three 138-kV circuit breakers, three 138-kV MOAB switches, one 138-kV circuit switcher, one 138/34.5-kV 30 MVA transformer, one 34.5 kV box bay structure, three 34.5 kV regulators, and four low side circuit breakers.

2d. Associated telecommunication upgrades.

<u>Component 3:</u>

3a. Rebuild approximately 25.5 miles of existing 69-kV transmission line to 138 kV from north of the new Mayo River 138-kV Substation, to the new Stoneleigh 138-kV Substation, to the existing Fieldale 138-kV Substation, to the new Smith River 138-kV Substation, and to the Structure No. 1365-4, located near the existing Philpott 138-kV Switch Station, as seen in **Exhibit 3**. The existing Structure No. 1365-4 will be constructed later in 2023 associated with a separate project (described below under the heading "Other separate, existing, future and conceptual work in the Project area for which the Company is not seeking SCC approval in this Application," first bullet item). The 25.5 miles includes the rebuild of approximately 0.7 miles of the existing Claytor-Fieldale 138-kV Transmission Line between the existing Philpott 138-kV Switch Station and the existing West Bassett 69/138-kV Substation. The majority of the line rebuild is in or near existing ROW, with the exception of approximately 3 miles of transmission line to be built in new ROW to integrate the proposed rebuilt transmission lines into the new substations and system.

3b. Construction of a new Stoneleigh 138-kV Substation, which replaces the existing Stanleytown 69-kV Substation). It includes the installation of one 16-foot x 18-foot control building, three 138-kV MOAB switches, one 138-kV double box bay structure, one 138/12-kV 25 MVA transformer, one 138-kV high side circuit switcher, one 12-kV box bay structure, three 12-kV regulators, and four 12-kV low side circuit breakers.

3c. Construction of a new Smith River 138-kV Substation, which replaces the existing Bassett 69-kV and West Bassett 69/138-kV substations. It includes the installation of five 138-kV circuit breakers, five 138-kV MOAB switches, five 3-phase 138-

kV CCVTs, two 138-kV circuit switchers, one 138/34.5-kV 30 MVA transformer, one 34.5-kV box bay structure, three 34.5-kV regulators, four 34.5-kV low side circuit breaker, one 138/12-kV 25 MVA transformer, one 12-kV box bay structure, three 12-kV regulators, and four 12-kV low side circuit breakers.

3d. Conversion of the existing Patrick Henry 69-kV Substation to 138 kV, which will include three high-side 88-kV Maximum Continuous Operating Voltage surge arresters, new jumpers to the high-side CCVTs, and new bus connections to the high side of the main substation transformer.

3e. Upgrades at the existing Fieldale 138-kV Substation, which will include upgrading substation relays and retirement of 69-kV equipment associated with the existing West Bassett and Stuart 69 kV-line terminals.

3f. Minor upgrades at the Fairystone 138-kV Substation (Transclosure) will be made to accommodate the new Philpott Dam – Smith River 138-kV line. The relay settings and line protection to the Smith River Station will be upgraded to current differential protection due to the addition of OPGW on the transmission line. This work will be within the existing substation fence and no expansions are necessary.

3g. Associated telecommunication upgrades.

Ordinary extension work and retirements for which the Company is not seeking SCC approval in this Application, but providing for context, include the below. The retirements described are no longer needed once the Project is in service (see **Figure 2** or **Exhibit 3**, Project Overview Map).

- Retire approximately 19 miles of the Claytor – Fieldale 138-kV Transmission Line between the existing Floyd 69/138-kV Substation and the existing Philpott 138-kV Switch Station located north of Bassett, Virginia.
- Retire approximately 7 miles of the Fieldale – West Bassett No. 1 69-kV Transmission Line located in Bassett, Virginia.
- Retire portions of the Claytor – Fieldale 138-kV Transmission Line between the West Bassett 69/138-kV Station and the Fieldale 138-kV Substation totaling approximately 6 miles.
- Retire the existing Stuart 69-kV Substation, Stanleytown 69-kV Substation, Bassett 69-kV Substation, Philpott 138-kV Switch Station, and the West Bassett 69/138-kV Substation. These facilities are no longer needed once the Project is in-service (see Company witness Bledsoe's direct testimony concerning the substation retirements).
- Associated distribution upgrades.

Other separate, existing, future, and conceptual work in the Project area for which the Company is not seeking SCC approval in this Application, but providing for context, includes the following (see **Figure 2** or **Exhibit 3,** Project Overview Map):

- **Existing Project:** Rebuild of approximately 1,700 feet of existing Philpott 138-kV

Tap Transmission Line in need of replacement due to its deteriorated condition within the existing ROW. The line name will change to Philpott Dam – Smith River 138-kV Transmission Line once the Project is completed (see confidential **Exhibit 6-C**, Existing and Proposed Transmission Line Circuit Configurations). This existing rebuild project is located entirely on United States Army Corps of Engineers ("USACE") property between their Philpott Dam 138-kV Substation and transmission line Structure No. 1365-4, which is also the terminus and tie-in point for Component 3, as shown on **Exhibit 3**. This existing work also includes construction of the Fairystone Substation (Transclosure) and Fairystone Switch Station. This short 138-kV rebuild will be completed by Fall 2023 to take advantage of a USACE-planned Philpott Dam Hydroelectric Facility shut down (presently until end of 2023) and planned de-energization of this short line extension. The Company does not intend to file an SCC application for this ordinary extension work.

- **Existing Project:** Construction of the new Patrick Henry 69/138-kV Substation located in Henry County (near the Henry and Patrick County boundary line). The new substation is adjacent to the existing Fieldale – Stuart 69-kV Transmission Line and will connect to it with three new 138-kV transmission line structures. The distribution substation will be completed by the end of 2025 and is designed to convert to 138 kV once the existing 69-kV line is rebuilt to 138 kV as part of the proposed Stuart Area 138-kV Transmission Improvements Project. The Company has received local approvals and does not intend to file a SCC application for this ordinary extension to address local distribution issues.
- **Future Project**: Rebuild of approximately 18 miles of the Claytor – Fieldale 138-kV Transmission Line between the existing Floyd 69/138-kV Substation and the existing Claytor 138-kV Substation. This rebuild and the proposed Project were included in the Company's PJM submittal (No. s2179) since both address improving the area's transmission system. The Claytor – Fieldale 138-kV Transmission Line Rebuild, however, will be a separate future SCC filing with independent asset renewal driver – this rebuild and the proposed Project would be completed with or without the other.
- **Conceptual Project:** A potential future distribution project may be necessary approximately eight miles southeast of Floyd Substation near the Patrick and Franklin County line. This distribution project would utilize about seven of the 19 miles of the to-be-retired Claytor – Fieldale 138-kV Transmission Line 100-foot ROW from near the Floyd Substation, across the Blue Ridge Parkway, and to near the Patrick County boundary line and Route 40. This distribution project is conceptual only and has not been developed and a SCC application determination will be completed later once the need and the scope are defined.

A-2: PROJECT JUSTIFICATION

The following describes the need, necessity, and justification for the three proposed Project components.

Project Justification for Component 1

The transmission improvements in Component 1 will address four identified needs in the Stuart Area. First, the new Mayo River – Willis Gap 138-kV Transmission Line will establish two-way service to the existing radially-fed Willis Gap 138-kV Substation and will provide an additional 138-kV source to the proposed Mayo River 138-kV Substation, thus improving reliability. The existing Willis Gap 138-kV Substation serves approximately 25 MVA of peak load and is currently served solely by the 14.5-mile Huffman – Willis Gap 138-kV Transmission Line, over very rugged mountainous terrain from the Huffman 138-kV Substation. See existing system map, **Figure 1**. From a planning perspective, the Company recommends addressing the 14.5-mile radial line serving a load of this size. Additionally, the Willis Gap Substation has limited distribution load transfer capability making the need for a second transmission source more critical.

The Project also provides a new source to the existing Huffman 138-kV Substation located in Carroll County, Virginia from the Willis Gap 138-kV Substation and the proposed Mayo River – Willis Gap 138-kV Transmission Line (see **Figure 2**). Currently, there is a total of approximately 200 MVA of load being served from the 138-kV and 69-kV networks throughout Carroll County, Wythe County, Grayson County, and the City of Galax (the "Huffman Area"). Approximately 140 MVA of this load is served from the 138-kV transmission line circuits from Jacksons Ferry to Wythe and Huffman to Jacksons Ferry. The 69-kV network around communities of Cliffview, Galax, and Fries serves approximately 60 MVA of the load. See existing system map, **Figure 1**. Under N-1-1 contingency scenarios involving the 138-kV sources, there is the potential to drop all 200 MVA of this load. With the availability of the new Mayo River – Willis Gap 138-kV Transmission Line source to the Huffman Area, the identified N-1-1 contingency scenario issues are resolved.

Furthermore, the proposed Mayo River – Willis Gap 138-kV Transmission Line provides a transmission source for a new Claudville 138-kV Substation. Distribution planners identified the need for the new Claudville Substation to be located approximately midway (11 miles from Willis Gap) between the existing Willis Gap and proposed Mayo River Substations to sectionalize the lengthy and exposed 34.5-kV distribution circuits currently served from the Willis Gap and Stuart Substations. The proposed distribution substation will establish new 34.5-kV feeders by splitting up the existing Willis Gap/Ararat distribution feeders (174 circuit miles) and the existing Stuart/Carroll distribution feeders (267 circuit miles). As a result, the new substation will sectionalize and decrease exposure on a total of 441 miles of existing distribution circuits.

Project Justification for Components 2 and 3

The transmission improvements in Components 2 and 3 will address asset renewal needs on the impacted assets as well as consolidate transmission infrastructure by eliminating 69-kV infrastructure in favor of building out a more modern, resilient, and reliable 138-kV system. Over 80 miles of existing transmission line will be retired or rebuilt and five substations will be retired or rebuilt. See **Table 1** below.

Table 1: Transmission Line Approximate Mileages

Transmission Line Approximate Mileages (Preliminary)						
	Line Name	**Component**	**From**	**To**	**Typical Project Type**	**Approximate Mileage**
Retirement	Floyd-Stuart 69kV Line	2	Stuart	Woolwine	Retirement[1]	9.9
			Woolwine	Floyd	Retirement[1]	11.0
	Woolwine Loop 69kV Line	2	Str. 599-75A/B	Woolwine	Retirement[1]	0.3
	Fieldale-Stuart 69kV Line	3	Fieldale	Str. 484-124A	Retirement[1]	7.9
			Str. 484-126A	Stuart	Retirement[1]	11.1
	Fieldale-West Bassett No. 1 69kV Line	3	Fieldale	Stanleytown	Retirement[2]	2.3
			Stanleytown	West Bassett	Retirement[2]	4.8
	Fieldale-West Bassett No. 2 69kV Line	3	Fieldale	Bassett	Retirement[1]	5.2
			Bassett	West Bassett	Retirement[1]	1.6
	Claytor-Fieldale 138kV Line	3	Floyd	Philpott	Retirement[2]	18.8
			Philpott	West Bassett	Retirement[1]	0.7
			West Bassett	Fieldale	Retirement[2]	6.4
	West Bassett Loop 138kV Line	3	Str. 30-224	West Bassett	Retirement[2]	0.1
	Total Line Retirement					**80.2**
Proposed	Mayo River-Willis Gap 138kV Line	1	Willis Gap	Claudville	New Line	12.5
			Claudville	Mayo River	New Line	12.0
	Mayo River-Woolwine 138kV Line	2	Mayo River	Woolwine	Rebuild	11.0
	Floyd-Woolwine 138kV Line	2	Woolwine	Floyd	Rebuild	11.0
	Mayo River-Smith River 138kV Line	3	Mayo River	Patrick Henry	Rebuild	9.5
			Patrick Henry	Stoneleigh Tap	Rebuild	7.5
			Stoneleigh Tap	Smith River	Rebuild	4.0
	Fieldale Extension 138kV Line	3	Fieldale	Stoneleigh Tap	Rebuild	2.0
	Stoneleigh Extension 138kV Line	3	Stoneleigh Tap	Stoneleigh	New Line	0.5
	Philpott Dam-Smith River 138kV Line	3	Smith River	Str. 1365-4	Rebuild	2.0
	Total Proposed Line					**72.0**

1) Denotes transmission line segments that will be converted and rebuilt.

2) Denotes tranmission line segments that will be retired under an ordinary extension. The Company is not seeking approval for rebuilding these assets as part of this filing.

As of July 1, 2023, American Electric Power's ("AEP") transmission system consists of approximately 40,000 miles of transmission lines; 3,600 substations; 5,000 power transformers; 8,000 circuit breakers; and operating voltages between 23 kV and 765 kV in three different RTOs, all of which connects 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 an internal document titled *AEP Transmission Planning Criteria and Guidelines for End-Of-Life and Other Asset Management Needs*, a current copy of which is included as **Exhibit 4**. This document outlines 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 - 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 (*i.e.*, wood, steel, lattice), conductor type, static wire type, shielding and grounding design criteria, and National Electric Safety Code ("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 also 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 - Solution Development

During the Solution Development stage, 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 - 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 following transmission lines located within the geographical areas of Components 2 and 3 needed to be replaced due to the combination of unacceptable condition, performance, and risk of the infrastructure:

- Component 2
  - Floyd – Stuart 69-kV Transmission Line
- Component 3
  - Claytor – Fieldale 138-kV Transmission Line
    - Segment from Floyd Substation to Fieldale Substation
  - Fieldale – Stuart 69-kV Transmission Line
  - Fieldale – West Bassett No. 1 69-kV Transmission Line
  - Fieldale – West Bassett No. 2 69-kV Transmission Line

In Component 2, the Floyd – Stuart 69-kV single-circuit, wood transmission line structures were primarily installed in 1939. The typical wood structure used during the time of construction in the 1930s fails to comply with current NESC Grade B loading criteria. Lines built before 1977 are not designed for NESC Extreme Wind and NESC Concurrent Ice and Wind load cases. The lack of this design criteria, along with the aging condition of the facilities, makes these lines more vulnerable to failures during severe weather events. Additionally, this line predominantly uses 4/0 Aluminum Conductor Steel Reinforced (“ACSR”) 6/1 “Penguin” conductors, which were installed in 1954 and which are beyond their projected life.

There are several lines of various ages associated with Component 3. The Claytor – Fieldale 138-kV single-circuit, wood transmission line segment from Floyd Substation to Fieldale Substation primarily has structures that were installed in 1948. This line predominantly uses 556,500 CM ACSR 26/7 “Dove” conductors, which were installed in 1948. The Fieldale – Stuart 69-kV single-circuit, wood transmission line structures were primarily installed in 1939. This line is comprised entirely of 336,400 CM ACSR 30/7 “Oriole” conductors, which were installed in 1939. The Fieldale – West Bassett No. 1 69-kV single-circuit, wood transmission line structures were primarily installed in 1926. This line predominantly uses a mixture of 4/0 ACSR 6/1 “Penguin” and 556,500 CM ACSR 26/7 “Dove” conductors, which were installed in 1926. The Fieldale – West Bassett No. 2 69-kV single-circuit transmission line structures are primarily wood structures installed in 1962. This line predominantly uses a mixture of 336,400 CM ACSR 30/7 “Oriole” and 556,500 CM ACSR 26/7 “Dove” conductors, which were installed in 1962.

Related to the structural strength of the Component 3 line assets, the typical wood structure used during the time of construction from the 1960s and earlier fails to comply with current NESC Grade B loading criteria. Lines built before 1977 are not designed for NESC Extreme Wind and NESC Concurrent Ice and Wind load cases. The lack of this design criteria, along with the aging condition of the facilities, makes these lines more vulnerable to failures during severe weather events.

There also are some concerning land use compatibility areas where the Fieldale – West Bassett No. 1 69-kV transmission line is located between a river and a railroad. This scenario presents a high risk for timely restoration in the event of an outage and limits the safe operation and maintenance of this asset. Further discussion of the siting constraints are discussed in the testimony of Company witness Santos.

Typical structural and related equipment degradation across all aging transmission lines subject to this Application includes a total of 455 open conditions. Examples of the most common conditions include woodpecker-damaged poles, rotten or corroded crossarms, and rotten poles. The conditions impacting each line are explained in further detail below in Section I.L.

The subject transmission lines carry six electrical circuits:

- Component 2
  - Floyd – Stuart 69-kV Circuit
- Component 3
  - Claytor – West Bassett 138-kV Circuit
  - Fieldale – West Bassett 138-kV Circuit
  - Fieldale – Stuart 69-kV Circuit
  - Fieldale – West Bassett No. 1 69-kV Circuit
  - Fieldale – West Bassett No. 2 69-kV Circuit

As shown below in Section I.K, 44 of the 85 outages recorded in the past five years (2017-2021) were attributed to lightning, including three of the 17 permanent outages, totaling nearly 110 hours of circuit outage time. Permanent outages are defined as outages lasting more than five minutes (0.083 hour). In addition, vegetation contacting the conductors from outside of the Company's ROW accounted for six of the 17 permanent outages, totaling just over 106 hours of circuit outage time.

The customer risk associated with the Project circuits is a combined peak load across Components 2 and 3 of approximately 140 megawatts ("MW"). The documented condition of the subject lines and performance of the subject circuits, discussed herein, further raises the risk of future outage impacts associated with these circuits.

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 s2179 to the Project. The Company developed the Project as a comprehensive solution to address the identified operational and asset renewal needs and is seeking approval to complete this work.

The Project also upgrades the substations in the Stuart Area to make the system more resilient to outages and to improve operational performance. The Stuart 69-kV Substation (in the Town of Stuart) is being retired and replaced by the proposed Mayo River 138-kV Substation, which is being built on a greenfield site to avoid lengthy outages and land use conflicts at the Stuart Substation. In the Bassett Area, the Project also will retire the Stanleytown 69-kV Substation, Bassett 69-kV Substation, West Bassett 69/138-kV Substation, and the Philpott 138-kV Switch Station and replace them with new consolidated substations at the proposed Stoneleigh 138-kV Substation and proposed Smith River 138-kV Substation (see Section I.A.F for more description).

A-3: PROPOSED PROJECT BENEFITS SUMMARY

The proposed Project is a comprehensive, long-term solution resulting in the following benefits:

- Upgrades and replaces transmission facilities and equipment that are 60 to 100 years old with identified asset renewal needs (documented with outage and maintenance history as well as representative photographs later within Section I) to maintain reliable electrical service to the Stuart Area. This includes the retirement and/or rebuild of over 80 miles of aging transmission line and five substations.
- Provides a new independent 138-kV source (the proposed Mayo River – Willis Gap 138-kV Transmission Line) to the currently 14.5 mile, radially fed (single source) Willis Gap 138-kV Substation (which has an approximate 25 MVA load).
- Provides a new 138-kV source from the Willis Gap 138-kV Substation to the Huffman 138-kV Substation and Huffman Area addressing N-1-1 contingency issues and protecting a 200 MVA load and thus eliminating the need for a separate transmission improvement project.
- Adds an additional 138-kV power source to the proposed Mayo River Substation and the Town of Stuart area from the proposed Mayo River – Willis Gap 138-kV Transmission Line.
- Connects the west and east 138-kV transmission systems with the new 24.5-mile

Mayo River – Willis Gap 138-kV Transmission Line resulting in operational benefits, flexibility, and options to minimize outage disruptions (*e.g.*, during maintenance and repairs).

- Adds a new Claudville 138-kV Substation (between Willis Gap and Mayo River Substations) to sectionalize and decrease exposure on 441 miles of existing distribution circuits.
- Improves the existing substation configurations related to automatic sectionalizing during fault events. The existing Stuart Area 69-kV system consists of straight bus configurations, which are more susceptible to system fault events. The proposed Project establishes new 138-kV ring bus configurations at Mayo River (which replaces Stuart) and Smith River (which replaces West Bassett and Bassett) substations, improving the reliability to customers in the Stuart Area.
- Provides a more reliable, robust, comprehensive, and cost-effective electrical solution compared to the Project Alternative (described in Section I.E).
- Supports economic development (per § 56-46.1 A of the Virginia Code) with the increased reliability and capability of the Stuart Area transmission system.
- Overall, the Project converts and upgrades the deteriorating Stuart Area transmission facilities from 69 kV to a modern, reliable, and resilient 138-kV system, improving power delivery to the Stuart Area to support the present electrical load and future load growth.

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:

B-1: ENGINEERING JUSTIFICATION FOR PROJECT

Component 1 pertains to the new Mayo River-Willis Gap 138-kV Transmission Line, which will establish two-way service to Willis Gap as well as providing a new available source to Mayo River (Stuart) and the surrounding area. The associated new Claudville Substation also enhances support for the distribution customers in the area.

Components 2 and 3 address the asset renewal needs on the impacted assets, as well as consolidate transmission infrastructure, by eliminating 69-kV infrastructure in favor of building out a more robust and reliable 138-kV system.

For a detailed description of the engineering justification of the proposed Project, please see Section I.A-2. For additional discussion of the benefits of the Project, see Section I.A-3.

B-2: KNOWN FUTURE PROJECTS

The proposed Project is a robust and comprehensive solution for the area, and there are no known future projects that require the construction of this Project. See earlier Section I.A-1 titled "**Other separate, existing, future, and conceptual work in the Project area for which the Company is not seeking SCC approval in this Application,"** but providing for context.

B-3: PLANNING STUDIES

See Section I.D.

B-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 present system one-line drawing is shown on confidential **Figure 3-C** in Volume 4 and the proposed system one-line drawing is shown on confidential **Figure 4-C** in Volume 4. Additionally, see confidential **Exhibit 6-C** in Volume 4, which shows the existing and resulting proposed transmission line circuit configurations. Project Components 1 through 3 are required to support long-term reliability of the transmission system as well as providing a new source to the Stuart Area.

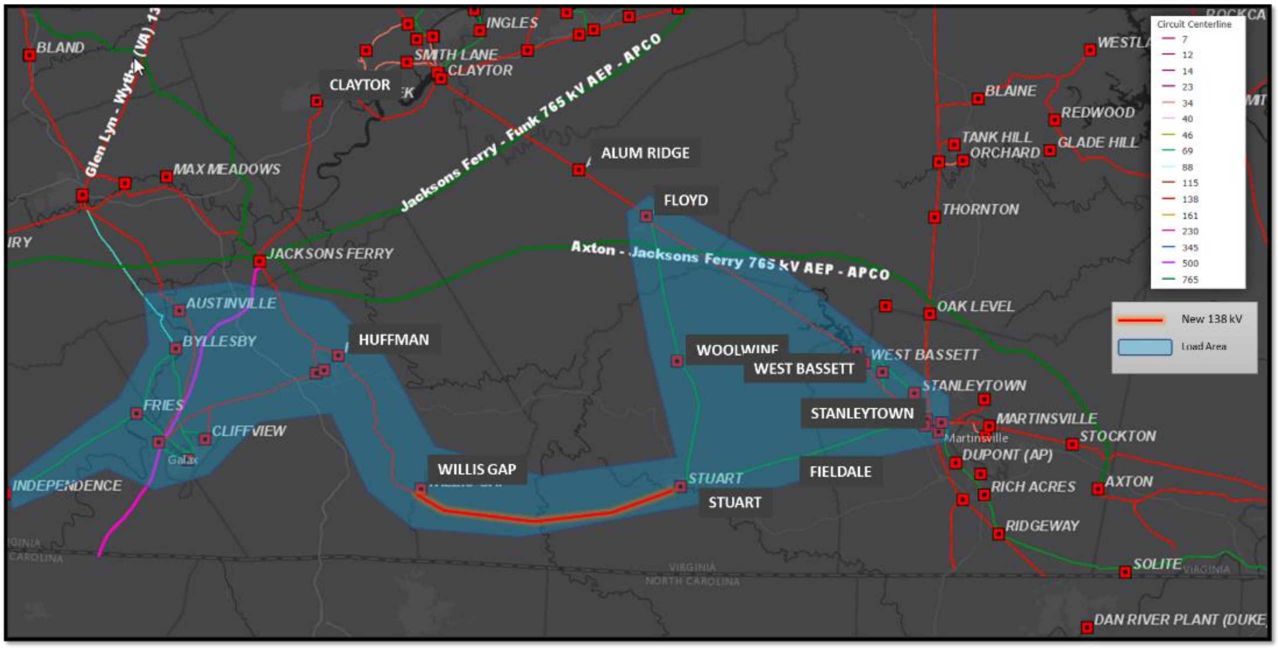


Figure 5: Project Load Area (Stuart Area)

AEP developed a load forecast for the Project Load Area (see above **Figure 5**) using an econometric model that forecasts peak demand. This model had explanatory variables for the gross regional product for Carroll, Grayson, Floyd, Henry, Patrick, and Wythe counties and the City of Galax, 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 winter of 2021/22. Gross county product 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 2 and 3 and **Figures 6 and 7** 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 ten years and the projected summer and winter peak loads for the next ten years.

Table 2: Historical and Forecasted Summer Peak Load Data

Stuart Load Area

	Actual Peak Load (MW)										Projected Peak Load (MW)									
Summer	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Peak	228.5	222.8	215.4	226.6	227.2	228.4	226.2	224.8	234.1	241.9	236.3	238.9	244.3	249.3	253.5	257.5	261.0	263.7	265.9	268.2

Table 3: Historical and Forecasted Winter Peak Load Data

Stuart Load Area

	Actual Peak Load (MW)										Projected Peak Load (MW)									
Winter	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Peak	301.6	372.5	363.6	316.9	324.7	357.7	321.4	287.1	308.7	338.6	333.2	331.9	337.1	342.2	346.9	350.8	354.7	357.7	360.1	362.4

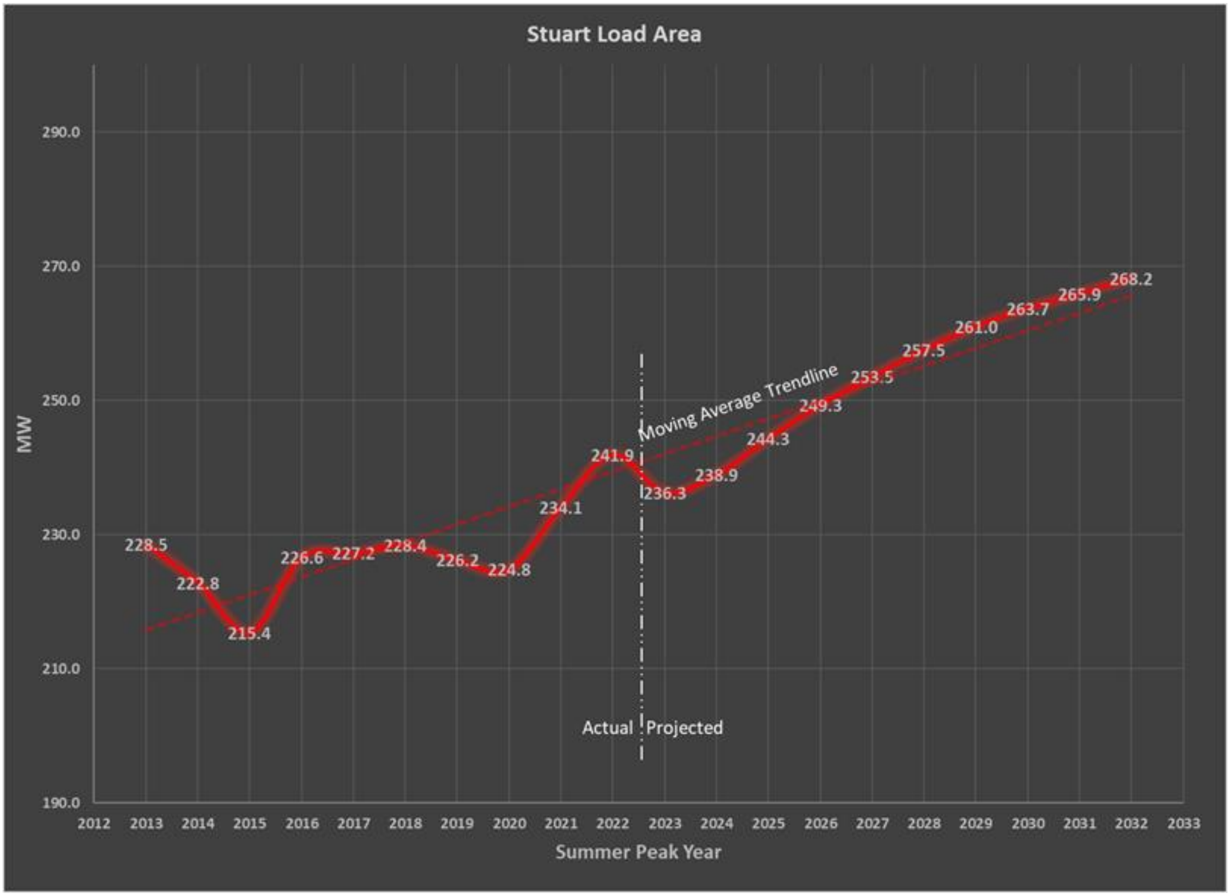


Figure 6: Project Load Area - Historical and Forecasted Summer Peak Load Data

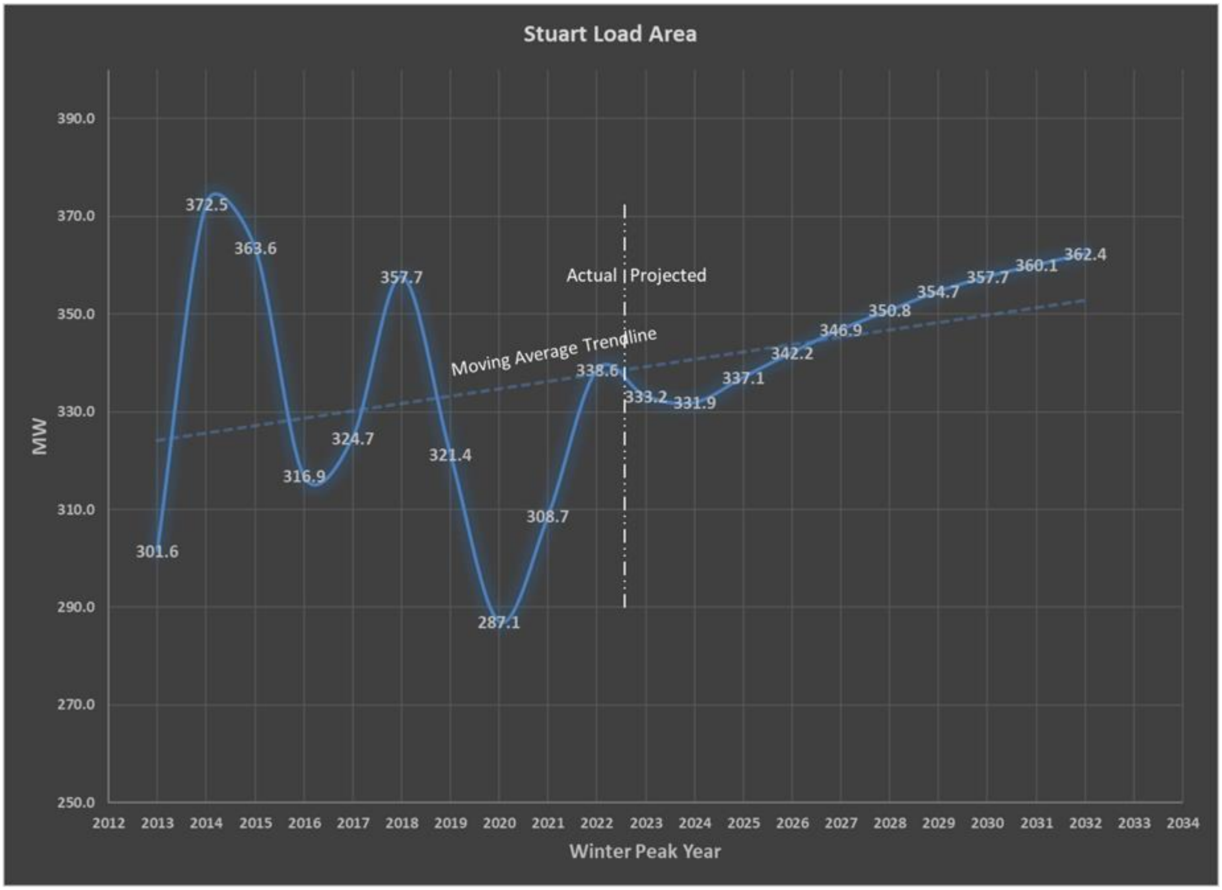


Figure 7: Project Load Area - Historical and Forecasted Winter Peak Load Data

The Project Load Area summer and winter peak demand are anticipated to grow at an average annual rate of approximately 1% over the course of the next ten years, beginning in 2023.

The existing transmission lines cannot continue to adequately serve the needs of the Company and its customers because of the existing infrastructures exhibiting unacceptable condition, performance, and risk as discussed in Section I.A. Completing the Project will support the Company's continued reliable electric service to support the future overall growth in 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 Company considered a project alternative to address the asset renewal needs by rebuilding all the existing Stuart Area 69-kV transmission lines of concern on or near existing ROW to current 69-kV standards, rebuilding all the existing 138-kV transmission lines of concern on or near existing ROW to current 138-kV standards, and replacing the identified substations' 138-kV and 69-kV equipment in need of replacement (see Project Alternative Map, **Figure 8**) (the "Project Alternative"). This would require rebuilding approximately 80 miles of existing 69-kV and 138-kV transmission lines, which is approximately 32 miles more than the proposed Project, including: Claytor-Fieldale 138-kV Transmission Line (approximately 26 miles), Floyd-Stuart 69-kV Transmission Line (approximately 21 mi.), Fieldale-Stuart 69-kV Transmission Line (approximately 19 miles), Fieldale-West Bassett 69-kV No. 1 Transmission Line (approximately 7.0 miles), and Fieldale-West Bassett 69-kV No. 2 Transmission Line (approximately 7.0 miles).

The necessary substation asset replacements for the Project Alternative include: Stuart 69-kV Substation (two 69-kV CBs, 69-kV circuit switcher and identified relays) and West Bassett 69/138-kV Substation (one 138-kV CB, three 69-kV CBs, 138/69/34 kV transformer #1 and identified relays). Additionally, substation upgrades would be necessary at Willis Gap and Huffman similar to the proposed Project. In addition, a new Claudville 138-kV Substation and a new 24.5-mile 138-kV line would be required between the Willis Gap, Claudville, and Stuart Substations as well as a 138/69-kV transformer at Stuart Substation. The Project Alternative does not include any future work that would be needed at the aging and space-constrained Bassett Substation.

The Project Alternative made the initial assumption that replacing equipment at the existing Stuart 69-kV and West Bassett 69/138-kV Substations was possible. However, during the proposed Project development and scoping, expansion restrictions were identified at the Stuart and West Bassett substations as explained in the Company witness Bledsoe's direct testimony. These same expansion restrictions would affect the Project Alternative restricting equipment replacement at the existing sites. Therefore, the Project Alternative includes two new substations and associated line routes similar to the proposed Project: (i) Smith River Substation which replaces existing West Bassett Substation (the existing Bassett Substation, however, would still be necessary in this alternative) and (ii) Mayo River Substation which replaces existing Stuart Substation.

The Project Alternative is approximately 20% more expensive than the proposed Project (largely due to the additional approximate 32 miles of transmission line build/rebuild necessary for the construction of the Project Alternative), is less comprehensive and robust, and does not address future work needs at Bassett Substation. The Project Alternative, therefore, was dismissed early at the conceptual stage. See Section I.I for further discussion on the Project Alternative cost.

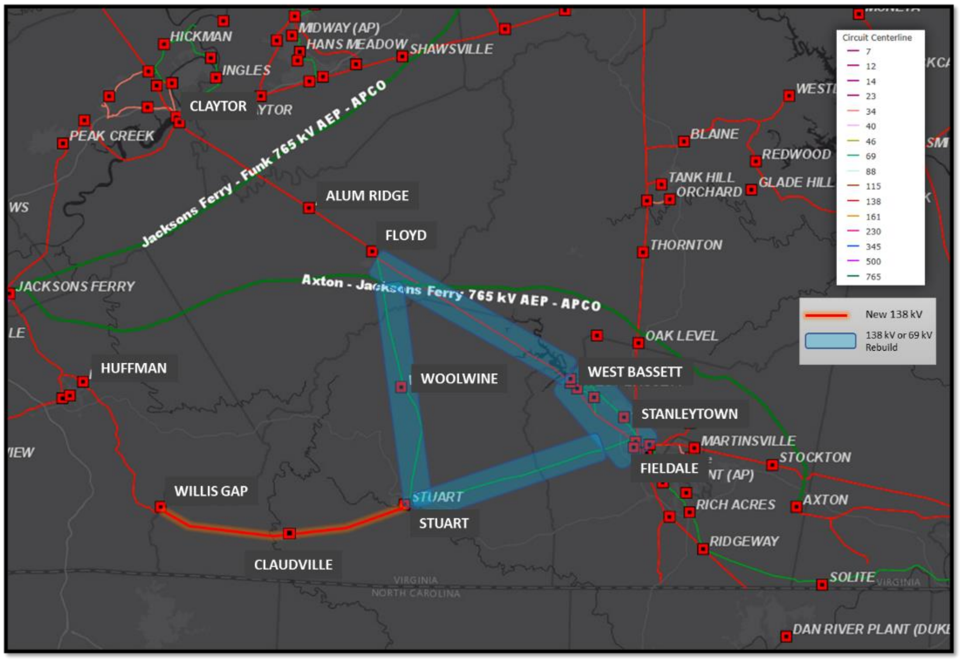


Figure 8: Project Alternative Area Map

While this Project Alternative incrementally addresses the identified aging infrastructure, the proposed Project provides the following significant advantages compared to the Project Alternative:

- Conversion of the local 69-kV system to a more modern, reliable, and resilient 138-kV system.
- Avoidance of building or rebuilding approximately 32 miles of additional transmission line and associated environmental impacts.
- Retirement of approximately 18 miles of 138-kV line (between Floyd and Philpott) and approximately seven miles of 69-kV transmission line (in the Bassett area).
- Avoids future work at Bassett Substation.
- Reduced overall costs.

The proposed Project's 69-kV to 138-kV conversion is the most comprehensive, cost-effective, and long-term solution.

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 current Summer Normal/Summer Emergency/Winter Normal/Winter Emergency (SN/SE/WN/WE) ratings in MVA for transmission line rebuilds are as follows:

- Stuart-Woolwine 69-kV Removal – Rebuild approximately 10 miles of 69-kV line to 138 kV.
    - 44/44/56/56 (MVA)

- Floyd-Woolwine 69-kV Removal – Rebuild approximately 11 miles of 69-kV line to 138 kV.
    - 50/50/63/63 (MVA)
- Fieldale-Stuart 69-kV Removal – Rebuild approximately 19 miles of 69 kV line to 138 kV.
    - 68/75/90/94 (MVA)
- Claytor – Fieldale 138-kV line between the existing Philpott Switch and Fieldale 69/138-kV Substation Removal – Removal of approximately six miles of line.
    - 202/202/258/262 (MVA)
- Fieldale – West Bassett No. 2 69-kV Removal – Rebuild approximately seven miles of 69-kV line to 138 kV.
    - 50/50/63/63 (MVA)

The current Summer Normal/Summer Emergency/Winter Normal/Winter Emergency (SN/SE/WN/WE) ratings in MVA for transmission facilities being retired as a result of the Project are as follows:

- Claytor – Fieldale 138-kV line between the existing Floyd 69/138-kV Substation and the existing Philpott 138-kV Switching Station (to be removed) – Remove approximately 19 miles of 138-kV line.
    - 205/280/258/320 (MVA)
- Fieldale-West Bassett No. 1 69-kV Removal – Remove approximately seven miles of 69-kV line.
    - 50/50/63/63 (MVA)
- Stuart 69-kV Substation
    - 50/50/63/63 (MVA)
- Stanleytown 69-kV Substation
    - 50/50/63/63 (MVA)
- Bassett 69-kV Substation
    - 50/50/63/63 (MVA)
- West Bassett 69/138-kV Substation
    - 50/50/63/63 (MVA)
- Philpott 138-kV Switching Station
    - 50/50/63/63 (MVA)

For further discussion of station retirements, please see the direct testimony of Company witness Bledsoe.

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 3**, 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 for the Project is December 2029, with an estimated design, ROW acquisition and construction time of approximately five years for the Project. A detailed description of the project construction timeline can be found in **Exhibit 5**.

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:

The total proposed Project cost is $423.5M, of which $319.5M is transmission-line-related cost, $101.5M is substation-related cost, and $2.5M is telecom-related cost. These estimates were prepared in 2023 as AEP Detailed Level Estimates based on detailed scopes.

The Project Alternative is a conceptual estimate from 2022 (using 2022 dollars). This Project Alternative cost is approximately 20% more in costs than the total proposed Project cost. The Company calculated such Project Alternative costs by completing a side-by-side comparison of the categories of costs for the Project Alternative (*i.e.*, transmission-related costs, substation-related costs, and telecom-related costs) directly against those categories of costs for the Project, as well as completing a comparison of the associated construction solutions at a conceptual scope level. The cost of the Project Alternative described in Section I.E is approximately 20% more than the total proposed Project cost, largely due to the additional approximate 32 miles of transmission line build/rebuild necessary for the construction of the Project Alternative. Based on a total proposed Project cost of $423.5M, the 20% additional cost for the construction of the Project Alternative equals approximately $496M.

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 s2179. The solution submitted to PJM also includes a future rebuild ("Future Project") between

Floyd and Claytor, which will be filed in a separate later application as described earlier in Section I.A-1.

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 4 through 15**. There are no maintenance records for the Fieldale – West Bassett No. 2 69-kV Line for the period of 2017 to 2021.

Table 4: Component 2 - Floyd – Stuart 69-kV Circuit Outage History

Circuit Outage Cause Summary			
Floyd – Stuart 69 kV Circuit (01/01/2017 – 12/31/2021)			
Date	Cause	Duration (Hours)	CI
10/12/17	Vegetation Fall-In (Outside R/W)	22.05	0
10/1/18	Distribution	0	0
2/7/19	Error - Field	0	0
7/4/19	Weather - Lightning/Tstorm	0	0
7/4/19	Weather - Lightning/Tstorm	0	0
5/22/20	Vegetation Fall-In (Outside R/W)	11.00	0
7/16/20	Weather - Lightning/Tstorm	0	0
9/26/20	Equip-Station-Other	22.70	0
12/24/20	Weather - Ice/Snow	0	0
6/13/21	Weather - Lightning/Tstorm	0	0

Table 5: Component 3 - Claytor – West Bassett 138-kV Circuit Outage History

Circuit Outage Cause Summary			
Claytor – West Bassett 138 kV Circuit (01/01/2017 – 12/31/2021)			
Date	Cause	Duration (Hours)	CI
5/31/17	Distribution	0	0
7/2/18	Weather - Lightning/Tstorm	0	0
8/19/18	Weather - Lightning/Tstorm	0	0
2/24/19	Equip-Station-Relay	0	0
2/24/19	Equip-Station-Relay	0.02	453
2/26/19	Distribution	0	0
4/14/19	Weather - Lightning/Tstorm	0	0
4/21/19	Distribution	0	0
10/26/19	Distribution	0	0
7/17/20	Vegetation Fall-In (Outside R/W)	19.93	0

Table 6: Component 3 - Fieldale – West Bassett 138-kV Circuit Outage History

Circuit Outage Cause Summary			
Fieldale – West Bassett 138 kV Circuit (01/01/2017 – 12/31/2021)			
Date	Cause	Duration (Hours)	CI
8/30/18	Relay Misoperation	0	0
9/1/18	Relay Misoperation	0	0
6/29/19	Weather - Lightning/Tstorm	0	0
12/13/19	Equip-Station-Breaker	71.38	0
5/24/20	Relay Misoperation	0	0
5/24/20	Relay Misoperation	0	0
5/24/20	Relay Misoperation	0	0
5/24/20	Relay Misoperation	0	0
5/24/20	Relay Misoperation	0	0
6/19/20	Weather - Lightning/Tstorm	0	0
6/21/20	Weather - Lightning/Tstorm	0	0
7/11/21	Relay Misoperation	0	0
7/30/21	Relay Misoperation	0	0

Table 7: Component 3 - Fieldale - Stuart 69-kV Circuit Outage History

Circuit Outage Cause Summary							
Fieldale – Stuart 69 kV Circuit (01/01/2017 – 12/31/2021)							
Date	Cause	Duration (Hours)	CI	Date	Cause	Duration (Hours)	CI
3/21/17	Weather - Lightning/Tstorm	0	0	6/7/19	Weather - Lightning/Tstorm	19.85	0
5/24/17	Relay Misoperation	2.40	0	7/2/19	Weather - Lightning/Tstorm	0	0
10/6/17	Unknown	0	0	4/6/20	Weather - Lightning/Tstorm	0	0
10/18/17	Unknown	0	0	6/17/20	Weather - Lightning/Tstorm	0	0
3/1/18	Weather - Wind	0	0	6/17/20	Weather - Lightning/Tstorm	0	0
3/2/18	Vegetation Fall-In (Outside R/W)	28.68	0	6/17/20	Weather - Lightning/Tstorm	0	0
3/31/18	Vandalism	100.58	0	11/8/20	Unknown	0.05	0
7/6/18	Weather - Lightning/Tstorm	0	0	4/21/21	Weather - Wind	0	0
9/1/18	Weather - Lightning/Tstorm	0	0	5/28/21	Weather - Lightning/Tstorm	0.03	0
10/1/18	Distribution	0	0	7/14/21	Weather - Lightning/Tstorm	0.17	0
10/3/18	Weather - Wind	0	0	7/14/21	Weather - Lightning/Tstorm	0	0
2/13/19	Equip-Line-Crossarm	35.07	0	8/11/21	Weather - Lightning/Tstorm	0	0
4/23/19	Weather - Wind	0	0				

Table 8: Component 3 - Fieldale – West Bassett No. 1 69-kV Circuit Outage History

Circuit Outage Cause Summary			
Fieldale – West Bassett No. 1 69 kV Circuit (01/01/2017 – 12/31/2021)			
Date	**Cause**	**Duration (Hours)**	**CI**
5/24/17	Relay Misoperation	2.38	0
3/2/18	Vegetation Fall-In (Outside R/W)	11.42	0
5/31/19	Weather - Lightning/Tstorm	0	0
6/7/19	Weather - Lightning/Tstorm	0	0
2/6/20	Weather - Lightning/Tstorm	0	0
5/24/20	Weather - Lightning/Tstorm	0	0
6/21/20	Weather - Lightning/Tstorm	0	0
7/17/20	Weather - Lightning/Tstorm	0	0
7/28/20	Weather - Lightning/Tstorm	0	0
7/28/20	Weather - Lightning/Tstorm	0	0
7/28/20	Weather - Lightning/Tstorm	0	0
8/3/20	Weather - Lightning/Tstorm	0	0
8/3/20	Weather - Lightning/Tstorm	0	0
8/3/20	Weather - Lightning/Tstorm	0	0
8/12/20	Weather - Lightning/Tstorm	0	0
8/12/20	Weather - Lightning/Tstorm	0	0
9/1/20	Weather - Lightning/Tstorm	0	0
9/22/21	Vegetation Grow-In	37.52	0

Table 9: Component 3 - Fieldale – West Bassett No. 2 69-kV Circuit Outage History

Circuit Outage Cause Summary			
Fieldale – West Bassett No. 2 69 kV Circuit (01/01/2017 – 12/31/2021)			
Date	Cause	Duration (Hours)	CI
5/24/17	Relay Misoperation	2.38	0
8/30/18	Weather - Lightning/Tstorm	0	0
9/11/18	Weather - Lightning/Tstorm	0	0
1/10/19	Vegetation Fall-In (Outside R/W)	13.23	0
4/29/19	Error - Field	0	0
5/31/19	Weather - Lightning/Tstorm	0	0
6/7/19	Weather - Lightning/Tstorm	89.85	0
7/10/20	Weather - Lightning/Tstorm	0	0
8/11/21	Weather - Lightning/Tstorm	0	0

Table 10: Components 2 and 3 - Appalachian (VA) Circuits Annual Outage Averages

Appalachian (VA) Circuits Annual Outage Averages			
5 Years (2017 - 2021)			
Voltage (kV)	# of Circuits	Frequency	Duration (Hours)
138	116	1.40	0.10
69	80	1.91	0.12

Table 11: Components 2 and 3 - Project Circuits' Annual Outage Averages

Circuit Annual Outage Averages		
5 Years (2017 - 2021)		
Circuit Name	**Frequency**	**Duration (Hours)**
Floyd – Stuart 69 kV	2.00	6.09
Claytor – West Bassett 138 kV	2.00	3.99
Fieldale – West Bassett 138 kV	2.60	7.14
Fieldale – Stuart 69 kV	5.00	6.57
Fieldale – West Bassett No. 1 69 kV	3.60	10.26
Fieldale – West Bassett No. 2 69 kV	1.80	5.63

Table 12: Component 2 - 5 Year Floyd – Stuart 69-kV Line Maintenance History

Line Maintenance History		
Floyd – Stuart 69 kV 5 Years (2017-2021)		
Year	**Work Performed**	**Cost ($)**
2018	Tree Removal	4,263.51
2018	ROW Clearing	33,974.88
2019	ROW Widening & Clearing	1,082.67
2019	Emergency – Broken Crossarm Replacement on Str. 452-9	18,121.07

Table 13: Component 3 - 5 Year Claytor – Fieldale 138-kV Line Maintenance History

Line Maintenance History		
Claytor - Fieldale 138 kV 5 Years (2017-2021)		
Year	**Work Performed**	**Cost ($)**
2017	ROW Widening & Clearing	48,388.28
2017	ROW Widening & Clearing	99,797.75
2018	ROW Widening & Clearing	10,279.20
2019	ROW Widening & Clearing	70,807.19
2019	Str. 30-38, 42, 49, 54, 190, 219, & 220 Condition Remediation	491,479.80
2020	ROW Widening & Clearing	72,176.62
2020	ROW Widening & Clearing	39,144.81

Table 14: Component 3 - 5 Year Fieldale – Stuart 69-kV Line Maintenance History

Line Maintenance History		
Fieldale – Stuart 69 kV 5 Years (2017-2021)		
Year	Work Performed	Cost ($)
2017	Comprehensive Inspection	28,106.96
2017	Broken Crossarm Replacement on Str. 484-8	6,216.68
2019	ROW Widening & Clearing	1,685.02
2019	Emergency - Str. 484-204 Condition Remediation	43,700.68
2019	Str. 484-158 Burnt Pole Replacement	46,406.95
2021	Open Condition Remediation	193,654.37

Table 15: Component 3 - 5 Year Fieldale – West Bassett No. 1 69-kV Line Maintenance History

Line Maintenance History		
Fieldale – West Bassett No. 1 69 kV 5 Years (2017-2021)		
Year	Work Performed	Cost ($)
2018	ROW Widening & Clearing	3,330.31
2019	Minor Storm – Replace Broken Equipment on Str. 485-59	23,960.37
2021	Open Condition Remediation on Str. 485-42	25,187.62

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:

Component 2 focuses on the approximately 21 miles of the existing Floyd – Stuart 69-kV Transmission Line in part to address the deterioration of structures and associated equipment. The most recent condition on the Floyd – Stuart 69-kV Transmission Line was reported on June 24, 2021. Currently, there are 36 structures with at least one open structural condition, which impacts 25% of the structures on this Line.

On those 36 structures, there are 49 unique open structural conditions, which include woodpecker-damaged poles (37), rot top poles (9), broken knee/vee braces (2), and a split crossarm (1). Also, there are 15 open hardware conditions, which include broken insulators (13) and gunshot-damaged insulators (2). Lastly, there are 11 open shield wire conditions, which include broken strands (6) and damaged (5) conditions.

Component 3 focuses on the approximately 19 miles of the existing Fieldale - Stuart 69-kV Transmission Line, the approximately 26 miles of a segment of the existing Claytor - Fieldale 138-kV Transmission Line from existing Floyd Substation to existing Fieldale Substation, and the approximately 14 miles of the existing Fieldale – West Bassett No. 1 and No. 2 69-kV Transmission Lines in part to address the deterioration of structures and associated equipment.

The most recent condition on the Fieldale – Stuart 69-kV Transmission Line was reported on October 28, 2020. Currently, there are 97 structures with at least one open structural condition, which is 33% of the structures on this line. On those 97 structures, there are 153 unique open structural conditions, which include rot top crossarms (49), woodpecker-damaged poles (43), rot heart poles (21), corroded crossarms (12), split poles (11), rot top poles (8), broken crossarms (2), broken knee/vee braces (2), insect-damaged crossarms (2), a damaged pole (1), a knee/vee brace with rot top (1), and a split knee/vee brace (1). Also, there are 12 open shield wire conditions, which include corroded (10) and damaged (2) conditions. There are three open conductor conditions for broken strands (3). There are two open grounding conditions for broken ground lead wires (2). Lastly, there is one open hardware condition for a broken insulator (1).

The most recent condition on the Claytor - Fieldale 138-kV Transmission Line was reported on September 28, 2021, for the segment between Floyd and Fieldale Substations. Currently, there are 80 structures with at least one open structural condition, which is 52% of the structures on this segment of the line. On those 80 structures, there are 144 unique open structural conditions, which include woodpecker-damaged poles (35), rot heart poles (35), crossarms with rot top (32), rot top poles (13), damaged poles (9), insect-damaged crossarms (6), corroded crossarms (5), rot shell poles (4), cracked X-braces (2), split crossarms (2), and a split pole (1). Also, there are two open conductor conditions for broken strands (1) and gunshot-damaged (1) conditions. Lastly, there is one open hardware condition for a broken insulator (1).

The most recent condition on the Fieldale - West Bassett No. 1 69-kV Transmission Line was reported on October 29, 2020. Currently, there are 23 structures with at least one open structural condition, which is 28% of the structures on this line. On those 23 structures, there are 33 unique open structural conditions, which include woodpecker-damaged poles (10), corroded crossarms (9), rot top poles (4), crossarms with rot top (3), split poles (2), a broken crossarm (1), a broken knee/vee brace (1), an insect-damaged crossarm (1), a leaning in-line pole (1), and a woodpecker-damaged crossarm (1). Also, there is one open grounding condition for a broken ground lead wire (1). Lastly, there is one open hardware condition for a broken insulator (1).

The most recent condition on the Fieldale - West Bassett No. 2 69-kV Transmission Line was reported on October 29, 2020. Currently, there are 18 structures with at least one open structural condition, which is 35% of the structures on this line. On those 18 structures, there are 26 unique open structural conditions, which include woodpecker-damaged poles (18), insect-damaged crossarms (2), rot top poles (2), a broken crossarm (1), an insect-damaged knee/vee brace (1), a loose knee/vee brace (1), and a crossarm with rot top (1). Lastly, there is one open hardware condition for a broken insulator (1).

See **Figures 9 through 34** showing representative photographs regarding the condition of the existing transmission lines subject to the Project. These pictured conditions in some cases are in addition to what has been described above from the traditional, maintenance-focused inspection reporting.

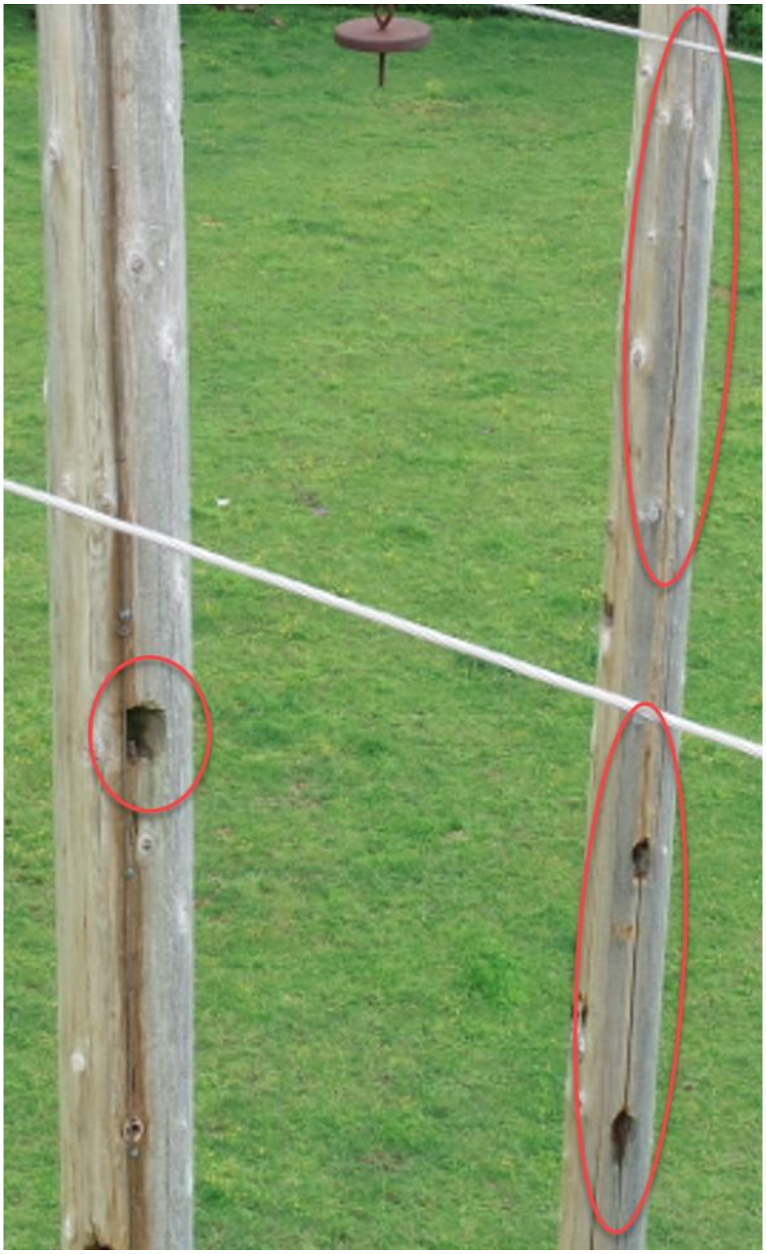


Figure 9: Component 2: Floyd – Stuart 69-kV Line
Structure 452-6: Multiple Pole Cavities and Pole Splitting

Figure 10: Component 2: Floyd – Stuart 69-kV Line
Structure 452-20: Severe Pole Splitting, Decay, and Woodpecker Holes

Figures 11 and 12: Component 2: Floyd – Stuart 69-kV Line
Structure 452-45: Large Pole Cavity, Pole Decay, and Broken Knee Brace


Figures 13 and 14: Component 2: Floyd – Stuart 69-kV Line
Structure 452-61: Severe Pole Splitting, Cavities, and Decay with Partial Rot Top

Figure 15: Component 2: Floyd – Stuart 69-kV Line
Structure 452-76: Remediated Crossarm Failure, Crossarm and Pole Splitting, Pole Rot Top, and a Large Woodpecker Hole

Figure 16: Component 2: Floyd – Stuart 69-kV Line Structure 452-100: Pole Splitting and Cavities

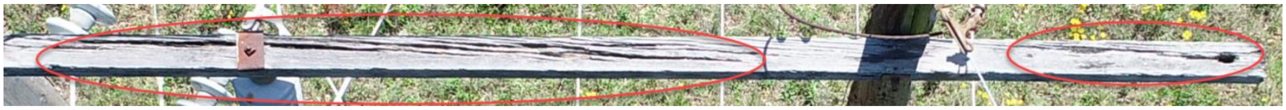


Figure 17: Component 2: Floyd – Stuart 69-kV Line Structure 452-133: Upper Crossarm Splitting

Figure 18: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-114: Severe Upper Pole Splitting Impacting Structural Integrity at Crossarm Attachment Point

Figure 19: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-129: Several Large Pole Cavities and Severe Vertical Pole Splitting with Potentially Compromised Knee Brace and Shield Wire Attachment Points

Figure 20: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-148: Severe Crossarm Splitting at Pole Attachment Point

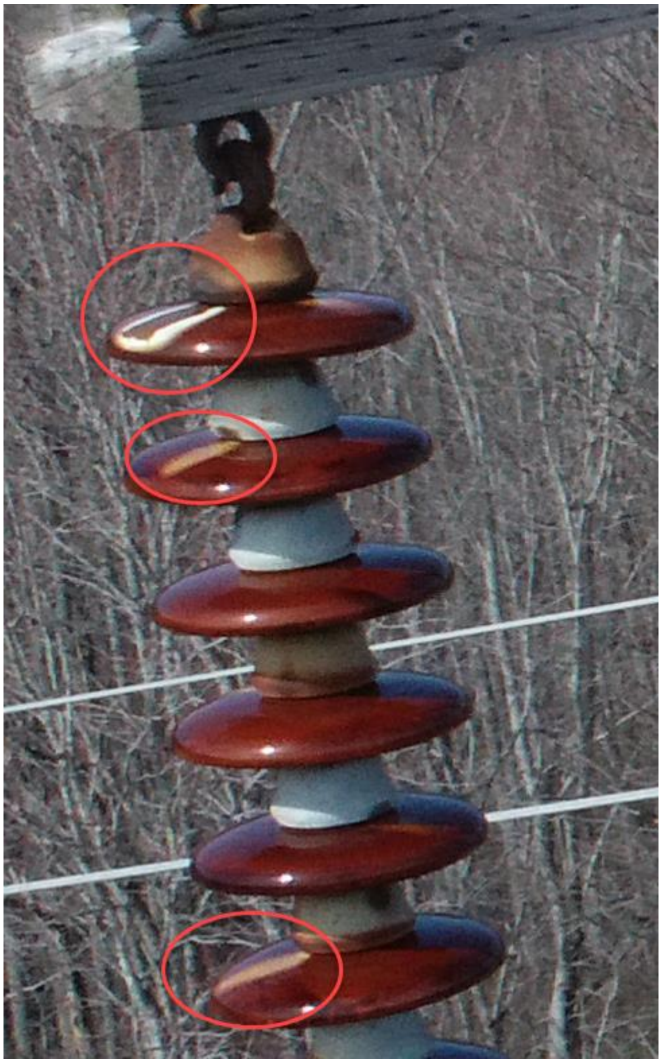


Figure 21: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-162: Multiple Flashover/Arcing Damage Indications to Insulator

Figure 22: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-185: Crossarm Splitting and Decay and a Pole Cavity

Figures 23 and 24: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-218: Moderate Vertical Pole Splitting and Flashover/Arcing Damage to Insulator


Figure 25: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-230: Several Large Woodpecker Holes

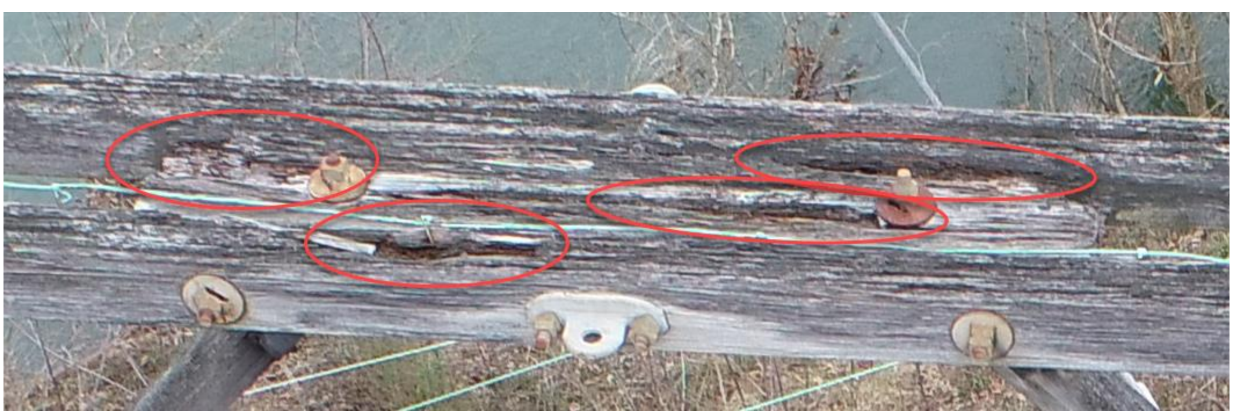


Figure 26: Component 3: Claytor – Fieldale 138-kV Line
Structure 30-264: Crossarm Splitting and Decay

Figure 27: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-45: Severe Pole Splitting with Upper Pole Decay

Figure 28: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-76: Severe Pole Splitting at Crossarm Attachment with Slight Crossarm Rolling

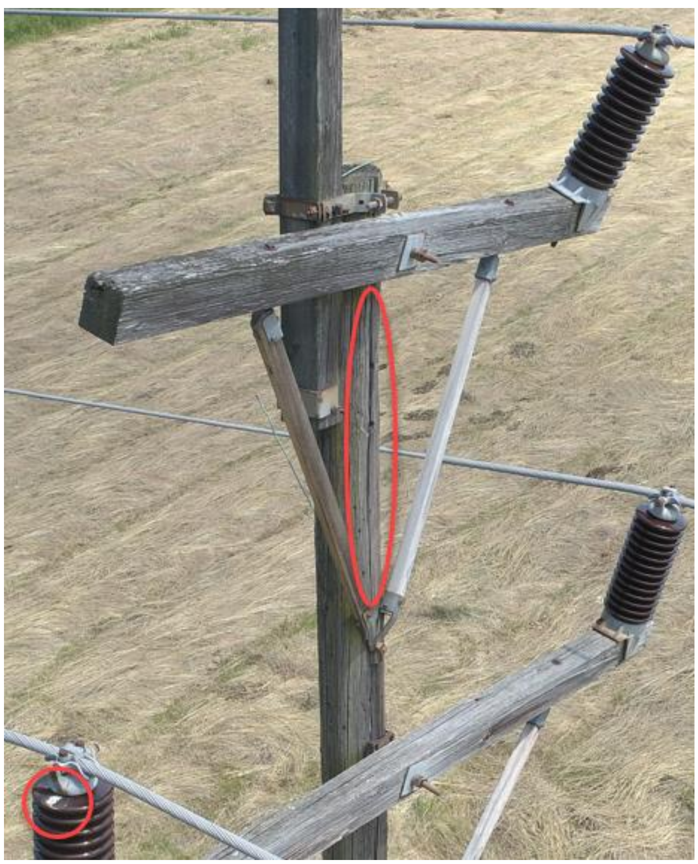


Figure 29: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-103: Pole Splitting, Slight Crossarm Rolling, and Flashover-Arcing Damage to Insulator

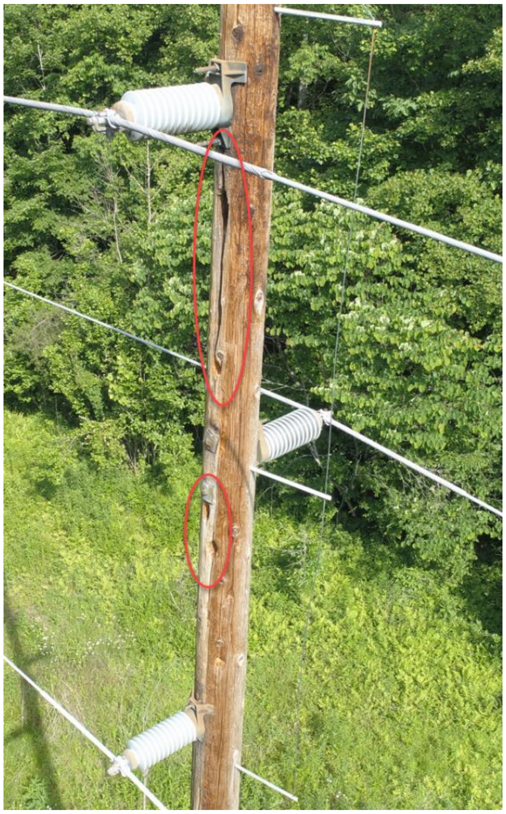
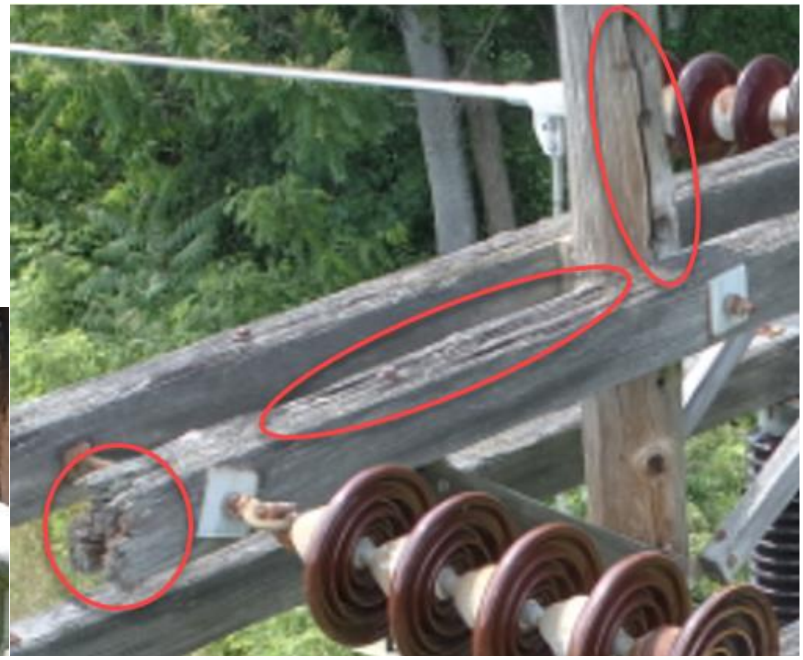


Figure 30: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-141: Severe Pole Splitting and Pole Cavities

Figure 31: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-202: Upper Pole Splitting and Decay

Figures 32 and 33: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-231: Broken Insulator Disk, Crossarm Splitting and Decay, and Pole Splitting at Crossarm Attachment Point

Figure 34: Component 3: Fieldale - Stuart 69-kV Line
Structure 484-286: Multiple Woodpecker Holes and Crossarm Splitting

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:

The new Smith River 138-kV Substation will connect to the existing Philpott Dam hydro generation facility owned by the USACE via a radial 138-kV extension to the 138-kV Fairystone Switch located near Philpott Dam (see **Exhibit 3**). The hydro generation facility has two turbines rated at 6,700 kilowatts each and a smaller unit rated at 600 kilowatts. In addition, Smith River will serve 34.5-kV and 12-kV distribution load formerly served from the retired West Bassett and Bassett Substations.

The new Mayo River Substation will serve 34.5-kV distribution load via two 138/34.5-kV transformers.

The new Claudville 138-kV Substation will serve 34.5-kV distribution load via one 138/34.5-kV transformer.

The Pinnacles Hydro-Generation Facility is located in Patrick County north of the proposed Claudville Substation (see **Exhibit 3**). This facility supports load in the City of Danville, Virginia and does not connect to any of the Project's proposed substations.

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 Project is organized into three components, which are generally the construction sequence (see Exhibit 3).

Component 1:

The Proposed Route for Component 1 requires new ROW and is approximately 24.5 miles long between the Company's Willis Gap Substation in Carroll County and the proposed Mayo River Substation in Patrick County, Virginia. The Component 1 Alternative Routes are generally 1 to 2 miles shorter. The longer Proposed Route, however, avoids open residential areas, parallels an existing transmission line, and responds to public input and preferences. See the Component 1 Siting Study in Volume 2 of the Application for further discussion on alternative routes considered.

Component 2:

The Proposed Route for Component 2 is mostly a rebuild in or near existing ROW and is approximately 22.0 miles long between the proposed Mayo River Substation in Patrick County and Floyd Substation in Floyd County, Virginia. Although the Proposed Route does include several minor deviations from the centerline of the ROW of the existing 69-kilovolt ("kV") line, only one viable alternative route was identified for Component 2, which is comparable in length. See the Component 2 Siting Study in Volume 2 of the Application for further discussion of alternative routes considered.

Component 3:

The Proposed Route for Component 3 is mostly a rebuild in or near existing ROW and is approximately 25.5 miles long between the proposed Mayo River Substation in Patrick County, and the proposed Stoneleigh Substation, the proposed Smith River Substation, and existing Structure No. 1365-4 in Henry County, Virginia. Although the Proposed Route does include several deviations from the centerline of the ROW of the existing 69-kV and 138-kV lines to be rebuilt, no viable alternative routes 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 were identified for Component 3. See the Component 3 Siting Study in Volume 2 of the Application for further discussion of alternative routes considered.

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 Overview Map is attached as Exhibit 3. Detailed GIS constraints maps illustrating the Project in relation to existing facilities, various resources, and sensitive features are attached as Exhibits 7 through 9. Furthermore, the Siting Studies (located in Volume 2 of the Application) include additional GIS maps and descriptions of the Project area. A shapefile of the Proposed Routes will be provided electronically to the Commission along with the Application.

   In locations where the Project will be rebuilt in new ROW, the unused portion of the existing ROWs will be evaluated by the Company for future transmission, telecom, or distribution use where possible.

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 Exhibits 7 through 9.

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:

Component 1:

Component 1 is not a rebuild of existing transmission line and all new ROW is required, as existing easement rights were not available for use.

Component 2:

The majority of Component 2 will be rebuilt within the existing ROW. The ROW easements for the existing line were obtained in the 1950s and are either defined at 100 feet or are undefined in width. In a few places, deviations from the existing centerline are necessary due to routing constraints or encroachments along the existing ROW, and the Company will acquire new easements for those portions of the proposed line. For an approximate three and a half-mile segment of Component 2, the new transmission line will be built on new ROW. This three and a half-mile portion of the line is necessary to connect the proposed line to the new Mayo River Substation site and avoids future land use conflicts with the Patrick County Hospital near the existing ROW.

Component 3:

The majority of Component 3 will be rebuilt within the existing ROWs. The ROW easements for the existing lines were obtained as early as the 1930s up to the 1960s and are varying in width, generally ranging between 50 and 100 feet wide. The Company also plans to supplement most of those easements in order to obtain an approximately 100-foot-wide ROW wherever possible to meet current standards. In a few places, deviations from the existing centerline are necessary due to routing constraints or encroachments along the existing ROW, and the Company will acquire new easements that are typically 100 feet in width.

The Stoneleigh Extension 138-kV Transmission Line is not a rebuild of an existing transmission line. All new ROW is required, as existing ROWs were not available for use.

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:

<u>Component 1:</u>

See Exhibits 10, 11, 12, 16, and 19.

<u>Component 2:</u>

See Exhibits 10, 11, 12, 16, 17, 18, and 19.

<u>Component 3:</u>

See Exhibits 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19.

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

Response:

<u>Component 1:</u>

The proposed route for Component 1 will require new ROW easements. The ROW easement will typically be 100 feet wide and will be located within a 600-foot filing corridor. In certain limited locations, the ROW may be more than 100 feet wide as needed to ensure compliance with safety requirements. Locations requiring a wider ROW are typically in long spans between structures, where conductors are displaced outside a typical 100-foot-wide ROW during extreme weather conditions, or where guy wires are needed to support certain angle structures to be used for the Project (see Company witness McMillen's direct testimony for more details). The precise location and extent of the places where the ROW would need to be more than 100 feet wide to accommodate conductor sway and guy wires cannot be determined until completion of detailed ground surveys and final engineering.

<u>Component 2:</u>

Areas where the transmission line will be rebuilt within the existing ROW (approximately 18.5 miles) are subject to existing easements, dating from the 1950s. A small number 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.

The ROW for the Project will typically 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 100-foot ROW width during extreme weather conditions or where guy wires are needed to support certain angle structures to be used for the Project (see Company witness McMillen's direct testimony for more details).

Component 3:

Areas where the transmission line will be rebuilt within the existing ROW (approximately 22.5 miles) are subject to existing easements, dating from the 1930s up to the 1960s. A small number 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 3.0 miles of the Project will be constructed in new ROW parallel to or near the existing ROW, as described in the Component 3 Siting Study in Volume 2 of the Application. 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 typically 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 100-foot ROW width during extreme weather conditions or where guy wires are needed to support certain angle structures to be used for the Project (see Company witness McMillen's direct testimony for more details).

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 and complying with NERC requirements.

ROW Clearing

a. In areas with 125 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 125-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 herbaceous 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.
    - 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.

<u>ROW Restoration</u>

a. Where stream banks are disturbed, they will be restored (*i.e.*, by planting herbaceous vegetation, 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/wire stringing 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. 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.

<u>ROW Maintenance</u>

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.

<u>Long-term ROW Maintenance Plan</u>

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 addressed.

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

Response:

For new transmission line easements, the property owner typically will retain the right to use the easement area for grazing, pasture lands, gardens, cultivated fields, driveways, parking, and bike and walking paths or any other use that is consistent with the Company's right to construct, safely operate, maintain or remove its electric transmission line. The Company will retain 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 may endanger the safe operation of the electrical transmission line.

Generally, the same can be stated with respect to the existing easements and new or supplemental easements to be acquired for the Project.

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:

The Project's route development process and conservation easements crossed are summarized for each Project component in the below Route Development Summary Section. For a detailed route development discussion, see the Project's Siting Studies and the associated maps referenced below included in Volume 2 of this Application prepared by POWER Engineers, Inc. ("POWER"). The direct testimony of Company witness Santos further discusses route development. Additionally, see Company witness Bledsoe's direct testimony concerning the description and site selection for the proposed Claudville, Mayo River, Stoneleigh, and Smith River substations. Also, see Section V (Notice) of this Application for a detailed Proposed Route description.

Concerning alternative route cost estimates, Component 1 is the only component that is not a rebuild with six (A through F) approximately 24-mile Alternative Routes. See Alternative Route Maps (Map 5) as part of the Siting Studies in Volume 2 of the Company's Application. Alternative Route C (Proposed Route for the Willis Gap-Claudville portion) is about one mile longer than Alternative Route A. However, Alternative Route A is closer to more residences and existing land uses resulting in more impacts and potential costs. Alternative Route E (Proposed Route for the Claudville-Mayo River portion) is about 1.5 miles longer than Alternative Route D. However, Alternative Route D crosses a mostly rugged, mountainous area requiring more access road construction and associated costs; whereas Alternative Route E parallels an existing transmission line with more existing access roads. Overall, the estimated costs for the six Component 1 Alternative

Routes would be comparable, and therefore, were not a factor in the Proposed Route selection, as described in the Route Development Summary below.

Components 2 and 3 are generally transmission line rebuilds in or near existing ROW and alternative development was minor or unnecessary. Therefore, Component 2 and 3 Alternative Routes are generally comparable in overall costs. See Section I.I concerning the Project's estimated costs.

Route Development Summary

Component 1:

Willis Gap to Claudville:

The Siting Team first identified the Proposed Route (Alternative Route C, 12.5 miles in length) for Willis Gap to Claudville by reviewing and evaluating three general routing concepts for the Study Area: routes traveling north of, through, or south of the community of Ararat, respectively. Once the end points were defined, the Siting Team undertook an iterative process that moved from routing concepts to increasingly refined study segments, alternative routes, and then the Proposed Route.

First, a Study Area was defined, and constraint data was collected. Next, three routing concepts for the Willis Gap to Claudville portion were developed. These three routing concepts were carried forward and developed into a Study Segment Network comprised of 16 Study Segments, which were presented at the public open houses. Using stakeholder input and analysis and site visit evaluations, the Study Segment Network was refined into three alternative routes including a northern, central, and southern route. The Siting Team reviewed and analyzed the three Alternative Routes based on resource constraints in the Study Area and arrived at Alternative Route C as the Proposed Route between the existing Willis Gap and proposed Claudville substations. After the Proposed Route was announced, affected landowners were contacted and more refinements completed as practical. The vast majority of the affected landowners have been contacted as of March 2023. See Route Development Maps as part of the Siting Studies in Volume 2 of the Company's Application.

The Proposed Route for Willis Gap to Claudville is the longest route and requires more tree clearing; however, it minimizes impact to the surrounding community by taking landowner feedback into consideration to the extent practical. The Proposed Route has the fewest landowners within the ROW compared to Alternative Routes A and B and generally avoids residential development and existing land uses. In addition, the Proposed Route has the fewest residences within 100, 250, and 500 feet of centerline compared to Alternative Routes A and B. The Proposed Route minimizes potential visual impacts to the community. Based on stakeholder input, the Proposed Route also will avoid planned future development in the area. Additionally, public stakeholder input generally favored the southern study segments (Proposed Route) since they were located in a forested area and maximized distance from the developed residential and visually open fields. For the reasons listed, the Proposed Route (Alternative Route C) for Willis Gap to Claudville has the least impact on the community and is the most suitable route.

Claudville to Mayo River (Stuart):

The Siting Team first identified the Proposed Route (Alternative E, 12.0 miles in length) for the Claudville to Mayo River portion through a review and evaluation of three general routing concepts for the Study Area: two northern paths and one southern path. Once end points were defined, the Siting Team undertook an iterative process that moved from routing concepts to increasingly refined study segments, alternative routes, and then the Proposed Route.

First, a Study Area was defined, and constraint data was collected. Next, three routing concepts were developed for the Claudville to Mayo River portion. These three routing concepts were carried forward and developed into a Study Segment Network comprised of 33 Study Segments, which were presented at public open houses. Using stakeholder input and analysis and site visit evaluations, the Study Segment Network was refined into three alternative routes including a northern and southern route. The Siting Team reviewed and analyzed the three 138-kV Alternative Routes based on resource constraints in the Study Area and arrived at Alternative Route E as the Proposed Route between the proposed Claudville and Mayo River substations. After the Proposed Route was announced, affected landowners were contacted and more refinements completed as practical. The vast majority of the affected landowners have been contacted as of March 2023. See Route Development Maps as part of the Siting Studies in Volume 2 of the Company's Application.

The Proposed Route (12.0 miles) for Claudville to Mayo River is the longest compared to Alternative Routes D (10.4 miles) and F (11.6 miles); however, it parallels an existing and comparable transmission line which was favored by the public and follows federal and state guidelines to use or parallel existing ROWs. While the Proposed Route is closer to residential development and crosses more landowners than Alternative Route D, it minimizes visual impacts by being cohesive with the existing visual character of existing transmission infrastructure. Additionally, Alternative Route D traverses a rugged, mountainous and unfragmented-forested area, which would require more ROW clearing and access roads and have associated visual and environmental impacts. The Proposed Route considers landowner feedback to the extent practical and was preferred by landowners overall. Based on stakeholder input, the Proposed Route attempts to minimize impacts to future development in the area. It also minimizes clearing, visual, and environmental impacts by paralleling existing ROW. For the reasons listed, the Proposed Route for Claudville to Mayo River is the most suitable route.

Alternative Routes C and E were identified by the Siting Team as the Proposed Route (24.5 miles in total length) for Component 1 after an extensive data gathering, route development, and comparative analysis process (see the Company's Application, GIS Constraints Map, Exhibit 7). The rationale for selecting the Proposed Route is derived from accumulation of siting decisions made throughout the process, Siting Team knowledge and experience, public and regulatory agencies' comments, and the comparative analysis of potential impacts. Collectively, the Siting Team believes the Mayo River to Willis Gap 24.5-mile Proposed Route (1) has been well vetted with affected landowners; (2) is most consistent with federal and state siting guidelines (*e.g.*, parallels existing ROWs); (3) reasonably minimizes adverse impacts on area land uses and the visual, natural and cultural environment; (4) minimizes special design requirements and unreasonable costs; and (5) can be constructed and operated in a safe, timely, and reliable manner.

Conservation Easements:

Based on the best information available, Component 1's Alternative Routes do not cross any 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). Therefore, none of the Alternative Routes were rejected for crossing a conservation easement.

There is one US Fish and Wildlife Service ("USFWS") conservation easement and one Patrick County forest/open space maintenance agreement easement near the Component 1's Alternative Route C (the Proposed Route) on the Willis Gap to Claudville portion (see the Company's Application, Component 1 GIS Constraints Map, Exhibit 7). These two conservation easements, however, will not be crossed or impacted. See Section III.G.9 for more description.

Component 2:

Mayo River (Stuart) to Floyd Transmission Improvements:

Alternative Route B and the Rebuild Route were identified as the Component 2 Proposed Route (22.0 miles in total length) following an extensive data gathering, route development, stakeholder input, and comparative analysis process. A summary of rationale for selecting the Component 2 Proposed Route as the route that minimizes impacts follows. This rationale is derived from accumulated siting decisions made throughout the process, Siting Team knowledge and experience, public and regulatory agency comments, and the comparative analysis of potential impacts.

A stepwise process was undertaken by the Siting Team to compare options for rebuilding the existing transmission line. First, a Study Area was defined, and constraint and opportunities data was collected. The existing ROW was reviewed, and a focus area with a reroute segment was developed due to existing land use constraints near the existing ROW. The Reroute Segments and the Rebuild Route were presented at in-person and virtual public open houses. Using stakeholder input, site visit evaluations, and comparative analysis, the Siting Team reviewed and analyzed two alternative routes (Alternative Route A and Alternative Route B) in the Mayo River Focus Area and the Rebuild Route. The Siting Team selected Alternative Route B and the Rebuild Route as the Component 2 Proposed Route. See the GIS Constraints Map, Exhibit 8 of the Company's SCC Application. Additionally, see Route Development Maps as part of the Siting Studies in Volume 2 of the Company's Application.

The Rebuild Route was selected because minimal new ROW is required, thereby minimizing impacts to the natural and human environment. It also minimizes potential constructability issues by reducing required new access roads and tree clearing and minimizing impacts to landowners along the Component's centerline. Alternative Route B was selected for the following reasons:

- Avoids engineering conflicts with the Patrick County Hospital's proposed Medvac/Helipad and future land use plans.
- Avoids additional visual impacts from Federal Aviation Administration marker balls and lighting near the hospital.
- Avoids two crossings over U.S. Route 58 (visual, permitting, and engineering benefits).
- Avoids multiple crossings of the scenic South Mayo River.
- Avoids proximity to residences.

Component 2 will be rebuilt on centerline of the existing ROW except for a greenfield portion to connect to the proposed Mayo River Substation and other minor deviations from centerline to optimize design or avoid constraints. The Proposed Route is 22.0 miles long, of which approximately 3.5 miles is greenfield construction and the remainder is in or near the existing ROW. After the Proposed Route was selected, additional engineering adjustment and analysis was completed, and the Siting Team further minimized potential impacts to landowners along the Component 2 Proposed Route through minor route shifts. Due to encroachments to the existing ROW, engineering adjustments were made so the Component 2 Proposed Route only has one residence within the proposed ROW. Accordingly, and subject to completion of final engineering and ROW negotiations with affected landowners, the Company will work with landowners to remove or relocate dwellings as needed.

Collectively, the Siting Team believes the Component 2 Proposed Route: (1) has been well vetted with affected landowners; (2) is most consistent with the siting guidelines by using existing ROW; (3) reasonably minimizes adverse impacts on area land uses and the natural and human environment by using existing ROW with logical diversions; (4) minimizes special design requirements and unreasonable costs; and (5) can be constructed and operated in a safe, timely, and reliable manner.

Conservation Easements:

There are three existing Virginia Outdoors Foundation ("VOF") conservation easements crossed by Component 2's existing ROW. The Proposed Route crosses each of these VOF easements within the existing ROW, which pre-dates the designation of the conservation easements. No additional ROW will need to be secured on these VOF easements.

The Project also 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 1,500 feet within the existing permit. The Company will continue to coordinate with the Parkway concerning the rebuild.

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) nor were any alternative routes rejected due to crossing a conservation easement.

Component 3:

Mayo River (Stuart) to Bassett Area Transmission Improvements:

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 §§ 56-46.1 and 56-259 of the Virginia 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 Fieldale – Stuart 69-kV Transmission Line is not outage constrained and can be rebuilt on existing centerline to the extent practical. POWER and the Company selected a route for the rebuild of the Fieldale - Stuart 69-kV Transmission Line that follows the centerline of the existing ROW for most of its length, to the extent practical and possible. The

Component 3 Proposed Route is 25.5 miles in total length and was selected for these reasons:

- Minimizes impacts to the visual, human, and natural environments by primarily using the existing transmission line ROW for much of its length as recommended by federal and state guidelines and public preferences.
- Reduces required access roads.
- Reduces required tree clearing.
- Further reduces land use impacts with practical refinements from the existing ROW.
- Minimizes new ROW and landowner impacts along the Component's Proposed Route centerline.

There are a few locations where the proposed route deviates briefly from the existing centerline, largely in order to avoid residences and/or buildings currently encroaching upon and located in the existing ROW. Greenfield sections where new ROW will need to be acquired are located near the existing Fieldale Substation and proposed Stoneleigh Substation and entering and exiting the proposed Smith River Substation. The total mileage of greenfield sections on Component 3 is approximately three miles and the total mileage of rebuild sections is approximately 22.5 miles. The Component 3 Proposed Route contains seven residences within the proposed ROW; however, this will likely be reduced to approximately two residences during final engineering (see Company witness McMillen's direct testimony for further discussion). 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 alternate routes for Component 3. The Company's route selection procedures are discussed in detail in the Component 3 Siting Study in Volume 2 of this Application.

Conservation Easements:

The Proposed Route crosses one VOF easement within the existing ROW, which pre-dates the designation of the conservation easements. No additional ROW will need to be secured on these VOF easements.

The Component 3 Proposed Route also crosses several parcels that are subject to a conservation easement held by the Blue Ridge Land Conservancy. The Proposed Route deviates from its existing ROW to some extent on these parcels to allow for engineering optimization, but the Company has expanded the filing corridor in case the result of the Company's negotiations with the owners and the conservancy results in the transmission line rebuild returning to its existing location on these parcels. The existing easements allow the line to be rebuilt in the existing ROW. The Company has been in contact with the landowner and the conservancy and will continue to coordinate with them.

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 Va. Code (or a comparable prior or subsequent provision of the Va. Code) nor were any alternative routes rejected due to crossing a conservation easement.

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:

General Description of Construction Activities

Project transmission line construction activities include: (i) the installation and maintenance of soil erosion and sedimentation control measures; (ii) access road construction; (iii) new and additional ROW clearing; (iv) removal of the existing transmission line wire and structures; (v) foundation, structure, and wire installation; and (vi) the subsequent rehabilitation of all areas disturbed during construction. Substation construction and improvements will occur concurrently or as necessary. All required environmental compliance permits and studies will be completed, and a stormwater pollution prevention plan will be developed and implemented under Virginia's general permit for discharges of stormwater from construction activities.

Service Disruption Mitigation Plan

The proposed Project is complex and includes many components as described in Section I. To minimize service disruptions, the following mitigations will be used:

1. The Company will coordinate with PJM, APCo Transmission and Distribution Operations, the City of Danville, APCo customers and other stakeholders as necessary concerning construction and outage schedules.
2. The proposed Claudville, Mayo River, Stoneleigh, and Smith River substations will be built in the clear reducing outage constraints and disruptions.
3. The proposed transmission line work can be constructed partially in the clear with outages needed for work inside existing substations and the final connection of transmission lines and substations to the existing system. Outages are needed on the existing transmission lines

in order to rebuild on or near the existing centerline. The Claytor – Fieldale 138-kV Transmission Line is outage constrained and will require coordination with the United States Army Corps of Engineers (“USACE”) to obtain short outages during the rebuild between Smith River and Philpott Dam.

4. When existing substations will be radially fed (single-sourced) from the existing, aged transmission line, while the redundant (second-source) transmission line is being rebuilt, the Company may use the following mitigation measures prior to the outages to reduce the risk of service interruptions with the loss of the radial line:
    a. Walking and/or aerial inspection of the existing transmission line to identify potential risks. Practical and cost-effective mitigations will be considered such as removing danger trees or short-term repairs on broken/damaged structure components.
    b. Plan and implement measures to transfer distribution load to nearby substations, where possible. This may include practical distribution upgrades to allow for this flexibility.
    c. Pre-construct access roads to the critical line rebuild segments prior to taking outages that will create a radial feed situation. This measure will allow for shortened restoration of the line in the event of a failure.
    d. Detailed outage planning and risk analysis to select the lowest risk and most efficient sequence for the Project. This minimizes customer and system exposure during construction outages while substations are in a single source configuration.

Construction Sequence

The proposed construction sequence has been designed to further minimize disruptions. This planned sequence will take approximately five years after a final order authorizing the Project to engineer, plan/coordinate outages, procure ROWs and material, and sequentially build the Project in its entirety. The Project is organized in three Components which generally follow the construction sequence. The three components cannot be constructed simultaneously and must be sequenced to avoid service disruptions and risks. Once the Project has been approved, outages will be requested and scheduled with PJM (the regional transmission organization) as necessary. The estimated construction sequence can be seen in Exhibit 5 and the existing and proposed transmission line circuit configurations can be seen in Exhibit 6. The below summarizes the preliminary proposed construction sequence:

1. Build the Claudville and Mayo River Substations “in the clear” and begin the upgrades at the Willis Gap Substation and Huffman Substation.

2. Construct the Claudville - Mayo River 138-kV circuit and the Claudville – Willis Gap 138-kV circuit section of the Claudville – Huffman 138-kV circuit.

3. Energize the new line between Mayo River, Claudville and Willis Gap and the Willis Gap, Claudville and Mayo River Substations.

4. Transfer the distribution load from the existing Stuart 69-kV Substation to the Mayo River and Claudville 138-kV Substations and de-energize Stuart Substation. This will place both Woolwine and Patrick Henry Substations in a radial (single source) scenario while the rebuilds between Mayo River to Woolwine and Mayo River to Patrick Henry are in progress.

5. Deenergize the Stuart – Woolwine 69-kV and Stuart – Patrick Henry 69-kV circuit sections.

6. Rebuild/upgrade to 138 kV the Mayo River side of the Woolwine Substation.

7. Remove the existing Stuart – Woolwine 69-kV circuit section and build the Mayo River – Woolwine 138-kV circuit section.

8. Remove the existing Stuart-Patrick Henry 69-kV circuit section and build the Mayo River-Patrick Henry 138-kV circuit section.

9. Energize the Mayo River – Woolwine 138-kV circuit section and the Mayo River side of Woolwine Substation.

10. Convert the Mayo River side of the Patrick Henry Substation from 69 kV to 138 kV.

11. Energize the Mayo River – Patrick Henry 138-kV circuit section and Patrick Henry Substation to 138-kV.

12. Deenergize the Floyd – Woolwine 69-kV and Patrick Henry – Fieldale 69-kV circuit sections.

13. Rebuild/upgrade to 138 kV the Floyd side of the Woolwine Substation.

14. Remove the existing Floyd – Woolwine 69-kV circuit section and build the Floyd – Woolwine 138-kV circuit section.

15. Remove the existing Patrick Henry – Fieldale 69-kV circuit section and build the Patrick Henry – Stoneleigh 138-kV circuit section of the Mayo River – Smith River 138-kV Circuit from the Patrick Henry Substation to the Stoneleigh Tap Structure.

16. Rebuild and expand the Floyd 138-kV Substation.

17. Energize the Floyd – Woolwine 138-kV circuit section, Floyd Substation and

the Floyd side of Woolwine Substation.

18. Convert the Smith River side of the Patrick Henry Substation from 69 kV to 138 kV.

19. Build the Stoneleigh and Smith River Substations "in the clear."

20. Transfer the Distribution load from the Bassett Substation to the Stanleytown Substation and retire the Bassett Substation. De-energize and remove the Fieldale – West Bassett No. 2 69-kV circuit.

21. Build the Stoneleigh – Smith River 138-kV double-circuit section of the Mayo River – Smith River 138-kV circuit and the Fieldale – Smith River 138-kV circuit from the Stoneleigh Tap structure to the Smith River Substation.

22. Build the Stoneleigh Extension 138-kV double-circuit section of the Fieldale – Smith River 138-kV circuit "in the clear" from the Stoneleigh Tap structure to the Stoneleigh Substation.

23. Energize the Smith River Substation from Mayo River and the Stoneleigh Substation from Smith River.

24. Transfer the Bassett distribution load (previously transferred to Stanleytown)and the West Bassett distribution load to Smith River and retire the 69-kV lines and equipment at West Bassett.

25. Transfer the Distribution-load from the Stanleytown Substation to the Stoneleigh Substation, then retire the Stanleytown Substation.

26. De-energize and remove the Fieldale – West Bassett No. 1 69-kV circuit.

27. Begin building the Fieldale Extension 138-kV circuit section of the Fieldale – Smith River 138-kV circuit from the Stoneleigh Tap structure to the Fieldale Substation and the Philpott Dam-Smith River 138-kV circuit section from the Smith River Substation to existing Structure 1365-4.

28. De-energize the Floyd – Philpott and the Philpott – West Bassett circuit sections of the Claytor – West Bassett 138-kV circuit. De-energize and remove the Fieldale – West Bassett 138-kV circuit. The removal of the Claytor-West Bassett and the Fieldale – West Bassett 138-kV circuits will be done in segments in order to minimize outages at Philpott Dam and to minimize exposure on the distribution and transmission systems.

29. Complete upgrades at the Fieldale and Fairystone Substations.

30. Energize the Philpott Dam – Smith River 138-kV circuit and the Fieldale Extension 138-kV circuit section.

31. Retire the Philpott Switch and West Bassett Substation.

32. Complete substation upgrades at Huffman 138-kV substation.

The above construction sequence is preliminary and subject to change based on final designs, outage constraints and outage approval. The sequence above is not linear and certain steps of the sequence may overlap or occur simultaneously.

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

Response:

Attachment 1 of the Guidelines were and will be generally followed during route development, engineering, and construction phases of the Project to the extent practical. For example, during route development, existing ROWs were used to the extent possible and engineering plans to use monopoles and H-Frames to the extent possible to minimize visual impacts. For a detailed discussion of the attention given to environmental resources and siting process used for this Project, see the Siting Studies and the Virginia Department of Environmental Quality ("VDEQ") Supplement included in Volumes 2 and 3 of this Application. Additionally, see Section III of this Response to Guidelines.

f. **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's Proposed Routes are located entirely inside Appalachian's certificated service area. The following details the counties the Proposed Route will pass.

Component 1:

The proposed route for the Mayo River – Willis Gap 138-kV transmission line is 24.5 miles long and crosses Carroll County (0.1 miles) and Patrick County (24.4 miles). See Confidential Exhibit 38-C, Virginia Department of Transportation ("VDOT") mapping.

Component 2:

The Proposed Route for the rebuild of the Stuart – Floyd 69-kV transmission line is 22.0 miles long and crosses Patrick County (17.0 miles) and Floyd County (5.0 miles). See Confidential Exhibit 38-C, VDOT mapping.

Component 3:

The Proposed Route for the rebuild of the Stuart – Fieldale 69-kV transmission line is 25.5 miles long and crosses Patrick County (9.5 miles) and Henry County (16.0 miles). See Confidential Exhibit 38-C, VDOT mapping.

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 Carroll, Floyd, Henry, and Patrick Counties to the Commission Staff with this Application in lieu of providing three hardcopies. Reduced copies of these maps are included as Confidential Exhibit 38-C to this Application. Maps provided in Confidential Exhibit 38-C contain additional information layered over the VDOT maps, and that information is Critical Energy Infrastructure Information and is treated as confidential. 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:

For the sections below see Confidential Figures 3-C and 4-C (located in Volume 4), the existing and proposed system electrical diagrams and Confidential Exhibit 6-C (located in Volume 4), the existing and proposed transmission line circuit configurations.

Component 1:

The proposed Mayo River – Willis Gap 138-kV transmission line will be a single-circuit line with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 megavolt ampere ("MVA") (summer emergency rating) and 404 MVA (winter emergency rating).

Component 2:

The proposed Mayo River – Woolwine and the proposed Floyd – Woolwine 138-kV transmission lines will primarily be single-circuit lines with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. Approximately 1.0 mile of the Mayo River-Woolwine 138-kV line segment will be a double-circuit line coming out of the proposed Mayo River Substation, carrying the Floyd – Mayo River 138-kV circuit and the Mayo River – Smith River 138-kV circuit with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. Approximately 0.5 mile of the Floyd-Woolwine 138-kV line segment will be constructed in a double-circuit configuration to provide a future circuit position entrance to Floyd Substation across the Floyd Economic Development Authority properties. The transmission line will be configured in a six-wired single circuit configuration for the approximately 0.5 mile carrying the Floyd – Mayo River 138-kV circuit with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating).

Component 3:

The proposed Mayo River – Smith River 138-kV transmission line will primarily be a single-circuit line with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. The line will be double circuit from the Stoneleigh Tap structure to the proposed Smith River substation, carrying the Mayo River – Smith River 138-kV circuit and the Fieldale – Smith River 138-kV circuit. Each circuit will have a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating).

The proposed Fieldale Extension 138-kV transmission line will be a single-circuit line with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating).

The proposed Stoneleigh Extension 138-kV transmission line will be a double-circuit line with each circuit section comprised of a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. This line will loop in and out of the Stoneleigh substation and will be carried on double-circuit structures. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating).

The proposed Philpott Dam – Smith River 138-kV transmission line will be a single-circuit line with a three-phase design and a nominal phase-to-phase design and operational voltage of 138 kV. A voltage upgrade is not anticipated for the Project. The maximum load transfer capability is 360 MVA (summer emergency rating) and 404 MVA (winter emergency rating).

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 single circuit 138-kV segments will consist of three 795 kcmil ACSR (Aluminum Conductor Steel Reinforced) "Drake" conductors with 26/7 stranding (1.108-inch diameter) with one conductor per phase. The proposed three-phase double-circuit 138-kV segments will consist of six 795 kcmil ACSR "Drake" conductors with 26/7 stranding (1.108-inch diameter) with one conductor per phase. Depending on the structure type, the single-circuit segments conductors will be arranged in either a vertical, horizontal, or delta configuration. The proposed double-circuit transmission line sections will be arranged in a vertical configuration with one circuit on each side of the structure. Most of the Project, however, will be in a horizontal configuration. See Exhibits 10 through 19 for proposed conductor configurations and phase separations.

The Project will typically utilize one 0.646-inch diameter 96 fiber optical ground wire ("OPGW") and one 7#8 Alumoweld ground wire (0.385-inch diameter) for lightning protection on the single circuit and double circuit lines. The OPGW is composed of aluminum clad steel strands surrounding a stainless-steel tube containing fiber optic strands used for utility operations and communication. See Exhibits 10 through 19 for the typical configurations of the proposed ground wires. Additionally, see further details and description of the structures in the following Section II.B.3.

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 will have a low reflective finish to reduce glare and mitigate visual impacts.

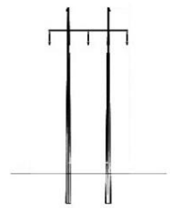
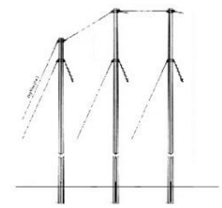
3. With regard to the proposed supporting structures over each portion of the ROW for the preferred route, provide diagrams (including foundation reveal) and descriptions of all the structure types, to include:

- ***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:

The transmission line structure type and estimated number of structures will be determined during final engineering, which includes aerial laser and ground topographic surveys and geotechnical studies. Nevertheless, the Company anticipates using a variety of galvanized steel 138-kV transmission line structures for the Project summarized in the following tables (5 pages), which respond to the above “a. through j.” response to guidelines questions.

Description of Proposed Structures (Responses to "a. through j.") (page 1 of 5)

	 H-Frame[2] **Project's Primary Structure (~70%)** (See Exhibit 10)	 Three-Pole Running Angle (See Exhibit 11)
a.1. mapping that identifies each portion of the preferred route;	See Exhibits 7, 8, & 9	See Exhibits 7, 8, & 9
a-2. number of circuits;	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)
a-3. project component used;	Components 1, 2, & 3	Component 1, 2, & 3
b. rationale for the selection of the structure type;	The proposed 138 kV H-Frame is a proven reliable structure in this region. It is best suited for medium-to-long spans, comparable to the existing structures in the area, and typically provides a lower profile due to its horizontal configuration.	The proposed 138 kV three-pole running angle structure is best suited for light-to-medium line angle locations.
c-1. estimated number of each type of structure;	Component 1: 100 Component 2: 86 Component 3: 102 **Estimated Project Total: 288**	Component 1: 23 Component 2: 8 Component 3: 1 **Estimated Project Total: 32**
c-2. estimated length of each portion of the ROW;	Component 1: 18.0 miles Component 2: 18.0 miles Component 3: 16.0 miles **Estimated Project Total: 52.0 miles**	Component 1: 4.0 miles Component 2: 1.0 miles Component 3: 0.5 miles **Estimated Project Total: 5.5 miles**
d-1. structure material	Galvanized Steel with a Low-Reflective Finish	Galvanized Steel with a Low-Reflective Finish
d-2. rationale for the selection of such material;	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.
e. foundation material;	The majority will be direct embedded (13.5' average depth)	The majority will be direct embedded (17' average depth)
f. average width at cross arms;	Approximately 32.0' to 40.0'	Approximately 31.0' to 36.0'
g. average width at base;	15.5' to 20.0' wide Average 3.0' diameter poles	31.0' to 36.0' wide Average 3.0' diameter poles
h-1. approximate average height of structures (above ground);	80'	80'
h-2. approximate typical structure height range (above ground);	55' to 115'	60' to 110'
i. average span length;	950'	850'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22.6'	22.6'

Notes:

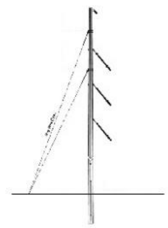
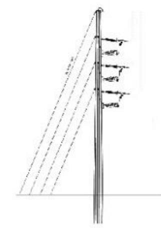
1. Totals and figures are approximations based on best available data until a detailed design has been finalized.
2. Some of the proposed H-Frame structures will have 2 guy wires to support loads from small line angles. The estimated number of H-Frames that require guy wires is 13, specifically there are 6 on Component 1, 3 on Component 2, and 4 on Component 3.

Description of Proposed Structures (Responses to "a. through j.") (page 2 of 5)

	 Three-Pole Dead-End (See Exhibit 12)	 Monopole Braced Post (See Exhibit 13)
a.1. mapping that identifies each portion of the preferred route;	See Exhibits 7, 8, & 9	See Exhibits 7, 8, & 9
a-2. number of circuits;	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)
a-3. project component used;	Component 1, 2, & 3	Component 3
b. rationale for the selection of the structure type;	The proposed 138 kV three-pole dead-end structure is best suited for taps into substations, heavy line angle locations, and breakng wire tension.	The proposed 138 kV braced-post monopole structure is best suited for short-to-medium spans.
c-1. estimated number of each type of structure;	Component 1: 12 Component 2: 4 Component 3: 8 **Estimated Project Total: 24**	Component 1: 0 Component 2: 0 Component 3: 9 **Estimated Project Total: 9**
c-2. estimated length of each portion of the ROW;	Component 1: 2.0 miles Component 2: 0.5 miles Component 3: 1.5 miles **Estimated Project Total: 4.0 miles**	Component 1: 0.0 miles Component 2: 0.0 miles Component 3: 1.0 miles **Estimated Project Total: 1.0 miles**
d-1. structure material	Galvanized Steel with a Low-Reflective Finish	Galvanized Steel with a Low-Reflective Finish
d-2. rationale for the selection of such material;	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.
e. foundation material;	The majority will be direct embedded (13' average depth)	The majority will be direct embedded (13' average depth)
f. average width at cross arms;	Approximately 31.0' to 50.0'	Approximately 11.5'
g. average width at base;	31.0' to 50.0' wide Average 3.0' diameter poles	Average 3.0' diameter poles
h-1. approximate average height of structures (above ground);	85'	80'
h-2. approximate typical structure height range (above ground);	65' to 105'	65' to 100'
i. average span length;	900'	500'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22.6'	22.6'

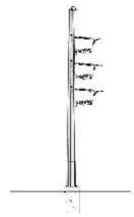
Notes:
1. Totals and figures are approximations based on best available data until a detailed design has been finalized.

Description of Proposed Structures (Responses to "a. through j.") (page 3 of 5)

	 Guyed Monopole Running Angle (See Exhibit 14)	 Guyed Monopole Dead-End Direct Embedded (See Exhibit 15)
a.1. mapping that identifies each portion of the preferred route;	See Exhibits 7, 8, & 9	See Exhibits 7, 8, & 9
a-2. number of circuits;	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)
a-3. project component used;	Component 3	Component 3
b. rationale for the selection of the structure type;	The proposed 138 kV guyed monopole running angle structure is best suited for light-to-medium line angle locations.	The proposed 138 kV guyed monopole dead-end direct embed 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;	Component 1: 0 Component 2: 0 Component 3: 13 **Estimated Project Total: 13**	**Estimated Project Total: 1 to 5 (preliminary design has 1)**
c-2. estimated length of each portion of the ROW;	Component 1: 0.0 miles Component 2: 0.0 miles Component 3: 1.5 miles **Estimated Project Total: 1.5 miles**	Structure to be utilized as required during detailed design, the estimated length of ROW used by this structure type is unknown at this time.
d-1. structure material	Galvanized Steel with a Low-Reflective Finish	Galvanized Steel with a Low-Reflective Finish
d-2. rationale for the selection of such material;	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.
e. foundation material;	The majority will be direct embedded (14' average depth)	The majority will be direct embedded (14' average depth)
f. average width at cross arms;	Approximately 4.0' to 9.0' (varies with line angle)	Approximately 6.5' to 13.0' (varies with line angle)
g. average width at base;	Average 3.0' diameter pole	Average 3.0' diameter pole
h-1. approximate average height of structures (above ground);	90'	85'
h-2. approximate typical structure height range (above ground);	70' to 105'	60' to 100'
i. average span length;	550'	650'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22.6'	22.6'

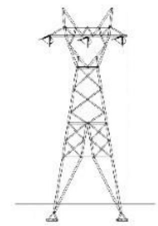
Notes:
1. Totals and figures are approximations based on best available data until a detailed design has been finalized.

Description of Proposed Structures (Responses to “a. through j.”) (page 4 of 5)

	 Monopole Dead-End Drilled Pier (See Exhibit 16)	 Monopole Tangent with Davit Arms (See Exhibit 17)
a.1. mapping that identifies each portion of the preferred route;	See Exhibits 7, 8, & 9	See Exhibits 7, 8, & 9
a-2. number of circuits;	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)	Double-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)
a-3. project component used;	Component 1, 2, & 3	Component 2 & 3
b. rationale for the selection of the structure type;	The proposed 138 kV monopole dead-end drilled pier structure is best suited for taps into substations, heavy line angle locations, and breaking wire tensions in locations requiring a smaller footprint.	The proposed 138 kV monopole tangent with davit arms structure is best suited for medium spans on double circuit sections.
c-1. estimated number of each type of structure;	Component 1: 2 Component 2: 2 Component 3: 4 **Estimated Project Total: 8**	Component 1: 0 Component 2: 9 Component 3: 24 **Estimated Project Total: 33**
c-2. estimated length of each portion of the ROW;	Component 1: 0.5 miles Component 2: 0.5 miles Component 3: 0.5 miles **Estimated Project Total: 1.5 miles**	Component 1: 0.0 miles Component 2: 1.5 miles Component 3: 4.0 miles **Estimated Project Total: 5.5 miles**
d-1. structure material	Galvanized Steel with a Low-Reflective Finish	Galvanized Steel with a Low-Reflective Finish
d-2. rationale for the selection of such material;	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.
e. foundation material;	The majority will be drilled pier concrete foundations (30' average depth) with an average reveal height of 1' above grade	The majority will be direct embedded (14.5' average depth)
f. average width at cross arms;	Approximately 7.0' to 13.0' (varies with line angle)	Approximately 21.5'
g. average width at base;	Average 6.0' diameter foundation	Average 3.0' diameter pole
h-1. approximate average height of structures (above ground);	75'	100'
h-2. approximate typical structure height range (above ground);	60' to 100'	75' to 145'
i. average span length;	550'	800'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22.6'	22.6'

Notes:
1. Totals and figures are approximations based on best available data until a detailed design has been finalized.

Description of Proposed Structures (Responses to “a. through j.”) (page 5 of 5)

	 Monopole Dead-End with Davit Arms Drilled Pier (See Exhibit 18)	 Self Supporting Lattice Tower Used Sparingly (See Exhibit 19)
a.1. mapping that identifies each portion of the preferred route;	See Exhibits 7, 8, & 9	See Exhibits 7, 8, & 9
a-2. number of circuits;	Double-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)	Single-circuit (Exhibits 7, 8, & 9 show the double and single-circuit portions)
a-3. project component used;	Component 2 & 3	Component 1, 2, & 3
b. rationale for the selection of the structure type;	The proposed 138 kV monopole dead-end with davit arms is best suited for taps into substations, heavy line angle locations, and breaking wire tension on double circuit sections.	The proposed 138 kV self supporting lattice tower is best suited for long spans.
c-1. estimated number of each type of structure;	Component 1: 0 Component 2: 4 Component 3: 7 **Estimated Project Total: 11**	**Estimated Project Total: 0 to 5 (preliminary design has 0)**
c-2. estimated length of each portion of the ROW;	Component 1: 0.0 miles Component 2: 0.5 miles Component 3: 0.5 miles **Estimated Project Total: 1.0 miles**	Structure to be utilized as required during detailed design, the estimated length of ROW used by this structure is unknown at this time.
d-1. structure material	Galvanized Steel with a Low-Reflective Finish	Galvanized Steel with a Low-Reflective Finish
d-2. rationale for the selection of such material;	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.	Galvanized steel was chosen for its durability and proven reliability in this region. Specifically, using galvanized steel will protect the proposed structures from wood pecker damage commonly experienced in this region. A low reflective finish was selected to reduce visual impacts.
e. foundation material;	The majority will be drilled pier concrete foundations (30' average depth) with an average reveal height of 1' above grade	The majority will have Four (4) Earth Grillages Per Structure (12-foot Average Depth)[2]
f. average width at cross arms;	Approximately 31.0'	Approximately 41.5' wide
g. average width at base;	Average 6.0' diameter foundation	Approximately 35.0' wide
h-1. approximate average height of structures (above ground);	100'	105'
h-2. approximate typical structure height range (above ground);	85' to 120'	80' to 120'
i. average span length;	600'	1300'
j. minimum conductor-to-ground clearances under maximum operating conditions.	22.6'	22.6'

Notes:

1. Totals and figures are approximations based on best available data until a detailed design has been finalized.
2. In select areas, depenidng on constructability and geotechnical conditions, Four (4) Drilled Concrete Piers per Structure (20-foot Average Depth) may be utilized.

Structure Type Selection Summary

The structure types were selected for this Project based on the terrain, land use, and number of circuits. Steel transmission line structures will be used exclusively on the Project since the existing wood transmission line structures in the Stuart Area have experienced significant woodpecker damage and deterioration as discussed in Section I. Overall, the steel structures are more durable than wood.

The single-circuit steel H-frame structures will be the primary structure for the majority of the Project with three-pole structures as angle structures. The H-frame structure is capable of providing long span construction, which reduces structures and impacts, and is a proven and optimal structure in this rolling terrain. Additionally, the H-frame is similar in character to the existing transmission line structures in the Stuart Area. The proposed H-frame, three-pole structures, and conductors will have a low-reflective finish.

The single-circuit lattice towers will be used sparingly as angle structures in place of the three-pole structures or to support long spans in steep terrain or over a waterbody (for example) as needed. The single-circuit self-supporting lattice towers are efficient, cost-effective, and reliable structures that have functioned well over the years on transmission lines of all voltages. The lattice tower enables long spans, blends into the environment, and has a smaller footprint than the guyed three-pole structures. The proposed lattice towers and conductors will have a low-reflective finish.

The single-circuit monopole structures (monopole and dead-end monopole) will be utilized sparingly on the transmission line rebuild portions in congested areas where short spans are required to maintain safe clearances from existing land uses (i.e., residences and businesses) that have developed in and along the existing transmission line ROW since the line was originally built. The single-circuit monopole also has a reduced footprint and may be used at substation entrances. The double-circuit monopole structures with davit arms will be utilized on the double-circuit Mayo River – Woolwine 138-kV line segment, Floyd – Woolwine 138-kV line segment, Stoneleigh Extension 138-kV Line, and the double-circuit segment of the Mayo River – Smith River 138-kV line. The proposed monopole structures and conductors will have a low-reflective finish.

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 55 feet (minimum height) and 145 feet (maximum height, which applies to only one structure with the next tallest structure being 120 feet). For additional information about the average structure heights per type of structure used on the Project, please see the details in Section II.B.3 above.

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:

The Project's Components 2 and 3 are generally transmission line rebuilds. Exhibits 8 and 9, the GIS Constraints Maps for Components 2 and 3, show the existing and proposed structure heights and locations. The shown proposed structures are preliminary. Exact heights and locations will be determined during final engineering. Below provides additional description and comparison.

Comparison of Proposed and Existing Structure Types (Components 2 and 3)

Overall, the proposed structures on Component 2 will typically be 35 feet taller on average than the existing structures with the largest height difference being approximately 65 feet. The proposed structures on Component 3 will typically be 45 feet taller on average than the existing structures, with the largest height difference being 70 feet. The height changes for the proposed structures for the rebuild portions are necessary in order to meet current electrical clearance requirements and to utilize longer span lengths. However, a significant decrease in the total number of transmission line structures in the existing ROW is expected because of the taller, longer spans, and more efficient proposed structures as well as consolidating multiple transmission lines into one corridor in the Bassett area (see Company witness McMillen's direct testimony for further discussion).

The typical existing 69-kV structures on the existing Floyd – Stuart 69-kV line (Component 2), Fieldale – West Bassett No. 1 69-kV line, and Fieldale – West Bassett No. 2 69-kV line (Component 3) are single circuit wood H-Frame structures approximately 52 feet above ground height with 10 feet from pole center to pole center. Typical ROW width is 60 feet (see Exhibit 20). For the Floyd-Stuart 69-kV line, the conductor is typically 4/0 ACSR 6/1 Penguin and the shield wire is 5/16 EHS 7 strand. For the Fieldale-West Bassett No. 1 69-kV line, the conductor is typically 4/0 ACSR 6/1 Penguin and the shield wire is 7#10 Alumoweld. For the

Fieldale – West Bassett No. 2 69-kV line, the conductor is typically 336.4 kcmil ACSR 30/7 Oriole and the shield wire is 7#10 Alumoweld.

The typical existing 69-kV structure on the existing Fieldale – Stuart 69-kV line (Component 3) is a single-circuit, wood monopole approximately 43 feet above ground height with an approximate 8-foot-wide cross arm located within a 60-foot-wide ROW (see Exhibit 20). The conductor is 336.4 kcmil ACSR 30/7 Oriole and the shield wire is typically 7#10 Alumoweld. The typical existing 138-kV structure on the existing Claytor – Fieldale 138-kV line is a single-circuit wood H-frame, approximately 56 feet above ground height with 15.5 feet from pole center to pole center within an 80-foot-wide ROW (see Exhibit 20). The conductor is 556.5 kcmil ACSR 26/7 Dove and the shield wire is 5/16 EHS Steel (7 strand).

Overall, the 60 to 100 year old existing lines are in a physically deteriorated condition that is proportionate with their age and need to be replaced.

The proposed single-circuit 138-kV structures are primarily steel H-frame structures. These H-frames are approximately 80 feet above ground height with approximately 32- to 40-foot-wide cross arms located within an approximate 100-foot-wide proposed ROW (see Exhibit 10). In congested, residential areas (*e.g.*, along the Mayo River – Smith River 138-kV line) steel monopole structures with braced posts may be utilized in place of H-Frames. These braced post monopoles are approximately 80 feet above ground height located within an approximate 80 to 100-foot-wide proposed ROW (see Exhibit 13).

The proposed double-circuit 138-kV structures are primarily steel monopole structures with davit arms. These monopoles are approximately 100 feet above ground height located within an approximate 100-foot-wide proposed ROW (see Exhibit 17).

A decrease of approximately 40% of the total number of transmission line structures is expected for the proposed Components 2 and 3 rebuilds as a result of the taller and more efficient proposed structures as well as consolidating multiple transmission lines into one corridor in the Bassett area. The expected decrease in the number of transmission line structures in or near existing ROW by Component is in the table below.

Project Component	**Decrease in Number of Transmission Line Structures** (Existing compared to Proposed)
1	N/A
2	25%
3	45%

The Company estimates that, overall, approximately 419 138-kV transmission line structures will be required for the Project. Overall, 728 existing structures will be removed. Of those existing structures, 417 will be replaced (408 69-kV structures and 9 138-kV structures to be replaced). The total structure count is a rough approximation based on preliminary engineering models developed using LiDAR data. The final number of structures will be determined during final engineering, which includes ground survey and geotechnical studies.

In summary, the Project will consist of removing approximately 728 existing structures and constructing approximately 419 proposed structures across all three components.

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 Exhibit 20 for photographs of typical existing structures, Exhibits 10 through 19 for comparable photographs of the proposed structures, and Exhibit 37 for visual simulations representing the final condition following the completion of the Project. Additional visual simulations showing the appearance of all planned transmission structures at identified historic locations within one mile of the proposed centerline are located in the VDEQ Supplements in Volume 3 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.

The following and Exhibits 21 through 36 and Company witness Bledsoe's direct testimony provide details concerning the Project's proposed substation work.

Proposed improvements at the existing Huffman 138-kV Substation:

This work will be within the existing substation fence and no expansions are necessary.

The existing line terminal to the Willis Gap Substation will have the bypass switch removed, three new Coupling Capacitor Voltage Transformers ("CCVT") installed, and a new wave trap installed to properly communicate with the new remote end substation Claudville. The bus tie switch will be removed and jumpers installed in its place. See Exhibit 21.

Proposed improvements at the existing Willis Gap 138-kV Substation:

Upgrades will be made to accommodate the new Claudville – Willis Gap 138-kV line. This work will be within the existing substation fence and no expansions are necessary.

Upgrades include one 16-foot x 18-foot control building, two 138-kV load break switches, three 138-kV single phase CCVTs, one 138-kV wave trap, six 34.5-kV load break hook stick switches, three 34.5-kV Potential Transformers ("PT"), one 34.5-kV station service transformer, and a new 138-kV line position and dead-end that will be installed within the existing substation fence. See Exhibit 22.

Proposed new construction of the Claudville 138-kV Substation:

The proposed Claudville 138-kV Substation will be configured as a distribution tap station. The fenced-in portion of the proposed new substation is approximately 160 feet by 215 feet (0.81 acres). The limits of disturbance will be approximately 3.5 acres.

This substation will require the installation of one 16-foot x 27-foot control building, two 138-kV circuit breakers, three 138-kV three phase CCVTs, three 138-kV Motor Operated Air Break ("MOAB") switches, one 138-kV wave trap, one 138-kV double box bay structure, one 138/34.5-kV transformer, one 138-kV high side circuit switcher, one 34.5-kV box bay structure, three 34.5-kV regulators, and four 34.5-kV low side circuit breakers. See Exhibit 23.

Proposed new construction of the Mayo River 138-kV Substation:

The proposed Mayo River 138-kV Substation will be configured as a ring bus. The fenced-in portion of the proposed new substation is approximately 300 feet by 330 feet (2.27 acres). The limits of disturbance will be approximately 9.21 acres.

This substation will require the installation of one 16-foot x 36-foot control building, six 138-kV circuit breakers, five 138-kV MOAB switches, two 138-kV circuit switchers, one 14.4 MVAR cap bank, two 138/34.5-kV 30 MVA transformers, six 34.5-kV regulators, and eight 34.5-kV circuit breakers. See Exhibit 24.

The new substation will replace the existing Stuart 69-kV Substation, which will be retired. The existing substation, originally built in the 1940s, cannot accommodate the new equipment and improvements required for the project due to existing space constraints. Company witness Bledsoe's direct testimony discusses this in more detail. See Exhibit 25.

Retirements at existing Stuart 69-kV Substation (Ordinary Extension Work):

The distribution load will be transferred to the new Mayo River 138-kV Substation. After the load is fully transferred, the entire substation will be retired. See Exhibit 25. Future use of the old substation site will be determined later.

Proposed improvements and 69-kV to 138-kV conversion at the existing Woolwine Substation:

Upgrades will be made to accommodate the new Floyd – Woolwine and Mayo River-Woolwine 138-kV lines that are replacing the existing Floyd – Stuart 69-kV line. The proposed upgrades to the Woolwine Substation will allow it to continue to operate as a distribution tap station configuration. This work will be within the existing substation fence and no expansions are necessary.

The existing 69-kV bus structure will be replaced with a new 138-kV bus structure built for in and out configuration with Auto Sectionalizing MOABs.

Additional equipment that will need to be installed includes three 138-kV MOAB switches, one 138-kV circuit switcher, one 138/34.5 kV 30 MVA transformer, one 34.5-kV box bay structure, three 34.5-kV regulators, and one low side circuit breaker. See Exhibit 26.

Proposed improvements at the existing Floyd 138-kV Substation:

Upgrades will be made to accommodate the new Floyd – Woolwine 138-kV line that is replacing the existing Floyd – Stuart 69-kV line and the retirement of the existing Floyd – West Bassett 138-kV circuit section. The proposed improvements at the existing Floyd 138-kV Substation will allow it to continue to operate as a single bus configuration. To accommodate these improvements, the existing fenced yard will be expanded approximately 122 feet to the east. This will increase the station footprint by 0.74 acre. The limits of disturbance will be approximately 3.59 acres.

The existing 138-kV lattice structure, 138/69/34.5-kV transformer, 69-kV box bay structure, 34.5-kV box bay structure, and existing control building will be removed.

New installation will include one 138-kV double box bay structure, three 138-kV circuit breakers, three 138-kV MOAB switches, one 138-kV circuit switcher, one 138/34.5-kV 30 MVA transformer, one 34.5-kV box bay structure, three 34.5-kV regulators, and four low side circuit breakers. See Exhibit 27.

Proposed 69-kV to 138-kV conversion of the Patrick Henry Substation:

The newly installed Patrick Henry Substation (expected in service date of the end of 2025) will be configured as a distribution tap station and will have a substation footprint of approximately 210 feet by 200 feet (0.96 acre). This work will be within the existing substation fence and no expansions are necessary.

It will be designed for 138-kV operation but initially operated at 69-kV until the Project is complete. The substation will have a multi-ratio transformer (installed in 2024) with a high side tap changer that will allow it to be switched from 69-kV to 138-kV with minimal ancillary work.

The equipment that will need to be installed to convert this substation to 138 kV will be three high side 88-kV MCOV surge arresters, new jumpers to the high side CCVTs, and new bus connections to the high side of the main station transformer. See Exhibit 28.

Proposed new construction of the Smith River 138-kV Substation:

The proposed Smith River 138-kV Substation will be configured as a vertical ring bus. The fenced-in portion of the proposed new substation is approximately 225 feet by 250 feet (1.29 acres). The limits of disturbance will be approximately 4.4 acres.

This substation will require the installation of five 138-kV circuit breakers, five 138-kV MOAB switches, two 138-kV circuit switchers, one 138/34.5-kV transformer, one 34.5-kV box bay structure, three 34.5-kV regulators, four 34.5-kV low side circuit breakers, one 138/12-kV transformer, one 12-kV box bay structure, three 12-kV regulators, and four 12-kV low side circuit breakers. See Exhibit 29.

The new substation will replace the existing Bassett 69-kV and West Bassett 69/138-kV substations, which will be retired and removed. The existing substations, originally built in the 1960s and 1970s, respectively, cannot accommodate the new equipment and improvements required for the Project. See Exhibits 33 and 34.

Proposed new construction of the Stoneleigh 138-kV Substation:

The proposed Stoneleigh 138-kV Substation will be configured as a distribution tap station. The fenced-in portion of the proposed substation is approximately 150 feet by 225 feet (0.77 acre). The limits of disturbance will be approximately 4.1 acres.

This substation will require the installation of one 16-foot x 18-foot control building, three 138-kV MOAB switches, one 138-kV double box bay structure, one 138/12-kV transformer, one 138-kV high side circuit switcher, one 12-kV box bay structure, three 12-kV regulators, and four 12-kV low side circuit breakers. See Exhibit 30.

The new substation will replace the existing Stanleytown 69-kV Substation, which will be retired and removed. The existing substation, originally built in the 1970s, cannot accommodate the new equipment and improvements required for the Project. Additionally, getting a double-circuit transmission line to the site would be challenging (see Company witness Bledsoe's direct testimony for description). See Exhibit 32.

Proposed improvements at the existing Fieldale 69/138-kV Substation:

This work will be within the existing substation fence and no expansions are necessary.

Three of the existing 69-kV circuit breakers will be retired. Upgrades to the existing station relays will be made. The existing 138-kV Line to West Bassett will be retired and replaced by the new 138-kV line to Smith River via Stoneleigh. See Exhibit 31.

Retirements at existing Stanleytown 69-kV Substation (Ordinary Extension Work):

The distribution-load will be transferred to the new Stoneleigh 138-kV substation. After the load is fully transferred, the entire station will be retired. Future use of the site will be determined later. See Exhibit 32.

Retirements at existing Bassett 69-kV Substation (Ordinary Extension Work):

The distribution-load will be transferred to the new Smith River 138-kV substation. After the load is fully transferred, the entire station will be retired. Future use of the site will be determined later. See Exhibit 33.

Retirements at existing West Bassett 69/138-kV Substation (Ordinary Extension Work):

The distribution-load will be transferred to the new Smith River 138-kV substation. After the load is fully transferred, the entire station will be retired. Future use of the site will be determined later. See Exhibit 34.

Proposed improvements at the existing Fairystone 138-kV Substation (Transclosure):

Minor upgrades will be made to accommodate the new Philpott Dam – Smith River 138-kV line. The relay settings and line protection to the Smith River Station will be upgraded to current differential protection due to the addition of OPGW on the transmission line. This minor work will be within the existing substation fence and no expansions are necessary. See Exhibit 36.

Retirements at existing Philpott 138-kV Switch Station (Ordinary Extension Work):

The entire switch station will be retired after the existing Claytor – Fieldale 138-kV line is deenergized and removed. See Exhibit 35.