STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. 23-_______

Petition of Vermont Transco LLC and Vermont Electric Power Company, Inc. (collectively, "VELCO"), for a Certificate of Public Good pursuant to 30 V.S.A. § 248 authorizing construction of the "Franklin County Line Upgrade Project" consisting of upgrades to VELCO's existing K42 transmission line in Georgia, St. Albans, Swanton, and Highgate, Vermont	

PREFILED TESTIMONY OF WILLIAM F. McNAMARA ON BEHALF OF VERMONT ELECTRIC POWER COMPANY, INC. AND VERMONT TRANSCO LLC

October 26, 2023

Mr. McNamara's testimony describes the transmission line upgrade design plans associated with the Franklin County Line Upgrade Project ("Project").

EXHIBITS

Exhibit Petitioner WFM-1	**Résumé of William McNamara**
Exhibit Petitioner WFM-2	**Plan and Profile: K42 115 kV Transmission Line**
Exhibit Petitioner WFM-3	**K42 Line Structure Information Table**
Exhibit Petitioner WFM-4	**Structure Assembly Typical Details**
Exhibit Petitioner WFM-5	**Typical Existing vs. Rebuilt Structure Comparison**

PREFILED TESTIMONY OF WILLIAM F. McNAMARA

Q1. Please state your name, occupation, and business address.

A1. My name is William F. McNamara. My business address is Vermont Electric Power Company, Inc. and Vermont Transco LLC (collectively referred to as "VELCO" or the "Petitioner"), 366 Pinnacle Ridge Road, Rutland, VT 05701. I am a Professional Engineer employed by VELCO, currently working in the Engineering Department.

Q2. Please describe your education and employment background.

A2. I received my Bachelor of Science degree in civil engineering from the University of Vermont in 1987. Afterwards, I obtained registration as a Professional Engineer in the States of New York and Vermont. I have performed in a variety of primarily technical roles, with periods of both technical and operational responsibilities. These roles have involved both mechanical and civil engineering projects. My transmission line experience began when I joined VELCO in July 2005. Since then, I have been involved with transmission line projects ranging in voltages from 46 kV to 345 kV, serving as the Project Engineer/Project Lead for the following transmission line projects: West Rutland to New Haven 345 kV; Lamoille County (Duxbury to Stowe) 115 kV; Southern Loop (Vernon to Newfane to Cavendish) 345 kV; Connecticut River Valley Project K31 Line Rebuild (Cavendish to Ascutney); and various smaller new substation driven line reroutes/modifications. I am currently Project Engineer for the transmission line portions of the Franklin County Line Upgrade Project (the "Project"). I am assisting as needed with other VELCO transmission line projects. My résumé is attached as **Exhibit Petitioner WFM-1**.

Q3. Have you previously provided testimony before the Vermont Public Utility Commission (the "Commission")?

A3. Yes. I provided testimony in connection with the Transmission Line Design aspects of the Southern Loop Project, Docket No. 7373; the Georgia Substation Project, Docket No. 7731; the Ascutney Substation Project, Docket No. 7751; the Bennington Substation Project, Docket No. 7763; and the Connecticut River Valley Project, Docket No. 8605.

Q4. Do you hold any professional licenses or certifications?

A4. Yes, I am registered as a Professional Engineer in the States of New York and Vermont.

Q5. What is the purpose of your testimony?

A5. My testimony describes the transmission line upgrade design plans associated with the Project. Specifically, I will address the structural design of the rebuilt Georgia – Highgate 115 kV line, which in the VELCO system is named the "K42 Line," connecting the Georgia Substation in Georgia and the Highgate Substation in Highgate, in the towns of Georgia, St. Albans, Swanton, and Highgate, Vermont. The existing K42 Line route is depicted in the resource orthophotos that are contained in the Natural Resources Report for the Franklin County

Line Upgrade Project, Exhibit Petitioner AM-2, and in the Plan and Profiles contained in **Exhibit Petitioner WFM-2**, K42 115kV Transmission Line, Sheets 1 through 16.

Q6. Please describe the existing transmission line connecting the existing Georgia and Highgate Substations.

A6. The existing line is the K42 Line, which was installed in 1958. This line is a single circuit, 115 kV line with primarily two-pole wood H-frame structures. Exceptions are two single pole structures, one outside the Georgia Substation, and one outside of the St. Albans Switching Station. The switching station effectively breaks the K42 Line into two sections: a south section from Georgia of approximately 6.7 miles; and a north section to Highgate of approximately 10 miles. The circuit utilizes 1,272 kcmil (1.345 inch diameter) 45/7 strand Aluminum Conductor Steel Reinforced ("ACSR") conductor in a typical one conductor per phase horizontal arrangement (three phase wires per circuit), and includes two approximately 3/8 inch diameter galvanized steel or copper coated steel overhead shield wires, and two existing underbuilt All Dielectric Self Supporting ("ADSS") fiber cables.

The poles of the typical H-frame two-pole in-line suspension and three-pole angle structures are spaced at 14 feet apart. The shield wires are attached to the top of the poles to provide protection from line trips due to lightning strikes, common for transmission structures of this type. ADSS fiber is underbuilt on the 115 kV lines. The majority of dead-end and angle structures are guyed wood three-pole structures. The existing line is located in an existing right-of-way ("ROW") corridor of typical 150 foot width. In the Highgate section of the corridor, the existing K42 Line shares the same ROW with other 46kV transmission lines.

Q7. What is the proposed configuration of the rebuilt K42 Line transmission line circuit connecting the existing Georgia and Highgate Substations?

A7. Between the existing Georgia and Highgate substations, the existing K42 Line will be rebuilt, adjacent to the existing line. New conductor will be installed for its full length. Two 1,272 kcmil (1.345 inch diameter) 45/7 strand ACSR conductors per phase will be used, with one stranded galvanized steel overhead shield wire assembly of approximately 5/8 inch diameter, which will also contain internal fiber optic strands, commonly referred to as an optical ground wire assembly ("OPGW").

The rebuilt line will primarily utilize a single pole vertically configured circuit configuration. The rebuilt line outside of the Highgate Substation south to the Missisquoi River crossing, and one structure outside of the Georgia Substation, will continue to use the existing horizontally configured H-frame configuration structure types, due to some ROW width and adjacent circuit restrictions there that are not present in the majority of the remaining ROW. See **Exhibit Petitioner WFM-5** for a comparison of the most typical existing structure to the typical replacement version.

The rebuilt structures will utilize self-weathering steel (also known as COR-TEN steel), single poles, steel arms, and steel braces, compared to the existing wood poles, wood arms, and wood braces. The self-weathering steel will have a similar look to wood components. The default foundation type will be directly embedded poles. Approximately ten structures will require some improved foundations to support the increased loads added by the second conductor per phase and reduced pole counts per structure. These improved foundations will likely be either a concrete pier, or steel screw/grouted rod type anchors.

The vertically configured structures will have slightly larger pole diameters, to support the additional loads created by the second conductor per phase, as well as the reduced pole counts per structure. The replacement structures have been designed to meet current clearance and strength design criteria.

Along the entire line, the newer of the existing two underbuilt ADSS fiber cables will be reinstalled, transferred from the existing to the new structures.

The rebuilt structures will generally be in the same locations as the existing, offset approximately 27 feet to the east. Small shifts (from 0 feet to 25 feet) ahead or back will occur periodically throughout the line to facilitate construction with the adjacent circuit still being energized. About two dozen structures are expected to be moving more than 25 feet, for three primary reasons: 1) to move out of wet areas, ponds, undesirable terrain, or to avoid other environmental resources; 2) to avoid other utilities or obstacles, including to improve sight lines responding to some landowner requests; and 3) to improve ground clearances complicated by steep rock outcrops, cliffs and related terrain, which also improves overall accessibility and construction sequencing. The existing and proposed structure locations are shown in Exhibit Petitioner WFM-2 (Plan and Profile sheets) with shifts identified in the plan view portion.

Other than the previously mentioned six horizontally configured replacement structures outside of the Highgate Substation and one outside of the Georgia Substation, the rebuilt structures will utilize vertical phase configurations, supported most often by a single pole structure. Average structure above ground heights ("heights") will increase, from approximately 50 feet on the existing line, to about 78 feet, an average height increase of approximately 28 feet.

The general height increases for the Project noted above are due to four factors:

1. Improving the circuit's lightning protection capability. This is accomplished by increasing the distance between the shield wire(s) and the highest phase conductors, from approximately 6 feet currently, to approximately 15 feet, at the most common tangent structures. This improves the existing typical shield angle from 45 degrees to 30 degrees, which is now considered an industry standard.
2. Improving existing clearances of the phase conductors and ADSS cables to ground, and between each other. The original structure installations in the 1950's did not account for fiber optic cable underbuilds, so additional height in some locations is being provided to better accommodate the ADSS lines.
3. The new phase conductors will sag marginally more in the same span distances than the existing phases, due to revised higher maximum operating temperature design cases.
4. With the phases to be separated vertically rather than horizontally, the required electrical separation between phases now needs to be provided using increased pole lengths, rather than with the existing manner of using horizontal spacing of poles.

Exhibit Petitioner WFM-3 provides a Structure Information Table for the Project. Structures identified with 'DA' and 'DE' names can be either one, two, or three-pole guyed dead-end structures. A dead-end wire configuration means the wire is fixed to the pole in strain, rather than running through the structure continuously, in a suspended condition. See Exhibit Petitioner WFM-2 and Exhibit Petitioner WFM-3 for these locations, and **Exhibit Petitioner WFM-4** (Structure Assembly Typical Details) for a general view of the structure assembly.

Because they are part of a wider, regional transmission system, any lines in VELCO's system that are out of service, impact other circuits in the region. In consideration of other utility outage needs, the regional power system operator ISO-NE's needs, and to minimize system exposure during large unpredictable weather events, in general, VELCO will be unable to take the existing K42 Line out of service during its reconstruction. Project design therefore includes the strategic placement of dead-end structures effectively breaking the longer line up into numerous shorter sections, to facilitate the efficient, segmental stringing of the new conductors, that can be completed in scheduled durations either not requiring outages, or requiring shorter ones, for the final re-energization.

Q8. Please describe the typical structure assembly for structures to be rebuilt or replaced in the Project.

A8. Typical structure details are shown in Exhibit Petitioner WFM-4.

Q9. What structural design standards were used to design the Project lines?

A9. The standards used for the structural design of the rebuilt line are the National Electrical Safety Code ("NESC") 2023 Edition and the similar VELCO typical structure assembly types and practices in use throughout the existing system.

Q10. Did you incorporate any design elements into the line designs to reduce aesthetic impacts?

A10. Yes. The rebuilt line will use non-specular conductors, including the OPGW, having a dull finish rather than the bright finish of the existing conductors. As well, the self-weathering steel poles to be used for this Project will have a similar look to wood components.

In all areas, pole heights have been limited to what is required to meet clearance targets. See the attached Exhibit Petitioner WFM-3 for a height comparison of the existing versus replacement K42 Line structures.

Q11. Describe the changes that are required to the existing ROW for the rebuilt K42 Line and the reasons they are necessary.

A11. No expansion of the existing ROW is anticipated for the rebuilt K42 Line.

Q12. What level of detail is reflected in the structural designs for the transmission line rebuild?

A12. The Project plans described in this petition are at a preliminary level of detailed engineering design. With few exceptions, the structure locations, heights, and the corridor alignments are generally established; however, during the final engineering design process, steel ordering, foundation design, construction sequencing design, and when the design is made ready for actual construction, there could be areas where adjustments will be required. If changes are made during the final engineering design process, updated plan and profile sheets will be provided to the Commission.

Q13. Does this conclude your testimony at this time?

A13. Yes, it does.

DECLARATION OF WILLIAM F. MCNAMARA

I declare that the above statements are true and accurate to the best of my knowledge and belief. I understand that if the above statements are false, I may be subject to sanctions by the Commission pursuant to 30 V.S.A. § 30.

10/26/23	*/s/ William F. McNamara*
Date	William F. McNamara