STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Case No. ____

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 upgrades to VELCO's existing Florence Substation, located in Pittsford, Vermont

PREFILED TESTIMONY OF EDWARD J. MCGANN
ON BEHALF OF VERMONT ELECTRIC POWER COMPANY, INC.
This testimony and associated exhibits have been filed ePUC

September 3, 2021

Ed McGann's testimony describes the proposed Florence Project's engineering and design details related to upgrading VELCO's existing substation located at 8040 Whipple Hollow Road, Pittsford, Vermont. Mr. McGann also addresses 30 V.S.A. § 248(b)(5) (public health and safety and air pollution - noise) in regards to the substation work.

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PREFILED TESTIMONY OF EDWARD J. MCGANN
ON BEHALF OF VERMONT ELECTRIC POWER COMPANY, INC.

1. Introduction

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

A1. My name is Ed McGann. I am the Manager of Engineering for Vermont Electric Power Company, Inc. and Vermont Transco LLC (collectively referred to as "VELCO" or the "Petitioners") and I am responsible for the overall technical design of VELCO's transmission facilities. I have served in an engineering capacity since joining VELCO in 2004. My business address is 366 Pinnacle Ridge Road, Rutland, Vermont 05701.

Q2. Please describe your educational background and work experience.

A2. I received my Bachelor of Science degree in Electromechanical Engineering Technology from Vermont Technical College in 1999. Specific information regarding my work experience is detailed in my resume, attached as Exhibit Petitioner EJM-1.

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

A3. Yes, I have provided testimony in PUC Docket No. 8604, the PV20 Cable Replacement Project, PUC Docket No. 8605, the Connecticut River Valley Project,

PUC Docket No. 17-3808, St. Albans Project, Case No. 19-1812, Berlin Project and PUC Docket No. 20-0444, the Sandbar Project.

Q4. Do you hold any professional licenses or certifications?

A4. Yes, I am a registered Professional Engineer in the state of Vermont.

2. Testimony Overview

Q5. What is the purpose of your testimony?

A5. My testimony addresses VELCO's proposed Florence Project's engineering and design details related to upgrading VELCO's existing substation located at 8040 Whipple Hollow Road, in Pittsford, Vermont that are not otherwise addressed in Dan Poulin's prefiled testimony. I also address 30 V.S.A. § 248(b)(5) (public health and safety and air pollution - noise) in regards to the substation and associated transmission line structure work.

Q6. Have you prepared exhibits relating to the proposed substation work?

A6. Yes. Exhibits related to the substation include Exhibit Petitioner EJM-2, which contains a One-Line Diagram of the Florence substation. Exhibit Petitioner EJM-3 contains an aerial photograph of the substation. Exhibit Petitioner EJM-4 contains the general arrangement plan and elevation drawings for the substation. Exhibit Petitioner EJM-5 contains the overall site plan and grading details for the substation. Exhibit Petitioner EJM-6 depicts the transformer oil containment system. Exhibit Petitioner EJM-7 addresses the substation's sound levels.

Exhibit Petitioner EJM-8 illustrates 115 kV and 46 kV line structure elevation details.

Q7. Are there any proposed changes to the existing spill containment system as part of the Project?

A7. Yes. VELCO proposes to install a new transformer with an associated new transformer oil spill containment system that will consist of a polyurea lined catchment surrounding the transformer. The system diverts all rainfall and oil to a sump containing a passive filtration media, which filters oil allowing water to drain from the sump outlet. In the event of an oil spill, the filtration media will plug the sump outlet preventing any fluid from draining. Once plugged, the liquid will rise in the sump until the liquid level reaches the overflow outlet to subsurface stage 2 storage. An alarm float located in the sump notifies the VELCO 24-hour staffed System Operations Center of an oil spill containment abnormal event. The stage 2 storage are sized to hold 110% of the oil in the transformer, plus the level of rainfall associated with a 25-year, 24-hour storm event. Exhibit Petitioner EJM-6 contains a conceptual illustration of the proposed substation oil containment system design for the Project. Given some of the site constraints, the stage 2 storage method depicted in EJM-6 is being further evaluated for design enhancements to reduce subsequent cleanup efforts for small, non-catastrophic maintenance related spills.

Q8. Please describe the Florence substation lighting plans.

A8. VELCO will mount yard lights on the building and steel structures and they will consist of high efficiency Light Emitting Diode ("LED") down-lights. The building mounted lights are controlled by a photocell and therefore will be on continuously at night and off during the day. Lights mounted to the steel structures will be manually switched remotely by SCADA and VELCO security or locally by on-site personnel during emergency repair and security response events.

Q9. Please explain the reliability benefits of the proposed ring bus versus retaining the existing 46 kV radial bus configuration.

A9. As mentioned in Dan Poulin's testimony, the ring bus offers maintenance flexibility to remove individual circuit breakers from service for planned maintenance without disruption of service to area customers. From a fault clearing perspective, the radial bus configuration requires all 46 kV circuit breakers to trip for a fault on the substation 46 kV bus. Similarly, a Florence circuit breaker failure occurrence during a request to trip for a fault on a 46 kV transmission line results in the same scenario where all Florence 46 kV circuits breakers are required to trip. The ring bus arrangement minimizes the number of 46 kV circuit breakers required to trip in these instances. With the proposed Project's ring bus design, substation faults will only trip the circuit breakers associated with the faulted ring position and a Florence circuit breaker failure occurrence will result in no more than (2) 46 kV ring positions required to trip. VELCO has studied the 46 kV ring position assignments to minimize the 46 kV system impact should a circuit breaker failure scenario occur.

Q10. Please provide an explanation for the increase in capacity of the capacitor bank from its 5.4 MVAR rating to the proposed 10 MVAR rating.

A10. VELCO has removed the existing 5.4 MVAR capacitor bank from service for some time due to substation equipment failures observed over time being diagnosed as a result of harmonic resonance overvoltages experienced on the substation equipment when the capacitor is placed into service. The capacitor bank is required to maintain 46 kV area operating voltages with all lines in service and more so when the Florence transformer or the 115 kV circuit into the Florence substation is out of service. Thus, VELCO evaluated the capacitor bank design for the Project.

VELCO proposes to redesign the capacitor bank as a 5th harmonic filter to account for an 11th harmonic resonance when VELCO places the capacitor into service. VELCO has designed the filter-to-filter harmonics at the 5th and greater to avoid overloading the 5th harmonic filter at the industrial customer plant, OMYA. VELCO proposes to replace the existing capacitor bank and associated inrush reactors to meet the electrical design parameter requirements of a tuned 5^{th} harmonic filter bank. Given the replacement of the capacitors, the inrush reactors, and need for a circuit topology change to meet the filter design requirements, VELCO reviewed the size of the reactive output of the design with GMP to determine if the existing 5.4 MVAR capacity still satisfied their 46 kV voltage criteria during a 115 kV outage scenario under peak load conditions. VELCO selected a 10 MVAR rating given the minimal incremental cost for the additional capacitors versus the improved area voltage performance when the filter bank is

placed into service. The 5.4 MVAR capacitor allowed GMP to meet its equal slope criteria, with the ability to maintain voltages 81% of the time. The larger capacitor bank will allow GMP to obtain 100% N-1 coverage for loss of the VELCO Florence 115/46kV transformer or 115 kV line sourcing the Florence substation.

Q11. What design standards did VELCO use to design the proposed Florence substation upgrades?

A11. VELCO followed its Substation Design Standards for the design of Florence substation upgrades. VELCO's Substation Design Standards are based on industry standards, including the National Electrical Safety Code ("NESC"), Institute of Electrical and Electronic Engineers ("IEEE"), American National Standards Institute ("ANSI") and National Electrical Manufacturer's Association ("NEMA").

Q12. Does VELCO plan on making any changes to the existing Florence substation access driveway? If yes, please describe.

A12. Yes. VELCO will upgrade the existing driveway access from Whipple Hollow Road. VELCO is proposing to widen the turning radius of the driveway where it intersects with Whipple Hollow Road to allow large trucks to enter and exit the driveway without having to go on the property directly across from the driveway. This improvement will eliminate this problem that has existed for years. The positioning of the substation requires minimal adjustment of the access road alignment to access the entry gates on the northwest fence line. Exhibit Petitioner EJM-5 (Site Grading Plan).

Q13. Will VELCO need to perform any grading for the substation upgrades?

A13. Yes, the new substation placement will require ledge removal on the easterly side of the station, a new finished grade elevation, and grading around the entire fenceline. Please see Exhibit Petitioner EJM-5 for details on the proposed grading plan.

Q14. Please describe the existing 115 kV transmission line elements associated with the Florence substation and the proposed upgrades related to this Project.

A14. The Florence substation 115 kV circuit is connected from the substation bus via a single span to a Ganged Operated Air Break (GOAB) switch tapped off VELCO's K30 transmission line to the west of the substation. VELCO will elevate the grade of the existing motor operators for the GOAB approximately two feet. The Project will relocate the substation and the associated 115 kV connection will require the addition of (2) 115 kV, three-pole structures. Please see Exhibit Petitioner EJM-8 for elevation details of the proposed 115 kV, three pole structures.

Q15. Please describe the existing 46 kV transmission line elements associated with the Florence substation and the proposed upgrades related to this Project.

A15. Each of the (3) 46 kV circuits will be re-routed to their new substation terminal position. The two lines exiting north of the substation will each require VELCO to remove an existing guyed angle structure and replace it with a new self-supported angle structure, to facilitate the new alignment of each line into the new substation. Similarly, the line exiting south of the substation will require VELCO to modify an

existing angle structure, and install one new angle structure, to facilitate the new alignment of the line into the new substation. Please see Exhibit Petitioner EJM-8 for elevation details of the proposed 46 kV, single pole, self-supporting structures for the two north lines, and the proposed 46kV single pole guyed structure for the south line.

Q16. Will there be temporary transmission line structures required to support construction of the Project?

A16. Yes, the (2) 46 kV transmission circuits exiting north of the existing substation cross over the western portion of the proposed Project site. VELCO will install temporary structures and raise these circuits to accommodate construction activities in this area. Additionally, VELCO will install temporary structures northeast of the Project site to facilitate 46 kV transmission circuit cutovers during the Project's construction phases. VELCO will remove these temporary structures at the end of Project construction.

Q17. In your opinion, have the Project elements included in the VELCO Florence substation proposals, as described in the exhibits you have sponsored, reached a design level of detail?

A17. Yes. The plans and elevations that VELCO has included as exhibits to this testimony reflect the locations and heights of the equipment proposed for construction of the Florence substation.

3. Public Health and Safety [30 V.S.A. § 248(b)(5)]

Q18. Will the substation upgrades have any adverse effects on the health, safety, or welfare of the public or adjoining landowners?

A18. No. The substation is an existing facility and not accessible to the general public. VELCO has designed and will construct the Project in accordance with industry safety standards, including the National Electric Safety Code requirements. VELCO will adhere to prudent utility construction practices throughout the construction phase and the Project will not endanger the public or adjoining landowners. The substation will be fenced in at all times during and after construction to protect against unauthorized access. VELCO will operate and maintain the upgraded substation in the same, safe manner that the company operates and maintains all of its facilities.

4. Air Pollution (Noise), [30 V.S.A. § 248(b)(5)]

Q19. Has VELCO evaluated the Project's sound impacts?

A19. Yes. VELCO retained Resource Systems Group, Inc. ("RSG") to conduct a noise assessment of the site, which included a pre-construction sound monitoring study to determine the existing sound conditions at the Florence Substation, and closest residence. Please see Exhibit Petitioner EJM-7 (Florence Project Preconstruction Sound Study).

Q20. Please describe the results of the sound monitoring.

A20. RSG performed sound measurements of the existing Florence substation and at the closest residence to determine existing sound levels.

RSG installed a long-term sound level monitor on the northeast fence-line of the substation, approximately 35 meters (115 feet) northeast of the power transformer, 282 meters (925 feet) west of the OMYA building and 265 meters (869 feet) south of Whipple Hollow Road. Long-term sound level measurements at the substation registered a daytime sound level of 53 dBA L90 and 54 dBA Leq, and a nighttime sound level of 53 dBA L90 and 54 dBA Leq.

RSG installed a long-term sound level monitor in the yard of the closest residence to the substation located approximately 255 meters (836 feet) northeast of the power transformer, and approximately 60 meters (197 feet) to the south of Whipple Hollow Road. Long-term sound level measurements for the residence registered a daytime sound level of 38 dBA L90 and 52 dBA Leq, and a nighttime sound level of 39 dBA L90 and 47 dBA Leq.

Q21. Please describe RSG's methodology for estimated sound level changes as a result of relocating the substation.

A21. As described in the report, RSG conducted the sound level modeling of the substation by applying the International Standards Organization ISO 9613-2 standard, which takes into account equipment sound specifications and the surrounding features including, for example, the surface reflection and absorption,

or other terrain and meteorological conditions. RSG conducted its study based on acoustical modeling software used by many other sound control professionals in the United States and abroad. Please see Exhibit Petitioner EJM-7, Section 4.0.

RSG estimated the maximum sound level at the nearby residence where long-term monitoring was performed is 24 dBA in the ONAN cooling mode and 26 dBA in the ONAF cooling mode. The proposed transformer has a sound power level that is 14 dB less than the existing transformer and the sound levels at area residences due to the substation transformer will be 6 to 15 dB less than existing transformer sound levels.

RSG estimates that the highest sound levels at nearby residences due to the new capacitor bank is 41 dBA. This is below the average daytime and nighttime sound levels in the area.

Q22. Are any sound mitigation measures necessary for the Project?

A22. No. RSG predicts no adverse sound impacts to the nearest residence as a result of the Project and thus does not recommend mitigation measures. For these reasons, VELCO does not propose post construction sound measurements or monitoring.

Q23. Does this conclude your testimony at this time?

A23. Yes, it does.