STATE OF VERMONT
PUBLIC UTILITY COMMISSION

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 the construction of the New Haven Operations Facility in New Haven, Vermont	))))))	Case No. 19-____-PET

PREFILED TESTIMONY OF DAVID P. HAAS ON BEHALF OF VELCO

November 15, 2019

Mr. Haas's testimony explains the need for the Project's Backup Control Center under 30 V.S.A. § 248(b)(2), and the benefits of the Project's Backup Control Center on system stability and reliability pursuant to 30 V.S.A. § 248(b)(3).

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PREFILED TESTIMONY OF
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ON BEHALF OF VELCO

1. Introduction

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

A1. My name is David Haas. I am employed by Vermont Electric Power Company, Inc. ("VELCO"). I serve as the Director of Operations and Energy Management Systems, and have oversight for control center operations and the tools to operate the transmission system within VELCO's headquarters at 366 Pinnacle Ridge Road, Rutland, Vermont 05701. I refer to those headquarters in this testimony as the Pinnacle Ridge Campus.

Q2. Please describe your educational background, qualifications and work experience.

A2. My resume is attached as Exhibit Petitioner DPH-1. I received an ASEET Degree from Vermont Technical College in 1982, after which I began working for VELCO. I have been employed with VELCO for over 37 years. During this time, I have worked in various capacities that include experience in field maintenance, electrical and power system design, system modeling, short circuit studies and analysis, project management, and load-flow studies and analysis. Currently, I am responsible for daily operation of VELCO's control center and energy management systems.

Q3. Have you testified previously before the Public Utility Commission?

A3. Yes, I have submitted prefiled testimony in several Commission proceedings, including Dockets 8033 and 8085 concerning transformer replacements in St. Albans. I also provided testimony in connection with VELCO's Lamoille County Project in Docket 7032.

Q4. What is the purpose of your testimony?

A4. My testimony describes the function of the Main Control Center or "MCC" at VELCO's Pinnacle Ridge Campus, and explains the need for VELCO's inclusion of the Backup Control Center or "BCC" as well as emergency work locations, all as part of the proposed New Haven Operations Facility at 760 Main Street, New Haven, Vermont (the "Project"). These elements are proposed for the interior of the "Main Building" as described in the prefiled testimony of Peter W. Lind. I also describe why the Backup Control Center will enhance system stability and reliability for purposes of 30 V.S.A. §248(b)(3).

2. Functions and Importance of Main Control Center

Q5. Please describe VELCO's existing operations center at the Pinnacle Ridge Campus.

A5. The MCC is made up of a 24/7/365 operated control center; an Energy Management System ("EMS") support group (Engineers); an Operation support group (Management, Engineers, Outage Coordinators, and Training Coordinator); an IT/Networks group; and several other disciplines that support the daily operations, e.g., Asset Maintenance,

Facilities, Telecommunications, System Planning, Civil/Electrical Engineering, Finance, Projects, Environmental, and Administration.

The existing MCC includes an eight-by-twenty-one foot video display board, eight large wall-mounted displays, and five System Operator workstations. The video board depicts the Vermont transmission system, all Vermont distribution utility sub-transmission systems, and interconnections to neighboring transmission entities such as Hydro-Québec, New York Power Authority, and several New England transmission systems. The large wall-mounted displays provide additional operator situational awareness that includes real-time weather data and forecasts, as well as security camera feeds. The five workstations include two dedicated operator desks, a manager's desk, a support/projects desk, and a training desk. Each of these desks is equipped with computers for corporate, EMS and Supervisory Control and Data Acquisition ("SCADA") functions, with a total of 29 desk-display monitors. The SCADA/EMS computers and monitors along with the video display board are operated via a dedicated and secure network requiring special credentials and physical security measures. The MCC is classified as a high-impact asset in accordance with North American Electric Reliability Corporation ("NERC") standards and requirements for what is referred to in the industry as Critical Infrastructure Protection. These standards require the control center to have a six-wall physical security perimeter and to be restricted with controlled access. The existing MCC is hardened to protect against physical attacks and varying levels of natural disasters.

Q6. Please provide examples to explain the role of VELCO's Transmission System Operators in managing the bulk transmission system in Vermont.

A6. NERC requires that all Transmission Operators ("TOPs") have NERC certification and maintain this certification through on-going credited training. The VELCO System Operators perform the following functions:

- Operate and monitor the VELCO transmission system and subtransmission systems serving the VT distribution utilities;
- Regulate the power system's real and reactive power flows, and control voltages;
- Perform real-time contingency analysis, risk assessments, and power-flow studies focused on maintaining system security by preventing cascading events that can lead to system instability and collapse;
- Undertake direct equipment switching and tagging for safe isolation of circuits required for both planned and unplanned outage activities;
- Coordinate all Vermont real-time operating activity with Independent System Operator-New England ("ISO-NE"), neighboring transmission entities, Vermont generators, and Vermont distribution utilities;
- Dispatch Vermont area generation;
- Perform emergency actions to maintain system reliability;
- Operate in full compliance with all Federal Energy Regulatory Commission ("FERC"), Northeast Power Coordinating Council ("NPCC"), NERC and ISO-NE standards, requirements, procedures and guides; and

- Train and mentor operator trainees in the control center environment.

The control center depends on a vast amount of secure data being shared with the Vermont distribution utilities, neighboring transmission entities and ISO-NE. Much of this data is transmitted and received via diverse and redundant communication networks, and these networks must continually operate at a very high level of reliability. As an example, contingency analysis is automatically executed every five minutes in the control center, running over 500 contingencies (i.e., "what-if" scenarios) each time. Additionally, real-time operation requires voice communications over the phone for the coordination of activity with all internal and external entities, performing switching orders with field crews, and in keeping ISO-NE and neighboring transmission operators apprised of system activity and conditions. System Operators rely on phone systems that are backed up (i.e., redundant) and diverse (different providers and different paths) to provide the reliability and availability needed.

VELCO Operations is responsible for a statewide emergency preparation program made up of the Vermont distribution utilities, telecommunication providers, Vermont Emergency Management, Department of Homeland Security, Vermont State Police, Vermont National Guard, the Red Cross, a full-time meteorologist, and several state agencies such as the Department and VTrans. Through VELCO Operations-sponsored conference calls, this group gets briefed and prepares for threats such as forecasted weather events and potential cyber-attacks, while supporting the coordination of mutual

assistance and staging of resources, and providing on-going restoration and recovery efforts.

Essentially, VELCO is in the public safety business, and communications is critical to us.

Q7. Please describe any significant regulatory standards that govern the design and/or function of an operations center.

A7. Vermont Transco LLC is registered with NERC as a TOP, and as such must comply with mandatory reliability standards established pursuant to Section 215 of the Federal Power Act. NERC standard Emergency Operating Procedure EOP-008-2 "Loss of Control Center Functionality"—attached as **Exhibit Petitioner DPH-2—**defines the requirements for functional entities to provide continuous control center functions. The purpose of this standard is to "ensure continued reliable operations of the Bulk Electric System ("BES") in the event that a control center becomes inoperable." EOP-008-2 requirement R6 states: "Each TOP shall have primary and backup functionality that do not depend on each other for the control center functionality required to maintain compliance with Reliability Standards."

Several other standards define the TOP's responsibilities in meeting these requirements; such as the ability to transition from primary to backup functionality within two hours, and to have backup functionality staffed by certified operators when control has been transferred to the backup functionality, including monitoring, control, logging, and

alarming sufficient for maintaining compliance with all Reliability Standards that are applicable to a TOP's main control center functionality.

VELCO is a Participating Transmission Owner ("PTO") in the New England Transmission Operating Agreement ("TOA"). Pursuant to TOA section 3.06, each PTO has the responsibility to maintain and operate their Local Control Centers ("LCC") on a 24-hour basis, including LCCs maintained as backup for a PTO's primary LCC. ISO-NE has the responsibility and authority under the TOA to periodically audit each LCC's BCC. In VELCO's most recent 2019 audit, section 7 (Evacuation Procedures) requires the periodic review and inspection of the BCC, in order to ascertain if its backup facilities can support continued operations (procedures, equipment, communications, personnel rotation, etc.). As described in Mr. Lind's prefiled testimony, VELCO had actually been working since 2014 to develop a replacement backup operations and data center due to certain identified inadequacies at those existing backup facilities.

Q8. Please describe the circumstances under which it may be necessary to use an alternate, off-site facility to operate the transmission system, and any current plan VELCO has in place to address such circumstances.

A8. VELCO operating procedure OP-54 ("Evacuation of the Main Control Center") provides the responsibilities, defined actions, and guidance for the VELCO System Operators to evacuate the MCC and transition control center functionality to the Backup Control

Center. OP-54 provides some scenarios that may require an evacuation include the following:

- A potential or actual life-threatening situation at the Pinnacle Ridge Campus, such as a bomb threat, fire, toxic fumes or gas, or natural disaster;
- The MCC is rendered unusable due to a loss of MCC workstations or communications systems that disables or compromises the functionality of the MCC, and where near-term recovery of such workstations or systems is deemed to be unlikely;
- Complete failure of incoming and outgoing data communications capabilities for the MCC (referred to as the Inter-Control Center Communications Protocol);
- Complete loss of voice communications capabilities (landlines, cell phones, satellite phones, etc.) with ISO-NE, other LCCs, and other VELCO personnel/facilities; and/or
- Threat of a cyber-attack on SCADA and EMS systems.

VELCO's Emergency Response Plan ("ERP") is a guide for VELCO staff to immediately respond to a variety of events, such as potential threats and emergencies that jeopardize the integrity of the VELCO transmission, communication and other assets, e.g. potential or actual cyber or weather events. The ERP is designed and aligns with the National Incident Management System ("NIMS") and Incident Command System ("ICS") for effective coordination among all organizations during larger scale events. The ERP allows for scalability in response to and recovery from an event, and generally is

activated for events with a duration of less than one week. Under the ERP, an Incident Command Center ("ICC") would be established at the VELCO Pinnacle Ridge Campus with multiple support functions. For loss of varying levels of functionality at the VELCO Pinnacle Ridge Campus, alternate recovery facilities would need to be established to support the ICC. The New Haven Operations Facility is designed to support the VELCO ERP, and to be available for use as the ICC where the Pinnacle Ridge Campus must be evacuated or is otherwise unavailable.

VELCO's Business Continuity Plan ("BCP") is companion document to the ERP: it identifies key business processes and tools, and explains the protocol for using the BCC during a sustained disruption of these processes and tools. For certain scenarios requiring the evacuation of all or portions of the Pinnacle Ridge Campus, the BCP may be activated to support continued functionality of VELCO's business operations from the BCC, e.g., loss of communication networks.

Copies of the BCP and ERP have been filed under seal as **Conf. Exhibit Petitioner PWL-16** and **Conf. Exhibit Petitioner PWL-17**, respectively.

3. Need for Backup Control Center at New Haven

Q9. Is the Project required to meet the need for present and future demand for service which could not otherwise be provided in a more cost effective manner through energy conservation programs and energy efficiency and load management?

A9. Yes. While Daniel Nelson's prefiled testimony addresses the need for the Secondary Data Center, I explain the need for the Backup Control Center. The existing operations BCC is situated within a section of a VELCO substation control building, and was an initial solution deployed approximately 15 years ago for providing backup control center functionality when VELCO registered under NERC as a Transmission Operator.

This substation serves several 115,000 and 345,000 voltage transmission circuits. Due to close proximity and collocation with critical computer-based SCADA/EMS and communications systems, the equipment can be susceptible to failure with high-voltage transients. This susceptibility cannot be feasibly addressed through upgrades or mitigation measures. In my opinion, this is one of the main reasons why the backup center should be physically separated from operational transmission facilities.

The existing BCC has four workstations and can support up to four System Operators and Operations/EMS support staff. The BCC cannot easily support other staff members if needed for more severe and longer duration event scenarios. Additionally, for longer duration events, the BCC does not have adequate facilities for supporting staff working 24/7 shift schedules. With respect to other employees, they would need to be deployed elsewhere, separate from the operations staff, to accommodate the BCP.

The existing BCC is equipped with two large wall-mounted monitors for displaying limited portions of the Vermont operating area, but it lacks the physical space to install a video display board for monitoring the entire Vermont area. This limits the System

Operators' situational awareness, and deprives them of the benefits of having a wide-area view for real-time monitoring and post system-event actions.

Q10. Please describe the key features of the proposed Backup Control Center at the New Haven Operations Facility that distinguish it from the existing BCC.

A10. The proposed BCC has a larger footprint that has been designed to support longer-duration operation from this facility. The New Haven Operations Facility includes work areas for EMS Engineers and IT Specialists to support 24/7/365 operation of the Vermont transmission system. The BCC operating tools include many special computer-based applications, such as SCADA and advanced EMS electric system models that require ongoing professional support from these groups.

The proposed BCC will be equipped with five workstations to support the aforementioned MCC functions, and additionally have a video display board to display the Vermont area transmission and subtransmission systems, as well as a wide-area view of the regional grid. The video display board provides improved System Operator situational awareness over the existing BCC.

The proposed facility, with its more centralized location in Vermont, will additionally serve as a training center for the VELCO System Operators and the Vermont distribution utility operators. The new BCC will allow for training operators using an Operating Training Simulator ("OTS"), and the operator workstations along with the SCADA/EMS tools will closely mirror the MCC operating environment.

Q11. Please describe what would be involved in deploying qualified personnel to the New Haven Operations Facility in the event of a BCP activation event at VELCO's Pinnacle Ridge Campus.

A11. The driving distance from the VELCO MCC at the Pinnacle Ridge Campus to the proposed New Haven facility is approximately 37 miles via U.S. Route 7 and VT Route 17, and the estimated travel time is 54 minutes. As previously described, NERC standard EOP-008-2 requires the ability to transition primary to backup functionality within two hours. Even considering seasonal driving conditions, the travel time to the New Haven facility will be less than the two hours. In addition, the location of this facility supports the ability to use alternate routes (e.g., VT Routes 30, 22A, 116).

The VELCO System Operators follow a well-scripted operating procedure for evacuating the MCC and transitioning functionality to the BCC. This procedure will be modified as needed for the proposed New Haven BCC. The System Operators on shift have the responsibility for transitioning functionality with no intentional delay. Following this transition and operating from the New Haven backup control center, operations management will develop a staffing plan at this facility for operations support and EMS personnel. For event scenarios requiring operation from the New Haven facility for extended periods, e.g., beyond one to two days, the VELCO BCP would likely be activated and tailored to maintaining control center operation at the New Haven facility. Other VELCO groups and disciplines, such as IT, would be called upon to support this BCP activation. It would be very likely that the event requiring transitioning control

center functionality to the New Haven facility would also impact the ability of other VELCO groups and disciplines to perform their key functions at the MCC. The BCP activation would include having these groups deploy personnel to work from the New Haven facility. The BCP activation would always be scaled and tailored to suit the business continuity need.

Q12. Describe the degree to which VELCO consulted with other transmission operators in designing the New Haven Operations Facility, and any recommendations adopted.

A12. There are no specific design standards that establish requirements as to the location or design of back-up facilities other than the NERC requirement to have the ability to transition from primary to backup functionality within two hours. The siting of the New Haven facility included solicitations from our peer New England transmission control center managers. Each of our peers have BCCs that are located to provide the physical diversity in reducing the risk of one event rendering both facilities inoperable. Siting locations are generally based on physical distances and geographic topologies, and our peers have BCCs that located between 14 to 30 miles from their MCCs.

One of our New England peers offered reference to the "Emergency Response Guidebook for Isolation Zones Around Chemical Spills and Plumes." Based on the general guidance summarized above, it was gleaned to be preferable to locate the backup facility in excess of 10 miles from the MCC location.

VELCO also looked to guidance from the North American Transmission Forum ("NATF"). The NATF is a peer transmission organization that promotes the exchange of information among its members for improving the reliability of the transmission systems in the U.S. and Canada: VELCO is a NATF member. The NATF publication *Bulk Electric System Monitoring and Control - An Overview of Backup Capabilities* provides an overview of the key capabilities for the reliable operation of the transmission grid, along with a description of the various approaches used within the industry to ensure redundancy for critical capabilities. A copy of the public version of the NATF publication is provided as **Exhibit Petitioner DPH-3**. Adherence to the approaches set forth in the publication allows for the BCC to be constructed in order to ensure that System Operators can continuously monitor and control the grid in the event of the loss of MCC capabilities. NATF also performs peer reviews of their members, which includes strengths, noteworthy practices and areas of improvement.

In August 2018, NATF conducted VELCO's on-site peer review and confirmed multiple shortcomings of the existing BCC, all as previously described. The review team was made up NATF personnel and subject matter experts from ten member transmission companies throughout the United States. The NATF peer review report recommended that VELCO proceed with the "planned enhancements," a term referring to the New Haven facility, in order to address adequacy of working space, and to recreate the MCC working environment in the backup facility, including to allow for operator training.

Q13. What benefits, if any, will the Backup Control Center have on system stability and reliability?

A13. Construction of the Project is critical to system stability and reliability of VELCO's transmission assets for the reasons previously stated. The proposed New Haven facility will support both the short- and long-term operation capabilities for the System Operators and support personnel, as well as the business continuity needs for other VELCO groups and disciplines. This facility being more centrally located in Vermont in relation to the Vermont distribution utilities, and having training capabilities such as access to the OTS, additionally will serve as a training center for the VELCO and Vermont distribution utility operators.

Currently, the OTS is functional but lacks the control room environment and tool sets that the VELCO System Operators use on a daily basis. The proposed Backup Control Center can be configured to operate as a simulator environment and allow for more Operator Training in an environment that closely resembles that of the MCC.

Failure to provide such a facility would create a situation in which adequate business continuity actions and/or operating functionality could not effectively occur. As outlined above, the existing emergency facilities are dispersed in the Rutland area and consist of a backup data and control center in the control house of a 345 kV substation yard and work locations near the MCC. Whereas there are several separate facilities identified in the BCP, the inadequacies of these facilities are compounded by the fact that personnel

would be working in separate, unsecure locations. Given the proximity to the Pinnacle Ridge Campus, one major event could render all these facilities inaccessible and/or inoperable.

4. Conclusion

Q14. Does this conclude your testimony?

A14. Yes.