MEMORANDUM

TO: Vermont Transco

FROM: Daymark Energy Advisors

DATE: June 22nd, 2023

SUBJECT: K42 Line Rebuild Benefits Calculation Review

Daymark was requested to perform a review of the direct and indirect benefits calculation performed by VT Transco pertaining to the K42 line upgrade, specifically a single pole rebuild and the benefits of adding a second conductor. As part of the review Daymark reviewed both the methodology used in the calculation as well as the assumptions made as part of the analysis to assess if they are in line with industry best practices.

Quantitative benefits for new single pole/single conductor line instead of in-kind replacement of all structures

Daymark examined the calculation VT Transco is presenting of the quantified benefits of upgrading structures and adding a second conductor instead of an in-kind replacement of the K42 line. The analysis uses a value of lost load ("VOLL") approach to evaluate the potential risk to customers, and society at large, of an outage event occurring in the event in-kind replacement is used. The premise behind this analysis is that an in-kind replacement increases the risk of lost load as any single contingency event would trigger load shed, whereas adding a parallel line ensures additional redundancy is in place, minimizing the risk of lost load. In effect, the value from a new line is insurance against a loss of load event occurring.

The VOLL calculations presented by VELCO are done using ICEcalculator.com, which is a reputable industry source commonly used for such calculations. VELCO further tailored the inputs used to reflect

the reliability standards (SAIFI 2.5 and CAIDI 2.6) with estimated outage times based on their operational experience[1].

The calculated VOLL is then adjusted to the same 2023 dollars used in the rest of the analysis to ensure a consistent basis for comparison.

Overall, Daymark agrees with the methodology used to evaluate the benefits regarding a new line versus in-kind replacement. The customer value of experiencing an adverse VOLL event outweighs the cost of the upgrade. This would be consistent with the view that the new line presents a higher benefit to society by reducing the risk of an adverse event occurring. This is very much in line with the principles of maintaining system reliability for customers.

Quantitative benefits for double conductor instead of single conductor

The calculation of net societal benefits for a double conductor as part of the K42 line upgrade is a simplified net present value ("NPV") calculation which is standard practice for a high-level evaluation cost-benefit of an infrastructure project. The NPV is predicated on several factors which can affect the overall value over time: the assumed power losses, the forecasted prices of energy and capacity, the social cost of carbon and the discount rate. Daymark reviewed the assumptions used in each portion of the NPV calculation and found them to be reasonable and using appropriate source data.

Daymark reviewed the values used for annual power loss estimates across the K42 line and the expected reduction in losses resulting from the line upgrade and has found the results to be reasonable. VT Transco utilizes figures from ISO New England PSSE power flow cases as the basis for the figures, which is the best available estimate.

The value of avoided power losses is based on the assumed price of energy and capacity in the year that the losses would have occurred. To review the reasonableness of the value used for calculating this energy price Daymark reviewed both the sources used as well as the methodology used to estimate pricing. VT Transco's analysis uses the energy prices published by the Vermont Department of Public Service in the 2023 RES Report for pricing out to 2025 and then extrapolated prices forward using the expected price of natural gas published in the United States Department of Energy Annual Energy Outlook report published in March 2023. This methodology is both appropriate and conservative as natural gas tends to set the marginal energy price in the New England power markets and the estimated

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[1] Vermont Electric Cooperative's reliability standards were used as a proxy for this area of concerned load loss as they have the largest amount of load in this area.

prices are lower than would have resulted from extrapolating forward the power pricing and capacity from the 2023 RES Report.

The estimated value of reduced carbon emissions is based on the avoided carbon resulting from reducing power losses along the K42 line. The amount of avoided carbon emissions is calculated based on the time-weighted locational marginal unit (LMU) marginal emission rates published by ISO New England and valued at the prices calculated by the by the Climate Council in a report titled "*Social Cost of Carbon and Cost of Carbon Model Review Analyses and 12 Recommendations to Support Vermont's Climate Council and Climate Action Plan.*" This approach uses the most appropriate source available to estimate the value of the avoided emissions. While federal values of carbon are lower than those utilized, it is expected that the Biden administration will revise these figures upwards. Furthermore, the value of carbon utilized by VT Transco is similar to (and based upon) those used by neighboring states, particularly New York, and used in their decision-making processes.

The final factor of the NPV calculation is the discount rate used to discount the benefits back to current day dollars and account for the opportunity cost of the investment. VT Transco used a societal discount rate for New England based on the Moody's credit rating of each state with a risk spread against the 10-year Treasury bill. A 2% annual inflation assumption was used to calculate a real discount rate, currently the 10-year government bond yields a 3.38% rate, which makes using 2% conservative. This real rate was then weighed by state GDP to produce a weighted average societal discount rate for the New England region to calculate an NPV. The use of the 10-year rate is appropriate as the benefits are accounted for over a 10-year period. Additionally, the use of a weighted average societal discount rate is appropriate as state governments are the elected representatives of the population, and while spending habits are not always perfectly aligned with societal wishes, it is the best empirical proxy available.

Overall Daymark concludes that the NPV calculated presented by VT Transco for the K42 line upgrade follows best practices and uses the most appropriate sources available to arrive at the final figure. Furthermore, this figure is a conservative estimate of the NPV as VT Transco only extends the benefit calculation out over 10 years. Using a 10-year horizon is conservative as topology changes on ISO-NE system become more unpredictable with each additional year which could cause variation in the MWh of losses. Discounting further out in time also comes with a higher discount rate in out years, simply due to uncertainty and the risks associated. However, while it may be increasingly difficult to quantify benefits past a 10-year horizon, there is little question that the reduced losses from upgrading the section of the K42 line would extend beyond 10 years and provide some level of benefit beyond the 10-year horizon.