STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 6860

Petitions of Vermont Electric Power Company, Inc. (VELCO) and Green Mountain Power Corporation (GMP) for a certificate of public good, pursuant to 30 V.S.A. Section 248, authorizing VELCO to construct the so-called Northwest Vermont Reliability Project, said project to include: (1) upgrades at 12 existing VELCO and GMP substations located in Charlotte, Essex, Hartford, New Haven, North Ferrisburgh, Poultney, Shelburne, South Burlington, Vergennes, West Rutland, Williamstown, and Williston, Vermont; (2) the construction of a new 345 kV transmission line from West Rutland to New Haven; (3) the reconstruction of a portion of a 34.5 kV and 46 kV transmission line from New Haven to South Burlington; and (4) the reconductoring of a 115 kV transmission line from Williamstown to Barre, Vermont **AND** amendment to VELCO petition to provide for: (1) proposed modifications to the route of the line between New Haven and South Burlington, specifically in the City of Vergennes and the Towns of Ferrisburgh, Charlotte and Shelburne; (2) proposed changes to the substations located in Vergennes, Shelburne, Charlotte and South Burlington; and (3) proposed changes to pole heights.

PROPOSED FINDINGS AND BRIEF

SUBMITTED BY PETITIONERS,

VERMONT ELECTRIC POWER COMPANY, INC.
AND
GREEN MOUNTAIN POWER CORPORATION

NOVEMBER 24, 2004

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I. INTRODUCTION

OVERVIEW

This case concerns Petitions filed with the Public Service Board ("Board") by Vermont Electric Power Company, Inc. ("VELCO") and Green Mountain Power Corp. ("GMP") (collectively, the "Petitioners"), on June 5 and June 9, 2003, respectively, seeking a certificate of public good ("CPG") pursuant to 30 V.S.A. § 248, to build a coordinated series of improvements to the VELCO transmission system designed to solve serious reliability problems in northwest Vermont and to provide adequate and reliable transmission service to the state of Vermont and to the systems with which it interconnects (collectively the "Project" or "NRP").

The Reliability Problem

The transmission system in Vermont has served the state well for many years in essentially its present configuration. Some of its principal elements, however, are up to forty years old. Major upgrades have been postponed to a point where small-scale upgrades are no longer effective. In the face of tremendous growth in load over this time, the margin built into the system has been depleted.

Transmission system studies performed by VELCO demonstrate that the Vermont transmission system is becoming increasingly susceptible to system failures and widespread outages (*i.e.*, blackouts). The greatest concern centers on, but is not exclusively limited to, the transmission system that serves the northwest part of the state – Chittenden, Franklin, Grand Isle and northern Addison Counties. This is the major load center of the state, and it is also where load is growing the fastest. Presently, Vermont is exposed to voltage collapse if there is a long-term outage of the Highgate Converter combined with the loss of any of the other three remaining 115 kV lines supplying northwest Vermont. Such an outage, if it were to occur during existing peak summer conditions, could result in a blackout for over half of Vermont's load (encompassing all of northwest Vermont) and possibly cascade to neighboring systems.

The Independent System Operator of New England ("ISO-NE"), the organization charged by the Federal Energy Regulatory Commission ("FERC") with ensuring the reliability of the New England regional transmission system, has reported that the

> ***"Northwest Vermont area faces serious reliability problems due to weak interconnections with the bulk transmission system and a lack of generating resources and distributed resources in the region."***[1]

The reliability problem is exacerbated by the fact that Vermont's two most critical transmission elements -- the Plattsburgh to Sand Bar 115 kV line ("PV-20") and the Highgate Converter -- are vulnerable to and have experienced extended equipment failures or outages in recent years. In

[1] ISO New England Board approved RTEP02 (Regional Transmission Expansion Plan), section 1.4.4, page 14.

fact, the Phase Angle Regulator ("PAR") located at Plattsburgh to control PV-20 flows, failed again on April 11, 2003, further weakening an already stressed transmission system.

The Project

The NRP corrects system deficiencies that exist at load levels far below today's peak demand and provides for reliable service up to a statewide load of 1200 MW, expected to be reached by 2011, according to the DPS 2002 statewide load forecast. VELCO's system studies reveal that most NRP elements are needed at critical load levels that are *lower* than present day Vermont peaks, and that all NRP elements must be in service by the 1100 - 1140 MW load level, expected to be reached beginning in 2005-06. The principal features of the NRP are:

(1) The construction of a new 35.5 mile 345 kV transmission line from West Rutland to New Haven, Vermont, parallel to VELCO's existing 115 kV transmission line, passing through the Towns of West Rutland, Proctor, Pittsford, Brandon, Leicester, Salisbury, Middlebury and New Haven;
(2) The replacement of existing 34.5 kV and 46 kV subtransmission lines with a 27 mile 115 kV transmission line between New Haven and South Burlington, Vermont, passing through the Towns of New Haven, Waltham, Vergennes, Ferrisburgh, Charlotte, Shelburne, and the City of South Burlington;
(3) The reconductoring of VELCO's existing 5.6 mile 115 kV transmission line between Williamstown and Barre, Vermont;
(4) Substation upgrades at eight existing VELCO substations located in New Haven, West Rutland, Poultney, Essex, Williston, Williamstown, Queen City and Hartford, Vermont; and
(5) Substation upgrades at existing GMP substations located in Ferrisburgh and Shelburne, Vermont, and the construction of new 115/34.5 kV substations in Charlotte and Vergennes.

In designing the Project, VELCO sought to use existing transmission facilities and transmission corridors wherever possible. As originally proposed, all of the substation upgrades would have occurred at existing sites. In response to concerns raised by local communities and the public, VELCO has proposed alternative preferred locations for various sections of the 115 kV line upgrade, as well as new locations for the 115 kV substations in Vergennes and Charlotte. With the exception of segments of the proposed New Haven to Queen City 115 kV line that will be rerouted to mitigate aesthetic impacts, the transmission lines in the NRP use existing

transmission corridors. In the case of the 115 kV New Haven to Queen City line, most of the existing corridor is located next to an active rail line. The 345 kV line will be located in an existing corridor next to VELCO's existing 115 kV line. This corridor has been planned to accommodate a 345 kV line upgrade to Burlington.

Project Cost

The total cost of the NRP is estimated to be $128 million (includes cost of Sand Bar upgrades already approved by the Board). On April 4, 2003 the New England Power Pool ("NEPOOL") Participants Committee approved VELCO's application to have most of the NRP designated as Pool Transmission Facilities ("PTF"), and therefore eligible for regionalized cost support under the Restated NEPOOL Agreement and NEPOOL Open Access Tariff.

Vermont will pay approximately 4.09% of the NRP PTF costs, or about $5 million dollars. In addition, Vermont will pay all the Non-PTF costs which are estimated to be $6.7 million. Thus, for the entire NRP, Vermont ratepayers will pay approximately $11.7 million, which represents the sum of Vermont-supported PTF costs plus the non-PTF costs.

Project Benefits

The NRP will make Vermont's transmission system reliable up to 1200 MW and reduce Vermont's existing exposure to a widespread outage. Widespread blackouts present serious risks to public health and safety. In addition, they would have large economic impacts on the business community through lost production.

As recognized by the U.S. - Canada Power System Outage Task Force, formed following the August 14, 2003 blackout, reliable electricity is not merely a convenience:

> *"Modern society has come to depend on reliable electricity as an essential resource for national security; health and welfare; communications; finance; transportation; food and water supply; heating, cooling, and lighting; computers and electronics; commercial enterprise; and even entertainment and leisure - in short, nearly all aspects of modern life. ..."*

U.S.-Canada Power System Outage Task Force, "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations," at 5 (April 2004) (the "Blackout Report").

Public health and safety are at risk when the public is served by an unreliable electric system that is vulnerable to power failures and blackouts. Representatives of Vermont's hospitals testified at public hearings that hospitals and their patients need reliable electric service to remain open and operate safely. Even temporary disruptions affect hospitals' and health care providers' ability to deliver essential service.

Society's growing reliance upon digital circuitry has made even brief disruptions of the power supply potentially costly. Many electronic components are seriously disrupted by power outages of less than a second, or by minor voltage fluctuations or other distortions of the electrical signal that in earlier years would have gone virtually unnoticed. IBM has indicated that even momentary voltage excursions can affect its manufacturing process and cost in excess of $500,000. A recent EPRI study (*see* Exhibit TD Reb-1) estimates that Vermont businesses lose between $330 million and $510 million in estimated annual outage costs, and between $52 million and $82 million in estimated annual costs due to power quality disturbances.

The Vermont Business Roundtable**,** on behalf of numerous business community organizations,[2] filed testimony emphasizing the importance of reliable electricity to attracting and retaining businesses in Vermont and noting that during the August 14, 2003 blackout, many businesses automatically separated significant load from the system to protect equipment. This separation, while it helped VELCO to continue providing service to customers, affected the productivity and profitability of these Vermont businesses, and in some instances damaged products being manufactured.

In an April 4, 2003 letter supporting the NRP, Christopher Barbieri, President of the Vermont Chamber of Commerce, stated:

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[2] Central Vermont Chamber of Commerce, the Franklin County Industrial Corporation, the Greater Burlington Industrial Corporation, The Lake Champlain Regional Chamber of Commerce, The Vermont Chamber of Commerce, the Vermont Homebuilders and Remodelers Association, the Vermont Society of Professional Engineers, and the Vermont Ski Areas Association.

"A reliable intrastate power transmission system is essential to retaining the businesses we have in Vermont, and attracting new investment to the state. The significant risk posed by a vulnerable transmission system thwarts our mission to promote Vermont as a place that is 'open for business'."

Finally, in addition to addressing serious reliability problems and congestion, the NRP provides Vermont with the option to align energy resource commitments with power supply needs. The amount of new resources that would be needed to solve the reliability problem today exceeds Vermont's current power supply needs. This asymmetry will change by the time the system reaches the 1200 MW peak load level, projected by the DPS to occur in 2011. Shortly after 2011,Vermont will need to replace approximately two-thirds of its power supply needs. The NRP preserves options to meet future electric demand, and also allows Vermont to defer decisions to build sizable amounts of new generation until a time when there will be both a reliability and power supply need.

Alternatives Evaluated

VELCO evaluated several transmission and non-transmission alternatives to the NRP and is convinced that the NRP is the most cost-effective, robust alternative *and* the only option whose implementation can be counted on for solving Vermont's reliability problems.

Transmission Alternatives. VELCO studied several transmission alternatives to the NRP. These included upgrading the PV-20 115 kV tie to 230 kV, making the Highgate Converter redundant, and various other options for upgrading other transmission lines. As described in the Transmission Alternatives report included with the filing as VELCO Exhibit Planning-8, the NRP is the best transmission option for reliably serving Vermont's load up to a statewide load of 1200 MW.

Demand Side Management ("DSM") as an Alternative. VELCO retained Optimal Energy, Inc. ("Optimal") of Bristol, Vermont to determine how much peak demand in northwest Vermont could be reduced by increased investments in energy efficiency programs and what it would cost to implement such programs. Optimal estimated that the economically deliverable

summer peak demand savings from energy-efficiency programs targeted in the northwestern part of the state would be 213 MW by 2012, at a cost of $618 million.

To achieve these aggressive load reduction goals, the study contemplated a large, ambitious investment campaign over a decade, utilizing the most aggressive proven market implementation strategies proven to acquire widespread participation by all market sectors:

- Sustained marketing to consumers and equipment suppliers;
- Generous financial incentives covering the full cost of retrofit measures and the full incremental cost for new construction/renovation measures;
- Comprehensive technical and information services for market participants; and
- Complete customer service delivery.

While OEI attached a high degree of confidence to its technology cost projections because they are all relatively well known, it also cautioned that ***"no utility has ever sustained such large efficiency investment commitments for so long in so many markets simultaneously and actually achieved the relative magnitudes of peak demand savings projected over the next decade in this report." In this sense, OEI testified that it was "forecasting well beyond the pooled, time-series sample data it was estimating from."***

Finally, even if all of the Optimal DSM savings could be achieved, they would not produce enough MW savings to meet the reliability needs. In addition to the incremental DSM savings estimated by Optimal, analysis performed for VELCO by LaCapra Associates showed that 120 MW of new generation located in Chittenden County plus many transmission components of the NRP would need to be built by 2005-06 to meet the resource deficiency in northwest Vermont.

Other Demand and Supply-Side Alternatives. VELCO retained LaCapra Associates ("LaCapra") to compare the NRP to various theoretical supply and demand side alternatives. The results of this analysis are contained in LaCapra's report, VELCO Exhibit MDM-2. Based upon the DSM adjusted DPS forecast, LaCapra constructed five theoretical alternate resource configurations ("ARCs") to evaluate as alternatives to the NRP. ARCs 1-4 were comprised primarily of generation of various sizes, while ARC 5 consisted of generation and a portion of the DSM savings identified by Optimal.

The results of the pro forma comparisons reveal that from a societal cost perspective, the NRP is less costly than the four generation alternatives and slightly more expensive than ARC 5. However, ARC 5 requires the largest capital investment of any of the options. ARC 5 requires an investment of $55 million for several NRP transmission elements (including the New Haven to Queen City 115 kV transmission line), a $110 million investment for three 50 MW combustion turbines and associated fuel and transmission infrastructure upgrades, and an additional investment of approximately $270 million over ten years for the intensive energy efficiency program. The investments in energy efficiency and generation, under current NEPOOL rules, would be borne by Vermont.

On a direct cost basis, taking into account PTF cost treatment, the difference between ARC 5 and the NRP is dramatic: $9.1 million dollars in NRP carrying costs compared to $270.1 million for ARC 5.

Although ARC 5 is estimated to be the least cost option from a societal cost perspective, VELCO believes that the NRP is the most cost-effective and robust solution. According to Optimal Energy, the level of investment and sustained commitment required to mobilize the intensive energy efficiency program in ARC 5 is unprecedented. In addition to this unprecedented amount of DSM investment, three 50 MW combustion turbines would need to be built in the greater Burlington area by 2005-06 to maintain reliability of the grid. Mr. Plunkett also testified that it was his opinion that there would be a substantially higher rate impact with the ARC 5 solution as compared to the NRP, due to the greater capital outlays, the lack of PTF treatment or even with PTF treatment, and the reduction in sales which would lead to higher unit costs or average rates. Finally, the impact of the intensive DSM programs on the need for NRP elements is relatively modest in that only the second phase of the Granite STATCOM would be deferred by eight years, saving approximately $8 million in carrying costs. From a perspective of deferring transmission investment, the $270 million investment in an intensive energy efficiency program is relatively ineffective in that it only avoids $8 million of transmission costs.

Moreover, the evidence brought forward identified numerous economic, technological and siting concerns that place in question the feasibility of the theoretical alternatives. Given these uncertainties, this difference in pro-forma societal costs between ARC 5 and the NRP does not adequately justify the sustained level of capital investment required to implement the unprecedented DSM program and construct the generation resources needed for ARC 5. As this Board recently concluded when it decided to reduce statewide expenditures on Efficiency Vermont's DSM efforts:

> "The least-cost provision of 30 V.S.A. § 218c does not require that the Board always choose the option that has the lowest total life-cycle cost. It requires a reasonable balancing of all factors including the magnitude of the initial investment and the timing of these investments, to achieve the optimum long-term benefits to Vermont ratepayers without short-term costs that are unacceptable. The Board has always faced the dilemma of how to balance spending on energy efficiency programs against what we know to be the very large potential for accomplishing energy savings. We have repeatedly approved utilities' DSM programs and EEU expenditures that fell short of acquiring all cost-effective DSM resources, but instead took into account reasonable expenditure levels and rate impacts."

Docket No. 6777, Investigation Into the Department of Public Service's Request to Reduce the Amount to be Collected Via the Energy Efficiency Charge in the Year 2003, Order of 12/30/2002, at 21-22. *See also* Summary of the Public Service Board's August 21, 2002, Workshop on Integrated Resource Planning, at page 3 ("In scenario analysis, we do not pick the result that is optimum under the most likely event. Rather, we pick the result which is robust or optimum across a range of scenarios. This means that we are willing to pick something that may not be the least-cost solution under the most likely model.").

Under Section 248, this Board is required to reach a finding that a project will benefit the general good of the State. The Vermont Supreme Court has found that the same standard applies to potential alternatives.[3] The bulk power system in New England cannot respond to theoretical

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[3] *See In re Petition of Twenty-Four Vermont Utilities*, 159 Vt. 339, 618 A.2d 1295 (1992). In that case, intervenors argued that the Board's finding of economic benefit to the state from the HQ purchase was erroneous because it failed to account for economic implications of the contract other than the price and

or "virtual" generation, DSM or demand response. It must be real and it must be reliable. The technical and practical feasibility of the theoretical alternatives, the enormous capital investments required by the alternatives, and consumer acceptability and ability to absorb rate impacts, are all relevant considerations that weigh in favor of approving the construction of the NRP transmission elements immediately.

While it is always tempting to seek to defer large capital improvements and frequently it is cost effective to do so, a growing economy, new construction, additional population, and new technology ultimately do cause electric loads to grow. The uncontradicted record of this docket establishes that during the past twenty years, the Chittenden County area has experienced both the above-mentioned growth and substantial investment in DSM. What has not occurred is the upgrading of the aging transmission infrastructure. The evidence further shows that the NRP is needed now and that there simply is no cost-effective, risk-adjusted alternative.

PROCEDURAL BACKGROUND

VELCO served its petition, direct prefiled testimony, and exhibits on June 5, 2003, and GMP served its petition on June 9, 2003, on the parties specified in 30 V.S.A. § 248(a)(4)(C).

Petitioners filed an amended proposal on February 6, 2004, to modify locations and specifications for portions of the proposed 115 kV line and facilities between New Haven and South Burlington, and at the Granite substation (the "Reroute Proposal").

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reliability. The Vermont Supreme Court disagreed, finding that the alternatives were not in conflict:

> "As with other arguments made by intervenors, the weakness is in the factual foundation for their legal position. This argument is made primarily with respect to DSM investments. As discussed above, the Board found that the state would need the HQ contract as well as feasible DSM. Although this conclusion was based in part on the costs of DSM, it was also based on the Board's judgment concerning the technological feasibility and consumer acceptability of DSM. The Board found no conflict between the HQ contract and DSM. Thus the relative job creation and tax revenue consequences of these approaches to the state's energy issues became irrelevant because the approaches were not being compared."

Id. at 359-360.

At the Board's request, VELCO filed additional testimony on the August 14, 2003 Blackout, on October 15, 2003. In accordance with schedules adopted by the Board, intervening parties submitted direct prefiled testimony on December 17, 2003, and on the Reroute Proposal on May 20, 2004. In accordance with Board orders, all parties filed rebuttal prefiled testimony on July 2, 2004, and surrebuttal prefiled testimony on September 3, 2004.[4]

The Board, on July 2, 2004, issued an order asking VELCO to file further testimony and evidence concerning the Project's design detail at a number of locations specified by the Board, and VELCO submitted this filing (the "Design Detail" filing) on September 14, 2004. Intervenors filed prefiled testimony concerning the Design Detail filing on November 30, 2004.

To date, a total of seven Prehearing and/or Status Conferences, five Public Hearings,[5] three days of site visits,[6] and thirty-four days of Technical Hearings[7] were held as scheduled. In addition, the Board has scheduled an additional round of technical hearings (on December 2 and 3, 2004) to address possible changes to the Reroute Proposal at Ferry Road in Charlotte. In accordance with the Board's October 21, 2004 Scheduling Order, separate briefs will be

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[4] VCSE was granted leave to file on September 14, 2004.

[5] Five Public Hearings were held as scheduled on September 4, 2003, at the Barre Auditorium in Barre, Vermont; September 29, 2003 and April 13, 2004 at the Otter Valley Union High School in Brandon, Vermont; September 30, 2003 and March 18, 2004 at the Charlotte Elementary School in Charlotte, Vermont. Notices of the Public Hearings were sent to all parties and interested persons. In addition, notices of the public hearings were published in the Burlington Free Press, the Valley News, the Brattleboro Reformer, the Rutland Herald, the Times Argus, the Essex Reporter, the Vermont Standard, Ltd, the Addison County Independent, the Rutland Tribune, the Williston Observer, the Shelburne News and the Charlotte News.

[6] The Board convened three days of site visits on October 28 and October 29, 2003 and June 29, 2004, at which time the Board and parties viewed the locations of the proposed Project upgrades.

[7] Fifteen days of Technical Hearings on the Petitioners' original proposal were held as scheduled between February 11, 2004 and March 5, 2004 at the Federal Court Room, Third Floor, United States Post Office and Courthouse, State Street, Montpelier, Vermont. The remainder of the Technical hearings were held as scheduled at the Public Service Board Hearing Room, Third Floor, 112 State Street, Montpelier, Vermont, including seven days of Technical Hearings on the Reroute Proposal, from June 10 to June 18, 2004; seven days of Rebuttal Technical Hearings from July 26 to August 6, 2004; three days of Surrebuttal Technical Hearings on September 21, 22 and October 20, 2004; and two days of Technical Hearings on the Design Detail filing on November 8 and 9, 2004.

submitted by the parties on the Ferry Road issues on December 17, 2004 with reply briefs due on December 30, 2004.

In addition to appearances by VELCO, GMP, Vermont Agency of Natural Resources ("ANR") and the Vermont Department of Public Service ("DPS" or "Department"), the following statutory parties noticed their appearances in this docket: The Towns of Shelburne, Charlotte, Middlebury, New Haven, Ferrisburgh, the City of Vergennes and Addison County Regional Planning Commission ("ACRPC"). The Board also granted the following twenty-three parties' requests for motions to intervene: The Voice for Potash Brook, ISO-NE, the Vermont Public Interest Research Group ("VPIRG"), Conservation Law Foundation ("CLF"), Vermont Citizens for Safe Energy ("VCSE"), Shelburne Park Homeowners, Associated Industries of Vermont ("AIV"), Eben Markowski and Heidi Mahoney, Mark and Kathy Gagnon, Ray and Alison Simmons, Edward Van Schwiebert, Burchfield Resources, Todd and Elizabeth Rheault, Jeremy and Jennifer Towne, Lake Champlain Regional Chamber of Commerce (on behalf of Central Vermont Chamber of Commerce, Franklin County Industrial Corporation, Greater Burlington Industrial Corporation, Vermont Business Roundtable, Vermont Home Builders and Remodelers Association, Vermont Society of Professional Engineers and Vermont Ski Areas Association), Vermont Chamber of Commerce, the Vergennes Partnership, Frederick Peyser, Gary Lange and Martha Redpath, Meach Cove Real Estate Trust, Richard and Edna Poulin, Robert Booher, Eric Durett and Catherine Hughes.

ISO-NE, the DPS, and all of the business groups took positions in favor of the need to build the NRP. Several communities and landowners raised concerns regarding the Project's potential impacts. VELCO representatives have worked with representatives of various state agencies, local communities, business groups and individual landowners, to address the Project's potential aesthetic and siting impacts. Various proposed changes to the Project have resulted from this ongoing effort.

CONCLUSION

The Chittenden County area is, for better or worse, not the same place it was twenty or thirty years ago, and it will never be again. Infrastructure, such as highways, water systems and telecommunications, have all been constantly upgraded. Transmission system upgrades have been deferred but, as the evidence shows, such deferrals cannot go on much longer without serious reliability risk.

Under 30 V.S.A. § 248(b)(3), this Board must find that the Project will "promote the general good of the State." The statute also requires the Board to find that the construction of the Project will satisfy each of the ten criteria set forth in 30 V.S.A. § 248(b)(1) through (10). The following findings and discussions, which are based upon the record evidence and applicable law, address in detail each of the ten Section 248(b) criteria and, as to each, support the conclusion that the Project satisfies the criteria.

The overwhelming weight of the evidence shows that the NRP is an essential reliability project that is needed to protect and promote the public good of the State of Vermont and its residents. VELCO respectfully requests this Board to approve the NRP as proposed by VELCO in this proceeding and issue an Order and CPG in the form attached hereto as Appendices A and B, authorizing construction of the Project.

II. FINDINGS

Based upon the substantial evidence of record and the testimony presented at the hearing, VELCO offers the following findings.

BACKGROUND

1. VELCO and GMP are each a "company" as defined by Section 201 of Title 30, Vermont Statutes Annotated, and as such each is subject to the Board's jurisdiction pursuant to Section 203 of Title 30. VELCO Pet. at 1.
2. VELCO's offices are located at 366 Pinnacle Ridge Road, Rutland, VT 05701. VELCO Pet. at 1.

3. GMP's offices are located at 163 Acorn Lane, Colchester, Vermont 05446. GMP Pet. at 1.
4. VELCO owns, operates and plans for the maintenance, upgrade and expansion of most of Vermont's high voltage transmission network (115 kV and above), including the lines that serve northwest Vermont. VELCO Pet. at 1; Dunn pf. at 4.
5. GMP owns and operates a 46 kV and 34.5 kV subtransmission system that extends from VELCO's New Haven substation to GMP's Queen city substation located in South Burlington. GMP Pet. at 1.
6. VELCO's existing transmission system is not capable of reliably meeting Vermont's existing and future and electrical needs. VELCO's transmission system was, for the most part, built in the 1950's and 60's and the transmission infrastructure is thus aged and at capacity. PSB Docket No. 6852, Order of 9/16/03, Finding No. 7; G. Parker pf. at 8-9.
7. In 1998, Vermont experienced a new summer peak load. Voltage problems were noted in and around Chittenden County during that peak load period. As a result, VELCO undertook extensive analyses to identify and determine solutions for these problems. VELCO analyzed the prior five years of hourly load information available from the SCADA (Supervisory Control And Data Acquisition) system, focusing on actual load distribution differences between summer and winter, load distribution differences among areas (Chittenden County vs. remainder of the state), and historical load growth trends in both peak and energy. Docket No. 6852, Order of 9/16/03 at Finding Nos. 36-37.
8. Analysis of this SCADA data revealed a significant redistribution of load in Chittenden County. Vermont historically has been a winter peaking system with ski area loads growing at the end of low voltage lines. However, the SCADA data showed that the load distribution in the summer months varied significantly from the winter months' load distribution. During the winter months, the ski areas are major load centers. In summer, the metropolitan areas, especially the Chittenden County area, are the major load centers, and there is little load remaining around the ski areas. In fact, Chittenden County

currently reaches its annual peak during summer, even while the load of the rest of the state remains winter peaking. Docket No. 6852, Order of 9/16/03 at Finding No. 38.

9. This summer load distribution is more concentrated in the northwest section of Vermont, which is the major load center of the state, and it is also where load is growing the fastest. Approximately one-half of VELCO's present summer peak demand is located in the northwest region of Vermont, which has been experiencing summer peak load growth at a rate of approximately 2.5% to 3% per year, compared to the approximately 2% summer peak growth rate experienced over the state as a whole. Planning Panel pf. at 3, 16.

10. Between 1999 and 2002, Vermont's summer peak demand increased by 84 MW (from 939 MW in 1999 to 1023 MW in 2002). The recorded all-time summer peak was 1023 MW in 2002.[8] his concentrated pocket of load growth is expected to continue over the next decade, which will result in an increasingly higher load proportion in northwest Vermont. According to the DPS August 5, 2002 statewide load forecast, the Vermont system summer peak is expected to reach 1100 MW between 2005 and 2006, and 1200 MW by 2011. Dunn pf. at 12, 14; Planning Panel pf. at 15; VELCO Exhibit Planning-6; Docket No. 6852, Order of 9/16/03 at Finding No. 8.

11. A third piece of the equation is that not only are the peaks and energy levels growing, and growing at different rates between summer and winter, but the number of hours that the Vermont load is at higher levels is increasing in both power periods. Docket No. 6852, Order of 9/16/03 at Finding No. 42.

12. Currently, approximately 50% of Vermont's peak load is served via four 115 kV transmission lines that supply the northwestern section of the state: the Highgate Converter connected to the Highgate to Georgia 115 kV line (K-21) from the north; the Plattsburgh to Sand Bar 115 kV line (PV-20) from the west; the West Rutland to Essex 115 kV line (K-30, K-63, K-43 and K-23) from the south; and the Granite to Essex 115

[8] During the summer 2003 peak hour, the load would have "registered" closer to 1035 MW, but for OMYA's voluntary curtailment of approximately 10 MW. VELCO Technical Panel Reb. pf. at 10.

kV line (K-26W, K-24E and K-24W) from the east. Docket No. 6852, Order of 9/16/03 at Finding No. 5; Planning Panel pf. at 3, 16; VELCO Exhibit TD-2 (VELCO system map); VELCO Exhibit Planning-5 (List of VELCO transmission lines).

13. Northwest Vermont is heavily dependent upon the full availability of the four 115 kV transmission lines and facilities that serve that region. These facilities, some of the principal elements of which are up to forty years old, have reached their loading capacities. Major upgrades have been postponed to a point where small-scale upgrades are no longer effective. In the face of tremendous growth in load over this time, the margin built into the system has been depleted. Pet. at 2; Planning Panel pf. at 2.

14. The most severe concern is a long term outage of the Highgate DC Converter Station ("Highgate") source. The Highgate Converter (225 MW), built in 1985, although not a generator, is the most critical resource in Vermont, because it serves a large percentage of the load in northwest Vermont. Statewide, Highgate represents about 20% of the 2001 peak load, whereas in northwest Vermont it serves approximately 40% of the peak demand. G. Parker pf. at 6; Planning Panel pf. at 3, 16.

15. Although an HVDC terminal has a minimal number of moving parts, it contains a very large number of components that can and do fail due to such factors as human error, system faults, equipment damage, aging and the environment.[9] G. Parker pf. at 6-7.

16. The exposure facing Vermont is not simply the loss of the Highgate terminal itself. Flows to Vermont through the Highgate Converter are dependent upon the availability of the approximately 50-mile transmission tie extending from Saint Cesaire, Quebec to

[9] At least three other thyristor based DC terminals (Itaipu-Brazil, Rihand-India and Sylmar-California), two of which utilized the same thyristor valve design as Highgate, have suffered catastrophic failures due to fire damage. A wall bushing failure, which started outside the valve hall at the Nelson River 1800 MW DC terminal facility, caused an oil fire that contaminated valve components with soot and oil deposits. It took crews about seven weeks, working 24 hours a day, to clean all valve components. G. Parker pf. at 6-7.

Georgia, Vermont. Together, the Converter and the line running north suffer an average of three forced outages per year.[10] G. Parker pf. at 6-7.

17. Over the past decade, the VELCO system serving northwest Vermont has suffered the following failures:

- Multi-month loss of PV-20 circuit due to multiple tower failures in the early spring of 1994 due to Lake Champlain ice flows.
- Import reduction over the Highgate Converter to perform transformer repairs in 1996/1997.
- Loss of the Middlebury 115/46 kV transformer in May 1997.
- Multi-month loss of imports over the Highgate-Georgia (K21) line due to an ice storm in southern Quebec in the winter of 1997/1998.
- Loss of all of the 115 kV lines south out of Niagara Mohawk's Whitehall substation, placing Niagara Mohawk's Whitehall and Ticonderoga loads radially off of VELCO's Blissville (K34 line) substation in the Fall of 1999.
- An eleven-month loss of the Plattsburgh PAR starting in March of 2000.
- Loss of the East Fairfax 115/34.5 kV auto transformer during September of 2001.
- A two-month loss of the Plattsburgh PAR starting in October of 2001 to repair a manufacturing defect and a multi-day outage again in March of 2003 to investigate an overheating problem.
- The Plattsburgh PAR failed again on April 11, 2003 and had to be replaced by a new PAR at Sand Bar.

G. Parker pf. at 4-5.

18. Since the filing of the NRP on June 5, 2003, Vermont experienced several severe transmission system failures. On the morning of January 16, 2004, when ambient

[10] In 1997, the Converter output was reduced for nearly 900 hours for transformer repairs. In 1998, the supply from Hydro Quebec through the Highgate Converter was out of service for over three hundred hours due to a major ice storm that destroyed the transmission lines in Quebec serving the Converter. Imports over the Highgate interconnection were reduced for over one month following the 1998 ice storm. G. Parker pf. at 6.

temperatures were below freezing, a problem on the Hydro-Quebec system in the Bedford area resulted in loss of the line to the Highgate Converter. Later that morning, the McNeil generating station went out of service. In response to the loss of these two facilities, VELCO operators armed the undervoltage load shedding system surrounding Burlington. Once armed, had the system experienced another contingency, the undervoltage load shedding system could have dropped the entire City of Burlington and most of Chittenden County. The estimated total loss of load would have been approximately 175 MW. It is likely that rotating blackouts would have been necessary due to the severe cold that day. Tr. 2/20/04, Vol. II at 150-151 (Dunn).

19. Another recent transmission system failure occurred during the blackout of August 14, 2003. On August 14, 2003, the VELCO system experienced significant voltage problems, and approximately 140 MW of load was lost,[11] including 30 MW of IBM load and 15 MW of Vermont Marble's manufacturing load. IBM has indicated that even momentary voltage excursions can affect its manufacturing process and cost in excess of $500,000. LaForest Blackout pf. at 3, 5; Exhibit DPS VELCO Cross-5, No. 31c.

20. The consequences of the August 14th blackout include a number of events that transmission planners never assume in planning and operating studies. These include:

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[11] Roughly one minute after 4:10:45 PM on August 14, 2003, the following changes had taken place on the Vermont system:

- Two 115 kV transmission lines with New York had opened - PV20 (between Plattsburgh, NY and Sand Bar, VT) and K6 (between Hoosick, NY and Bennington, VT). Vermont's third tie with New York, between Blissville, VT and Whitehall, NY, was still intact but VELCO was radially serving about 50 MW of NY load (i.e. Whitehall was disconnected from the NY grid).
- VELCO's Highgate DC Converter tripped, causing the loss of almost 200 MW of power import (over 20% of the state's energy supply at the time).
- Almost all Vermont generation north of Rutland and west of Waterbury tripped off-line. In total about 130 MW of generation was lost during the event (McNeil at 50 MW and roughly 80 MW of hydro).
- Vermont lost at least 15% (some 140 MW) of its load immediately after the event.

LaForest Blackout pf. at 3.

- Coincident loss of the PV20 tie and the Highgate DC Converter within seconds of one another;[12]
- Nearly simultaneous loss of all generation within a defined area of Vermont due to a single event;
- Uncontrolled loss of significant load due to low voltage coincident with an event.

LaForest Blackout pf. at 3.

21. The VELCO Critical Load Study revealed that the Vermont transmission system is deficient at loads below peak load levels experienced today. The majority of the NRP upgrades are needed today, irrespective of the power transfer conditions tested. The existing system has deficiencies beginning at the 700 to 800 MW load level. Pet. at 2; Dunn pf. at 5; Planning Panel pf. at 3; Docket No. 6852, Order of 9/16/03 at Finding No. 9.

22. The NRP, as proposed, would address the present-day thermal and voltage concerns, and also allow the system to reliably support near-term load growth. It is a set of transmission upgrades designed to add a fifth transmission path into northwest Vermont from the West Rutland 345 kV source, and to strengthen the Granite to Essex path. A fifth transmission path will address thermal concerns on the northwest Vermont interface ties. A fifth path in service will also address voltage problems after major contingencies. This new path needs to be at 345 kV, because otherwise, at loads above 1150 MW (forecasted to occur between 2008-2009), voltage concerns will resurface in northwest Vermont for loss of the Granite - Barre 115 kV (K-26W) line. Planning pf. at 3-4.

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[12] Typical bulk planning design studies assume one key facility out of service for a duration of 30 minutes to a few months. During that time the system is exposed to the loss of a second facility. It is assumed that within the first 30 minutes of the initial outage, the system operators will attempt to position the network in preparation for the second outage. Due to the timing of events during the blackout, VELCO's operators did not have that time to counteract the effect of the loss of Highgate before losing the PV20 line. Examination of VELCO Exhibit Blackout-2.2 shows that the PV20 tie was lost less than 2 seconds after Highgate. LaForest Blackout pf. at 4.

THE PROJECT

23. The NRP is a combination of the following upgrades at existing VELCO and GMP substations and transmission line corridors, which work together to supply a projected Vermont summer peak load of 1200 MW:

1. **West Rutland to New Haven 345 kV Line**
   a. Construct approximately 35.5 miles of new 345 kV (2-954 MCM) along the existing VELCO West Rutland - New Haven 115 kV transmission corridor
   b. VELCO West Rutland Substation:
      - Install 2 345 kV breakers on existing 4-breaker ring bus
   c. VELCO New Haven Substation:
      - Install 4-position 345 kV ring bus (install 2 breakers initially)
      - Install 6-position 115 kV ring bus (presently contains two 115 kV line breakers)
      - Install 60 MVAR shunt reactor and breaker at New Haven 345 kV station (taps the 345 kV line via a breaker)
      - Install 2 345/115 kV, 336 MVA autotransformers
      - Install 1 115/46 kV, 12.5 MVA transformer
2. **New Haven to Queen City (South Burlington) 115 kV Line**
   a. Construct approximately 27 miles of new 115 kV line (1272 ACSR) (mostly along GMP's New Haven to Queen City 46 kV/ 34.5 kV transmission corridor)
   b. Remove 1.4 miles of 46 kV line from New Haven to Vergennes
   c. New VELCO Vergennes 34.5 kV Substation:
      - 115/34.5 kV, 30 MVA Transformer
      - Construct .5 miles of 34.5 kV line
      - Install 4 115 kV breaker ring (3 breakers initially)
   d. North Ferrisburgh Substation:
      - Install 1 115/13.2 kV 20 MVA transformer and disconnect switches
   e. New VELCO Charlotte Substation:
      - Install 115/12.47 kV 20 MVA Transformer
      - Metalclad switchgear
      - Install 1 115 kV circuit switcher
   f. Shelburne Substation:
      - Install 115/12.47 kV 20 MVA Transformer
      - Metalclad switchgear
      - Install 1 115 kV circuit switcher
   g. VELCO Queen City (South Burlington) Substation:
      - Install 6-position 115 kV ring bus (4 breakers initially)
3. **VELCO Blissville (Poultney) Substation 115 kV Phase Angle Regulator (PAR)**
      - Install a 115 kV PAR, 200 MVA, 40 degree range
      - Install 2 115 kV breakers

4. **VELCO Essex (Williston) Substation 115 kV Breaker**
   - Install a 115 kV breaker on line K-24 (Essex to Berlin)
5. **VELCO Williston Substation 115 kV Ring Bus**
   - Install a 3-breaker 115 kV ring bus
   - Install 1 115 kV breaker
6. **VELCO Hartford Substation Capacitor**
   - Install a 24.75 MVAR capacitor and 115 kV breaker
   - Install 2 115 kV line breakers
7. **VELCO Granite (Williamstown) Substation Expansion:**
   a. 115 kV yard:
      - Install 2nd 230/115 kV, 300 MVA transformer
      - Install +/- 150 MVAR (STATCOM/SVC {1st stage is +/- 75 MVAR})
      - 1st and 2nd stages connected at separate bus positions on 115 kV ring bus
      - Install 3 115 kV Breakers, completing a 6 position ring bus
      - Install 6 25 MVAR capacitor banks (1st stage is 4 capacitor banks, 2nd stage is 2 capacitor banks)
   b. 230 kV yard:
      - Install 4-position 230 kV ring bus (install 2 breakers initially)
      - Install 230 kV, 550 MVA PAR, 60 degree range
      - Install 1 230 kV breaker for the PAR
8. **Reconductor Granite (Williamstown) to Barre 115 kV Line**
   - Reconductor 115 kV line to 1272 ACSR (5.6 miles)

Pet. at 3-5; Planning Panel at 22-23.

Substation and Line Upgrades Associated with the Proposed West Rutland to New Haven 345 kV Line

West Rutland to New Haven 345 kV Line Upgrade

24. The new 35.5 mile 345 kV transmission line will be constructed on wood H-frame structures, located within VELCO's existing right-of-way between West Rutland and New Haven and parallel to VELCO's existing 115 kV transmission line currently located in that corridor. The corridor passes through the towns of West Rutland, Pittsford, Proctor, Brandon, Leicester, Salisbury, Middlebury and New Haven. Boers pf. at 6-7.

25. For the first 27.8 miles, between VELCO's West Rutland and Middlebury substations, the new 345 kV line will be constructed west of the existing 115 kV line. For the remaining 7.7 miles, between VELCO's Middlebury and New Haven substations, the

new 345 kV line will be constructed east of the existing 115 kV line. Boers pf. at 7; Dunn Supp. pf. at 8.

26. The new 345 kV line will be constructed with 2-954 ACSR phase conductors in a horizontal configuration and two overhead shield wires for lightning protection. The proposed heights of the new 345 kV line structures will be between 61 and 97 feet tall, with average spans of 800 feet with the spans of the proposed line matching the spans of the existing 115 kV line in visually sensitive areas. Boers pf. at 7; Dunn Supp. pf. at 8; VELCO Exhibit TD-4; VELCO Exhibit DJB-8.

VELCO West Rutland Substation Upgrade

27. Improvements at VELCO's recently expanded West Rutland substation, located at the northeast corner at the junction of Pleasant and Marble Streets in the Town of West Rutland, will include the addition of two 345 kV breakers, disconnect switches, and related protective relaying and control equipment. This substation equipment will be located within the existing 345 kV yard and will not require any expansion of the yard. Dunn/Rowe pf. at 4-5; Exhibit VELCO DJB-4.

VELCO New Haven Substation Upgrade

28. The New Haven substation is located approximately one-quarter mile south of Vermont Route 17, in the Town of New Haven in Addison County, Vermont. Access to the New Haven substation is off Vermont Route 17 in New Haven. Dunn/Rowe pf. at 13; VELCO System Map, Exhibit VELCO TD-2.

29. The 115 kV line between the VELCO Middlebury substation and the VELCO Williston substation loops in and out of the New Haven substation. The purpose of the existing substation is to serve Central Vermont Public Service's ("CVPS") 46 kV lines to Hewitt Road (Bristol) and GMP's 46 kV line to Vergennes. Boers pf. at 4; VELCO Exhibit TD-4 & 8; VELCO Exhibit DJB-5 & 6.

30. The purpose of the proposed New Haven substation upgrade is to receive 345 kV service from VELCO's West Rutland substation, provide 115 kV service to VELCO's Queen City substation (located in the City of South Burlington), to permit replacement of the 46 kV and 34.5 kV service to GMP's North Ferrisburgh, Charlotte and Shelburne substations along the proposed transmission route and to provide 115 kV services to a new Vergennes substation. Modifications to the electrical equipment will consist of the addition of a 345 kV yard, expansion of the 115 kV yard, and modification of the 46 kV yard. Boers pf. at 4-5; VELCO Exhibit DJB-7.

31. The existing substation fenced area is approximately 0.88 acres. The upgraded site will be expanded to approximately 6.80 acres, requiring 5.91 acres of improved grading. Of this 5.91-acre expansion, approximately 3.58 acres will be south of VELCO's existing substation property. The expanded site can be graded to approximately match the existing site elevations by cutting into the natural terrain at the north end of the site and building up the grade at the south end. Boers pf. at 6; VELCO Exhibit DJB-7.

32. In response to the Board's Order of July 2, 2004, VELCO prepared additional details for the New Haven Substation and the line leading into it. VELCO is proposing to match the new 345 kV structures with the existing 115 kV structures in this line segment, and also proposes to use 2 pole wood or corten steel H-frames for tangent structures. Dunn/Harr DD pf. at 4.

Substation and Line Upgrades Associated with the Proposed New Haven to Queen City 115 kV Line

New Haven to Queen City 115 kV Line Upgrade

33. VELCO is proposing to construct approximately 27 miles of new 115 kV transmission line between the New Haven and Queen City substations to replace the existing subtransmission line. The existing subtransmission line between the New Haven and Queen City substations is comprised of a 46 kV line from New Haven to Vergennes, and a 34.5 kV line from Vergennes to Queen City. The first 1.2 miles of the 6.5 mile long 46

kV line is owned by CVPS. The remainder of the 46 kV line and all of the 34.5 kV line is owned by GMP. The existing line is constructed on single wooden poles. Dunn pf. at 9; Boers pf. at 18.

34. The new 115 kV line will be built using a new single circuit line utilizing 1-1272 ACSR conductor per phase on single wood poles designed in a delta configuration. The new 115 kV line will utilize an overhead ground wire for lightning protection. The existing intermittent 12kV distribution underbuild lines will be transferred to the new 115 kV structures or removed prior to the construction of the Project. Most of these structures will be between 52 and 75 feet in height above ground. Poles with distribution lines attached will be approximately 70 feet in height above ground. Dunn pf. at 9; Dunn Supp. pf. at 8.

35. The new 115 kV line will follow the existing 46 kV line corridor for the first 2.9 miles, replacing the 46 kV line. The 115 kV line will parallel the Vermont railroad for the remaining 3.4 miles to a new substation in Vergennes. Boers pf. at 20; Boers Supp. pf. at 9.

Vergennes Reroute

36. In its original petition, VELCO sought authorization to construct the 115 kV line from VELCO's New Haven substation to GMP's existing Vergennes substation located off Mechanic Street in downtown Vergennes, and to remove the existing 46 kV line owned by GMP and CVPS. In meetings with officials and residents from the City of Vergennes, concerns were expressed about the visual and land use impacts of the proposed replacement of the 46 kV line with a 115 kV line and the expansion of the existing GMP Vergennes substation. VELCO was asked to consider alternatives that would eliminate the need to construct new facilities in the downtown Vergennes area. Boers pf. at 8-10; Boers Supp. pf. at 2; Dunn Supp. pf. at 3-4.

37. In response, VELCO filed the Reroute Proposal, which would move the entire 115 kV line corridor outside of downtown Vergennes, leaving the existing GMP 34.5 kV substation and lines in downtown Vergennes unchanged. VELCO now proposes to build

a new 115/34.5 kV substation on a 19-acre property in the northeast corner of Vergennes, with frontage access to Route 22A. A short section of new 34.5 kV line will be required to connect VELCO's new Vergennes Substation to the existing 34.5 kV line that presently feeds GMP's Vergennes Substation from Ferrisburgh Substation. The 46 kV service to GMP's Vergennes Substation from VELCO's New Haven Substation will be abandoned. Boers Supp. pf. at 2-3; Dunn Supp. pf. at 3-4;VELCO Exhibit TD-Supp(1)-4.

38. The new substation will feed the existing GMP Vergennes substation with a 1.6-mile radial line. The 46 kV line from New Haven to Vergennes will be removed (although most of the poles would remain because of the underbuilt distribution). Cecchini Supp. pf. at 3 & 5.

39. As now proposed, instead of following the existing 46 kV line in a westerly direction at mile marker 2.85, the new 115 kV line will continue north along the railroad corridor for another 3.45 miles toward the new substation location. At this point, the new 115 kV line will leave the railroad corridor and traverse a few spans to the new location of the Vergennes Substation. The new 115 kV line north out of the new Vergennes location will traverse cross-country a short distance back to the railroad corridor, at which point it will meet up with the route originally proposed by VELCO at mile marker 7.8. Boers Supp. pf. at 9.

Little Chicago Road, Ferrisburgh Reroute

40. In its initial petition, VELCO proposed for the new line to continue along the railroad right-of-way in this section. At meetings with representatives from the Town of Ferrisburgh, including the Town Manager, VELCO was asked if it was possible to move the proposed line to avoid several residences in the Little Chicago Road area. VELCO agreed that the reroute was possible and that it would not affect reliability of the 115 kV line, and modified its proposed route in the Reroute filing. Dunn Supp. pf. at 6.

41. As now proposed, the 115 kV line will depart from the railroad corridor between mile markers 8.9 and 9.75. Instead of crossing over to the east side of the railroad tracks at

mile marker 9.2 and continuing north as VELCO proposed initially, the new 115 kV line will follow a small unnamed stream to the northwest for approximately 0.25 miles, at which point it meets up with the existing 34.5 kV line that it will be replacing. Along this section of cross-country line away from the railroad, the new 115 kV line will require a new 100' wide right-of-way, cleared 50' on either side of the line centerline. The new 115 kV line will follow the existing 34.5 kV line corridor for approximately 0.75 miles until meeting up with the originally planned route along the railroad at mile marker 9.75. The existing 34.5 kV line right-of-way width along this section is 100 feet. The new 115 kV line will not require any additional right-of-way. Boers Supp. pf. at 10.

Shelburne Reroute

42. In its initial petition, VELCO proposed continuing the line along the existing GMP right-of-way. Due to concern over the proposed line's close proximity to several homes in the Davis Park neighborhood, VELCO modified its plans in its Reroute filing. Dunn Supp. pf. at 8.

43. As now proposed, the new 115 kV transmission line will depart from the existing 34.5 kV line corridor between mile markers 21.55 and 22.0. Instead of continuing north along the existing 34.5 kV corridor through the residential area, the new 115 kV line will be rerouted approximately 500 feet to the west for approximately 0.5 mile. Along this new section of line, a new 100' wide right-of-way, cleared 50' on either side of the line centerline, will be necessary. This new right-of-way is part wooded and part wetland and therefore will probably require special construction techniques. Boers Supp. pf. at 10-11.

GMP North Ferrisburgh Substation Upgrade

44. The proposed new 115 kV line between the Charlotte and Vergennes substations will loop in and out of the North Ferrisburgh substation, located on the north side of Long Point Road in the Village of Ferrisburgh, Vermont, just west of the railroad tracks. A new single story control building will be required. The purpose of the proposed North

Ferrisburgh substation upgrade is to upgrade the 34.5 kV service feed to 115 kV. Boers pf. at 10-11; VELCO Exhibit TD-5 & 10; VELCO Exhibit DJB-12, 13 & 14.

45. The existing substation fenced area is approximately 0.09 acres. The modifications proposed will require expanding the enclosure fence by 25 feet to the north, and 93 to 117 feet to the west. Boers pf. at 11-12; VELCO Exhibit DJB-14.

New GMP Charlotte Substation

46. The existing Charlotte Substation is located on Ferry Road in Charlotte, Vermont. The substation is served by 34.5 kV lines from GMP's North Ferrisburgh and Shelburne substations. Boers pf. at 12; Boers Supp. pf. at 4.

47. In its original petition, VELCO proposed to upgrade the 34.5 kV service feeds at the existing Charlotte substation to 115 kV. Boers pf. at 12-14; Boers Supp. pf. at 4.

48. In response to environmental and aesthetic concerns regarding the expansion of the existing substation, VELCO modified its plans in its Reroute filing. VELCO now proposes to build a new 115/12.47 kV substation on an undeveloped site approximately 850 feet to the north of the existing site and to the west of the Vermont Railroad, placing it on the same side of the railroad as the existing 34.5 kV transmission line that is to be upgraded to 115 kV. Upon completion of the new 115/12.47 kV Charlotte Substation at the new location, GMP's existing 34.5/12.47 kV Charlotte Substation will be abandoned. Boers Supp. pf. at 4-5; Dunn Supp. pf. at 11; VELCO Exhibit TD-Supp(1)-2 & 5.

49. The proposed site is approximately 1.7 acres. The new substation enclosure fence will be approximately 95' by 175', requiring approximately 0.53 acres of improved grading. Access to the proposed site from Ferry Road will be through the recently closed Vermont Railroad commuter station property. Boers Supp. pf. at 5.

GMP Shelburne Substation Redesign

50. The existing Shelburne Substation is located on Harbor Road in Shelburne, VT. The substation is served by 34.5 kV lines from GMP's Charlotte Substation and VELCO's Queen City Substation. Boers pf. at 14; Boers Supp. pf. at 5.

51. In its original petition, VELCO proposed to upgrade the 34.5 kV service feeds at the existing Shelburne substation to 115 kV. Boers pf. at 14-16; Boers Supp. pf. at 5.

52. The original proposed design called for expanding the existing substation fence to the west, while salvaging the existing 12.47 kV structures and distribution line taps. This expansion would displace a portion of the Ti-Haul Road and raised concerns regarding aesthetic impacts. Due to these concerns, VELCO modified its plans in its Reroute filing. Rather than expanding the site to the west as originally proposed, VELCO now proposes to completely rebuild a new 115/12.47 kV substation and expand the site only to the north. In addition, the front of the substation adjacent to Harbor Road will be set back an additional 34 feet to allow more room for landscaping as a visual screen. Boers Supp. pf. at 5-6; Dunn Supp. pf. at 12.

53. The existing site is approximately 0.10 acres. The proposed redesign will move the southern fence (facing Harbor Road) 34 feet further back off the road than the originally proposed substation. The improvements proposed will require expanding the enclosure fence approximately 114 feet to the north. The upgraded site will be expanded to approximately 0.46 acres. Boers Supp. pf. at 6.

VELCO Queen City Substation Upgrade

54. VELCO's Queen City substation is located south of Queen City Park Road in the City of South Burlington, Vermont. The purpose of the existing substation is to serve 34.5 kV lines to GMP's Queen City substation and a 13.8 kV line to the Burlington Electric Department ("BED"). Boers pf. at 16-17; VELCO Exhibit TD-5 & 13; VELCO Exhibit DJB-21 & 22.

55. The purpose of the substation upgrade is to install a second 115 kV service feed from VELCO's New Haven substation. Boers pf. at 17; Boers Supp. pf. at 7; VELCO Exhibit DJB-Supp(1)-43-46.

56. The existing substation fenced area currently occupies approximately 0.79 acres of a six-acre VELCO parcel. The original proposal called for routing the new 115 kV line into the substation from the south side of the site, which would have required the removal of most of the trees that presently screen the substation from the south. In response to neighbor's concerns, VELCO is proposing to reconfigure the layout of the substation modifications to allow the new line to enter the substation from the east within the existing transmission corridor. Boers pf. at 17; Boers Supp. pf. at 7; VELCO Exhibit DJB-Supp(1)-43-46.

Other VELCO Substation and Line Upgrades

Sand Bar Substation

57. The proposed Sand Bar upgrade, also part of the Northwest Reliability Project, was approved by the Board in Docket 6852. PSB Docket No. 6852, Order 9/16/03 at 21.

VELCO's Essex Substation Upgrade

58. VELCO's Essex substation is located on a 7.7 acre parcel of land owned by VELCO, located east of Vermont Route 2A in the Town of Williston, Chittenden County, Vermont. Project improvements include the addition of one 115 kV breaker, disconnect switch and 115 kV bus work, all within the existing fence. Dunn/Rowe pf. at 23-24; Boers pf. at 31; VELCO Exhibit DJB-27.

VELCO's Williston Substation Upgrade

59. The existing Williston substation is situated approximately 1,000 feet west of Vermont Route 2A in the town of Williston. The proposed upgrades involve conversion of the

single bus arrangement to a three-position ring bus. Boers pf. at 32-33; VELCO Exhibit TD-14; VELCO Exhibit DJB-28, 29 & 30.

60. The existing site yard is approximately 0.52 acres. The modifications proposed will require expanding the enclosure fence and the upgraded site will be expanded to approximately 1.06 acres, requiring 0.54 acres of improved grading, all within existing VELCO property. Boers pf. at 33; VELCO Exhibit DJB-30.

VELCO's Granite Substation Upgrade

61. The Granite substation is located on a 24.5 acre remote parcel of land owned by VELCO, located southwest of the intersection of Martin Road and Baptist Street in the Town of Williamstown, Vermont. Boers pf. at 34; VELCO Exhibit TD-3 & 18; VELCO Exhibit DJB-31 & 32.

62. The upgrade to the substation will consist of expansion of the 115 kV yard to a four-position ring bus, expansion of the 230 kV yard to a three-position ring bus, the addition of a Flexible Alternating Current Transmission System (FACTS) device and six capacitor banks. Additional 115 kV equipment will include three new 115 kV breakers and associated disconnect switches, 115 kV bus work, and nine new 115 kV potential transformers. Boers pf. at 34-35; VELCO Exhibit DJB-33.

63. The existing substation yard is approximately 4.72 acres. The modifications proposed will require expanding the enclosure fence by 188 feet to the west. The upgraded yard will be expanded to approximately 6.66 acres, requiring approximately 1.94 acres of additional improved grading, all within existing VELCO property. Boers pf. at 35-36; VELCO Exhibit DJB-33.

64. In response to the Board's Order of July 2, 2004, VELCO prepared additional design details for the Granite substation. VELCO's proposal includes installation of synchronous condensers within a building proposed for the northwest side of the station and the addition of four shield masts for lightning protection. VELCO is continuing to evaluate the technical aspects of a synchronous condenser installation. At this time, the

synchronous condenser technology is the preferred technology for the Granite substation. This installation will fit into the expansion area that VELCO requested in its original June 5, 2003 filing. VELCO also plans to replace the first structure on the 230 kV line outside the substation, originally a 2 pole, wood H-frame, with a 3 pole, wood or corten steel angle structure, because the 230 kV line will deadend in a new location within the substation. The new structure will be located in the same area as the existing structure. This is the only transmission pole which VELCO proposes to change within 1/4 mile of the substation. Dunn/Harr DD pf. at 8-9.

Granite-Barre 115 kV Line Reconductoring

65. The existing 115 kV line between VELCO's Granite substation in the Town of Williamstown and its Barre substation in the City of Barre will be upgraded by replacing the phase conductors with 1272 Aluminum Conductor Steel Reinforced ("ACSR") conductor. The existing 115 kV line is approximately 5.6 miles long, and is constructed on wood H-frame structures utilizing 795 ACSR conductors in a horizontal phase configuration, and two overhead shield wires for lightning protection. The heights of the 115 kV line structures vary between approximately 43 to 61 feet with average spans of 550 feet. In order to support the larger wires, the existing two-pole tangent H-frame structures will be retrofitted with cross-brace members between each of the two supporting wood poles. The existing 150 foot right-of-way is sufficient, and no additional clearing will be required. Boers pf. at 36; Dunn pf. at 9;VELCO Exhibit TD-3.

VELCO's Hartford Substation Upgrade

66. The Hartford substation is located approximately 900 feet east of the intersection of U.S. Route 5 and Interstate 91 in the Town of Hartford. Modifications to the electrical equipment will include two new 115 kV breakers with associated disconnect switches, five 115 kV potential transformers, and a capacitor bank with associated 115 kV circuit breaker. Boers pf. at 37; VELCO Exhibit TD-16; VELCO Exhibit DJB-34, 35 & 36.

67. The existing substation fenced area is approximately 0.71 acres. The modifications proposed will require expanding the enclosure fence by 35 feet to the east. Boers pf. at 38; VELCO Exhibit DJB-36.

VELCO's Blissville Substation Upgrade

68. The Blissville Substation is located at 621 Blissville Road in the Town of Poultney, Vermont. VELCO proposes to install a 115 kV/200 MVA PAR device to improve reliability by controlling power flow between the VELCO and Niagara Mohawk transmission systems. Modifications to the electrical equipment will include one new 115 kV breaker with associated disconnect switches, three new 115 kV potential transformers, and one new three-phase station service transformer. Boers pf. at 38-39; VELCO Exhibit TD-17; VELCO Exhibit DJB-37, 38 & 39.

69. The existing substation fenced area is approximately 0.76 acres. The modifications proposed will require expanding the enclosure fence by approximately 65 feet to the west. The upgraded site will be expanded to approximately 0.93 acres, requiring 0.17 acres of improved grading, all within the existing VELCO property. Boers pf. at 39-40; VELCO Exhibit DJB-39.

PROJECT COST

70. The total cost of the Project is estimated to be $128 million. Dunn pf. at 7; Dunn Supp. pf. at 13.

71. On April 4, 2003 the New England Power Pool ("NEPOOL") Participants Committee approved VELCO's application to have most of the Project, $121.2, designated as Pool Transmission Facilities ("PTF"), and therefore eligible for regionalized cost support under Section 15.5 of the Restated NEPOOL Agreement and NEPOOL Open Access Transmission Tariff ("NEPOOL OATT"). Dunn pf. at 7; LaForest Surr. pf. at 2; Board Exhibit 3.

72. Pool Transmission Facilities "are transmission facilities owned by Participants rated 69 kV or above required to allow energy from significant power sources to move freely on the New England transmission network." Because of this designation, the cost of the NRP 115 kV and 345 kV transmission lines and the related substation facilities will be allocated to all of the electric load in New England (regional cost allocation).[13] Dunn pf. at 16 (citing Section 15.1 of the Restated NEPOOL Agreement); Tr. 2/17/04, Vol. I at 27 (ISO-NE).

73. Vermont will pay approximately 4.09% of the NRP PTF costs, or about $5 million dollars. In addition, Vermont will pay all the Non-PTF costs which are estimated to be $6.7 million. Thus, for the entire NRP, Vermont ratepayers will pay approximately $11.7 million, which represents the sum of Vermont-supported PTF costs plus the non-PTF costs. Pet. at 5; Dunn pf. at 7, 16; Dunn Supp. pf. at 13.

74. VELCO calculated the financial effects on Vermont ratepayers, over the period between 1977 (when the NEPOOL OATT took effect) and 2010, of the regionalization of PTF costs under the NEPOOL OATT. The net benefit to Vermont ratepayers of the regionalization of PTF costs in New England through the period analyzed, is $92.786 million. Board Exhibit 3 (Affidavit of Gerald F. Spring, VELCO CFO and Treasurer).

SECTION 248(B) FINDINGS

Orderly Development of the Region

[30 V.S.A. § 248(b)(1)]

75. The Project will not unduly interfere with the orderly development of the region, with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of municipal legislative bodies,

[13] Regional cost support means that the costs of the transmission facilities will be rolled into the regional transmission rates paid by all network transmission customers under the NEPOOL OATT. VELCO Cross ISO-13 at 8, section C.

and the land conservation measures contained in the plan of any affected municipality. This finding is supported by findings 76 through 98, below.

76. An extension of the 345 kV transmission system north from the West Rutland substation has been planned for over twenty years. Docket No. 4649, Order of 9/7/83 at Finding No. 3.

77. The Project involves proposed improvements to transmission facilities and the use of existing utility corridors in the following Vermont communities: Town of West Rutland, Town of Proctor, Town of Pittsford, Town of Brandon, Town of Poultney, Town of Leicester, Town of Salisbury, Town of Middlebury, Town of New Haven, Town of Waltham, City of Vergennes, Town of Ferrisburgh, Town of Charlotte, Town of Shelburne, City of South Burlington, Town of Williston, Town of Milton, Barre Town, Barre City, Town of Williamstown and Town of Hartford. Dunn/Rowe pf. at 3.

78. West Rutland, Proctor, Pittsford, Brandon and Poultney are within the planning jurisdiction of the Rutland Regional Planning Commission ("RRPC"). Dunn/Rowe pf. at 3.

79. Leicester, Salisbury, Middlebury, New Haven, Waltham, Vergennes and Ferrisburgh are within the planning jurisdiction of the ACRPC. Dunn/Rowe pf. at 3.

80. Charlotte, Shelburne, South Burlington, Williston and Milton are within the planning jurisdiction of the Chittenden County Regional Planning Commission ("CCRPC"). Dunn/Rowe pf. at 3.

81. Barre Town, Barre City and Williamstown are within the planning jurisdiction of the Central Vermont Regional Planning Commission ("CVRPC"). Dunn/Rowe pf. at 3.

82. Hartford is within the planning jurisdiction of the Upper Valley Lake Sunapee Regional Planning Commission ("UVLSRPC"). Dunn/Rowe pf. at 3.

83. By letters dated March 13, 2003, VELCO notified the Selectboards and Planning Commissions of West Rutland, Proctor, Pittsford, Brandon, Leicester, Salisbury, Middlebury, New Haven, Waltham, Vergennes, Ferrisburgh, Charlotte, Shelburne, South Burlington, Williston, Barre City, Barre Town, Williamstown, Hartford, Poultney, and

each of the affected regional commissions. Dunn/Rowe pf. at 5-42; VELCO Exhibit DR-5.

84. Representatives from VELCO arranged to meet and discuss the Project with many of the affected towns' planners, planning commissions, town managers, Selectboards, and zoning personnel, including representatives from West Rutland, Pittsford, Brandon, Leicester, Salisbury, Middlebury, New Haven, Waltham, Vergennes, Ferrisburgh, Charlotte, Shelburne, South Burlington, and Williamstown. In many cases, multiple meetings were conducted. VELCO also met and discussed the Project with all of the affected regional planning commissions except for the UVLSRPC. At the time of its initial filing, VELCO had conducted around eighty meetings with town officials, environmental and business groups and other interested parties. Dunn/Rowe pf. at 5-44; Dunn pf. at 21.

85. VELCO reviewed the land conservation measures (if any) of each of the municipalities and regional commissions and determined that the Project is not inconsistent with any such measures. Alexandra Rowe testified that she read the town plans in their entirety, including the land conservation measures of the towns, and that she shared them with Terrence Boyle, VELCO's landscape architect. Dunn/Rowe pf. at 5-44; Tr. 2/20/04, Vol. II at 84-89 (Rowe); Rowe/Disorda/Gilman/Briggs Reb. pf. at 24-25; VELCO Exhibit RDGB-Reb-8.

86. VELCO made decisions regarding the location of the transmission line with consideration given to town plans. For example, in Shelburne, VELCO proposed locating the 115kV line in a rail corridor to avoid an impact to the LaPlatte River Natural Area. In Vergennes, VELCO proposed to locate the line in a rail corridor to avoid an impact on Comfort Hill and Botsford Road. Tr. 2/20/04, Vol. II at 88-89 (Rowe); VELCO Exhibit RDGB Reb-8.

87. VELCO has received no written comments or formal recommendations from the following towns and regional planning commissions: West Rutland, Proctor, Pittsford, Brandon, Leicester, Salisbury, Waltham, Williston, Barre City, Barre Town, Hartford,

Poultney, the RRPC, the CCRPC, the CVRPC, and the UVLSRPC. Dunn/Rowe pf. at 5-44.

88. In response to a presentation to the Williamstown Planning Commission and Town Manager on December 11, 2001, the Town of Williamstown sent the Public Service Board a letter of support for the Project. Dunn/Rowe pf. at 27-28.

89. The Town of Middlebury filed testimony expressing concerns about the Project. VELCO has duly considered the recommendations of the Town of Middlebury and Jean Vissering, aesthetic expert for the Town, regarding aesthetics and project design and has worked to modify its mitigation and design proposals to accommodate those recommendations. See findings 416 through 667, below. Dunnington pf.; Vissering pf.

90. The Town of New Haven has filed testimony expressing concerns about the Project. VELCO has duly considered the recommendations of the Town of New Haven and Ms. Vissering, aesthetics expert for the Town, regarding the New Haven substation expansion and line upgrade impacts in New Haven. As discussed in the aesthetics section below, VELCO finds the Town's proposal to relocate the substation prohibitively costly and unwarranted. VELCO has utilized existing facilities, corridors, and agreed to and recommended a number of mitigating measures, which limit the Project's impacts in this area. See findings 416 through 667, below. Sparling Reb. pf.; Vissering Reb. pf.

91. In meetings with officials and residents from the City of Vergennes, concerns were expressed about the visual and land use impacts of the proposed replacement of the 46 kV line with a 115 kV line and the expansion of the existing GMP Vergennes substation. VELCO was asked to consider alternatives that would eliminate the need to construct new facilities in the downtown Vergennes area. In response to this request, VELCO and GMP developed an alternative route and new substation site. Dunn Supp. pf. at 4.

92. The rerouted line will avoid the Comfort Hill and Botsford Road vicinity completely. The Vergennes City Manager has indicated that the City supports the reroute proposal. Dunn Supp. pf. at 4.

93. At meetings with representatives from the Town of Ferrisburgh, including the Town Manager, VELCO was asked if it was possible to move the proposed line to avoid several residences in the Little Chicago Road area. VELCO agreed that the reroute was possible and that it would not affect reliability of the 115 kV line, and accordingly revised its proposed route. Dunn Supp. pf. at 6.

94. Representatives of the Town of Ferrisburgh submitted testimony in support of VELCO's reroute proposal, noting, however, some areas of concern with regards to aesthetics and scenic resources. Blanchard Supp. pf.; Heindel Supp. pf.; Donovan Supp. pf.; Ingraham Supp. pf.; Donovan Reb. pf.; Donovan DD pf.

95. VELCO has duly considered the additional recommendations of the Town of Ferrisburgh and its representatives regarding aesthetics and has worked to modify its mitigation and design proposals to accommodate those recommendations. See findings 416 through 667, below.

96. The Town of Charlotte has filed testimony expressing concerns about the Project. VELCO has duly considered the recommendations of the Town of Charlotte and its representatives regarding aesthetics and has worked to modify its mitigation and design proposals to accommodate those recommendations. In response to Charlotte's concerns, VELCO proposed to relocate the Charlotte substation to reduce the visual impact of the substation and move it further from nearby residences. In addition to relocating the substation, VELCO has proposed several alternative routes to reduce the visual impact in the vicinity of Ferry Road and Waldorf School, and continues to work to develop an acceptable solution for that location. See findings 416 through 667, below. Bloch pf.; Donovan pf.; Aabo pf.; Emerson Reb. pf;. Dunn Supp. pf. at 11.

97. The Town of Shelburne submitted testimony expressing concerns about the Project. VELCO has duly considered the recommendations of the Town of Shelburne and its representatives regarding aesthetics and has worked to modify its mitigation and design proposals to accommodate those recommendations. See findings 416 through 667, below. Dates pf.; Bohne pf.; Pierce pf.; Henderson-King & Lalley pf.; Webb pf.;

Alswang pf.; Wang pf.; Henderson-King Supp. pf.; Aabo Supp. pf.; Alswang Supp. pf.; Dates Supp. pf.

98. The ACRPC submitted testimony raising concerns about the Project. VELCO has duly considered the recommendations of the ACRPC and Ms. Vissering, aesthetics expert for the ACRPC, regarding aesthetics and has worked to modify its mitigation and design proposals to accommodate those recommendations. See findings 416 through 667, below. Lougee pf.; Vissering pf.; Lougee Supp. pf.; Vissering Supp. pf.;Vissering Reb. pf.; Vissering Surr. pf.; Vissering DD pf.

Discussion re: Orderly Development of the Region

30 V.S.A. § 248(b)(1) provides in pertinent part that a Project should:

> "not unduly interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality."

This Section 248 standard differs materially from that found in Vermont's land use planning statute, Act 250 (10 V.S.A. § 6086(a)(9)), which requires conformance with zoning and planning regulations and policies. As the Vermont Supreme Court has noted, the "due consideration" standard under 30 V.S.A. § 248(b)(1) "at least impliedly postulates that municipal enactments, in the specific area, are advisory rather than controlling." *See City of South Burlington v. Vermont Elec. Power Company*, 133 Vt. 438, 447 (1975).

Furthermore, in *In re Vermont Elec. Power Co. Inc*, 131 Vt. 427, 435 (1973), the Court found that the requirements of 30 V.S.A. § 248(b)(1) were satisfied when the Board "extended to the Planning Commission the same opportunity to be heard as the other parties and due consideration was given to the recommendations of the Planning Commission." In that case, the Board's findings in the underlying proceeding (including its rejection of proposals to bury VELCO's 115 kV transmission line) were contrary to the South Burlington Planning Commission's recommendations; thus, the Board and Court implicitly acknowledged that

compliance with 30 V.S.A. § 248(b)(1) does not require that the project conform to the recommendations of local and regional planning commissions or municipal legislative bodies, as long as due consideration is given.

VELCO representatives took substantial measures to reach out to the communities impacted by this proposal and duly considered the input they received from those towns. VELCO did a thorough job of proactively consulting with many town and regional planners to incorporate local considerations in the design process.

The most significant area in which VELCO's proposal departs from the recommendations of town and regional planning organizations is with regards to undergrounding. The ACRPC, Middlebury, Ferrisburgh, Charlotte, and Shelburne have all suggested placing portions of the proposed line underground, and the Charlotte Town Plan specifically references undergrounding utility lines as an objective. As discussed in the aesthetics section below, however, undergrounding is not a reasonable option due to cost, reliability concerns, and environmental and archaeological impacts.

VELCO's decision to consider but not adopt undergrounding and certain other recommendations made by the towns and regional planning commissions does not mean that the Project fails to meet the requirements of 30 V.S.A. § 248(b)(1). Though VELCO has not adopted every recommendation made by the towns and planning commissions who have intervened or provided comment in this docket, the record reflects that due consideration has been given to their suggestions and plans. Indeed, VELCO's aesthetic mitigation proposals and project design have been revised several times to address the specific concerns of the towns and regional planning commissions and incorporate many of their recommendations.

This Project, which involves utilization of existing transmission line and railway corridors and existing substation sites (except in Vergennes and Charlotte, where the towns have proposed new, preferred locations), has been designed to minimize local impacts to the extent practicable. As the Board has concluded with regards to previous transmission line upgrades, "[b]y paralleling the existing corridor... a proposed routing has been chosen that has already been considered in the developmental aspects of communities by both public and private endeavors."

Petition of Vermont Electric Power Company, Inc., Docket No. 4381, Order of 3/6/80 at Finding No. 12; *see also, Delaware & Hudson Railway Co. v. Central Vermont Pub. Serv. Corp*, 134 Vt. 322, 324 (1976) (Electric transmission lines should be built in railroad corridors "to minimize the amount of land condemnation and maximize the effective use of land taken.").

The upgraded transmission facilities of the NRP will not unduly interfere with the orderly development of the impacted communities.

Need for Present and Future Demand for Services

[30 V.S.A. § 248(b)(2)]

99. The Project is required to meet the present and future demand for services which could not otherwise be provided in a more cost effective manner through energy conservation programs and measures and energy efficiency and load management measures. This finding is supported by findings 100 through 231, below.

The Incremental Upgrades Built by VELCO in Recent Years Are No Longer Capable of Sustaining a Reliable Transmission System

100. VELCO's existing transmission system is aged, at capacity, and no longer capable of reliably meeting Vermont's existing and future electric needs. Findings 6 through 21, above.

101. Engineers from VELCO, GMP, CVPS and Burlington Electric Department ("BED"), as well as from the DPS, have been participating in a group referred to as the Strategic Options Working Group since December 1996. Meetings of this Working Group in 1998 and early 1999 focused on Vermont reliability as a major issue. Docket No. 6252, Order of 10/7/99 at Finding No. 143.

102. VELCO has worked continually to address the northwest Vermont reliability problem since 1998, when it first identified serious voltage concerns in northwest Vermont. Technical Panel Reb. pf. at 14.

103. VELCO met with the Vermont DPS in December of 1998 to describe the summer reliability problem and potential solutions under consideration. The list of potential solutions included extending the 345 kV system to West Rutland and beyond to South Burlington, but VELCO ultimately determined that a STATCOM device at the Essex substation was at that time the most cost effective and timely solution. Ultimately, this Board found that the STATCOM was the most cost effective solution and issued a CPG on October 7, 1999. The Essex STATCOM began operation on May 1, 2001. Docket No. 6852, Order of 9/16/03 at Finding No. 34; Technical Panel Reb. pf. at 15.

104. In March of 2000, during the construction of the STATCOM, the Plattsburgh PAR failed. Facing a one year outage to repair the Plattsburgh PAR (and after having set a new summer peak of 939 MW in 1999), VELCO evaluated several options to increase system reliability before the impending 2000 summer load period. The options evaluated included energizing the Coolidge to West Rutland line at its rated 345 kV, building 6 miles of 115 kV line between Irasburg and Moshers Tap to close in the so-called "Northern Loop," and installing temporary generation. It was determined that the temporary generation option, supplemented with a last resort, undervoltage load shedding (UVLS) scheme, was the only viable option able to be implemented before the summer. With this Board's approval, the temporary generator / synchronous condenser was on line June 8th, 2000 and removed after the PAR was restored in February of 2001. PSB Board Order Docket No. 6375, 5/2/00.

105. Subsequently, on August 29th, 2000, VELCO met with the DPS and PSB to discuss Vermont's reliability problems and VELCO's need to reinforce the transmission system. Exhibit VELCO TW-1; Technical Panel Reb. pf. at 15-16; Tr. 2/27/04, Vol. I at 81-82 Wies).

106. On March 16, 2001 VELCO submitted a Section 248 filing for the Rutland Region Reliability Project ("RRRP"), PSB Docket No. 6479, a project that involved interconnecting and operating the existing Coolidge to West Rutland line at 345 kV. At

the same time, VELCO was developing the Northern Loop Project ("NLP") for submission for a CPG, PSB Docket No. 6792. VELCO received its CPG for the RRRP on August 1, 2001. VELCO completed its work and submitted its filing for the NLP on December 20, 2002. The NLP was reviewed and approved by the PSB on July 17, 2003, and VELCO has already begun construction on components of that project. Technical Panel pf. at 16.

107. As part of the RRRP, VELCO and the DPS entered into a stipulation that set forth a series of planning studies VELCO would perform to address future system needs, timing of those needs and potential alternatives to address them. The completion dates for the studies which were originally expected to be concluded in Spring of 2002, were (pursuant to several Board authorized extensions) completed in December 2002 and Spring 2003, and were used to support VELCO's NRP filing in this docket. See CLF Cross VELCO-1 (Stipulation); Tr. 2/27/04, Vol. I at 82 (Burke); Exhibits VELCO MDM-2, Planning 6.

108. Other somewhat smaller projects have also been put in place. In 1995, plans were put in place to utilize the Sand Bar Overload Mitigation Scheme series reactor ("OMS") to restrict the PV-20 flow if the Plattsburgh PAR were to fail. These plans provided the basis for operation when the PAR actually failed in 1999. In 1999, a back-up VELCO control center was installed at VELCO's West Rutland substation as part of a SCADA system upgrade. Beginning in 2000, various aging transformers were either rebuilt or replaced and the spare transformer inventory was increased. On April 11, 2001, VELCO obtained Board approval in Docket No. 6473 to install its portable 115/34.5 kV back-up transformer at VELCO's Queen City substation in South Burlington to prevent overloading of the three VELCO 115/34.5 transformers that serve the Chittenden County area. On April 1, 2003, VELCO, together with Green Mountain Power Corporation and Vermont Electric Cooperative, submitted a Section 248 application to upgrade transmission facilities at Tafts Corner in Williston, Vermont, in order to provide a third 115 kV/345 kV source to the sub-transmission system serving Chittenden County. The CPG for the Tafts Corner project was issued by the Board on October 22, 2003, and

construction of that project is underway. Technical Panel Reb pf. at 14-15; G. Parker pf. at 9.

109. For each of the VELCO projects requiring a Section 248 CPG, this Board found that the project solutions recommended by VELCO were the most cost effective to address the reliability need. PSB Docket No. 6252, Order of 10/7/99 at Finding No. 34; PSB Docket No. 6473, Order of 4/11/02 at Finding No. 28; PSB Docket No. 6479, Order of 8/1/01 at Finding No. 57; PSB Docket No. 6792, Order of 7/17/03 at Finding No. 37; PSB Docket No. 6839, Order of 10/22/03 at Finding No. 32; and PSB Docket No. 6852, Order of 9/16/03 at Finding No. 28.

110. In summary, subsequent to the realization of the summer reliability problem in 1998, VELCO's planning and engineering resources have worked essentially non-stop to implement the necessary corrective measures. Technical Panel Reb. pf. at 14-16.

111. Although VELCO's planning approach has been long-term and continuing, the upgrades have been presented and built incrementally in order to control costs and preserve resource flexibility, while still addressing immediate threats to the reliability of the system. However, VELCO has not built any significant transmission lines since the 1970s and 1980s. The incremental upgrades listed above are not capable of sustaining the existing or future reliability of the Vermont transmission network. G.Parker pf. at 8-9.

VELCO Planning Studies Highlight the Need for Major Transmission Upgrades Now

112. In this proceeding, VELCO submitted extensive studies that evaluated the sufficiency of the existing bulk power system to serve Vermont and the region. These included detailed transmission system studies, as well as studies performed by respected energy consulting organizations, to evaluate the potential for supply and demand-side alternatives to address Vermont's reliability problems. The results highlight the immediate need for major system upgrades. Findings 6 through 21; 113 through 138; 145 through 163; and 175 through 189.

113. The studies submitted by VELCO followed the guidelines established by NEPOOL and the Northeast Power Coordinating Council ("NPCC"), which have developed standards for the planning and design of the regional bulk power system. The transmission planning standard, a deterministic standard called the so-called N-2 criterion, requires that the bulk power system be designed with sufficient transmission capacity to serve loads after the loss of any critical system element and, within thirty minutes, be capable of sustaining the loss of the next most critical element. Montalvo pf. at 2-3; Montalvo Reb. pf. at 4; NPCC Document A-2 (Exhibit Planning-10) and NEPOOL Procedure 3 (Exhibit Planning-9).

114. The resource adequacy planning criterion (used for generation studies) requires that the electric system be designed such that the probability of disconnecting non-interruptible customers is no more than, on average, once in ten years. Montalvo pf. at 2-3; Montalvo Reb. pf. at 4; NPCC Document A-2 (Exhibit Plannint-10) and NEPOOL Procedure 3 (Exhibit Planning-9).

Facilities Serving Northwest Vermont Fail to Meet the N-2 Reliability Criterion

115. Vermont's aging transmission network has also reached its capacity. VELCO's Transmission Planning engineers undertook an extensive analysis of the Vermont transmission system, the Critical Load Study (VELCO Exhibit Planning-6),[14] which processed 5,000 load flow contingency simulation to test the system's thermal and

[14] In performing the Critical Load Study, a standard load flow technique was used to test and document system performance. VELCO's PSLF load flow software, in conjunction with a contingency processor, simulated numerous combinations of load flow base cases and contingencies. 178 contingencies were run against a subset of the initial base cases. This subset included the base cases, from the initial set, that were voltage and thermally limiting. Over 5,000 load flow contingency simulations were processed, and a significant number were run manually as well. Planning Panel pf. at 23.

voltage performance at various load levels and under numerous contingencies.[15] The Critical Load Study reveals that the power system serving northwest Vermont does not currently meet the N-2 transmission planning standard and, in fact, faces today the risk of suffering thermal overloads and possible voltage collapse under certain contingency scenarios which could result in a blackout for over half of Vermont's load (encompassing all of northwest Vermont) and possibly cascade to neighboring systems. Pet. at 3; Dunn pf. at 5-6; findings 116 through 127, below.

116. A voltage collapse is a series of system behaviors that result in insufficient voltage and, as a consequence, loss of load.[16] The extent of voltage collapse is difficult to predict for any one unique set of circumstances, but the direct impact, of course, is loss of load. Planning pf. at 8-9.

117. Thermal overloads accelerate equipment aging/deterioration, may cause irreversible equipment damage and failures that can be catastrophic, and may pose a risk for public safety. As is the case with low voltage, thermal overloads have the potential to cause widespread blackout. If a line fails because of thermal overload, power would then redirect to other lines, which may in turn overload, overheat, and open as well. This

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[15] The VELCO transmission planners used the Department of Public Service ("DPS") August 5, 2002 load forecast and adjusted the forecast to account for DSM savings estimated by Optimal Energy, Inc. ("Optimal") for continuation of existing Efficiency Vermont ("EVT") and Burlington Electric Department ("BED") DSM programs. Thus, within its NRP load forecast, VELCO incorporated "base" DSM load reductions expected from continuation of existing EVT and BED efficiency programs. These programs are currently funded and have a history of performance, so that there is a relatively good degree of confidence in the savings estimates from continuation of these programs. Mallory Reb. pf. at 4.

[16] There are also contingency scenarios that, while not leading to voltage collapse, would lead to sub-optimum system performance. Low voltage, excessive voltage and/or thermal overloading of system components could result from a variety of contingencies on today's system. Low voltage reduces the ability of appliances and machinery to function. Some appliances will not run below a specified voltage level, and prolonged operation at reduced voltage can prematurely age, or destroy an appliance. High voltage may damage equipment, such as computers, light bulbs, and televisions. Large voltage changes, a phenomenon that occurs on weaker transmission systems, can be noticeable to individuals and especially to sensitive equipment, such as computers. These voltage changes are not just a nuisance, they can affect manufacturing processes and result in significant financial loss. Planning pf. at 9-11.

situation is like a domino effect where overloads cascade until load can no longer be served. Under severe conditions, equipment damage and load disconnection can occur quickly without any time for operator intervention. Planning pf. at 9-10.

118. VELCO used the August 5, 2002 DPS load forecast for all of its planning studies, which represented the Department's view of expected load growth across Vermont at that time. Adjusted for Base DSM, the Base Case Load forecast used in the Alternatives Study had an average growth rate of 1.83% for Vermont-wide peak loads for the study period (2005 to 2016). Planning pf. at 17.

119. The base case load forecast produced by ISO-NE for the 2003 and 2004 CELT (Capacity, Energy, Loads and Transmission) report is essentially the same as the base case load forecast that VELCO used in its planning studies.[17] Montalvo Reb. pf. at 8.

120. The VELCO Critical Load Study revealed that the Vermont transmission system is deficient at loads below peak load levels experienced today. The majority of the upgrades are needed today, irrespective of the power transfer conditions tested. The existing system has deficiencies beginning at the 700 to 800 MW load level.[18] This means that

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[17] In April of 2003, NEPOOL published its 2003 CELT (Capacity, Energy, Loads and Transmission) report for New England. That report projects that peak loads in Vermont will grow at an average rate of 1.70% per year for the next ten years. According to the 2003 CELT Reference Case, peak loads in Vermont will reach 1100 MW critical load level by 2005 and 1200 MW by 2010. The 2004 CELT Reference Case projects that peak load growth in Vermont of 1.30% per year for the next ten years. Although growth has slowed, this forecast still has peak loads in Vermont reaching 1100 MW in the 2005/2006 time frame, with the 1200 MW now reached by 2012 or 2013. Montalvo Reb. pf. at 8.

[18] The fact that elements of the Project are needed at loads as low as 700 MW does not mean that the transmission system was unreliable in the 1980s when these load levels were first experienced. VELCO summer load levels did not exceed 700 MW until 1986, did not exceed 800 MW until 1988, and did not exceed 900 MW until 1998. The seasonality of the peaks, location of load, location and amount of generation, and other factors also play a role. In addition to the growing summer loads, the geographic distribution of load within Vermont has changed over the past two decades. Population growth, and the accompanying growth in residential, commercial and industrial load, has become more centered in and around Chittenden County over the last 20 years. The 700 MW summer load level today in Vermont has a higher concentration of load in northwestern Vermont than a 700 MW Vermont peak load level from the middle 1980s. Technical Panel Reb. pf. at 13-14; VELCO Exhibit Technical Reb-1.

system improvements are needed today. Pet. at 2; Dunn pf. at 5; Planning Panel pf. at 3; Docket No. 6852, Order of 9/16/03 at Finding No. 9.

121. The 1100 MW load level is the critical load level by which all NRP elements (except the expansion of the Granite dynamic reactive device from +/-75 to +/-150 MVArs) are needed in service to ensure that the power system both meets applicable planning standards and is able to reliably serve the region's growing loads. Montalvo Reb. pf. at 7-8.

122. The greatest concern continues to center on, but is not exclusively limited to, the transmission system that serves northwest Vermont. The most severe concern is a long term outage of the Highgate source. With Highgate out, VELCO studies reveal that the loss of either the PV-20 line or the Vermont Yankee ("VY") to Coolidge 340 line (the 345 kV line that feeds Coolidge substation and ultimately the West Rutland to Essex path), could cause the system to suffer voltage collapse at loads below present-day summer peaks. G. Parker pf. at 5; Planning Panel pf. at 4.

123. With Highgate out of service, McNeil in-service, 15 MW of Hydro generation, and no NRP elements in service, the existing system would be exposed to possible voltage collapse at a Vermont load of approximately 825 MW. At this load level, thermal and low voltage concerns that are addressed in the Critical Load Study with the Blissville and Sand Bar PARs, at 700 and 760 MW respectively, have worsened to the point that Vermont faces an exposure to voltage collapse. A VY 1T breaker failure, which takes out the VY generator and the Coolidge - VY 345 kV (340) line, causes overloads on both the Whitehall, NY and Plattsburgh, NY transmission ties. The Whitehall tie then trips, and the Sand Bar inductor inserts to reduce the flow on the PV20, but at this load level the reduction is not sufficient, so as a result the tie trips. Loss of both ties results in voltage collapse. The same scenario described above would cause voltage collapse at a Vermont load level of approximately 875 MW for loss of the 340 line by itself with no breaker failure involved. Exhibit DPS-VELCO-Cross-18, No. 27a.

124. Even if the system did not suffer an immediate voltage collapse, it is likely that the remaining lines would become thermally overloaded, trip, and the system would eventually suffer voltage collapse. These results could take place under any New England power transfer condition at today's peak load levels. Planning Panel pf. at 4.

125. VELCO studies show that if a PV-20 outage were to cause voltage collapse, load disconnection of an unknown magnitude (but probably greater than 150 MW) would need to occur in the northwest Vermont area to prevent voltage collapse from cascading over a much wider area. This is actually an optimistic scenario, because it assumes that the appropriate relaying could be designed to make such a load shed possible, and, even more conservatively, it assumes that if a major contingency were to occur, voltage collapse would take place slowly enough to allow the necessary load-shedding actions to be taken before it was too late. Planning pf. at 8-9.

126. If nothing is done to correct the existing reliability problems, by the time the Vermont summer peak reaches 1100 MW (forecasted for 2005-2006), loss of the West Rutland - Middlebury 115 kV (K-30) line or the Granite - Barre 115 kV (K-26W) line would be a contingency that could result in voltage collapse. The K-30 line contingency, the worst of the two, could cause voltage collapse at loads as low as 1050 MW (forecasted by 2005) if nothing is done to improve the existing system. With further load growth, the list of critical contingencies increases. Planning pf. at 5-6; Dunn pf. at 12; VELCO Exhibit Planning-6; Docket No. 6852, Order of 9/16/03 at Finding No. 8.

127. The NRP, as proposed, would address the present-day thermal and voltage concerns, and also allow the system to reliably support near-term load growth. It is a set of transmission upgrades designed to add a fifth transmission path into northwest Vermont from the West Rutland 345 kV source, and to strengthen the Granite to Essex path. A fifth transmission path will address thermal concerns on the northwest Vermont interface ties. A fifth path in service will also address voltage problems after major contingencies. This new path needs to be at 345 kV, because otherwise, at loads above 1150 MW

(forecasted to occur between 2008-2009), voltage concerns will resurface in northwest Vermont for loss of the Granite - Barre 115 kV (K-26W) line. Planning pf. at 3-4.

Although Opponents Questioned the Appropriateness of N-2 Standard, it is Required and Appropriate for Planning the Vermont Bulk Transmission System

128. During the hearings, counsel for the Town of New Haven and CLF alleged that the NPCC/NEPOOL N-2 standard used by VELCO and ISO-NE is inappropriate and too restrictive, purportedly relying upon the NERC's use of an N-1 standard. 11/15/04 New Haven Motion to Reconsider.

129. NERC was formed to promote the reliability and adequacy of the bulk electric supply by the electric systems in North America. NERC was established in 1968 as a result of the Northeast blackout in 1965. NERC Transmission Adequacy Issues Task Force, "Transmission Expansion: Issues and Recommendations," at 4 (2002), Exhibit VELCO Cross Blohm Surr-33, Attachment D; Blackout Report at 10.

130. The NERC Planning Standards expressly instruct regional power pools and their members to develop their own appropriate or more detailed planning and operating reliability guides, and if the regional or individual member planning criteria are more restrictive than the NERC Planning Standards, "the more restrictive reliability criteria and guides must be observed." NERC Planning Standards at 4-5, VELCO Cross Blohm Surr-32. NERC Transmission Adequacy Issues Task Force, "Transmission Expansion: Issues and Recommendations," at 4 (2002), VELCO Cross Blohm Surr-33, Attachment D (a "basic tenet in the planning and expansion of the transmission systems is that the transmission systems should be capable of delivering or transferring electric power to meet the customer demands for electricity while surviving certain critical system disturbances or contingencies by operating with specified thermal, voltage, and stability limits").

131. NERC recently praised ISO New England's use of the N-2 reliability standard as a "best practice" for other NERC members. NERC ISO New England May 5-6, 2004 Control Area Readiness Audit Report at 6-7 (VELCO Cross Blohm Surr-31).

132. One of the principal reasons why an N-2 planning criterion is appropriate for the New England bulk power system, as opposed to perhaps other regions of the country, is because New England is at the end of the line. Vermont has three interconnections: New York, New Brunswick and Hydro Quebec. The flexibility within these interconnections to address regional concerns is not nearly as great as in other regions. TVA, for example, is in the middle of the eastern interconnection, with 51 different interconnecting lines into that region, 5000 MW total of hydro and 1600 MW of pumped hydro, and so there are almost limitless resources available to respond to a second contingency. Tr. 9/21/04, Vol. II at 60-61 (Whitley).

133. If Northwest Vermont violates the N-2 standard, there are potential adverse impacts for other parts of the New England grid. This year, ISO-NE had to modify the amount of power brought into New England because of the weaknesses in the northwest Vermont system. Tr. 9/21/04, Vol. II at 67 (Whitley).

134. The need for the Project is not just a question of whether planning standards may be broken, "it's needed to be reasonably confident that the lights stay on." Tr. 9/21/04, Vol. II at 15 (Whitley).

135. ISO-NE, NEPOOL and its members (including VELCO) operate under a FERC approved tariff that adopts the N-2 criterion. Ultimately, regardless of its provenance, that criterion is the one that is the right substantive standard for New England. Tr. 9/21/04, Vol. II at 56, 59-60 (Whitley).

136. "The central organizing principle in electricity reliability management is to plan for the unexpected. The unique characteristics of electricity mean that problems, when they arise, can spread and escalate very quickly if proper safeguards are not in place. Accordingly, through years of experience, the industry has developed a network of

defensive strategies for maintaining reliability based on the assumption that equipment can and will fail unexpectedly upon occasion." Blackout Report at 8-9.

Northwest Vermont Fails to Meet NPCC/ NEPOOL Resource Adequacy Standard

137. VELCO retained LaCapra to evaluate the capability of existing generation and demand-side resources required to meet the NEPOOL/NPCC loss of load probability ("LOLP") of no more than one day in ten years. LaCapra's study revealed that there is an expected frequency of disconnecting firm load in northwest Vermont of more than one day in ten years beginning in 2004 due to inadequate generating resources. The expected frequency increases to 1.65 days per year in 2008, and to 7.3 days per year in 2011. Montalvo Reb. pf. at 5-6.

138. The LaCapra study also forecasts many hours of unserved energy, i.e., hours when load would have to be shed within Vermont to protect the system. LaCapra estimates that there are numerous hours of unserved load in each year after 2007 (43 hours by 2008, and 325 hours by 2011). Mallory/Montalvo pf. at 11; VELCO-MM-3.

The NRP Solution and Construction Schedule

139. The NRP, as proposed, will address the Vermont transmission system's present-day thermal and voltage concerns, and will also allow the system to reliably support near-term load growth. It is a set of transmission upgrades designed to add a fifth transmission path into northwest Vermont from the West Rutland 345 kV source, and to strengthen the Granite to Essex path. A fifth transmission path will address thermal concerns on the northwest Vermont interface ties. A fifth path in service will also address voltage problems after major contingencies. This new path needs to be at 345 kV, because otherwise, at loads above 1150 MW (forecasted to occur in 2008), voltage

concerns will resurface in northwest Vermont for loss of the Granite - Barre 115 kV (K-26W) line. Planning pf. at 3-4.

140. The Critical Load Study took the approach of constructing the least expensive upgrades first, and as a result, in that study, the 345 kV line was put in service after the Northern Loop Project ("NLP"), system power factor correction (to 0.98), and all elements of the NRP, except the expansion of the Granite dynamic reactive device. If all of these other reliability improvements were built immediately (i.e. today or tomorrow), the Critical Load Study shows that the 345 kV line is still needed by a Vermont peak load of 1100 MW, which is forecast to occur between 2005 and 2006 according to the DPS August 5, 2002 forecast. VELCO Technical Panel Reb. pf. at 3.

141. However, with the system as it exists today (i.e. without any of the aforementioned preceding upgrades), the 345kV line is needed at a 955 MW peak load level, which is nearly 70 MW below the summer peak load level Vermont experienced during the summer of 2003. VELCO Technical Panel Reb. pf. at 3.

142. All elements of the NRP are being scheduled for construction as quickly as it will be possible to complete them. The 345 kV line is the primary focus of the schedule, however, for a number of key reasons:

1. The 345 kV line is an additional line rather than a replacement of an existing facility. As a result, its construction is not as dependent on the ability to take outages on existing system transmission elements. Because of this fact, the following scheduling approach is being taken: If the opportunity presents itself to reliably take an outage to complete any portion of the NRP, it will be done. If enough of these opportunities do not present themselves to allow the completion of less expensive elements of the NRP first, the 345 kV line will be completed first because it requires the least exposure to unreliable system conditions.
2. The 345 kV line is one of the first elements of the NRP needed for bulk system reliability when Highgate is assumed in service (i.e. under normal operating conditions), and it provides the largest increase in bulk system reliability out of all NRP elements when Highgate is in service.
3. Line maintenance is carried out on a regular basis on all VELCO 115 kV lines. During normal maintenance of the 115 kV line from Williston to West Rutland, a

significant amount of load at New Haven, Middlebury, and Florence can be exposed to disconnection for certain contingencies. Also, because the Williston to West Rutland line is a bulk system 115 kV path to northwest Vermont, the entire northwest Vermont load is being supported by one less tie when it is out of service for maintenance, and is, as a result, in a much less reliable situation. Constructing the 345 kV line mitigates this exposure.

4. Long lead items such as transformers have the potential to cause significant delays for any transmission upgrade. However, in the case of the 345 kV line, a second transformer already exists at West Rutland, that could be moved to New Haven should such a lead item concern threaten to delay the in-service date significantly.
5. Unlike the proposed 115 kV line upgrade, VELCO owns easements along the transmission line corridor between West Rutland and New Haven. As such, VELCO can construct this line more quickly than it could the 115 kV line.

VELCO Technical Panel Reb. pf. at 4-5.

143. Construction logistics and operational considerations militate in favor of constructing the New Haven to West Rutland 345 kV line first. If the 345 kV line is not built immediately, irrespective of the load forecast or any DSM program pursued, analysis performed for VELCO by LaCapra Associates shows that some 150 MW of generation should be put in service in its place by Summer 2006 (at least on a temporary basis) to ensure the reliable operation of the bulk power system in Vermont through the 1100 MW load level. Montalvo Reb. pf. at 10-11.

144. If all other elements of the NRP are put in service without the 345 kV line, the system, when repositioned to maintain reliability for loss of Highgate, will have fairly significant incremental losses due primarily to the need to utilize the Granite PAR to increase power from Comerford, New Hampshire. VELCO Technical Panel Reb. pf. at 8.

ISO-NE, NEPOOL and the Vermont DPS Concur That Vermont Faces a Serious Reliability Problem and Recommend the NRP Transmission Upgrades as the Solution to the Problem

ISO-NE and NEPOOL Support the NRP Solution

145. ISO-NE, the organization charged by FERC with ensuring the reliability of the New England regional transmission system, has concluded:

"*Northwest Vermont area faces serious reliability problems due to weak interconnections with the bulk transmission system and a lack of generating resources and distributed resources in the region. The condition is expected to worsen with continued load growth.*"

Dunn pf. at 6; Whitley/Kowalski pf. at 10; ISO-NE Board approved RTEP02 (Regional Transmission Expansion Plan), section 1.4.4, page 14.

146. ISO-NE operates the power grid for the six-state New England region, which includes approximately 350 generating facilities connected by approximately 8,000 miles of transmission lines. This regional network, originally established with the formation of NEPOOL in 1971, serves electricity in real time to more than 14 million New England residents and businesses.[19] Whitley/Kowalski pf. at 7.

147. As the independent system operator, ISO-NE complies with FERC Order No. 889.[20] In this regard, ISO is an independent, private, non-profit, non-stock company. ISO-NE therefore has no shareholders, and its Directors, employees and consultants are barred from being employed by or owning shares in NEPOOL Market participants. Its budget is

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[19] The "Independent System Operator" concept was developed by the FERC as part of the framework to support competitive electricity markets. ISO-NE was established to be the Independent System Operator of the New England bulk power grid on July 1, 1997, (New England Power Pool, Order Conditionally Authorizing Establishment of an Independent System Operator and Disposition of Control Over Jurisdictional Facilities, 79 FERC ¶ 61,374 (1997)(authorizing formation of ISO)), and it assumed certain operating and transmission reservation responsibilities which had previously been carried out by NEPOOL, which transferred staff and assets to ISO-NE. In June, 2001, FERC conferred authority on ISO to be responsible for the regional transmission planning process. (ISO New England Inc. & New England Power Pool, Order On Rehearing Requests and Compliance Filings, 95 FERC ¶ 61384 (2001)(authorizing ISO to oversee regional transmission planning). In June 2003, FERC confirmed ISO's authority to approve planning for upgrades and changes to supply and demand-side resources (New England Power Pool & ISO New England Inc., 103 FERC ¶ 61,304 (2003) (accepting October 2001 compliance filing as to the directive regarding Sections 18.4 and 18.5 of the Restated NEPOOL Agreement, and stating that "[w]e are persuaded by ISO-NE's arguments that it is the appropriate authority to approve planning for transmission upgrades and changes to supply and demand-side resources."). Whitley/Kowalski pf. at 4.

[20] Open Access Same-Time Information System Conduct, Order No. 889, 75 FERC ¶ 61,078 (1996)(rules establishing and governing Open Access Same-Time Information System).

reviewed and approved annually by FERC, and ISO-NE's Tariff only recoups its annual expenses. Whitley/Kowalski pf. at 5.

148. ISO-NE's responsibilities include independently operating and maintaining a highly reliable bulk transmission system, promoting efficient wholesale electricity markets, and working collaboratively and proactively with state and federal regulators, NEPOOL Participants, and other stakeholders. NEPOOL Participants include generators, transmission owners, marketers, municipalities and "end users." Whitley/Kowalski pf. at 6.

149. Pursuant to this mission, ISO-NE must maintain a level of system reliability that meets criteria established by NEPOOL, NPCC and the North American Electric Reliability Council ("NERC"). Whitley/Kowalski pf. at 6.

150. In June 2001, FERC conferred upon ISO-NE responsibility for conducting long-term system planning for the New England region. The Regional Transmission Expansion Plan, or RTEP, is a comprehensive electrical engineering assessment comprised of numerous studies and analyses of New England's bulk electric power system and is developed through an open process and through participation of, and review by, interested parties, including state regulators and NEPOOL market participants. Market responses might include investment in generation, merchant transmission facilities, and demand response programs. If the market does not respond with adequate solutions, ISO-NE is charged with providing a coordinated transmission plan that identifies appropriate upgrades for reliability and economic needs. Whitley/Kowalski pf. at 8-9.

151. As there have been no market responses that would significantly mitigate reliability concerns for northwest Vermont, the NRP was designated a "Reliability Upgrade"[21] and

[21] "Reliability Upgrade" is defined under the NEPOOL Tariff as: "Those additions and upgrades not required by the interconnection of a generator that are nonetheless necessary to ensure the continued reliability of the NEPOOL system, taking into account load growth and known resource changes, and include those upgrades necessary to provide acceptable stability response, short circuit capability and system voltage levels, and those facilities required to provide adequate thermal capability and local

included in the 2002 Regional Transmission Expansion Plan (RTEP02). ISO-NE recommends completion of Project components as soon as practicable. Whitley/Kowalski pf. at 11; VELCO Cross CLF-7; VELCO Cross ISO-13; Dunn pf. at 15; ISO-NE pf. at 9-10; NH-Cross-21(a).

152. ISO-NE staff independently assessed the VELCO NRP Critical Load Study inputs, assumptions and methodology. *See* VELCO Exhibit Planning-6 and VELCO Exhibit Planning-8. These reports underwent a public review process through the appropriate NEPOOL Committees and ISO-NE. The RTEP reports incorporated those analyses and those comments, and concluded that the NRP is a needed upgrade to meet reliability standards. Whitley/Kowalski pf. at 3,11.

153. RTEP03 concludes that reliability remains a critical issue in northwest Vermont due to a lack of power plants[22] in the area and weak transmission links. While the situation is critical today, it is expected to worsen considerably with continued load growth. Whitley/Kowalski pf. at 10-11; RTEP03 Executive Summary, § 5.3.4, NH Cross 21.

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voltage levels that cannot otherwise be achieved with reasonable assumptions for certain amounts of generation being unavailable (due to maintenance or forced outages) for purposes of long-term planning studies. Good Utility Practice, applicable reliability principles, guidelines, criteria, rules, procedures and standards of NERC and NPCC and any of their successors, applicable publicly available local reliability criteria, and the NEPOOL System Rules, as they may be amended from time to time, will be used to define the system facilities required to maintain reliability in evaluating proposed Reliability Upgrades." Restated NEPOOL Open Access Tariff, Section 1.106.

[22] Existing Vermont generating resources are limited. The VY Nuclear Power Station in Vernon is located a considerable distance from the State's load center in northwest Vermont. Due to its remote location relative to northwest Vermont, VY provides little support to northwest Vermont. Since 1972, when VY came on line, only limited additional generating resources have been added. The McNeil 51 MW wood-burning plant was built in Burlington in 1984; the Ryegate 20 MW wood-burning plant was built in Ryegate (northeast Vermont) in 1992; and the Vermont Marble Power Division Combustion Turbines (west-central Vermont) were added in 1982. In the critical northwest Vermont area, the most reliable fossil fuel generator is the 50 MW McNeil plant, although this unit has experienced recent outages. The area's combustion turbines and diesels (Burlington GT, Essex and Vergennes Diesels and Gorge GT) are old, expensive to operate, and frequently out of service for repair. G. Parker pf. at 3-4.

154. Mr. Whitley, ISO-NE's Chief Operating Officer, testified that from ISO-NE's perspective, northwest Vermont is a very large load pocket. It's the fourth largest area of New England that is presenting reliability problems for the regional bulk power system. Tr. 9/21/04, Vol. II at 65 (Kowalski).

155. ISO-NE's load estimate for Vermont has already increased this year over last year. According to ISO-NE, we are going to fail criteria if we don't get moving. "We need to get something going now to ... keep the lights on . ..." Tr. 2/17/04, Vol. I at 55 (Whitley); Tr. 9/21/04, Vol. II at 11, 44 (Whitley).

156. There is also concern that local generating units, which may be in great demand, may not be available, given the natural occurrences of unexpected outages, limited hydro-electric plant capability in the summer, and the age and nature of several of these units. Permanent shut down due to either catastrophic failure or owner retirement is also a possibility. The problems in providing electricity are exacerbated if local supplies of electricity are unavailable. As a result, there must be a robust transmission system in place to import needed electricity into and around this region. However, the amount of electricity that the existing transmission system can import from other areas and transmit within the northwestern region of Vermont is limited, putting that region at an unacceptable risk of failure under NEPOOL Reliability Standards. Whitley/Kowalski pf. at 13-14.

157. It has been ISO-NE's experience in operating the system that the northwestern region of Vermont has been unreasonably close to experiencing blackouts. Residents and businesses in northwest Vermont have experienced several close calls in losing electricity from the spring of 2000 through the present. Whitley/Kowalski pf. at 14.

158. ISO-NE believes that what Vermont needs is one major efficient high voltage transmission line, as currently proposed in the NRP, to bring power in from the rest of the grid so that when one unit is out the system does not fail, but remains tied to the entire portfolio of resources in New England. Simply adding generation in northwest

Vermont, given the weaknesses of the existing transmission infrastructure, is not an appropriate solution. Tr. 2/11/04, Vol. II at 69, 70 (Whitley).

The Vermont DPS Supports the NRP Solution

159. Beginning in 2001, VELCO undertook the extensive NRP planning studies in close coordination with engineers and other experts at the Vermont DPS, in accordance with a stipulation worked out between the parties. Exhibit CLF-VELCO-Cross-1.

160. After extensive discussions and discovery, the DPS submitted testimony supporting the need for the Project. Mertens pf., Smith and Litkovitz pf., Welch pf. and Lesser pf.

CLF and Other Parties Challenged the Need for the Project, But Offered No Evidence to Support Their Positions

161. CLF's principal witness, Paul Chernick, questioned the need for the Project. However, he admitted that he had not conducted or could not provide any studies, data or other evidence to contradict the findings and conclusion of VELCO, ISO-NE, NEPOOL, or the DPS regarding the reliability problem in northwest Vermont and he had no formal education, training or experience in transmission system planning, electrical, engineering or the design and operation of transmission systems. Tr. 2/20/04, Vol. I at 16-18 (Chernick). VELCO Cross CLF-1, 2; Exhibit DPS-CLF-Cross-55 (Mr. Chernick provided no independent statistical analysis regarding likelihood of outages at Highgate or PV-20).

162. Mr. Chernick has never been a member of any NEPOOL, NPCC or ISO-NE task force or committee. Tr. 2/20/04, Vol. I at 24 (Chernick).

163. Mr. Chernick testified that he accepted the conclusion of the VELCO transmission planners that the Vermont system has a reliability problem today. Tr. 2/20/04, Vol. I at 23 (Chernick).

There Are No Cost Effective, Robust Alternatives to the NRP

Transmission Alternatives

164. There are no viable transmission alternatives to the Project that would sufficiently address the system's reliability concerns. Upgrading one of the existing four 115 kV transmission paths to 230 kV would only make the outage of that path the most limiting outage. Similarly, installing a second Highgate Converter would still leave the system vulnerable to voltage collapse for a large number of critical contingencies. While it is possible that the current proposed 345 kV line from West Rutland to New Haven could be replaced by a second 115kV line instead, an additional 115kV line from Granite to Middlesex would need to be added in this scenario to achieve comparable reliability. Planning Panel pf. at 39-41; Exhibit DPS VELCO Cross 10, 11, 15, 17.

165. The 345 kV line is needed to reduce the reactive impedance necessary to achieve acceptable voltage performance. Tr. 2/11/04, Vol. II at 158-59 (LaForest).

166. VELCO evaluated whether re-conductoring the existing GMP New Haven to Queen City 34.5 kV line would address the reliability problem, and concluded that it would not. In addition to reconductoring the line, VELCO would need to install a new 115 kV line between the Williston and Queen City substations. Moreover, reconductoring the line by itself would not solve the voltage problem and the system would remain exposed to loss of the line with Highgate out, since loss of the line is the limiting outage. Tr. 2/11/04, Vol. II at 142-43, 153 (LaForest) ; DPS Cross Exhibit 11.

167. The DPS' transmission engineers, who evaluated the VELCO studies and conducted their own independent analysis, agreed that substantial transmission reinforcements of the VELCO system are needed now and that the NRP is the superior transmission solution. Smith/Litkovitz pf. at 3-4.

Generation

168. If the 345 kV line is not built immediately, irrespective of the load forecast or the DSM program pursued, analysis performed for VELCO by LaCapra Associates shows that some 150 MW of generation should be put in service in the Burlington area in 2005 (at least on a temporary basis) to ensure the reliable operation of the bulk power system in Vermont through the 1100 MW load level. Montalvo Reb. pf. at 10-11.

169. VELCO Planners calculated that 475 MW of generation or load reduction is needed to replace or defer the need for the 115 kV line between New Haven and Queen City. Tr. 2/11/04, Vol. II at 132 (LaForest, Presume); Exhibit CLF Cross 13.

170. At VELCO's request, LaCapra evaluated whether generation could provide a cost effective solution to the northwest Vermont reliability solution. On the supply side, various generation technologies, including utility-scale generation, distributed generation, and renewable technologies, were screened to identify the most viable options. Based upon the higher proforma costs of generation and distributed generation resources, and implementation barriers, generation options are not a viable alternative to solving northwest Vermont's reliability problem. Findings 168 through 174; 190 through 208.

171. VELCO explored whether there were any plans to build new generation in northwest Vermont, and none are planned. No evidence was identified or brought forward by any party indicating possible plans for locating generation in northwest Vermont in the near future. The generation alternatives studied in the LaCapra report are thus hypothetical only, and do not present concrete alternatives to address Vermont's reliability problems. CLF Cross 10, VELCO Exhibit MDM-2 at 78-81.

172. Based upon his experience within NEPOOL and in meeting with numerous market participants in New England, Mr. Dunn testified that he doubts that the generation needed for Vermont's immediate reliability needs could be built in Chittenden County. Tr. 2/11/04, Vol. II at 27 (Dunn).

173. ISO-NE does not believe that adding generation in northwest Vermont, given the weaknesses of the existing transmission infrastructure, is an appropriate solution. To place one more generator in northwest Vermont would not help reliability, because generation units do not run continuously and the system would remain exposed to loss of Highgate, which would be devastating. What Vermont needs is one major efficient high voltage transmission line, as currently proposed in the NRP, to bring power in from the rest of the grid so that when one unit is out, the system does not fail, but remains tied to the entire portfolio of resources in New England. Tr. 2/11/04, Vol. II at 69, 70 (Whitley).

174. Mr. Chernick, CLF's witness, admitted that he did not know what generation or distributed generation would or could be built or where in New England, that would provide a more cost effective solution to the NRP to solve Vermont's reliability problems. Exhibit DPS-CLF-Cross-59, 61.

Energy Conservation

175. DSM load reductions can be useful in lowering or deferring peak load levels that trigger reliability problems and there is a certain penetration of DSM assumed in the NEPOOL Capacity, Energy, Loads, Transmission ("CELT") forecast. However, for transmission planning purposes in NEPOOL and in ISO-NE's Regional Transmission Expansion Plan, DSM is not treated as a capacity resource. Mallory Reb. pf. at 2-3; VELCO Exhibit Mallory Reb-1; VELCO Exhibit Mallory Reb-2 (pp.13-15 of RTEP-03); Tr. 2/17/04, Vol. II at 71 (Whitley).

176. Forecasted DSM load reductions must pass a validity test before being incorporated into the CELT forecasting process. Forecasted load reductions that fail to materialize could impair system reliability. ISO-NE checks CELT load forecasts for reasonableness against prior year forecasts. Any significant increases or decreases are questioned and verified by ISO-NE as they pertain to funding sources or other conditions. An example of this can be found within VELCO Exhibit Mallory Reb-3, "NEPOOL Participant Planned Demand-

Side Management Impacts on the NEPOOL Load Forecast 2004-2013," where changes in the State of Connecticut DSM funding caused ISO-NE to adjust the forecast. Mallory Reb. pf. at 3.

177. While ISO-NE used 5.3 MW of DSM resources last summer along with emergency generation to fill the gap in reliability faced by southwest Connecticut ("SWCT"), under its 2004 SWCT GAP RFP, the SWCT DSM forecasts were backed by performance guarantees to ensure that the load reductions could be counted upon for system reliability. ISO-NE's standard contract for this RFP process includes financial assurance requirements for the contracting party to provide a corporate guarantee, letter of credit, or cash posting that can be drawn upon by ISO-NE as liquidated damages should the supplying entity fail to meet its committed DSM capacity amounts at specific time intervals, and ISO-NE's right to cancel the contract should the resource fail to perform. Mallory Reb. pf. at 3-4; VELCO Exhibit Mallory Reb-4, "Agreement For Supplemental Installed Capacity Southwest Connecticut."

178. VELCO hired Optimal Energy, Inc. ("Optimal" or "OEI") of Bristol, Vermont to determine how much peak demand in northwest Vermont could be reduced by increased investments in energy efficiency programs and what it would cost to implement such programs. Additionally, Optimal provided an estimate of the expected savings over the next ten years from the continuation of Efficiency Vermont's ("EVT") programs funded at current levels. This estimate of expected savings was used to adjust the DPS 8-5-02 forecast. Dunn pf. at 18.

179. OEI concluded that 213 MW of summer peak demand savings could be achieved from energy-efficiency programs targeted in the northwestern part of Vermont by 2012, at a cost of $618 million. OEI pf. at 4; VELCO Exhibit OEI-1, Tables 1 and 13A.

180. To achieve these aggressive load reduction goals, the study contemplated a large, ambitious investment campaign over a decade, utilizing the most aggressive proven

market implementation strategies proven to acquire widespread participation by all market sectors:

- Sustained marketing to consumers and equipment suppliers;
- Generous financial incentives covering the full cost of retrofit measures and the full incremental cost for new construction/renovation measures;
- Comprehensive technical and information services for market participants; and
- Complete customer service delivery.

VELCO Exhibit OEI-1 at 3; OEI pf. at 7.

181. While OEI attached a high degree of confidence to its technology cost projections because they are all relatively well known, it also cautioned that ***"no utility has ever sustained such large efficiency investment commitments for so long in so many markets simultaneously and actually achieved the relative magnitudes of peak demand savings projected over the next decade in this report." In this sense, OEI testified that it was "forecasting well beyond the pooled, time-series sample data it was estimating from."*** OEI pf. at 7.

182. Optimal testified that the main disadvantage of the energy efficiency programs it studied is that they are highly capital intensive. In 2012, efficiency investments in the Inner and Metro-Area and Northwest/Northwest Central Area load zones would require total capital outlays of $64 million (Table 16A), roughly three and a half times the $19 million Vermont spent statewide on efficiency at the peak of utility DSM investment a decade ago. OEI pf. at 6.

183. A second disadvantage is that its benefits are so diffuse. These benefits originate from multiple sources, which (in decreasing order) are distribution ($298 million), non-electric - fossil fuel and water ($258 million), and avoided generation ($207 million). No one source of benefits is large enough to cover the total costs of the efficiency resources, almost all of which consist of capital required in large amounts. Concerted effort on the

part of many parties would be required to mobilize this unprecedented level of sustained capital investment. VELCO's share of these benefits is relatively small and by no means sufficient to support the acquisition of a major share of the economically deliverable transmission capacity in the load zones studied. OEI pf. at 6; VELCO Exhibit OEI-1, Table 13A.

184. Despite the unprecedented nature of the efficiency program commitments assumed by Optimal, their estimated results, even if realized, would not be sufficient to address Vermont's reliability problem. Taking into account Optimal's aggressive DSM programs, LaCapra still expects a peak load carrying capability deficit in 2005 of approximately 89 MW (partly due to the slow rate of projected DSM savings acquisition (5.5 MW in 2005, 9.7 MW in 2006, 12.6 MW in 2007, 13.7 MW in 2008, with a total of 74 MW of peak load reductions by 2012)). As a result, additional resources are required in 2005 to address the load carrying capability deficiency in northwest Vermont. Montalvo Reb. pf. at12; CLF Cross Exhibit 2, No.6; Exhibit CLF Cross VELCO 23.

185. Although CLF's witness, Mr. Chernick, took the position that the 74 MW of peak load reductions estimated by OEI could be achieved by 2012, he admitted that he had not compiled any data that indicated such reductions had ever been achieved, nor did he have any information that contradicted OEI's statements concerning the unprecedented undertaking of such an aggressive efficiency program. Exhibit DPS-CLF-Cross-57, 63.

186. In addition to the incremental DSM savings estimated by Optimal, LaCapra's analysis showed that 120 MW of new generation located in Chittenden County plus many transmission components of the NRP would need to be built to meet the resource deficiency in northwest Vermont. Mallory Reb. pf. at 4-5.

187. As shown in VELCO Exhibit MDM Reb-3, which identifies projected DSM contribution rates, even if all of the DSM identified by OEI had been included in the study, the timing of the need for the NRP elements listed as non-deferrable would be unaffected. The timing of the need for the West Rutland to New Haven 345 kV line and the Granite-Barre

115 kV reconductoring would be similarly unaffected. The total peak load carrying capability need in NWVT would be reduced by 0.4 MW in 2005 and 11.9 MW in 2009 with the addition of DSM savings from the Outer Northwest zones, leaving a need of approximately 82 MW and 79 MW, respectively. All of the NRP elements would be required to meet this level of need. Montalvo Reb. pf. at 13.

188. LaCapra studied a hypothetical DSM alternative combined with generation and transmission resources, and its results demonstrate that cost, timing, and other feasibility factors make consideration of DSM as an alternative to the NRP highly unrealistic. See findings 190 through 208, below.

189. DPS' witness Carol Welch testified that given the high capital costs to Vermont ratepayers compared to a transmission solution, the lack of PTF treatment for DSM, and the magnitude of the apparent immediate transmission capacity need, it was her opinion that DSM is not a robust option for deferring or avoiding the NRP or any of its major components. Welch pf. at 8.

LaCapra's Theoretical Alternative Resource Configurations (ARCs)

190. LaCapra compared the NRP to a broad set of potential alternatives to the NRP, including system expansion plans composed of utility-scale power plants, distributed generation installations and DSM programs. The goal of the study was to develop a robust solution to the transmission reliability problem facing northwest Vermont. The results of this analysis are contained in Mr. Montalvo's report, VELCO Exhibit MDM-2. Montalvo pf. at 2.

191. LaCapra first identified the amount of resources needed in northwest Vermont. The data used for this phase of the analysis included the DPS load forecast for northwest Vermont (DPS 8-5-02 DSM-adjusted Vermont load forecast) and the capability of the transmission lines and generators supplying northwest Vermont. Once the need was determined,

LaCapra evaluated options for meeting this need. On the supply side, various generation technologies, including utility-scale generation, distributed generation, and renewable technologies, were screened to identify the most viable options. Dunn pf. at 18; VELCO Exhibit MDM-2.

192. LaCapra constructed five alternate resource configurations ("ARCs") of comparable reliability with the Project. Each ARC included estimated future savings from the continuation of Efficiency Vermont's existing programs. ARCs 1-4 are comprised primarily of generation of various sizes. ARC 5 utilizes generation and a portion of the DSM savings identified by Optimal. LaCapra noted that many of the Project elements cannot effectively be replaced by non-transmission alternatives. Project elements that provide voltage control, ensure system stability or direct flows are not good candidates for replacement by non-transmission alternatives due to either cost or operational characteristics. Thus many of the Project elements are included in each ARC. Dunn pf. at 18-19; Montalvo pf. at 4-5.

193. The non-transmission components of the alternatives tested are as follows:

1. ARC 1 is composed of 180 MW of simple-cycle combustion turbines ("CTs") and approximately 15 MW of distributed generation ("DG") installations.
2. ARC 2 is composed of a 90 MW combined-cycle ("CC") and 120 MW of CTs.
3. ARC 3 is composed of a 150 MW CC and 120 MW of CTs.
4. ARC 4 is composed of a 200 MW CC and 120 MW of CTs.
5. ARC 5 is composed of 3 CTs (120 MW total) and 74 MW of DSM-based peak demand savings. The fifth ARC reflects DSM contributions consistent with OEI's maximum achievable (or aggressive) DSM forecast.

Montalvo pf. at 6-8.

194. For each ARC and for the NRP, the following costs were compared on a net present value basis (2005-2016, with 2005 present value): (1) the option's carrying costs; (2) the

net variable costs to serve Vermont's load; and, (3) net societal costs. Each of these costs was calculated and summed under "Base DSM" case load conditions (expected loads, taking into account incremental MW savings estimated by OEI from continuation of existing Vermont DSM programs). ARCs 1, 4, and 5 and the Project were also evaluated under several additional scenarios (e.g., high/low load growth, high fuel prices and low market prices) to determine the performance of the options under varying conditions. Finally, uncertainties with respect to implementation were evaluated. The alternative with the best expected economic and societal performance and distribution of outcomes – whether the NRP or an alternative resource configuration – was identified as the preferred option. Dunn pf. at 19; Montalvo pf. at 6-8.

195. From a societal cost perspective, LaCapra found that the Project is cheaper than the four generation alternatives and slightly more expensive than ARC 5. On a societal cost basis, ARC 5 is slightly less costly than the Project due primarily to the value of the estimated avoided generation and avoided distribution and subtransmission upgrades. Montalvo pf. at 6, 11.

196. The NRP has the lowest total present value capital outlay (carrying charges) between 2005 and 2016 ($94.2 million), and ARC 5 the highest ($306.7 million). Montalvo pf. at 6.

197. On a direct cost basis, ARC 5 requires an investment of $55 million for several Project transmission elements, a $110 million investment for three 50 MW combustion turbines and associated fuel and transmission infrastructure upgrades, and an additional investment of approximately $270 million over ten years for the intensive energy efficiency program. The investments in energy efficiency and generation, under current NEPOOL rules, would be borne by Vermont. According to LaCapra's analysis, the investment in energy efficiency would only defer the need for the second phase of the Granite STATCOM (+/- 75 MVAR) by eight years, saving approximately $8 million in carrying costs for a $270 million investment. Dunn pf. at 19-20; Montalvo pf. at 11.

198. Under a Low Load Growth Scenario - defined therein as zero load growth for five years followed by load growth equal to the base case rate – the need for the majority of the NRP elements and some generation to be installed and in service in the 2005/06 time frame remains unchanged. Moreover, under the Low Vermont Load Growth Scenario, the economics are such that pursuit of any alternative to the NRP would result in higher total societal costs. *That is, the slower the load growth, the more economic the NRP is as compared to the alternatives (including the DSM ARC 5) on a total societal basis.* Montalvo Reb. pf. at 9; VELCO Exhibit MDM-2 at 75, Table 26, and at 76.

199. Should load growth increase as represented in the High Vermont Load scenario, all of the NRP or the generation elements of the ARCs would still have to be installed and in service as soon as possible. Under such circumstances, it is doubtful that the acquisition of DSM savings under ARC 5 could be sufficiently accelerated so as to avoid the need to install 180 MW of generation in the 2005/2006 time frame. The need to accelerate the installation of generation in the alternatives to ensure reliability, further front-loads the capital costs. This pushes the economic performance of the alternatives in favor of the NRP. Montalvo Reb. pf. at 9; VELCO Exhibit MDM-2 at 75, Table 26, and at 76.

200. Moreover, the physics of the power system would favor the NRP. That is, transmission elements are limited only by thermal and voltage constraints. If load were to grow as in the High Vermont Load scenario, the VELCO operators could likely implement emergency procedures that would allow them to meet load (although with degraded reliability) above the 1200 MW load level for a couple of years, while additional transmission, generation or demand-side measures were implemented. By contrast, the generation-based ARCs are capacity limited and thus do not have the operational flexibility of a strong transmission network, severely limiting the ability of the alternatives to reliably serve loads above the 1200 MW critical load level while additional infrastructure is added to the system. Montalvo Reb. pf. at 8-9; VELCO Exhibit MDM-2 at 76.

201. In addition to lower pro-forma costs, and based upon the evaluation of the uncertainties, the NRP has fewer cost and implementation related uncertainties than do any of the ARCs. Montalvo pf. at 11-12; VELCO Exhibit MDM-3 at 86-87.

202. LaCapra utilized Optimal's estimates within the ARC 5 scenario. Because DSM savings alone are insufficient to close the load carrying capability deficiency identified in the first several years of the study, three 50 MW combustion turbines were added in 2005-06 to ARC 5. These generators are required to ensure the reliability of the system while DSM savings accrue into meaningful load reductions. Near term, the 345 kV line serves essentially the same function in the NRP as do the combustion turbines added in ARC 5. DSM alone does not allow construction of the 345 kV line to be reliably deferred. Montalvo Reb. pf. at 12.

203. When one accounts for the NEPOOL PTF rate treatment which the NRP is currently expected to receive, the societal cost differences between ARC 5 and the NRP close to within $10 to $20 million. On a direct cost basis, taking into account PTF cost treatment, the difference is dramatic: $9.1 million dollars in NRP carrying costs compared to $270.1 million in ARC 5 carrying costs. Montalvo pf. at 11.

204. The difference in pro-forma societal costs between ARC 5 and the NRP does not adequately justify the sustained level of capital investment required to implement the DSM program and construct the generation and the transmission plant for ARC 5. Montalvo pf. at 11-12.

205. Some opponents questioned whether VELCO's decision was biased to favor the NRP. VELCO does not have an incentive to favor the NRP transmission upgrade over ARC 5. In fact, because of the way that the VELCO tariff works, VELCO makes its profit on the amount of its investment, not on the amount of power that flows through its transmission lines. If profit were VELCO's motive, it would promote ARC 5, since it has a larger capital investment. Mr Wies, VELCO's General Counsel testified that this is why ARC 5, as compared to the NRP, looks so good to VELCO. Tr. 2/27/04, Vol. 1 at 49-50 (Wies).

206. John Plunkett, President of Optimal Energy, testified that this Board should conclude that VELCO did a good faith effort at integrating DSM alternatives into its analysis; it was the best he had ever seen. He also testified that Optimal was vigilant throughout this exercise to make sure that there was no built in favoritism or handicaps applied to disfavor DSM, and that there was not deliberate or even accidental bias built into the construction of ARC 5. Tr. 2/18/02, Vol. I at 96 and Vol. II at 38 (Plunkett).

207. Mr. Plunkett also testified that it was his opinion that there would be a substantially higher rate impact with the ARC 5 solution as compared to the NRP, due to the greater capital outlays, the lack of PTF treatment or even with PTF treatment, and the reduction in sales which would lead to higher unit costs or average rates. Tr. 2/18/04, Vol. I at 114-15 (Plunkett).

208. ISO-NE's Chief Operating Officer, Stephen Whitley, testified that reliance on the hypothetical alternatives evaluated by LaCapra, where no alternative has actually come forward to respond to the reliability problem, is a course of action that ISO-NE does not support: "[W]e can't move forward and protect reliability just because somebody produces a study. We have to have physical facilities to protect the system and protect reliability." The reliability problem faced by Vermont is today, not 10 years from now. The NRP "is certainly critically needed for system reliability ... ." Tr. 2/17/04, Vol. I at 20, 55, 65 (Whitley).

PTF or Regional Cost Support is Not Available for Non-Transmission Alternatives, Even Under a Gap RFP

209. Certain parties have suggested that VELCO could have sought regional cost allocation for non-transmission alternatives to the NRP. However, under the NEPOOL Tariff, the cost allocation method available to the NRP is not also available to non-transmission

alternatives. Tr. 2/17/04, Vol. II at 6-7, 8-9 (Whitley); VELCO Cross ISO-13, Schedule 12 (NEPOOL Tariff).[23]

210. Non-transmission alternatives to the NRP are not entitled to regionalized cost support under a Gap Request for Proposal ("RFP"). A Gap RFP is reserved for "near-term" (short term) solutions to reliability problems. VELCO Cross ISO-11 at 2; Tr. 2/17/04, Vol. II at 16 (Whitley).

211. According to NEPOOL's Secretary, costs paid under any Gap RFP contract "shall be allocated and charged each month to the Reliability Region affected by the Gap RFP." VELCO Cross ISO-11 at 3; Tr. 2/17/04, Vol. II at 74-76 (Whitley); NH Cross 10 at 1004. *See also* Market Rule 1, Section 10.1(c) ("Costs for Load Responses and other generation resources selected through any Gap RFP issued by the ISO pursuant to this Section 10 shall be allocated and charged in the same manner as fixed-cost charges associated with RMR Resources under Section 6.4.4(c) of Market Rule 1"); Market Rule 1, Section 6.4.4(c) (stating costs will be allocated "within the affected Reliability Region").

212. Thus, the Gap RFP process is not available to provide regional cost sharing for non-transmission alternatives to the NRP. Likewise, the highly discretionary Section 7.5(G) does not allow for regional cost sharing of non-transmission alternatives to the NRP because it, too, is meant for "short-term deficiencies in the amount of resources available to meet the pool's reliability objectives." NEPOOL Agreement, Section 7.5(G); Tr. 2/27/04, Vol. I at 11-14 (Wies)

Load (Demand) Response

213. Currently there are only 5.985 MW of Vermont Demand Response assets enrolled in ISO-NE's Demand Response Program. These resources do not come close to addressing

[23] FERC has been presented with an option to allow regional cost recovery for non-transmission alternatives and has twice rejected that approach. December 18, 2003 order; 105 FERC § 61,300 at 10; June 6, 2003 order; 103 FERC § 61,304 at 22.

Vermont's reliability problems. Tr. 2/17/04, Vol. II at 34 (Whitley); Exhibit CLF-11; Mallory Reb. pf. at 13; Exhibit VELCO Exhibit Mallory Reb-9.

214. ISO- NE testified that larger participation rates from states like Maine are attributed to three large paper mill customers in Maine that participate in ISO- NE's Demand Response program. Tr. 2/17/04, Vol. II at 25, 34 (Whitley).

215. Most of the Demand Response emergency resources used in southwest Connecticut were diesel generators backed in on trailers. Tr. 2/17/04, Vol. II at 21 (Whitley).

216. LaCapra studied a hypothetical Demand Response alternative combined with generation and transmission resources, and its results demonstrate that cost, timing, and other feasibility factors make consideration of Demand Response as an alternative to the NRP highly unrealistic. Findings 190 through 208.

217. LaCapra also developed a hypothetical demand response (DR) ARC - ARC 6, comprised of a small amount of Demand Response, around 12 MW, along with 180 MW of generation to be built in 2005, and a portion of the DSM identified in ARC5. Montalvo Reb. pf. at 12.

218. ARC 6 exhibited total societal costs adjusted for PTF treatment that were between six and twelve percent greater than those of the NRP for each of the base, high and low fuel scenarios. Even with an assumed optimistic level and participation rate for Demand Response, other resources are necessary to solve the reliability problem in northwest Vermont. The total societal cost of such a scenario is significantly greater than that of the NRP. VELCO Exhibit MDM Reb-6; Montalvo Reb. pf. at 14-15.

219. The assumptions used by LaCapra for the demand response resources in ARC 6 were optimistic. The 12 MW of DR included in ARC 6 is twice the current enrollment level in ISO- NE DR programs (currently there are only 5.985 MW of Vermont Demand Response assets enrolled in ISO's Demand Response Program). Mallory Reb. pf. at 13; VELCO Exhibit Mallory Reb-9.

220. Additionally, LaCapra assumed that 100% of the demand response would participate when called upon. In reality, this is highly unlikely. Experience with ISO-NE DR programs to date has shown average participation rates on the order of 50%. Mallory Reb. pf. at 13.

221. In addition to the limited amount of this resource, there are functional limitations that limit the ability of Demand Response to address reliability problems on the New England bulk power transmission grid. Findings 175 through 189.

222. Demand Response resources are not the functional equivalent of transmission in their ability to respond to system reliability needs. Reliable operation of the power grid is complex and demanding. Electricity flows at close to the speed of light (186,000 miles per second or 297,600 km/sec) and is not economically storable in large quantities. Therefore, electricity must be produced the instant it is used. Blackout Report at 6; Mallory Reb. pf. at 8; Tr. 2/17/04, Vol. II at 15-16 (Whitley).

223. Demand Response resources cannot provide instantaneous voltage or flow control across the transmission grid, because they have advance notice requirements of at least 30 minutes before interruption. As such, these resources do not qualify as providing 30 minute operating reserves, and obviously they cannot meet the requirements of 10 minute spinning/instantaneous reserves. Thus, while Demand Response is helpful to the system, it is not the same as transmission or generation for solving a reliability problem (e.g., a contingency that can happen with little or no notice and that requires instantaneous response). Mallory Reb. pf. at 8; Tr. 2/17/04, Vol. II at 15-16 (Whitley).

224. ISO-NE is limited to calling upon these resources only during NEPOOL Operating Procedure #4 ("OP4") emergency events. For operating conditions where reliability is negatively impacted, but which do not qualify as an OP4 event, Demand Response resources are not used. Mallory Reb. pf. at 9.

225. In addition, because these resources do not face financial sanctions for failing to follow system operator instructions, as a generator or transmission operator would, the consumer

can ignore the request to interrupt. Thus, when these consumers are called upon to reduce demand, the system operator cannot count on 100% of the enrolled demand to respond. For example, during the hours 8:00 to 18:00 on 8/15/03 in Connecticut, the amount of load that actually curtailed out of the enrolled Demand Response resources varied from a maximum of 70% to a minimum of 14%. The average reduction during this period was 48% of the enrolled amount. The average reduction during a period later that day was 18%. VELCO Exhibit Mallory Reb-7; Mallory Reb. pf. at 10-11.

226. Demand Response, if used to address the reliability concerns addressed by the NRP, would also be severely limited by geographic location of the resources. Demand Response resources in southern Vermont (Bennington / Stratton / Brattleboro) and that portion of northern Vermont connected normally to Quebec or Littleton (Highgate, Newport and St. Johnsbury) will do practically nothing to relieve the reliability concerns noted in this proceeding. This fact immediately reduces the pool of potential load from which to draw Demand Response resources by some 15% of state load, making it more difficult to potentially utilize Demand Response for system emergency purposes. Mallory Reb. pf. at 10-11.

227. Mr. Whitley testified that Demand Response resources really are not viable alternatives to a transmission project, which brings a whole bevy of resources to Vermont through transmission access. When a portion of the regional grid fails, the system can go down in seconds, less than that, and Demand Response resources cannot be on-line fast enough to respond, so it is not the same. Tr. 2/17/04, Vol. II at 15-16 (Whitley).

228. In fact, Mr. Whitley testified that the Demand Response resources that were in place in southwest Connecticut during the August 14, 2003 blackout could not get on line fast enough to protect the system and prevent a blackout in southwest Connecticut. Tr. 2/17/04, Vol. II at 16 (Whitley).

229. Emergency generators, like those used to fill the reliability gap in southwest Connecticut, are not intended to and should not be running every day because of operational and

environmental permitting restrictions. Mr. Whitley testified that emergency generation can work in instances where one can see ahead of time a high load period and plan for that, but they cannot protect the reliability of the system in contingencies. Tr. 2/17/04, Vol. II at 21 (Whitley).

230. Mr. Plunkett testified that he lacked confidence in load response to provide sustained transmission capacity over time of equivalent dependability as transmission capacity , e.g., over sustained heat waves, because the load reductions produced are attributable to short term changes that are not sustainable. For example, by the 5th day of a heat wave, if DR participants have an opportunity to opt out, they will. He had much less confidence in load management than energy conservation as a strategy for addressing transmission capacity problems. Tr. 2/18/04, Vol. II at 74-75 (Plunkett); CLF-16, Answer c.

231. While CLF, through its witness, Mr. Chernick, claimed that Demand Response could address Vermont's reliability needs, Mr. Chernick admitted that he did not perform a specific analysis of load management programs to address northwest Vermont's reliability problem, nor did he have any studies or data to support his claims. Exhibit DPS-CLF-Cross 58, 65.

Discussion Regarding the Need for the Project Under § 248(b)(2)

> "Modern society has come to depend on reliable electricity as an essential resource for national security; health and welfare; communications; finance; transportation; food and water supply; heating, cooling, and lighting; computers and electronics; commercial enterprise; and even entertainment and leisure - in short, nearly all aspects of modern life. ..."

U.S.-Canada Power System Outage Task Force, "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations," at 5 (April 2004) (the "Blackout Report").

The overwhelming evidence presented in this case demonstrates that the State of Vermont needs the transmission improvements proposed by VELCO today in order to provide

safe and reliable electric service now and in the future. The Critical Load Study reveals that the power system serving northwest Vermont does not currently meet the N-2 transmission planning standard and, in fact, faces today the risk of suffering thermal overloads and possible voltage collapse under certain contingency scenarios which could result in a blackout for over half of Vermont's load (encompassing all of northwest Vermont) and possibly cascade to neighboring systems. "[U]ninterupted utility service to customers is related to both their health and safety. The consequences of unexpected interruption of electric service certainly would be as serious from an outage based on system inadequacy as from an unwarned disconnect." *Vermont Elec. Power Co., Inc. v. Bandel*, 135 Vt. 141,149, 375 A.2d 975, 980 (1977).

The evidence also supports the conclusion that the NRP is the most cost-effective and robust solution to solving the northwest Vermont reliability problem. The demand that the NRP will serve is not primarily one of energy; it is one of reliability. "Generation ... is a theoretical alternative, but, as voltage support is needed today, as well as in the future, it would not be prudent to await the development of commercial generation." PSB Docket No. 6515, Order of 8/14/01 at Finding No. 8. Moreover, generation and load management cannot supply the constant, instantaneous support needed for reliable operation of the transmission network.

Unless the demand for power in Chittenden County and northwest Vermont were reduced by orders of magnitude, electric reliability simply cannot be maintained without the NRP. Even if such reductions were theoretically feasible in the long run, the need for the NRP to protect against an unacceptable level of risk of system collapse is immediate.

Optimal's analysis concluded that even with an aggressive energy conservation investment campaign, reductions in peak demand from energy conservation alone would not accrue quickly enough to avoid the need for new resources. LaCapra's theoretical DSM alternative (ARC 5) would require a combination of all of the cost effective DSM savings estimated by Optimal, ***PLUS*** a substantial portion of the NRP transmission upgrades, as well as three 50 MW combustion turbines sited in the greater Burlington area in 2005-06. On a pro forma basis, ARC 5 had marginally lower total societal costs than the NRP in all but the Low

Load Growth Case, due to the large societal benefits (principally avoided distribution and power purchase costs) that accrue to the DSM component of ARC 5. On a capital outlay basis, however, the NRP had the lowest total present value capital outlay (carrying charges) between 2005 and 2016 ($94.2 million), and ARC 5 the highest ($306.7 million).

The investments in energy efficiency and generation required for the theoretical DSM alternative would, under current NEPOOL rules, be borne by Vermont. On a direct cost basis, taking into account PTF cost treatment, the difference between the DSM alternative and the NRP is dramatic: $9.1 million dollars in NRP carrying costs compared to $270.1 million for ARC 5.

Importantly, the theoretical DSM alternative would not, on its own, displace or defer any material part of the NRP. According to LaCapra's analysis, the investment in energy efficiency would defer the need for only the second phase of the Granite STATCOM (+/- 75 MVAR) by eight years, saving approximately $8 million in carrying costs for a $270 million investment. Dunn pf. at 19-20; Montalvo pf. at 11.

If load grows more quickly than projected by the DPS load forecast, Vermont will be under extreme pressure to execute quickly an extensive construction program to preserve system reliability. That program necessarily would include the NRP and other resource options. On the other hand, if load grows more slowly than predicted in the base case, the economics clearly favor the NRP. Montalvo Reb. pf. at 9-10.

Moreover, the evidence brought forward identified numerous economic, technological and siting concerns that place in question the feasibility of the alternatives. Given these uncertainties, Petitioners are of the view that this difference in pro-forma societal costs between ARC 5 and the NRP does not adequately justify the sustained level of capital investment required to implement the unprecedented DSM program and construct the generation resources needed for ARC 5. As this Board recently concluded when it decided to reduce statewide expenditures on Efficiency Vermont's DSM efforts:

> "The least-cost provision of 30 V.S.A. § 218c does not require that the Board always choose the option that has the lowest total life-cycle cost. It requires a reasonable balancing of all factors including the magnitude of the initial

> investment and the timing of these investments, to achieve the optimum long-term benefits to Vermont ratepayers without short-term costs that are unacceptable. The Board has always faced the dilemma of how to balance spending on energy efficiency programs against what we know to be the very large potential for accomplishing energy savings. We have repeatedly approved utilities' DSM programs and EEU expenditures that fell short of acquiring all cost-effective DSM resources, but instead took into account reasonable expenditure levels and rate impacts."

Docket No. 6777, Order of 12/30/02, at 21-22. *See also* Summary of the Public Service Board's August 21, 2002, Workshop on Integrated Resource Planning, at page 3 ("In scenario analysis, we do not pick the result that is optimum under the most likely event. Rather, we pick the result which is robust or optimum across a range of scenarios. This means that we are willing to pick something that may not be the least-cost solution under the most likely model.").

We also note that while there were suggestions that VELCO has an incentive to favor transmission over non-transmission solutions, the facts do not bear this out. In fact, because of the way that the VELCO tariff works, VELCO makes its profit on the amount of its investment, not on the amount of power that flows through its transmission lines. The larger the capital investment, the larger the profit to VELCO. Every other alternative to the NRP involved larger capital investments.

John Plunkett, President of Optimal Energy, also testified that Optimal was vigilant throughout this exercise to make sure that there was no built-in favoritism or handicaps applied to this to disfavor DSM, and that there was not deliberate or even accidental bias built into the construction of ARC 5. Tr. 2/18/02, Vol. I at 96 and Vol. II at 38 (Plunkett). Mr. Plunkett also testified that it was his opinion that there would be a substantially higher rate impact with the ARC 5 solution, as compared to the NRP, due to the greater capital outlays, the lack of PTF treatment (or even with PTF treatment), and the reduction in sales which would lead to higher unit costs or average rates. Tr. 2/18/04, Vol. I at 114-15 (Plunkett).

Under Section 248 this Board is required to reach a finding that a project will benefit the general good of the State. The Supreme Court has found that the same standard applies to

potential alternatives.[24] The bulk power system in New England cannot respond to theoretical or "virtual" generation, DSM or demand response. It must be real and it must be reliable. The technical and practical feasibility of the theoretical alternatives, the enormous capital investments required by the alternatives, and consumer acceptability and ability to absorb rate impacts, are all relevant considerations that weigh in favor of approving the construction of the NRP transmission elements immediately.

Finally, despite the somewhat heated debate in this docket squaring the NRP against theoretical alternative resources, this Board should not treat the NRP and non-transmission resources as mutually exclusive resource options to address Vermont's existing and near-term energy needs. The NRP will not displace the need for acquiring feasible DSM, load response, or supply resources. The NRP is needed today to meet Vermont's immediate reliability needs. The Project corrects existing system deficiencies at load levels as low as 700 MW and provides for reliability to a statewide load of approximately 1200 MW. Based on the Public Service Department's load forecast, adjusted for savings from continuation of the existing energy efficiency programs, this load level is projected in 2011. Shortly after 2011,Vermont will need to replace approximately two-thirds of its power supply resources. At approximately the same time, it may have an additional transmission reliability need to address. In addition to addressing serious reliability problems, the Project provides Vermont with the option to align new energy

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[24] *See In re Petition of Twenty-Four Vermont Utilities*, 159 Vt. 339, 618 A.2d 1295 (1992). In that case, intervenors argued that the Board's finding of economic benefit to the state from the HQ purchase was erroneous because it failed to account for economic implications of the contract other than the price and reliability. The Vermont Supreme Court disagreed, finding that the alternatives were not in conflict:

> "As with other arguments made by intervenors, the weakness is in the factual foundation for their legal position. This argument is made primarily with respect to DSM investments. As discussed above, the Board found that the state would need the HQ contract as well as feasible DSM. Although this conclusion was based in part on the costs of DSM, it was also based on the Board's judgment concerning the technological feasibility and consumer acceptability of DSM. The Board found no conflict between the HQ contract and DSM. Thus the relative job creation and tax revenue consequences of these approaches to the state's energy issues became irrelevant because the approaches were not being compared."

Id. at 359-360.

resources with power supply and transmission capacity needs. Alternative resources could play a significant role in meeting both needs.

The Northwest Reliability Project is the best means to address the region's reliability problems and to meet its incremental load requirements.

Discussion re: Response to the Board's Footnote 10 of its April 21, 2004 Order

In its April 21, 2004 Order Re Town of New Haven Motion to Require VELCO, GMP and ISO-NE to Seek Regional Cost Support, in footnote 10, the Board expressly asked parties to brief the following question: "[What is the] appropriate course of action should the Board find that (1) the Petitioners have failed to adequately pursue cost-effective non-transmission alternatives, and (2) is there now insufficient time to implement such alternatives without subjecting Vermont electric customers to unacceptable reliability risks?"

As to the second part of the question, Petitioners believe that the record amply supports a conclusion that there is not sufficient time to implement non-transmission alternatives to the NRP without subjecting Vermont electric customers to unacceptable reliability risks. Vermonters are today exposed to such risks, and the exposure will increase as months pass and loads continue to grow. Moreover, the evidence overwhelmingly reveals that there are no alternatives that could provide a more cost effective and robust solution to the reliability problem facing northwest Vermont.

As to the first part of the question, Petitioners have not failed in any respect to address Vermont's reliability problems. VELCO has worked continually to identify and implement system reinforcements to address these concerns. See findings 17 and 100 through 111. Importantly, at each step, this Board found that the solutions identified and proposed by VELCO were "required to meet the present and future demand for services which could not otherwise be

provided in a more cost effective manner through energy conservation programs and measures and energy efficiency and load management measures."[25]

Nor do Petitioners believe that Vermont utilities or agencies have failed in their obligations. The aging nature of the VELCO transmission infrastructure, changes in seasonal and geographic load distributions, and increasing system demands during the mid to late 1990s as identified by VELCO planners in 1998, occurred during the same time that other significant shifts were occurring in the electric markets and regulatory and planning environments. As this Board noted in its September 30, 1999 Order in Docket No. 5980, between 1992 and 1996, Vermont's energy efficiency programs will have, over their lifetimes, avoided the need to produce 2.3 million megawatt hours, and will have saved consumers more than two hundred million dollars. Docket No. 5980, Order of 9/11/99 at 72. Since 1996, Vermont utility investments in energy efficiency began to fall off , "casualties of a growing uncertainty in the face of significant upheaval in the electricity sector, both in Vermont and throughout the nation." *Id.* This Board concluded that given these shifts, creation of the state's energy efficiency utility was a next logical step. *Id.* At the same time, during this period, Integrated Resource Planning ("IRP") was suspended by the Board on a generic basis while proceedings in Docket 6290 developed plans for the creation of processes (developed through years of collaborative workshops) for distribution utilities to undertake distributed utility planning ("DUP") and IRP.

As this Board noted in its 1999 Order in Docket 5980, beginning in 1990, "utility sponsored DSM and IRP revolutionized the way companies met demand for energy services." Docket No. 5980, Order of 9/11/99 at 73. Since 1999, Vermont regulators and Vermont utilities embarked on a process to refine Vermont's approach to resource planning. "Distributed utility planning is a new concept, and its implementation raises many challenging issues." Docket No. 6290, Order 4/16/03 at 8. In its April 16, 2003 Order, the Board approved several DUP process

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[25] *See, e.g.,* PSB Docket No. 6252, Order of 10/7/99 at Finding No. 34; PSB Docket No. 6473, Order of 4/11/02 at Finding No. 28; PSB Docket No. 6479, Order of 8/1/01 at Finding No. 57; PSB Docket No. 6792, Order of 7/17/03 at Finding No. 37; PSB Docket No. 6839, Order of 10/22/03 at Finding No. 32; and PSB Docket No. 6852, Order of 9/16/03 at Finding No. 28.

plans for the service territories of CVPS, GMP, Burlington Electric Department, Citizens Utilities, Vermont Electric Cooperative and Washington Electric Cooperative. *Id.* at 1. With the guidance of the DUP collaborative and workshops sponsored by the Board, the DPS and the state's distribution utilities also underwent a process during this time to reintroduce integrated resource planning under a new strategy involving use of scenario analysis. *See* Docket No. 6290, Order of 2/21/03 at 2; *See also* Summary of the Public Service Board's August 21, 2002, Workshop on Integrated Resource Planning. Distribution utility IRPs under this new approach have been submitted to the Board beginning in late 2003, after the NRP was filed.

While it is always tempting to seek to defer large capital improvements, and frequently it is cost effective to do so, a growing economy, new construction, additional population, and new technology, ultimately do cause electric loads to grow. The uncontradicted record of this docket establishes that during the past twenty years, the Chittenden County area has experienced both the above-mentioned growth and substantial investment in DSM. What has not occurred is the upgrading of the aging transmission infrastructure. The evidence further shows that the NRP is needed now and that there simply is no cost-effective, risk-adjusted alternative. There is no evidence that any action by VELCO or the area distribution utilities could have or should have eliminated the need for this transmission system upgrade.

The Chittenden County area is, for better or worse, not the same place it was twenty or thirty years ago, and it will never be again. Infrastructure, such as highways, water systems and telecommunications, have all been constantly upgraded. Transmission system upgrades have been deferred but, as the evidence shows, such deferrals cannot go on much longer without serious reliability risk.

System Stability and Reliability

[30 V.S.A. § 248(b)(3)]

232. The Project will not adversely affect system stability and reliability; in fact, the Project will enhance system stability and reliability. This finding is supported by findings 100 through 231, above.

Economic Benefit to the State

[30 V.S.A. §248(b)(4)]

233. The evidence in this docket reveals that Vermont today is exposed to system failures and blackouts. Widespread blackouts not only present serious risks to public health and safety, but also have large economic impacts on the business community through lost production. Dunn pf. at 12-13; VELCO Exhibit TD-20.

234. Vermont will realize substantial economic benefits from the improved power quality and electrical system reliability that the NRP will bring. While the benefits of improved power quality and reliability of the system cannot be easily quantified in economic terms, they will flow through to ratepayers as smoother operation of their equipment and reduced risk of power outages. Docket 6252 Order of 10/7/99 at 76.

235. The Electric Power Research Institute ("EPRI") recently released "The Cost of Power Disturbances to Industrial & Digital Economy Companies," a report which discusses the results of a study of the costs to U.S. businesses resulting from power outages and disturbances. The data shows that across all business sectors, the U.S. economy is losing between $104 billion and $164 billion a year due to outages and another $15 billion to $24 billion due to power quality phenomenon. The data shows that as to Vermont, all business sectors lose between $330 million and $510 million in estimated annual outage costs, and between $52 million and $82 million in estimated annual costs due to power quality disturbances. VELCO Exhibit TD Reb-1 at E-3, D-2 and D-5.

236. Society's growing reliance upon digital circuitry has made even brief disruptions of the power supply potentially costly. Many electronic components are seriously disrupted by power outages of less than a second, or by minor voltage fluctuations or other distortions of the electrical signal that in earlier years would have gone virtually unnoticed. VELCO Exhibit TD Reb-1 at 1-1.

237. IBM has indicated that even momentary voltage excursions can affect its manufacturing process and cost in excess of $500,000. Finding 19, above.

238. In an April 10, 2003 letter supporting the NRP, Robert Lang of IBM, stated the following:

> "As the state's largest employer and largest retail electric consumer, an ample supply of reliable and competitively priced electricity is critical to IBM's ability to manufacture high-quality semiconductor products that are competitive on world markets. We understand that the NRP will use existing corridors allowing Vermont to meet this important need in a cost and operating efficient manner, while preserving Vermont's natural beauty. We support VELCO's efforts to have the cost of the NRP shared across New England."

VELCO Exhibit TD-20.

239. The Vermont Business Roundtable**,** on behalf of numerous Vermont business organizations,[26] filed testimony emphasizing the importance of reliable electricity to attracting and retaining businesses on Vermont. Ventriss pf. at 2-3.

240. During the August 14, 2003 blackout, many businesses automatically separated significant load from the system to protect equipment. This separation, while it helped VELCO to continue providing service to customers, affected the productivity and profitability of these Vermont businesses, and in some instances damaged products being manufactured. Ventriss pf. at 2-3.

241. These business organizations expressed worry that our region (Vermont) will be disadvantaged if we do not take steps to ensure reliable electric service now. Ventriss pf. at 3.

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[26] Central Vermont Chamber of Commerce, the Franklin County Industrial Corporation, the Greater Burlington Industrial Corporation, The Lake Champlain Regional Chamber of Commerce, The Vermont Chamber of Commerce, the Vermont Homebuilders and Remodelers Association, the Vermont Society of Professional Engineers, and the Vermont Ski Areas Association.

242. In an April 22, 2003 letter supporting the NRP, Bryant Watson, Executive Director of VAST, stated the following:

> "Snowmobiling creates an annual $511 million impact on Vermont's economy. In order for us to remain a vibrant and viable sport, within Vermont, we need to assure that Vermonters are employed and that their employment offers them a livable wage, one that assures them of disposable income and allows them to enjoy our sport. In order to assure that we, as a state, can provide the above we must have a clean, plentiful, cost effective and ***reliable*** supply of electricity."

VELCO Exhibit TD-20.

243. In an April 4, 2003 letter supporting the NRP, Christopher Barbieri, President of the Vermont Chamber of Commerce, stated the following:

> "A reliable intrastate power transmission system is essential to retaining the businesses we have in Vermont, and attracting new investment to the state. The significant risk posed by a vulnerable transmission system thwarts our mission to promote Vermont as a place that is 'open for business'."

VELCO Exhibit TD-20.

244. In an April 9, 2003 letter supporting the NRP, James B. Stewart, Executive Director of the Addison County Economic Development Corporation, stated the following:

> "The Chamber believes that it is in the best interest of Vermont to initiate the improvements to the electric transmission system as proposed by VELCO. Faced with the realities of summer demand increasing by 9% each year since 1999, no major additions in capacity since the early 1980's and the severe reliability problems identified in Vermont, we believe that these are clear indicators that we must take the necessary steps to ensure that our transmission system is capable of handling current and increasing loads."

VELCO Exhibit TD-20.

245. The Project also reduces Vermont's exposure to the cost of congestion on the grid. Under current market rules, these costs will be paid by Vermont. Vermont is exposed to additional costs due to the need to run local, more expensive generation required to support the transmission system. Absent the construction of new transmission or new

power plants in Northwest Vermont, Vermont is expected to see an increase in congestion costs as our load grows. Projections suggest that these costs could exceed $17 million per year in 2008, and total over $164 million during the 2005 to 2011 period (nominal dollars). With the Project, these congestion costs are expected to be slightly less than $49 million during the same (2005-2011) period. Dunn pf. at 13; Montalvo and Mallory pf. at 8-11; VELCO Exhibit MDM-2; VELCO Exhibit MM-2.

246. The Project provides Vermont with increased access to the wholesale electric market. This means that Vermont will have more options to choose from in the wholesale market (e.g., renewable generation located outside of northwest Vermont or new, efficient gas plants). Without the Project, there will be periods, during times of higher demand, when Vermont will need to run local generation out-of-economics to support the grid, perhaps displacing less costly generation located outside the constrained area. Dunn pf. at 13-14.

247. Several intervenors argued that VELCO failed to adequately account for economic implications of the Project other than the price and reliability, such as property tax impacts (New Haven witness Deborah Brighton), the potential impacts of the Project on property values (VCSE witness Matthew Wilson), and economic benefits of DSM alternatives (New Haven witness Douglas Hoffer). Hoffer pf. at 3; Brighton pf. at 2-4; Wilson pf. at 4, 6-9.

248. Mr. Hoffer's testimony suggested that VELCO did not fully account for savings from the Optimal's DSM scenario. Aside from the fact that Mr. Hoffer appeared to double count savings, his points are irrelevant given that Optimal's programs would be insufficient by themselves to address the reliability problem in Northwest Vermont. Hoffer pf. at 3; Tr. 2/16/04, Vol. I at 23-24 (Hoffer).

249. Ms. Brighton testified that because current Vermont law requires a "pooling" of tax revenues from Vermont communities to fund education, the addition of taxable property from the estimated $14 million in NRP investments in the Town of New Haven will not

lead to much of a reduction in the average New Haven taxpayer's bill. Brighton pf. at 2-4.

250. The fact that tax revenues from the NRP may, under Vermont's system of property taxation and education funding, be shared across Vermont instead of benefitting individual communities only, is not inconsistent with Section 248. Under Section 248(b)(4), this Board must find that the Project "will result in an economic benefit *to the state and its residents*, not just individual communities." *See* 30 V.S.A. § 248(b)(4) (emphasis added).

251. Mr. Wilson challenged the alternatives analysis conducted by LaCapra Associates for failure to incorporate "state of the art" theory or methods for calculating social and environmental externalities, citing in part a Board 1990 Order in Docket No. 5980, which he criticized for being fourteen years old and outdated. Wilson pf. at 4.

252. Mr. Wilson, not LaCapra, was relying upon outdated data. LaCapra used the externalities adjustment approved by this Board in its 1999 Order in Docket No. 5980 and the DUP collaborative effort that followed that order. VELCO Exhibit MDM-2 at 68 (and footnote).

253. Mr. Wilson also speculated upon potential adverse impacts of the NRP 115 kV line upgrade upon land use values, and criticized VELCO for not accounting for these alleged costs in the externalities adjustments used by LaCapra. Mr. Wilson alleged that VELCO has made a "claim" that the Project will have "little or no adverse impact on property values." Wilson pf. at 6-9.

254. A project's potential impact upon property values is not a factor under any of the Section 248 criteria nor under the externalities adjustments that this Board uses for resource planning. Even if it were, Mr. Wilson's generalized review of literature, without any specific evaluation or assessment of the utility facilities at issue here or their associated land uses impacted, leaves his testimony speculative at best. Tr. 2/26/04, Vol. I at 59 (Wilson).

255. In particular, Mr. Wilson concluded that all of the studies he reviewed looked at comparisons of no line versus a new line, and none attempted to place a value on land use impacts where an upgrade of an existing line is involved, as is the situation here. Tr. 2/26/04, Vol. I at 60-62 (Wilson).

256. The arguments of the intervenors suffer from weaknesses in the factual foundation for their legal positions. Given the demonstrated reliability need for this Project, and the reliability and related economic benefits associated with it, the novel and unproven economic impacts identified by intervenors are irrelevant.

Aesthetics, Historic Sites and Water Purity, the Natural Environment and Public Health and Safety

[30 V.S.A. § 248(b)(5)]

257. The Project will not have an undue adverse affect on aesthetics, historic sites and water purity, the natural environment and the public health and safety. This finding is supported by findings 258 through 689, below, which are based on the criteria specified in 10 V.S.A. §§ 1424a(d) and 6086(a)(1) through (8) and (9)(K).

Public Health and Safety

[30 V.S.A. § 248(b)(5)]

258. The reliability benefits from the Project will promote public health and safety. A representative of the Vermont Association of Hospitals and Health Systems stated at the March 18, 2004 Public Hearing in Charlotte, that: "Hospitals, in order to remain open and operating safely at all times, need a reliable supply of electricity. Even temporary disruptions affect the hospitals' ability to deliver essential services because almost every function that goes on in hospital depends on electricity ... . Generators are not an ideal solution. Reliable power is." Tr. 3/18/04 at 65 (Kimball).

259. At a public hearing on September 29, 2003, Tom Huebner, President of Rutland Regional Medical Center, stated:

> "Hospitals are obviously entirely dependent upon reliable electricity. We can't operate without it. While we have emergency capacity, emergency generators in case of an outage, they only last for so long a period of time, and we have patients in our communities who are in fact reliant upon devices in their homes. For an extended period of outage we in fact would be in deep trouble.
>
> We believe it is time for reinvestment to happen in the infrastructure for our electric system. Certainly what happened around the country in August is a further indication of how intradependent we are, and we are here simply to speak in support of the project especially at the moment where a good portion of the cost could be picked up out of state."

Tr. 9/29/03 at 18-19.

260. The Project will have no adverse impact on health, safety or welfare of the public, as all facilities are electrical facilities and will be designed and constructed in accordance with the current National Electrical Safety Code (NESC C2-2002) and Minimum Design Loads for Buildings and Other Structures (ASCE 7-2002). The Project design will also be compatible with the reliability standards of the Northeast Power Coordinating Council and VELCO operating and design standards. Johnson pf. at 15; Boers pf. at 41.

Electric and Magnetic Field ("EMF") Exposure

261. Several parties raised concerns that the Project may cause a health risk due to electric and magnetic fields ("EMF") associated with the power lines. Although "electric and magnetic fields" may sound mysterious and ominous, scientists have had a good understanding of them since the 19th century. They arise from many natural sources. The earth itself has a strong, steady magnetic field arising from the rotation of its inner core. The human body is a strong source of electric fields: nerve and muscle cells produce strong electric fields near the cell membrane. "These naturally occurring [electric] fields are at least 100 times more intense than those that can be induced by exposure to

common power-frequency fields." Since the development of commercial and domestic uses of electricity in the last century, many manmade sources of electric and magnetic fields have been added to these naturally occurring exposures. *San Diego Gas & Elec. Co. v. Covalt*, 55 Cal.Rptr.2d. 724, 728-29 (1996).

262. All matter contains electrically-charged particles. Electrical effects both in nature and in society's use of electricity (generation, transmission, consumption) produce EMF. When electric charges move, an electric *current* exists, and a current generates a *magnetic field*. The current of moving electric charges produces a magnetic field that exerts force on other moving charges. The force from a magnetic field is usually expressed in units of gauss (G) or milligauss (mG). The size of the earth's steady magnetic field in North America is about 570 mG.. "Permanent magnets" generate strong, steady magnetic fields. Typical toy magnets (*e.g.*, "refrigerator-door" magnets) produce 100,000 – 500,000 mG. Valberg pf. at 3-4.

263. It is important to stress that electric and magnetic fields arise not only from powerlines, but also from the distribution and use of that power inside the home, office, or factory. One common source of such fields is the wall and ceiling wiring of the building itself, which delivers the electricity to the individual rooms in which it is used for lighting, heating, cooling, or operating appliances. *Covalt,* 55 Cal.Rptr.2d. at 732; Valberg pf. at 3-4.

264. The most intense magnetic fields in the home are found near appliances (particularly those with small motors or transformers such as hair dryers and fluorescent light fixtures). For example, can openers, mixers, blenders, refrigerators, fluorescent lamps, electric ranges, clothes washers, toasters, portable heaters, vacuum cleaners, electric tools, and many other appliances produce magnetic fields of size 40 – 300 mG at distances of 1 foot.[27] Magnetic fields from personal-care appliances held within ½ foot

[27] VELCO Cross Delpizzo-8 (National Institute of Environmental Health Sciences, Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, NIH Publication 02-4493 (2002)).

(*e.g.*, shavers, hair dryers, massagers) can produce 600 – 700 mG. In the school and work environment, copy machines, vending machines, video-display terminals, electric tools, lights, and motors are all sources of EMF. *Covalt*, 55 Cal.Rptr.2d. at 733 (citing U.S. Cong., Office of Technology Assessment, Biological Effects of Power Frequency Electric and Magnetic Fields(1989)); Valberg pf. at 5.

265. In sum, "There are electric and magnetic fields wherever there is electric power." *Covalt*, 55 Cal.Rptr.2d. at 733 (citing OTA Rep.) "Keeping fields out of the home would mean keeping *any* electricity from coming into or being used in the home." And because the sources of electric and magnetic fields inside the home are so numerous, "Occupants of the average household are probably exposed to higher fields from their house wiring and appliances than from the outside wiring," i.e. from powerlines." *Id*. at 733.

266. VELCO hired an independent health expert on EMF, Dr. Peter Valberg, to assess the potential health effects of EMF exposure related to the proposed Project. Dr. Valberg served for 25 years as a faculty member in the Department of Environmental Health at the Harvard School of Public Health, where he has performed research and taught toxicology, cell biology, environmental health and public health, directed a research grant from the National Cancer Institute on the topic of "Magnetic Field Effects on Macrophages," and performed research, studies and peer review for various international, national and state agencies regarding EMF, including the World Health Organization (WHO), the National Institutes of Environmental Health Sciences (NIEHS), the American Cancer Society. He is a member of the International Society for Environmental Epidemiology, the Health Physics Society, the Bioelectromagnetics Society, and the Committee on Man and Radiation. Valberg pf. at 1.

267. Dr. Valberg provided testimony summarizing the current state of scientific research and consensus about possible health effects of power-line EMF and also calculated predicted EMF levels associated with the Project. On the basis of the EMF levels at issue and on the basis of the scientific literature and public health guidance available in this area, he

concluded that "the EMF that will be produced as a result of this Project will not have adverse public health effects." Valberg pf. at 3, 22.

268. The sum of scientific evidence currently available from a vast amount of EMF research and human experience does not establish that environmental levels of power-line EMF are hazardous to health. The scientific data on EMF and health have been assembled and periodically reviewed by many independent consensus groups of research and health scientists. These groups and agencies include the World Health Organization, the National Radiation Protection Board (UK), the National Academy of Sciences, the American Medical Association, the American Physical Society (the professional society for American physicists), the American Cancer Society, the Swedish National Health and Welfare Board, and others. These blue-ribbon panels do not identify EMF from any type of electric-power transmission line as unsafe for nearby residents and public. The reports of these groups are voluminous, thorough, and even-handed. Valberg pf. at 6, 12.

269. EMF epidemiology studies have received the most attention. "Epidemiology" is a statistical science that looks for correlations between patterns of disease occurrence and patterns of human lifestyle, diet, environment, or exposure. An epidemiologic study published in 1979 suggested that living near electric power distribution lines was linked to an increased risk of childhood cancer. In this and a number of other studies, the actual EMF levels that children had been exposed to were unknown, so the researchers developed a surrogate for past EMF exposures that was based on the proximity, number, and size of electric-utility distribution lines near the homes. This summary description of the electric power distribution line configuration near a home was called its "wire code," and homes with high wire codes (and presumably higher EMF levels) were found to be disproportionately represented in the cancer cases as opposed to homes of the children who were selected as non-cancer controls. Since this first study, a number of epidemiologic studies have examined associations between disease and the "wire code" classification of homes. If an association was seen with the wire code classification, it was interpreted as showing an effect of EMF on the disease being studied. However,

repeat studies showed that the associations with wire code were weak and inconsistent. Moreover, the associations often weakened or disappeared when actual measured magnetic fields were substituted in place of wire codes. It was found that the wire codes were poor surrogates for actual EMF exposure, but rather, were good surrogates for non-EMF factors such as traffic density, age of the home, rental *vs.* ownership, and assessed value of the home. This made it unlikely that the wire code associations with cancer risk were actually an effect of EMF exposure *per se*. That is, it was not possible to isolate the EMF exposure as the "causal" factor in the associations reported. Valberg pf. at 6-7.

270. In 1999, after six years of intensive research, the National Institutes of Environmental Health Sciences ("NIEHS"), concluded that evidence for risk of cancer and other human diseases from EMF around power lines is "weak." NIEHS 6/15/99 Press Release, VELCO Cross Delpizzo 7.

271. In its report to Congress, the NIEHS explained that:

> "The ultimate goal of any risk assessment is to estimate the probability of disease in an exposed population. In general, this involves the combination of three basic pieces of information: the probability that the agent causes the disease, the response as a function of exposure given the that the exposure does cause disease, and the distribution of exposures in the population being studied. The NIEHS believes that the probability that ELF [extremely low frequency]-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm."
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> ***
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> "The NIEHS suggests that the level and strength of evidence supporting ELF-EMF exposure as a human health hazard are insufficient to warrant aggressive regulatory actions; thus, we do not recommend actions such as stringent standards on electric appliances and a national program to bury all transmission and distribution lines. Instead, the evidence suggests passive measures such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. NIEHS suggests that the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards. We also

encourage technologies that lower exposures from neighborhood distribution lines provided that they do not increase other risks, such as those from accidental electrocution or fire."

VELCO Cross Delpizzo 8 at 36, 37-38.

272. Some of the conclusions of other organizations are given below:

American Cancer Society:[28]

"The majority of studies published so far suggest either no increased risk or a very slightly increased risk. The vast majority of cases of leukaemia are clearly not related to EMF exposure. Non-ionizing radiation: Electromagnetic radiation at frequencies below ionizing and ultraviolet levels has not been proven to cause cancer. Some studies suggest an association with cancer, but most of the now-extensive research in this area does not."

National Radiation Protection Board (NRPB) of the United Kingdom (UK):[29]

"Laboratory experiments have provided no good evidence that extremely low frequency electromagnetic fields are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in general. There is, however, some epidemiological evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children. In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cells, the epidemiological evidence is currently not strong enough to justify a firm conclusion that such fields cause leukaemia in children."

International Agency for Research on Cancer (IARC):[30]

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[28] American Cancer Society, "What are the Risk Factors for Leukaemia? Environmental Risk Factors: Electromagnetic Field Exposure," (2002); VELCO Cross Delpizzo 9 at 2 ("EMF's have not been shown to cause cancer. In fact, no non-ionizing radiation has been shown to cause cancer or to promote its growth once it has started. In contrast, ionizing radiation can cause cancer to start by changing atomic structure and thereby causing genetic mutations within cells").

[29] Valberg pf. at 15, quoting, ELF Electromagnetic Fields and the Risk of Cancer: Documents of the NRPB, Vol. 12, No. 1. (2001).

[30] VELCO Cross Delpizzo 1 (Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields. IARC Monographs on the Evaluation of Carcinogenic Risks in Humans, 80:1-429 at 332, 338 (2002)).

"There is *limited evidence* in humans for the carcinogenicity of extremely low-frequency magnetic fields in relation to childhood leukaemia.

There is *inadequate evidence* in humans for the carcinogenicity of extremely low-frequency magnetic fields in relation to all other cancers."

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"The association [found in some epidemiological studies] between childhood leukaemia and high levels of magnetic fields is unlikely to be due to chance, but it may be affected by bias. In particular, selection bias may account for part of the association. [Thus] there is limited evidence in humans for the carcinogenicity of extremely low-frequency magnetic fields in relation to childhood leukaemia. There is inadequate evidence in humans for the carcinogenicity of extremely low-frequency magnetic fields in relation to all other cancers."

World Health Organization (WHO):[31]

"'Possibly carcinogenic to humans' is a classification used to denote an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals.

This classification is the weakest of three categories ('is carcinogenic to humans', 'probably carcinogenic to humans' and 'possibly carcinogenic to humans') used by IARC to classify potential carcinogens based on published scientific evidence."

There is no consistent evidence that exposure to ELF fields experienced in our living environment causes direct damage to biological molecules, including DNA. Since it seems unlikely that ELF fields could **initiate** cancer, a large number of investigations have been conducted to determine if ELF exposure can **influence** cancer promotion or co-promotion. Results from animal studies conducted so far suggest that ELF fields do not initiate or promote cancer.

While the classification of ELF magnetic fields as possibly carcinogenic to humans has been made, it remains possible that there are other explanations for the observed association between exposure to ELF magnetic fields and childhood leukaemia. In particular, issues of selection bias in the epidemiological studies and exposure to other field types deserve to be rigorously examined and will likely require new studies. WHO therefore recommends a follow-up, focused research programme to provide more definitive information...."

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[31] VELCO Cross Delpizzo 2 at 2, 3, 4 (Electromagnetic Fields and Public Health: Extremely Low Frequency Fields and Cancer. Fact Sheet No. 263, October 2000).

The Department of Protection of the Human Environment, World Health Organization:[32]

> "Scientific knowledge about the health effects of EMF is substantial and is based on a large number of epidemiological, animal and in-vitro studies. Many health outcomes ranging from reproductive defects to cardiovascular and neurodegenerative diseases have been examined, but the most consistent evidence to date concerns childhood leukemia. In 2001, an expert scientific working group of WHO's International Agency for Research on Cancer (IARC) reviewed studies related to the carcinogenicity *of static and extremely low frequency (ELF) electric and magnetic fields.* Using the standard IARC classification that weighs human, animal and laboratory evidence, ELF magnetic fields were classified as *possibly carcinogenic to humans* based on epidemiological studies of childhood leukaemia. An example of a well-known agent classified in the same category is coffee, which may increase risk of kidney cancer, while at the same time be protective against bowel cancer. 'Possibly carcinogenic to humans' is a classification used to denote an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals. Evidence for all other cancers in children and adults, as well as other types of exposures (i.e. static fields and ELF electric fields) was considered inadequate to classify either due to insufficient or inconsistent scientific information. While the classification of ELF magnetic fields as possibly carcinogenic to humans has been made by IARC, it remains possible that there are other explanations for the observed association between exposure to ELF magnetic fields and childhood leukaemia."

The American Physical Society:[33]

> "The scientific literature and the reports of reviews by other panels show no consistent, significant link between cancer and power line fields. This literature includes epidemiological studies, research on biological systems, and analyses of theoretical interaction mechanisms. No plausible biophysical mechanisms for the systematic initiation or promotion of cancer by these power line fields have been identified. Furthermore, the preponderance of the epidemiological and biophysical/biological research findings have failed to substantiate those studies which have reported specific adverse health effects from exposure to such fields. While it is impossible to prove that no deleterious health effects occur from

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[32] Exhibit VELCO Cross Delpizzo 3 at 6-7.

[33] Exhibit VELCO Cross Delpizzo 10 at 1.

> exposure to any environmental factor, it is necessary to demonstrate a consistent, significant, and causal relationship before one can conclude that such effects do occur. From this standpoint, the conjectures relating cancer to power line fields have not been scientifically substantiated."

California Medical Association and the American Medical Association:[34]

> "Low-frequency electromagnetic fields have many types of biologic effects including medical applications in diagnosis and the treatment of injuries and inflammation. Some studies of the past 15 years have associated exposures to 50 to 60 Hz electric and magnetic fields with slightly elevated risks of developing cancer or leukemia in children or adults. However, the inconsistency of the results and the shortcomings of most of the studies, in terms of selecting test and control groups, estimating exposures, and accounting for key variables that might affect outcomes, detract from the studies' conclusions....a limited data base with serious deficiencies calls for circumspect conclusions. It is not certain that electromagnetic fields pose health risks, or if they do, which attribute or mechanism of action is responsible."

273. According to IARC, electromagnetic fields have been placed in the cancer-causing risk category as the following substances: coffee; carrageenan (food additive); (gasoline) engine exhaust; (Pickled vegetables); carbon black (candles, photocopying, car tires) ; and acetaldehyde (grapes, wine). VELCO Cross ISO-4.

274. In an amicus brief filed in *San Diego Gas & Electric Co. v. Superior Court (Covalt)*, 55 Cal. Rptr.2d 724 (1996), seventeen prominent scientists, including six Nobel Prize winners, stated:

> "While the scientific literature on the biological effects of electromagnetic forces is extensive, and some recognized scientists suggest that exposure to electromagnetic fields may cause leukemias, brain cancers or other diseases, most scientists in the field conclude that no serious danger to health due to exposure to normal intensities of low frequency electromagnetic fields has been established."

VELCO Cross Delpizzo 14 at 28.

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[34] Exhibit VELCO Cross Delpizzo 13, Exhibit A at 10.

275. The Vermont Department of Health performed its own independent review of the scientific literature and the expected EMF fields associated with the Project, and also concluded that this Project will not be a public health hazard, and further concluded that there are no compelling health concerns or reasons requiring modification to the NRP. Exhibit DPS-VDH-3 at 7-8.

276. The Vermont DPS has adopted a prudent avoidance standard:

> "Utilities should follow a prudent avoidance strategy for electromagnetic field (EMF) risks, which may include the use of low EMF design structures when constructing or rebuilding lines and siting new or rebuilt lines away from populated areas. Utilities should monitor and might consider participating in research on EMF effects and on construction and design alternatives that would reduce EMF exposure. Finally, utilities could provide information on EMF for their customers and the public, including information that would allow concerned individuals to reduce EMF exposure on their own. (Chapter 5 Section D)."

DPS Twenty Year Electric Plan at 8-3.

> "[A prudent avoidance approach] means adoption of policies that limit magnetic field exposure whenever this can be done for a small investment of money and effort. Prudent avoidance argues that a sufficient basis for concern does exist but not enough is presently known to justify large investments for avoiding magnetic field exposure. Under this approach, large expenditures would not be made until research provides a clearer picture of the existence and magnitude of the risks involved."

DPS Twenty Year Electric Plan at 5-12.

277. The Vermont Department of Health has concluded that the Board should apply the policy of prudent avoidance, consistent with the DPS Twenty Year Electric Plan. Crist/White pf. at 37.

278. Regarding the prudent avoidance standard, The Department of Protection of the Human Environment of the World Health Organization has stated:

> "In the context of the EMF issue, some national and local governments have adopted *"prudent avoidance,"* a variant of the precautionary principle, as a policy option. It was originally used for ELF fields and is described as using

simple, easily achievable, low to modest (prudent) cost measures to reduce individual or public EMF exposure, even in the absence of certainty that the measures would reduce risk.

The explicit recognition that a risk may not exist is a key element of precautionary approaches. If the scientific community concludes that there is no risk from EMF exposure or that the possibility of a risk is too speculative, then the appropriate response to public concern should be an effective education programme. If a risk for EMF were to be established, it would then be appropriate to rely on the scientific community to recommend specific protective measures using established public health risk assessment/risk management criteria. If large uncertainties remain, then more research will be needed.

If regulatory authorities react to public pressure by introducing precautionary limits in addition to the already existing science-based limits, they should be aware that this undermines the credibility of the science and the exposure limits."

VELCO Cross Delpizzo 3 at 56-57.

279. Seventeen prominent scientists, including six Nobel Prize winners, have stated:

"A principle of 'Prudent Avoidance' has been advocated by some analysts, interest groups and policy makers. 'Prudence' means that you take steps to control risks at a modest cost. It has a similarity to the 'As Low As Reasonable Achievable' (ALARA) concept for exposure to ionizing radiation. Superficially the principle sounds very attractive but many commentators have questioned it. If 'you' in the above sentence is each individual acting for himself or herself, then the principle may be applied without definition and little harm is done. But when 'you' becomes the general public as the body politic and the principle is used to encourage or mandate public expenditure, it must be carefully examined. As soon as one does so, it appears that the principle is ill defined and leaves open whether in fact there is a risk, and what a modest cost is. There has been, until now, little professional discussion of the question. Nonetheless, the principle has entered the public consciousness and perhaps has heightened public fears. The California EMF Consensus Group refrained from recommending 'prudent avoidance' or any specific level of action."

VELCO Cross Delpizzo 14 at 27.

280. Neither the federal government nor Vermont have specific standards for EMF.

Crist/White pf. at 44.

281. "[I]n comparison to the international, national and state standards and guidelines on EMF exposure levels. . . , the EMF levels [for the VELCO Project] (both the maximum levels and at the right-of-way edge) are considerably below what is permissible by the guidelines. Moreover, in terms of the magnetic fields, which are the component of EMF that has been subject to the greatest scrutiny, the increment caused by the Project is either very modest or, in fact, in a direction that reduces the magnetic field impact. . . ." Valberg pf. at 22; Exhibit DPS-VDH-3 at 11.

282. VCSE sponsored the testimony of three witnesses regarding EMF: Dr. Vincent Delpizzo, co-author of a report on EMF prepared for the California Public Utilities Commission by the California Department of Health Services (the "California EMF Study"); Dr. Daniel E. Wartenberg, epidemiologist and Assistant Professor in the Department of Environmental and Community Medicine at the Robert Wood Johnson Medical School of the University of Medicine and Dentistry of New Jersey; and Kurt Oughstun, a Professor of Electrical Engineering in the College of Engineering and Mathematics at the University of Vermont. Oughstun pf. at 1-3; Wartenberg pf. at 1-3; Delpizzo pf. at 1-2.

283. All three of these witnesses admitted that they were not offering opinions to this Board that the NRP will cause an undue adverse health impact. Dr. Wartenberg recommended that the Board "limit exposure to power line EMF where one could do so at a reasonable cost and limited inconvenience." Tr. 2/24/04, Vol I. at 57 (Wartenberg); Tr. 2/24/04, Vol. II at 86 (Oughstun); Tr. 2/23/04, Vol. II at 69 (Delpizzo); Wartenberg pf. at 9-10.

284. The "precautionary principle" advocated by Dr. Wartenberg is essentially the same as the "prudent avoidance," policy suggested by the DPS. DPS Twenty Year Plan at 8-3.

285. Although Dr. Oughstun criticized the EPRI model that VELCO utilized to model expected magnetic fields along the power lines rights-of-way for the Project,[35] he did not conclude that the NRP will have an undue adverse health impact to Vermonters, nor did

[35] Dr. Oughstun was not familiar with the EPRI model that VELCO used to calculate magnetic fields from the proposed power lines, nor did he make an independent attempt to calculate the predicted magnetic fields from the NRP. Tr. 2/24/04, Vol. II at 81 (Oughstun).

he offer the opinion that the proposed route of the NRP be changed in any way. Tr. 2/24/04, Vol. II at 86,87 (Oughstun).

286. Dr. Delpizzo, relying upon the results of his conclusions in the California EMF Study, testified that in his "professional opinion ... I am almost certain that a 50-100% increase in the risk of childhood leukemia is real." Delpizzo pf. at 8.

287. Dr. Delpizzo's opinion is inconsistent with the conclusions of prominent national and world health organizations and scientists throughout the world who have studied this issue extensively, and he admitted that he is not aware of any studies in the peer reviewed literature that agree with his opinion. Findings 270 through 279; Tr. 2/23/04, Vol. II at 67-68 (Delpizzo).

288. Moreover, Dr. Delpizzo has had no formal education or training in epidemiology, the science he relied upon for his opinion. Dr. Sander Greenland, author of the renowned treatise on Modern Epidemiology and acknowledged by Dr. Delpizzo as an "authoritative source regarding methodology for conducting epidemiological research," strongly criticized the California EMF Study and, in particular, Dr. Delpizzo's work:

> "***The reviewers [in the California EMF Study] conclude it is "more than 50% possible" that EMFs at home or work could cause a very small increased risk of childhood leukemia . ... I have concluded that the reasoning suffers from serious errors of logic and statistics, that there is repeated counting of the same data and subjective priors in the formation of conclusions, and that certain key data are not accounted for properly.*** There is also evidence of bias in the reasoning of the DHS reviewers away from the null (against the hypothesis of no effect), toward concluding there is an effect. This general bias is evidenced in the summary tables in Chapter 8 of Draft 3, which display a tendency to misinterpret negative evidence (favoring no effect) as neutral or positive, to misinterpret neutral evidence as positive (favoring an effect), to double-count only positive evidence and opinions, and to ignore literature aspects that would call into question the validity of the epidemiologic studies."
>
> "These problems have led to overstatements of confidence about EMF effect in light of available data, and render much of Draft 3 invalid. ***DHS Reviewer 1 [Delpizzo] displayed so many error and gaps in his knowledge of statistics, epidemiologic methods, and the underlying data sources, along with fallacies of reasoning, that his evaluations should be discarded.*** "

VELCO Cross Delpizzo 17 at 3-4 (Critique of California EMF Study by Dr. Sander Greenland) (emphasis added); Tr. 2/24/04, Vol. I at 10-11, 13-14 (Delpizzo).

289. In 1993, the California Public Utilities Commission ("CPUC"), in an interim report, established the policy that required utilities to implement no-cost or low cost steps to reduce or mitigate electric and magnetic fields. *Covalt*, 55 Cal. Rptr.2d 729, 746-47. A "low cost" step means approximately 4% of the projects overall costs. Id. at 747. Despite the release of the California Department of Health's report on EMF, VELCO Cross Delpizzo-15, the CPUC has not revised its "low-cost no-cost" policy. Tr. 2/23/04, Vol. II at 70-71 (Delpizzo).

290. Several landowners raised concerns about the impacts from the power lines on medical devices. Dr. Valberg testified that despite the ubiquitous nature of public exposure to EMF from many existing high-voltage transmission lines, his analysis of the available scientific and medical data did not identify recorded cases of medical-device disruption by power-line EMF. There are no FDA-issued safety alerts, public health advisories, and notices addressing potential medical device interference from power-line EMF. Based upon the scientific literature and data just summarized, it was Dr. Valberg's opinion that the VELCO Project will not present any undue adverse health risk associated with EMF on medical devices. Valberg Reb. pf. at 3; Exhibit VELCO Valberg Reb-1 .

Water Purity, the Natural Environment

[30 V.S.A. § 248(b)(5)]

291. VELCO hired Arthur Gilman and Errol Briggs of William D. Countryman Associates to perform a thorough assessment of the Project's potential impacts upon water purity and the natural environment. They concluded, after extensive review of the Project plans and the areas selected for the Project upgrades, that the Project will not have an undue adverse impact upon these resources. Gilman/Briggs pf. at 3: Gilman/Briggs 5/20/04 Supp. pf. at 4-17.

Outstanding Resource Waters

[10 V.S.A. § 1424a(d)]

292. The Project does not involve a facility affecting or located on any segment of water designated "outstanding water resources" by the Vermont Water Resources Board. Gilman/Briggs pf. at 4; Gilman/Briggs Supp. pf. 5/20/04 at 4.

Water and Air Pollution

[10 V.S.A. §6086(a)(1)]

Water Pollution

293. The Project will not result in undue water pollution. This finding is supported by findings 308 through 355, below.

Air Pollution

294. The Project will not result in undue air pollution. This finding is supported by findings 295 through 296, below.

295. Air emissions resulting from the Project upgrades will be very limited. During the construction phase, no brush will be burned. Brush from any necessary clearing activities will be chipped and/or hauled away if necessary, and trees will be windrowed for the property owners' use or removed. Dust from vehicular traffic and construction activities will be controlled during construction with the application of water and/or chloride, as necessary. Johnson pf. at 2.

296. New sulfur hexafluoride (SF_6) "gas" breakers will be installed at several substations. These are the same type of breakers that the Board authorized VELCO to install at the Essex, Coolidge and West Rutland substations (*See* Docket Nos. 6252 and 6479). One of the benefits of using this type of breaker is the reduction of mineral oil-filled substation equipment at the site. Although SF_6 is a "greenhouse gas," it is not emitted into the air as part of the proper operation of the breakers. VELCO carefully monitors circuit breakers for leakage prior to installation and during time of service. When maintenance is

performed on this type of breaker, the gas is recycled with a gas cart to prevent emissions. Johnson pf. at 2-3.

Noise

297. The substation upgrades associated with the Project will not result in undue noise levels. This finding is supported by findings 298 through 307, below.

298. Though the project's transformers and FACTS equipment will emit some noise, the increased noise levels from this equipment should not exceed applicable noise standards. VELCO requires in its equipment procurement specifications that the manufacturers meet or exceed the required noise standards (NEMA Standard TR-1 and the most recent version of ANSI C57.12.90) and EPA recommended guidelines. Johnson pf. at 3.

299. VELCO retained an expert, Kenneth Kaliski, to assess the potential impact of the noise generated by the New Haven and Granite substations. Noting that neither New Haven nor Williamstown has a quantitative community noise standard and that there are no federal or state standards that apply to the NRP project, Mr. Kaliski looked to the following three standards to determine that the project will not have an undue adverse effect at the two substation sites:

- The US EPA Protective Noise Level Guideline
- The World Health Organization Suggested Community Noise Criteria
- Environmental Board precedents

Kaliski DD pf. at 3.

300. The US EPA Protective Noise Level Guideline was established to determine a sound level that protects the public health and welfare with an adequate margin of safety. It is not a standard and is not meant to be applied as a standard. For most residential areas, the Protective Level is 55 dBA Ldn. The Ldn is day-night average sound level, with sounds during the night weighted by +10 dBA. Kaliski DD pf. at 3-4.

301. The World Health Organization's "Guidelines for Community Noise" suggests noise criteria is based on the most recent scientific research on noise effects. The Guidelines, published in 1999, recommend a limit of 50 dBA, averaged over the day to protect against moderate annoyance, and 45 dBA, averaged over the night to protect against sleep disturbance. Kaliski DD pf. at 4.

302. The Environmental Board has ruled on a number of cases involving noise, including OMYA, Alpine Stone, Barre Granite Quarries, etc. The only case involving nighttime noise was Hannaford, in which the Board imposed a noise limit of 60 dBA during the day and 50 dBA during the night for residences along US 7 (in South Burlington), and 55 dBA during the day and 45 dBA during the night for residences of the quieter Queen City neighborhood behind the store. These standards are based on instantaneous maximum levels. Kaliski DD pf. at 4.

303. At the New Haven Substation, Mr. Kaliski conducted measurements of existing sound around the existing transformer, within a 50-foot radius, and around the fenceline. Based on these measurements, a computer model was employed to determine the potential noise impacts of the NRP upgrades. Modeling the site assuming the use of low-noise transformers and a berm along portions of the south and east side of the fenceline, the sound levels at the nearest homes were found to be below the standards. Kaliski DD pf. at 5.

304. Based on Mr. Kaliski's report, VELCO proposes the use of 345/115 kV transformers that have guaranteed noise emission levels more than10 dBA lower than the NEMA standard, as well as berming along the south and east sides of the substation. Kaliski DD pf. at 5.

305. The same process was applied at the Granite substation as at New Haven. Mr. Kaliski conducted monitoring of the existing facility and modeling of both the existing and proposed facility. Modeling of the site using guaranteed sound power emission levels from a low noise PST resulted in noise levels below standards. Kaliski DD pf. at 6.

306. Based on Mr. Kaliski's report, VELCO proposes the use of a PST with a guaranteed sound power level no greater than 100 dBA at the Granite substation. Kaliski DD pf. at 6.

307. With the mitigation proposed by VELCO, there will be no undue adverse impact at either the New Haven or the Granite substations. Kaliski DD pf. at 6-7.

Headwaters

[10 V.S.A. § 6086(a)(1)(A)]

308. The Project will meet all applicable health and environmental conservation regulations regarding reduction of the quality of the ground or surface waters flowing through or upon headwaters areas. This finding is supported by findings 309 through 311, below.

309. No Project facilities are or will be located above 1,500 feet, and much of the route of the power lines (from Leicester to New Haven and New Haven to Queen City) is on low-lying areas along valley floors in gently rolling, low valley areas. These areas are characterized by gentle slopes and deep soils. These lands are not often thought of as "headwaters" and are not particularly sensitive from a water purity point of view. The primary areas of steep slopes and shallow soils are between West Rutland and Leicester. However, this portion of the corridor is well vegetated, and there are no major areas of erosion. The Granite to Barre line is also generally characterized by steep slopes, but the Project work on this segment of transmission line corridor is limited to line reconductoring, and will not adversely impact the soils. Gilman/Briggs pf. at 5; Gilman/Briggs Supp. pf. at 4.

310. The Project power line corridor areas of concern will be adequately protected during construction and maintenance with application of the construction erosion control techniques and described in findings 357 through 360, below.

311. Any additional clearing of right-of-way will also have a minimal effect on water quality, because the land will re-vegetate rapidly and densely, except for minor areas such as ledge exposures, and its capacity to hold water will not be significantly diminished, even

on steep slopes and shallow soils. The impact on groundwater quality or the recharge capacity of aquifers from the existence of additional poles in the ground will be de minimis, given the wide spans that the power lines will have and the small dimensions of the poles at and underneath the surface of the soil. Gilman/Briggs pf. at 5-6; Gilman/Briggs Supp. pf. at 4-5.

Waste Disposal

[10 V.S.A. §6086(a)(1)(B)]

312. The Project will meet all applicable health and DEC regulations for waste disposal and will not involve the injection of waste materials or any harmful toxic substance into ground water or wells. This finding is supported by findings 313 through 317, below.

313. Construction debris will be disposed of at approved landfills. Johnson pf. at 3.

314. Some of the new or expanded substation control buildings will house sink and toilet facilities connected to approved on-site septic systems. VELCO will obtain Water Supply/Wastewater Disposal Permits from the Vermont Department of Environmental Conservation ("DEC") for the New Haven, Queen City, and Granite substations. The West Rutland and Essex substations already have permitted systems. Johnson pf. at 3.

315. To minimize the potential for oil contamination, all new transformer installations will be mounted on concrete foundations with an integral fluid retention design sufficient to contain the total transformer insulating fluid volume, in accordance with ANSI/IEEE Standard 980, "IEEE Guide for Containment and Control of Oil Spills in Substations." Johnson pf. at 4.

316. Project impacts upon stormwater discharges are expected to be minimal. Because no part of the Project involves paving of surfaces and, for the most part, substation surfaces are filled with loose crushed stone, the increase in impervious surface area will be minimal. Gilman/Briggs pf. at 7.

317. In 2003 and 2004, VELCO had a number of communications with Padraic Monks, Environmental Analyst at Vermont ANR, regarding whether or not VELCO's typical substation yard design, its method for draining accumulated rainwater from oil containment systems, and its substation fence underdrain system require a stormwater discharge permit. Stormwater discharge permits are not required for any of these activities, with the exception of VELCO's Granite substation, which will have a newly designed stormwater collection and discharge system. Rowe/Disorda/Gilman/Briggs Reb. pf. at 15.

Water Conservation

[10 V.S.A. § 6086(a)(1)(C)]

318. All plumbing fixtures installed in the new or expanded control buildings will use low-flow water conserving devices. None of the substations are manned, and thus water usage will be minimal. Johnson pf. at 4.

Floodways

[10 V.S.A. § 6086(a)(1)(D)]

319. The Project will not restrict or divert the flow of floodwaters or increase the peak discharge of the streams and endanger the health, safety, and welfare of the public or of riparian owners during flooding. This finding is supported by findings 320 through 321, below.

320. There are several areas along the Project route from West Rutland to New Haven, and also from New Haven to Queen City, where existing pole structures are located in the floodway fringe (*i.e.*, outside the 100 year floodway boundary but inside the 500-year boundary). However, power lines have very small footprints on the landscape, and many of the existing 115 kV pole structures along the West Rutland to New Haven corridor are already located in floodway fringe. Since the Project pole structures will have a small footprint, they will not pose a significant hazard for the collection of debris

or diversion of floodway flow. The amount of fill required for the installation of utility poles is generally insufficient to decrease flood storage or restrict or divert flood flow patterns in a noticeable way. As a result, the pole structures associated with the Project will have no noticeable or undue impact on water quality or the health, safety or welfare of the public or riparian owners during flooding. Gilman/Briggs pf. at 7-8; Gilman/Briggs Supp. pf. at 5-6.

321. The site of the existing Shelburne substation is located at the edge of the 100-year flood boundary of McCabe Brook, very near to the mouth of that waterway. Immediately downstream from the substation location is a very large wetland complex, which has a great deal of capacity to store floodwaters. The relocated substation will be outside of the floodway fringe, effecting an improvement over the design submitted in VELCO's initial petition. Gilman/Briggs pf. at 8-9; Gilman/Briggs Supp. pf. at 5.

Streams

[10 V.S.A. § 6086(a)(1)(E)]

322. The Project will maintain the natural condition of involved streams and will not endanger the health, safety, or welfare of the public or adjoining landowners. This finding is supported by findings 323 through 334, below.

323. There are 56 identified streams[36] and rivers along the Project corridor from West Rutland to New Haven, and 48 on the segment from New Haven to Queen City (the New Haven to Queen City route proposed by VELCO in its initial petition encompassed 49 streams or rivers). There are 16 streams or watercourses on the Barre-Granite line, and there are also several streams or watercourses within 100 feet of the New Haven, Vergennes, Charlotte, Shelburne and Williston substations. Gilman/Briggs pf. at 9; Gilman/Briggs Supp. pf. at 6; VELCO Exhibit G&B-Supp(2)-3.

[36] VELCO's consultants applied a broad definition to the term "streams," and included small, intermittent streams that are essentially drainage ditches on agricultural lands. Gilman/Briggs pf. at 9-10.

324. For the most part, any streams identified along the Project transmission line corridors will be spanned by the conductors, leaving the stream morphology, bottom, banks, fish habitat and other characteristics intact. This will reduce the extent of excavation or other disturbance along streambanks or shorelines, which otherwise can pose a threat to bank stability, and provide for a minimum amount of construction within the 50 to 100 foot buffer zone from the top-of-bank that the ANR Buffer Zone Procedure recommends. Johnson pf. at 7-8; Gilman/Briggs pf. at 11.

325. There are some locations on the power line routes of the Project, however, such as the New Haven River, the Leicester River, and others, where existing pole structures are located within 50 or 100 feet of the shoreline and the new pole structures may also need to be located within the buffer zones of these shorelines. The primary impacts of placing pole structures in these locations will be temporary and transitional, *i.e.*, due only to the activities of construction equipment during construction. Appropriate erosion control measures will be employed during construction in accordance with ANR's Erosion and Sediment Control Plan Checklist and the Erosion Prevention and Sediment Control Plans ("EPSCPs") approved by ANR. Rowe/Disorda/Gilman/Briggs Reb pf. at 13-14; Johnson pf. at 7-8; Gilman/Briggs pf. at 11; Gilman/Briggs Supp. pf. at 6-7; VELCO Exhibit RJ-4 & 5.

326. For construction access, VELCO will avoid stream crossings where possible. Where crossings are necessary, VELCO will make full use of temporary bridges during construction, which will not require a permit because of the limited soil disturbance associated with their use. Johnson pf. at 8; Rowe/Disorda/Gilman/Briggs Reb. pf. at 14-16.

327. Where installation of a culvert or permanent bridge is necessary, VELCO will obtain a stream crossing structure permit. Johnson pf. at 8; Gilman/Briggs pf. at 11-12; Gilman/Briggs Supp. pf. at 6-7; VELCO Exhibit RJ-6.

328. Moderate or low-gradient typical Vermont streambanks or shorelines whose trees are removed, as will be needed for the proposed power line to cross (with stumps and root systems left in place), become re-vegetated quickly (e.g., within 2-3 years) with increased ground-layer and shrub-layer vegetation. This provides a high degree of bank stabilization, in some cases greater stability than existed prior to the clearing. For very small streams, such dense but low vegetation effectively shades the watercourse, contributing to cooler summer temperatures, which are important to fish and other aquatic life. Due to this, most smaller streams or rivers along the routes of the power lines for this Project will not experience undue warming as a result of tree removal along the banks. VELCO will retain as much cover over the streams as possible; vegetation that is 12 feet or shorter in close proximity of the streams will be kept to preserve the shade the streams have today. Johnson pf. at 8-9; Gilman/Briggs pf. at 12; Gilman/Briggs Supp. pf. at 6-7.

329. At the larger streams and rivers, trees provide more extensive shade than do shrubs. Some thermal impacts on the streams or rivers (or simply loss of shade cover for fish) will be unavoidable in these circumstances. The Project's impacts in this regard are relatively minor and not unduly adverse. First, many of the crossings of larger streams and rivers are perpendicular to the watercourse, which limits any adverse thermal impacts due to the limited linear extent of tree removal along the banks. Otter Creek, the Leicester River, the Middlebury River, the New Haven River and Lewis Creek are all crossed perpendicularly. Second, where the crossings of larger rivers and streams are not perpendicular, such as Beaver Brook in Middlebury or McCabe Brook in Shelburne, they are the consequence of following the existing corridor in these areas, which yields other environmental benefits because vegetation across much of the corridor width has already become well established and stabilized. Finally, the larger streams and rivers have large expanses that are presently not shaded. As a result, any increase in water temperature due to tree clearing along relatively short segments of shoreline will be a small, marginal increase to overall water temperature. Gilman/Briggs pf. at 12-13.

330. At the New Haven substation, there is a drainage ditch or swale across gently sloping farmland that drains to a more naturally defined stream off-site. The substation expansion will require filling the swale and rerouting or culverting runoff, but there should be no impacts to the off-site stream. Gilman/Briggs pf. at 14.

331. The existing substation at Charlotte is within a few feet of a ditched outlet from a larger wetland. The relocated substation will not be in close proximity to any streams. Gilman/Briggs pf. at 14-15; Gilman/Briggs Supp. pf. 2/6/04 at 5; VELCO Exhibit G&B-Supp(2)-3.

332. The existing Shelburne substation is in close proximity to the top of the bank of McCabe Brook and is partially within the floodway and floodway fringe of the waterway. The relocated substation will continue to be adjacent to McCabe Brook but will be outside of the floodway fringe. Gilman/Briggs pf. at 15; Gilman/Briggs Supp. pf. 5/20/04 at 5; VELCO Exhibit G&B-Supp(2)-3.

333. The existing Williston substation is located relatively near (in horizontal distance) to a small stream, but on a terrace high above it. The expansion will not threaten the stability of the terrace, since VELCO will employ measures to divert flow away from the terrace. With this mitigation there will be no undue adverse impacts on the stream. Gilman/Briggs pf. at 15.

Shorelines

[10 V.S.A. §6086(a)(1)(F)]

334. The Project will, insofar as possible, retain all shorelines and waters in their natural condition, allow continued access to the waters and the recreational opportunities provided by the waters, retain or provide vegetation which will screen the Project from the waters, and stabilize the bank from erosion, as necessary, with vegetation cover. Johnson pf. at 7-8; Gilman/Briggs pf. at 11.

Wetlands

[10 V.S.A. § 6086(a)(1)(G)]

335. The Project will not violate the rules of the Water Resources Board relating to significant wetlands. This finding is supported by findings 336 through 355, below.

336. This Project will require Conditional Use Determinations ("CUD"s) from the Agency of Natural Resources for any impacts to Class Two wetlands and their 50 foot buffer zones. Construction of new poles will classify as conditional uses. Gilman/Briggs pf. at 20-21; Rowe/Disorda/Gilman/Briggs Reb. pf. at 5.

337. The Project will also require a US Army Corps of Engineers ("ACOE") permit (a so-called 404 permit) for the discharge of dredged or fill material into waters of the United States, including wetlands. In connection with the Corps' 404 review, other federal agencies will have the opportunity to review wetlands impacts, namely the U.S. Environmental Protection Agency (on water quality issues), and the U.S. Fish and Wildlife Service (on fish and wildlife issues). VELCO will file for and obtain an Army Corps of Engineers permit prior to construction. Both the CUD and 404 permit will likely have a series of detailed conditions designed to protect wetlands from undue adverse impacts. Gilman/Briggs pf. at 20-21.

338. VELCO's consultants completed wetland delineations throughout the Project corridor, including the reroute segments north of New Haven. These delineations were made according to the 1987 Army Corps of Engineers Wetlands Delineation Manual, as specified by the Vermont Wetland Rules and the Army Corps of Engineers permit program. Each wetland was evaluated for its classification and the functions and values recognized by the Vermont Wetland Rules and the Army Corps of Engineers. Rowe/Disorda/Gilman/Briggs Reb. pf. at 4.

339. There are no Class One wetlands in the Project area. Rowe/Disorda/Gilman/Briggs Reb. pf. at 4.

340. A total of approximately 137 individual Class Two and Three wetlands have been identified in the West Rutland to New Haven corridor, and approximately 168 additional Class Two and Three wetlands have been identified in the New Haven to Queen City corridor. Class Two wetlands have been identified in the area of the Shelburne, Williston, Vergennes, Charlotte, and Blissville substations. Class Three wetlands have been identified in the area of the New Haven, Ferrisburgh, Queen City, and Granite substations. Gilman/Briggs pf. at 16-17; Rowe/Disorda/Gilman/Briggs Reb. pf. at 4.

341. Whenever possible, VELCO will avoid construction in wetland areas. The long spans of the high voltage transmission lines help in this regard. As with most projects this size, however, total avoidance is not physically possible or economically feasible. Johnson pf. at 9; Gilman/Briggs pf. at 18-19.

342. The Project's impacts to wetlands will accrue from structures that will be located in wetlands and buffer zones, creation of access roads, and filling of wetlands at substations sites to provide a stable base for equipment. However, the footprint of each pole structure is quite small, and the conductors will span hundreds of feet. Therefore, permanent wetland impacts from the structures themselves will be relatively low. Gilman/Briggs pf. at 18.

343. Impacts from construction activities, access roads and right-of-way maintenance may be higher than pole placements, in terms of surface area impacted, but these will be temporary in nature. Gilman/Briggs pf. at 19.

344. VELCO plans to reduce disturbance to wetlands during construction by conducting as much of the Project construction as feasible during the winter months, when wetland areas are frozen, or during dry summer months, allowing construction vehicle traffic into the wetland without causing significant disturbance. VELCO also plans to use construction mats, if necessary. Johnson pf. at 9.

345. There are four areas where the Project will affect wetlands of particular sensitivity. The first is a group of wetlands commonly referred to as "floodplain forests," found on this

Project at the crossings of Otter Creek, the Leicester River, New Haven River and LaPlatte River. They are located on the West Rutland to New Haven corridor in the vicinity of milepost 11.8-12.0, milepost 18.5 and milepost 31.2. Spanning as much of these wetlands as possible will minimize impacts from construction and pole placement. Gilman/Briggs pf. at 19.

346. The second area of particular sensitivity is a wetland in the vicinity of milepost 33.5 – 34.2 on the West Rutland to New Haven corridor. There is a continuation of this wetland at milepost 1.1 of the New Haven to Queen City corridor. Carrying out construction during the winter in this wetland will minimize the impacts associated with installing poles, both on the soils and plants and on animal species. Surrounding the poles with rock islands will also provide additional nesting habitat for waterfowl that use the wetland, thereby enhancing the value of the wetland. Gilman/Briggs pf. at 20.

347. The third sensitive area is the South Slang in North Ferrisburgh. While the route as originally filed would have bypassed this area and would have had no impact at all, the adverse impacts from the Reroute are not undue. This route follows an existing corridor and does not require significant widening. The most valuable portions of the wetlands, i.e., the aquatic habitat of the Lake arm itself and its fringing marshes, are spanned without intrusion. VELCO has proposed a pole location further back from the current poles to move the structures away from the shoreline and reduce any potential impact. Access is available to both sides, and there is no need for crossing the area with equipment. In short, the conditions post-construction should not be significantly changed from conditions prior. Gilman/Briggs Supp. pf. 5/20/04 at 8-9; Tr. 11/8/04, Vol. II at 88-89 (Harr).

348. The final sensitive area is in the region of the LaPlatte River in Shelburne. The proposed 115 kV line's crossing of the river will require intrusion into wetlands on the south side of LaPlatte River. There will need to be at least one pole, and the corridor will need to be cleared. Given the large extent of the forested wetland, and given that the proposed

corridor is adjacent to the existing railroad corridor and also a municipal sewer line corridor, the impacts will be minimized and not unduly adverse. Gilman/Briggs Supp. pf. 5/20/04 at 9.

349. Prior to commencing construction in wetland areas subject to the jurisdiction of ANR or Army Corps, VELCO will obtain applicable CUDs from the Agency of Natural Resources and US Army Corps of Engineers and will comply with the conditions of those permits. Gilman/Briggs pf. at 20-21; Rowe/Disorda/Gilman/Briggs Reb. pf. at 5.

350. Seasonal herbicide application in wetlands is an allowed use under Section 6.2 of the Vermont Wetland Rules. Application of herbicides in any of VELCO's transmission line rights-of-ways requires a Permit to Conduct Rights-of-Way Herbicide Treatment, which is issued annually by the Department of Agriculture in consultation with the Vermont Pesticide Advisory Council ("VPAC"). VELCO's herbicide permit restricts herbicide application within 30 feet of waters of the state,[37] but does not restrict herbicide use in uplands or wetlands without surface water. Rowe/Disorda/Gilman/Briggs Reb. pf. at 5-6.

351. The use of mechanical methods of vegetation management in wetlands does not necessarily result in less of an environmental impact than herbicide application.[38] It is the consensus of VPAC that judicious use of herbicides in wetlands may have less of an impact than mechanical means, and VPAC and the Department of Agriculture have explicitly excluded any language in herbicide application permits that would prohibit the use of herbicides in wetlands. Rowe/Disorda/Gilman/Briggs Reb. pf. at 6-7.

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[37] 10 V.S.A. §1251 defines "waters" as "rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, and all bodies of surface waters... ."

[38] A 1989 Massachusetts study of impacts of vegetation management techniques on wetlands for utility rights-of-way, which study has been extensively reviewed and discussed by VPAC, concludes that mechanical treatments result in relatively higher impacts than selective herbicide use. For example, the study found that wildlife habitat values were rated low for mechanical techniques and medium for herbicide techniques, and that residue from petroleum products (bar oil or hydraulic fluids) were found in the leaf litter on mechanically treated sites. No herbicide residues were found on herbicide-treated sites. Rowe/Disorda/Gilman/Briggs Reb. pf. at 6-7.

352. VELCO's current practice is to judiciously apply herbicides in upland and wetland areas, while maintaining a 30' buffer from standing water, a 100' buffer from streams within watersheds that serve public water supplies, a 200' buffer from public water supplies, a 100' buffer from private water supplies, and a 100' buffer from homes, or as specified in VELCO's current annual herbicide permit. Rowe/Disorda/Gilman/Briggs Reb. pf. at 7.

353. It would not be appropriate to impose a condition on this Project that is stricter than or conflicts with the Vermont Wetland Rules and the annual herbicide permit issued to VELCO by the Department of Agriculture. VPAC agrees with this position and recommends consistent regulation. Rowe/Disorda/Gilman/Briggs Reb. pf. at 7.

354. Mr. Alan Quackenbush of ANR testified that ANR's position is "basically what the Vermont Pesticide Advisory Council position is." Tr. 8/5/04, Vol. I at 42-43 (Quackenbush).

355. It is evident that it would be unwarranted to impose conditions on the Project that differ from existing regulation. Findings 350 through 354, above.

Sufficiency of Water and Burden on Existing Water Supply

[10 V.S.A. §6086(a)(2) and (3)]

356. The infrequent use of sanitary facilities at substations will not burden existing water supplies. Water needed during construction for dust control will also be limited. Johnson pf. at 5.

Soil Erosion

[10 V.S.A. § 6086(a)(4)]

357. The Project will not cause unreasonable soil erosion or reduction of the land to hold water. This finding is supported by findings 358 through 360, below.

358. VELCO will require its contractors and employees to employ soil erosion control and construction techniques consistent with ANR's Erosion and Sediment Control Plan Checklist, the Vermont Handbook for Soil Erosion and Sediment Control on

Construction Sites, and the site specific EPSCPs submitted to and approved by ANR for this Project. Johnson pf. at 5-6; Rowe/Disorda/Gilman/Briggs Reb. pf. at 13-14.

359. Prior to construction, VELCO will apply for and obtain a General Permit for Stormwater Runoff from Construction Sites ("CGP") from ANR, which is required for discharge of stormwater runoff from qualifying construction sites in the state of Vermont where the activities result in the disturbance of five or more acres of land. Kimberly Greenwood of ANR testified that the CGP is very often one of the last authorizations or permits that is sought in the construction process and that the Agency expects that VELCO will not have difficulty obtaining the necessary Project permits. Rowe/Disorda/Gilman/Briggs Reb. pf. at 13, 14; Tr. 6/11/04, Vol. II at 84 (Greenwood).

360. The issuance of a 401 Water Quality Certificate by ANR will be coordinated between ANR's Wetlands and Water Quality staff upon receipt of all associated permit applications. Rowe/Disorda/Gilman/Briggs Reb. pf. at 16.

Traffic

[10 V.S.A. § 6086(a)(5)]

361. The Project will not cause unreasonable congestion or unsafe conditions with respect to transportation systems. Construction vehicles should be able to park at the existing or newly created parking areas adjacent to the substation sites and in the construction areas. There will only be minimal traffic to the substations for maintenance efforts once the Project is completed. Johnson pf. at 14.

362. During line construction there will potentially be times when traffic will have to be stopped for very short periods of time (seconds or a few minutes) to allow pulling of ropes, wires, or conductors. When necessary, all local and state road crossing and construction permits will be obtained. Johnson pf. at 14.

Educational and Municipal Services

[10 V.S.A. § 6086(a)(6) and (7)]

363. There will be no impact on educational services, as the Project will not bring additional students into the area or otherwise impair the ability of the municipalities involved to provide educational services. Johnson pf. at 14.

364. The Project will not place an unreasonable burden on the ability of the involved municipalities to provide municipal services. The Project will not create an additional burden on local fire departments or local law enforcement officers. The Project will not generate significant solid waste. Johnson pf. at 14-15.

Rare and Irreplaceable Natural Areas

[10 V.S.A. §6086(a)(8)]

365. The Project will not have an undue adverse effect on any rare and irreplaceable natural areas. This finding is supported by findings 366 through 376, below.

366. William D. Countryman, the environmental consulting firm retained by VELCO, has identified several locations in the Project area that may be considered rare and irreplaceable natural areas. The first set of locations contain terrain that may be considered "clay plain forest." The clay plain forest type is found in the Champlain Valley, and is characterized by the post-glacial, clay-soil lake plain typical of the Champlain Valley, most of which has been used for intensive agriculture for +/-200 years. Gilman/Briggs pf. at 22.

367. William D. Countryman identified four areas that meet a broad definition of clay plain forests:

West Rutland to New Haven corridor:

a. North of Bullock Road, in Leicester, at mileposts 16.8-17.1;

b. In the vicinity of Halnon Brook, in Salisbury, around milepost 23.0;

c. South of the Middlebury substation, around milepost 27.3;

New Haven to Queen City corridor:

d. North of East Slang in Ferrisburgh, near milepost 10.0 and 11.0.

Gilman/Briggs pf. at 23.

368. The Project's impacts upon these areas will not be unduly adverse. First, with respect to each of these areas, the Project will not significantly affect the fundamental conditions of soil type and structure. Second, with respect to areas (a), (b) and (c), the clearing will be only a minor encroachment on a larger expanse of clay plain forest on both sides of the corridor, leaving pieces on both sides that are large enough to retain their characteristics as clay plain forest. To the extent that the connectivity between pieces is important to continued health of the forest type, the power line corridor would not constitute a significant barrier to animal movement or plant dispersal. Third, area (c) is an area that is only moderately characteristic of clay plain forest. Whatever impact the Project would cause in this area would be relatively minor, due to its characteristics and to the reasons discussed above. Gilman/Briggs pf. at 23-24.

369. Bob Popp of the Vermont ANR suggested in his testimony that in the areas of the wet clay plain forests identified south of Halnon Brook in Salisbury (Mile 22) and north of Bullock Road in Leicester (Mile 17), VELCO make the new 345 kV poles taller and closer to the existing 115 kV line in order to limit the amount of new clearing. He proposed that VELCO use poles tall enough in these forested areas to avoid cutting some of the mature trees while still maintaining adequate line clearance. Popp pf. at 6-7.

370. Placing the lines and poles above the tops of mature trees and limiting the width of new clearing to less than the proposed 100' will result in serious reliability and aesthetic impacts. Any restriction on cutting the full width of right-of-way will reduce reliability. The aesthetic impacts would also be considerable, given that the existing canopy height is

approximately 60 to 70 feet, and, in order to meet safety clearance requirements, the pole heights would probably exceed 100 feet in height. Gilman/Briggs Reb. pf. at 22-23.

371. VELCO proposes to feather the right-of-way edges in these areas, which involves tapering the height of vegetation as you move from mature trees at the right-of-way edge closer to the line. This would be accomplished by selectively cutting trees as they mature and removing any trees that would pose a threat to the line. Rowe/Disorda/Gilman/Briggs Reb. pf. at 22-23.

372. In addition to the clay plain forest areas, there are two more locations in the proposed Project, the South Slang area in North Ferrisburgh and the LaPlatte River area in Shelburne, that have been identified as possible rare and irreplaceable natural areas. The Project will not cause undue adverse impacts upon these resources. Findings 373 through 375, below.

373. The South Slang area is along an existing corridor and would represent only an incremental impact which, to our minds, would not be unduly adverse. The minimization of impacts at the LaPlatte River area, where the Project follows along one edge and does not bisect the community, would also be incremental and not unduly adverse. Gilman/Briggs Supp. pf. 5/20/04 at 10.

374. The South Slang is of some importance, with freshwater marshes and aquatic habitat adjacent to Lake Champlain. It is not shown on the Vermont significant habitat maps as a natural area, but has been considered one. The Project will cause little change to the Slang, particularly to the aquatic environment, because it is in the same corridor as an existing powerline. Construction techniques protective of the environment will be used so that there will be no degradation of the water quality, habitats, natural communities, or wildlife use at South Slang. Gilman/Briggs Supp. pf. 5/20/04 at 10; VELCO Exhibit G&B-Supp(2)-1 at 6-7.

375. In Shelburne, the proposed 115 kV line will cross the LaPlatte River adjacent to the Nature Conservancy LaPlatte Natural Area. VELCO will need to remove some trees in

this area and to place one pole in the floodplain wetland. However, the line would be adjacent to an already existing railroad and sewer line, and the impacts would be clustered; thus the route meets a standard of minimization. The work necessary at this locale should not have an undue adverse impact on the protected wetlands functions and values, including wildlife habitat. The area is generally secluded, being on the opposite side of the railroad from US Route 7, and the area involved, except for a small area adjacent to the river itself, is not in a natural state - much is of an 'old field' character where topsoil has been stripped, or is otherwise undistinguished, second-growth woodland. A powerline use is compatible with the character of the area. Gilman/Briggs Supp. pf. 5/20/04 at 11; VELCO Exhibit G&B-Supp(2)-1 at 13-14.

376. VELCO will submit a clearing and protection plan to the Vermont Nongame and Natural Heritage Program for the areas identified as possible rare and irreplaceable natural areas, and will comply with the terms and conditions of that protection plan and any changes suggested by Vermont Nongame and Natural Heritage Program. Rowe/Disorda/Gilman/Briggs Reb. pf. at 24.

Necessary Wildlife Habitat and Endangered Species

[10 V.S.A. §6086(a)(8)(A)]

377. The Project will not destroy or significantly imperil necessary wildlife habitat or any endangered species. This finding is supported by findings 378 through 400, below.

Necessary Wildlife Habitat

378. William D. Countryman has reviewed resource maps as well as the entire Project area, with the exception of a few parcels along the Reroute, to investigate the Project's impact on necessary wildlife habitat and endangered species. Gilman/Briggs pf. at 24-25; Gilman/Briggs Supp. pf. 5/20/04 at 11.

379. Wildlife and wildlife habitat will not be unduly adversely affected by the Project. Findings 380 through 388, below.

380. The potential impacts on wildlife habitat stem almost exclusively from the power line corridors, which are often very attractive to a broad range of wildlife. VELCO's corridors are managed in such a manner as to result in a diversity of vegetative structure, *i.e.*, herbs and shrubs, with trees along the edges, which can have many niches and abundant "edge," providing many resources to wildlife. Wildlife travel lanes are maintained on VELCO corridors in appropriate locations to promote the movement of white-tailed deer and other wildlife across the corridor. Gilman/Briggs pf. at 25-26.

381. Deer wintering habitat is the only habitat in the Project that constitutes necessary wildlife habitat. The Project will require the clearing of approximately 43 acres of deer wintering habitat at 22 different sites. Gilman/Briggs pf. at 25, 27; Rowe/Disorda/Gilman/Briggs pf. at 16-17.

382. The power line corridor from West Rutland to New Haven crosses a number of deer wintering areas. The corridor from New Haven to Queen City, including the Reroute proposals, crosses fewer deer wintering areas, and there are no deer wintering areas in the vicinity of any of the proposed substation expansions. At almost all of these sites, the habitat on either side of the corridor is sufficient to function as deer wintering area despite the additional clearing in the corridor. Where there is habitat on both sides, and it appears for topographical reasons to be prudent, VELCO will establish deer crossing lanes where coniferous (evergreen) shrubs and trees, up to the maximum size allowable consistent with safety, will be maintained across the width of the corridor to provide cover and aid deer in traveling across the corridor. To the extent that any of the deer wintering areas fragmented by expansion of the corridors are determined to be nonfunctional, or it is determined that adequate connections to larger areas cannot reliably be established, some additional compensatory measure will be taken, such as establishing deer crossing lanes elsewhere on VELCO's system to enhance habitat in those locations, or conservation of additional deer wintering areas. Gilman/Briggs pf. at 27; Johnson pf. at 10; Gilman/Briggs Supp. pf. 5/20/04 at 11-12; Rowe/Disorda/Gilman/Briggs Reb. pf. at 16-17.

383. VELCO has determined that, in total, 43 acres of deer habitat will be impacted by the Project, and as such VELCO will need to permanently conserve 86 acres of comparable habitat. Rowe/Disorda/Gilman/Briggs Reb. pf. at 17-18.

384. VELCO will include wildlife travel lanes on the Project plan and profile maps that will be developed for each line. VELCO will also include with the plan and profiles, a schematic cross section and notes detailing deer crossing lane management. Final plan and profile drawings for the 345 kV and 115 kV lines will be referenced whenever work is planned in the right-of-way, and all VELCO right-of-way maintenance personnel and contractors will be instructed to adhere to the techniques described therein. Rowe/Disorda/Gilman/Briggs Reb. pf. at 18.

385. Winter construction of the Project power lines near deer wintering areas will be accomplished without significantly imperiling or destroying deer wintering areas. Overstory trees next to the existing corridor cut during winter will make browse material (food) available to deer at a time when they need it most. This browse would otherwise be inaccessible to them. This same material would be rendered unacceptable as browse if cut at other seasons, and its value would be lost. Brush and tops cut in the vicinity of deer wintering areas will thus be left, and only larger dimension branches be chipped. The creation of access roads and trails along the corridor during clearing operations may also enhance the mobility of deer in the vicinity of winter construction. Gilman/Briggs pf. at 28.

386. Some of the wetlands where the Project will be located may be considered waterfowl and wading bird habitat, where ducks, geese, and wading birds, including some rare species such as moorhens, rails, herons, and bitterns, are likely to occur. The existence and operation of a power line in such habitat does not pose any difficulty for these species. Potential impacts during construction will be minimized by designing pole placements to span wetlands where possible; placing nest boxes within the corridor in habitats associated with larger rivers and streams, e.g., at Leicester River and at LaPlatte River,

where some trees may need to be removed that could be of potential use to wood ducks; and limiting construction in these areas to fall and winter, which are outside of the normal breeding and brood-rearing seasons. Gilman/Briggs pf. at 28-29; Johnson pf. at 10; Gilman/Briggs Supp. pf. 5/20/04 at 12.

387. An eight acre VELCO parcel bordering the Leicester River has been proposed to be conserved as suitable mitigation for potential loss of wetland wildlife habitat. Rowe/Disorda/Gilman/Briggs Reb. pf. at 17.

388. The Project will not impact any critical habitat for amphibians and reptiles, with the possible exception of a couple of woodland pools where amphibian breeding likely occurs. Design criteria allow for spanning these areas and leaving them intact, so there will be no impact on those resources. Gilman/Briggs pf. at 30.

Threatened and Endangered Species

389. VELCO's environmental consultants have identified a number of plant species that are listed as threatened or endangered by the State of Vermont. Gilman/Briggs pf. at 30; Gilman/Briggs Supp. pf. 5/20/04 at 12.

390. Most of the plant populations along the corridor will be avoided by carefully locating access roads and pole placements and fencing off areas that should not be touched during construction. Avoidance of all threatened or endangered plant species throughout the entire Project area may not be possible, however, and if it is necessary to take any of these species, VELCO will obtain an endangered species permit from ANR. Gilman/Briggs pf. at 31; Rowe/Disorda/Gilman/Briggs Reb. pf. at 21 & 24.

391. A number of other species of plants that are considered rare or uncommon in Vermont have been found along the Project route. These species are have been mapped and data has been provided to the NNHP. For the most part, populations can be avoided or only partially impacted. In some instances, the power line corridor itself provides optimum habitat for these species, *i.e.*, a managed "open" sunny area without pasturage or high levels of activity. Gilman/Briggs pf. at 31; Gilman/Briggs Supp. pf. 5/20/04 at 12.

392. VELCO will flag and protect the seven rare species listed in the testimony of Mr. Popp that are of particular concern. Rowe/Disorda/Gilman/Briggs Reb. pf. at 24.

393. One endangered animal species has been documented within the Project area; this is the known nest site of osprey (*Pandion haliaaetus*) on an existing powerline 2-pole structure on the south (west) side of South Slang in North Ferrisburgh. This structure will need to be replaced for the proposed Reroute. VELCO will install a raised wooden platform at the top of H-frame structure on the west side of the Slang, allowing the osprey to build a new nest atop the new structure without interfering with the safe operation of the 115 kV line. Gilman/Briggs Supp. pf. 5/20/04 at 13.

394. VELCO has constructed several of these platforms on other H-frame structures to allow the osprey to successfully coexist with energized transmission lines. The existing nest would be removed when it is unoccupied (November through February) in preparation for construction of the new line. VELCO will apply for and obtain an Endangered Species Permit from the Secretary for this action. This will constitute adequate mitigation for the removal of the existing nesting structure. Gilman/Briggs Supp. pf. 5/20/04 at 13; Dunn/Harr DD pf. at 5-6.

395. As the Project passes through the Champlain Valley, there is a possibility that it may pass through the habitat of the Indiana bat (*Myotis sodalis*), a federally listed endangered species. VELCO participated in site visits and discussions with the US Fish & Wildlife Service, Scott Darling of the Department of Fish &Wildlife, the EPA and the ACOE on the potential impacts of the Project on Indiana bats. VELCO subsequently conducted a roost tree habitat survey, followed by emergence counts and acoustrial monitoring at five sites between Pittsford and Vergennes that showed the highest possibility for providing roosting habitat. Although the resulting data provide support for a finding that the NRP will not adversely affect Indiana bat roosting habitat, the Project may have some effect on roosting habitat. VELCO and ANR have agreed that any potential impact of the NRP can be adequately minimized by specially managing some acreage adjacent to the

transmission corridor in Salisbury, so as to provide alternate roosting opportunities for Indiana bats for a period of five years. To that end, VELCO has agreed to arrange to acquire rights to an approximate five acre parcel of private land that would enable ANR to conduct monitoring and roost tree enhancement measures for five years. It is likely that the Fish and Wildlife Department and the US Fish and Wildlife Service will request that VELCO clear the line from Pittsford to Vergennes only during the hibernating period for bats (November 1 through April 1). Gilman/Briggs Supp. pf. 5/20/04 at 13; Rowe/Disorda/Gilman/Briggs Reb. pf. at 20.

Motorized Vehicle Use in the Project Corridor

396. Various parties have expressed concern over the potential impacts of motorized vehicle use in the Project corridor. In the course of their field work, VELCO's environmental consultants have observed no current problems with regard to motorized vehicle use within the NRP corridors. Rowe/Disorda/Gilman/Briggs Reb. pf. at 19.

397. VELCO holds easements only (i.e. does not own the land) for most of its transmission rights-of-way in the state, and its easements do not grant rights to restrict access. Rowe/Disorda/Gilman/Briggs Reb. pf. at 19.

398. Much of the West Rutland to New Haven corridor is, and has been for many years, an established VAST trail. John Austin of ANR testified that it is not a practice of the Department to apply a restriction retroactively, where an existing VAST trail has been used for some time, since the impact has already been established. Snowmobiling on VAST trails is an allowed use under Section 6.2(j) of the Wetlands Rules. Rowe/Disorda/Gilman/Briggs Reb. pf. at 19; Tr. 6/10/04, Vol. I at 92 (Austin).

399. Bob Popp of ANR has suggested that a means to protecting RTE species from impacts from motorized vehicle use would be to simply and unobtrusively place downed logs or trees around the plants. VELCO has agreed to this requirement. Popp pf. at 10; Rowe/Disorda/Gilman/Briggs Reb. pf. at 23-24; Tr. 6/16/04, Vol. I at 112 (Popp).

400. VELCO has agreed that if the ANR determines that a Project area is being adversely affected by ATV or snowmobile use, it will participate in discussions among ANR, landowners, VAST and VASA to address such impacts. Rowe/Disorda/Gilman/Briggs Reb. pf. at 19.

Primary Agricultural Soils

[10 V.S.A. §6086(a)(9)(B)]

401. The Project's impacts upon agricultural soils will be minimal. This finding is supported by findings 402 through 415, below.

402. The West Rutland to New Haven line will have a minimal impact. Impacts to agricultural soils are typically not severe due to the small footprint of the structures, as evidenced by continued use of many fields with structures in them now. Gilman/Briggs pf. at 33-34.

403. The New Haven to Queen City line will have even less of an impact on agricultural soils. First, the line will, in most places, replace an existing power line. Where the line will pass through areas where no line currently exists, there will be some incremental impacts, but the overall impact on agricultural soils will be minimal. Gilman/Briggs pf. at 34; Gilman/Briggs Supp. pf. 5/20/04 at 14.

404. The reconductoring of the Barre-Granite line will have no impact on agricultural soils, since the Project will not add any new structures. Gilman/Briggs pf. at 35.

405. The area of the proposed expansion to the New Haven substation has Vergennes clay and Melrose fine sandy loam soils, which are of statewide and prime significance, respectively. This area, which is in current agricultural use, is approximately 5.91 acres, so this will be the largest single impact to agricultural soils from the entire Project. Gilman/Briggs pf. at 35.

406. There is agricultural soil (Vergennes clay) mapped at the proposed new Vergennes substation. VELCO Exhibit G&B-Supp(2)-1 at 5.

407. The area of the proposed expansion of the Ferrisburgh substation is mapped as Elmwood fine sandy loam, an agricultural soil, so there would be a small area of impact there. Some of the adjacent area is currently farmed. Gilman/Briggs pf. at 35.

408. The area of the proposed Charlotte substation, although mapped as having Covington silty loam, a soil of statewide importance, is limited by wetness and need to be drained. It is not now used for agriculture and is beginning to grow up. VELCO Exhibit G&B-Supp(2)-1 at 3.

409. The area of the proposed Shelburne substation expansion would be either on Covington silty loam, or on Enosburg and Whately soils (or both), all of which are listed agricultural soils, so there would be some area of impact there. The area has been used as pasture or field in the past, but this use has been abandoned and the area is grown up to shrubs and small trees. Gilman/Briggs pf. at 36.

410. The Queen City substation is located on an area of Adams and Windsor fine sandy loam soils, which have statewide significance, although the area of the proposed expansion is mostly on Enosburg and Whately soils, which are of prime and statewide significance respectively. The current land use is as forest, *i.e.*, a woodland patch. Due to its small size and position between roadways and the substation, this area will doubtfully ever be used for agriculture. Gilman/Briggs pf. at 36.

411. The Williston substation is on an area of Peru extremely stony loam, which is not an agricultural soil. Gilman/Briggs pf. at 36.

412. The Granite substation, where an expansion is proposed, is on an area mapped as having Cabot stony silt loam, 8 to 15% slope, which is not an agricultural soil. Gilman/Briggs pf. at 36.

413. The Blissville substation is mapped as having Bomoseen and Pittstown soils, which can be of significance; however, the area of the proposed expansion is on filled or made land, in an area of slate quarries, so there will be no impacts. Gilman/Briggs pf. at 36.

414. In meetings with VELCO, Marian White of the Department of Agriculture stated that the Department's preference is to require VELCO to make a cash payment to the Vermont Housing and Conservation Board's ("VHCB") conservation fund as mitigation for soil impacts, and that alternative mitigation by conserving comparable farm land is almost never practiced. Mitigation ratios will be applied based on soil types impacted by the NRP; the best agricultural soils are mitigated at 1:3, and the least valuable at 1:2. The VHCB has established rates in $/acre, which depend on the soil type affected and the area of the state impacted. Rowe/Disorda/Gilman/Briggs Reb. pf. at 25.

415. Once final design is complete, VELCO will quantify total acreage of impact to prime agricultural soils from substation expansions and pole locations, and amount of compensation due based on the total acreage impacted for each soil type. The money will go to VHCB and will be used to protect viable farmland in the counties affected by the project. Rowe/Disorda/Gilman/Briggs Reb. pf. at 25-26.

Scenic or Natural Beauty of the Area, Aesthetics

[10 V.S.A. 6086(a)(8)]

West Rutland to New Haven

416. The new 345 kV transmission line will be constructed parallel to the existing 115 kV transmission line for the entire 35.8 mile route between West Rutland and New Haven, within VELCO's existing right-of-way. This long established right-of-way generally avoids roadways and residences and is often located in low bottomland out of the view of most people. Boyle pf. at 5-6.

417. VELCO will continue its practice of selective clearing and right-of-way management along the corridor, which allows vegetation to break up the cleared right-of-way and provides visual diversity and contrast. Boyle pf. at 6.

418. At transmission line road crossings where there is no hedgerow or a limited hedgerow and the corridor departs fields and enters woods, VELCO will utilize visual "plugs" of evergreen plantings to mitigate the aesthetic impact. Boyle pf. at 6.

419. VELCO committed to using non-specular wire for the entire length of the 345 kV line. Dunn DD pf. at 3.

420. A review of all regional and local standards and goals which have relation to aesthetics, scenic beauty and/or utilities for the areas through which the proposed line will pass revealed no extant provisions that state specific standards which would be violated by the NRP proposal. Exhibit DPS-DR-1 at 135.

421. Overall, the corridor will not have an undue adverse impact on the aesthetics of the surrounding areas. This is an established corridor, generally well located and with 115 kV structures already in place. At the macro level, the established corridor provides a context that satisfies the test for undue adversity, even if certain areas with high levels of viewer exposure to structures may be adverse. Applying the Quechee test for undue adversity, locating utility structures in an existing utility corridor is not shocking or offensive. No clear written community standards deny upgrades within an existing transmission corridor. VELCO has stated that it will, within engineering and design limitations, endeavor to mitigate visual impacts by careful pole placement and applying sound vegetative management practices within the corridor. Boyle pf. at 9; Boyle Reb. pf. at 24.

Whipple Hollow Road (Mile 0.0 to 5.0)

422. The proposed corridor in this section is generally backgrounded against the hillside from Whipple Hollow Road and Pleasant Street. VELCO Exhibit TJB-3 at 3.

423. Only where the cross slope is greater than 35% and downhill vegetation is lower than 75 feet will the right of way clearing be potentially visible when viewed at right angles. Selective clearing and right of way management at locations where the cross slope is

greater than 35% will lessen the potential for a "stripe" in this section. Boyle Reb. pf. at 4; VELCO Reb. Exhibit TJB 1-1.

424. In the Florence/Pittsford section of this corridor (mile 2.8 - 4.5), the existing 115 kV corridor is initially visible at the height of land in Pittsford and then traverses the east edge of the Proctor boundary to mile 3.7 before again entering Pittsford. It is intermittently visible from the turnoff to Florence; just north of Pittsford, to the height of land just south of Brandon Village and from Otter Valley Regional High School. The OMYA 46 kV line running alongside the 115 kV corridor and separated by a thin strip of vegetation further adds to the noticeability of the corridor. The new 345 kV circuit will be on the west side, up the slope from the existing 115 kV circuit, adding to the corridor width. Most of the new 345 kV structures will be backgrounded by the topography or vegetation. A mitigating factor is that at certain times of the year, the low angle of the sun places the structures in shadow. At other times, the 115 kV conductors may be quite reflective; all of the proposed NRP transmission lines, however, will be constructed with non-specular conductors. The aesthetic impact of the line can be minimized by continuing the practice of selective vegetation removal in the area to be cleared. This will create meadow-like clearings and mitigate the visibility of a wide lineal clearing, especially in the winter landscape. VELCO Exhibit TJB-3 at 4-5; Dunn-Harr DD pf. at 3.

425. Mr. Raphael acknowledged in a September 22, 2004 hearing before the Board that he has not explored the extent to which his proposal for a single pole configuration would increase pole height or cost, nor has he analyzed how many sections of the corridor exceed a 35% slope and thus present the potential for striping. Tr. 9/22/04, Vol. I at 21 (Raphael).

Whipple Hollow Road Crossing (Mile 5.5 to 6.6)

426. At mile 5.5, the 115 kV circuit is visible to both the north and south as the traveler approaches from the east. Structure 74, north of the crossing, is on the east side of a small

knob of managed cedars. This is not a heavily traveled road, but the mix of field, forest and topography makes it scenic. VELCO Exhibit TJB-3 at 5.

427. The aesthetic impact will be mitigated by locating the 345 kV structure out of the meadow to the south, with an 800-foot span to the next 345 kV structure in the cedars on the hillside to the north, and planting cedars in the right-of-way to minimize exposure of the hillside 345 kV structure. VELCO Reb. Exhibit TJB 1-2.

428. VELCO's proposal to locate the pole in the brush line on the southern side will provide similar mitigation to that recommended by Mr. Raphael, without incurring additional aesthetic impact by adding planting to an open meadow as Mr. Raphael has proposed. Boyle Reb. pf. at 4-5.

Fire Hill Road (Mile 5.75)

429. Sparse stands of cedar exist in the wetland to the south of this location with wetland brush to the north, and a small hill to the north that may be problematic for conductor clearance. Mitigation will include conducting selective clearing and maintaining cedar in the full corridor to Whipple Hollow Road, and continuing selective clearing and management of the deciduous wetland vegetation to the north. VELCO Exhibit TJB-3 at 6.

High Pond Road (Mile 9.4)

430. Roadside vegetation and topographic features provide good screening at this road crossing. The corridor descends a wooded hillside and crosses Breese Mill Stream south of the road, crosses the road and distribution line and proceeds up a steep slope to the north. The roadside vegetative screen will be continued in the widened corridor, providing screening for the adjacent residence to the west as well as from the road. VELCO Exhibit TJB-3 at 6.

Long Swamp Road (Mile 11.2)

431. A partial vegetative roadside screen to the south of this road crossing and the feathered edge of the right-of-way to the north help to lessen the visual impact of the existing corridor as it crosses this minor road. Continuing the existing vegetative management practices when the corridor is widened will mitigate any additional aesthetic impact. VELCO Exhibit TJB-3 at 6-7.

Otter Creek Crossing at Champlain Street/Route 73 (Mile 12.1)

432. The existing 115 kV circuit passes through an agricultural area to the north and south of this road crossing. The circuit is backgrounded by topography and vegetation to the north and south beyond the farm fields. The structures close to the crossing will be skylined. The wooded corridors on the hillside to the north and south are well managed. A wider corridor will open up more wooded areas to the north and south, but since they are at right angles to the highway, they are out of the normal cone of vision. VELCO Exhibit TJB-3 at 7.

433. Mitigation will include matching structures on the south side of the creek and spanning to the first hedgerow north of Route 73. If it is possible, the 115 kV structure will be moved to the same hedgerow. The north bank of the Otter Creek will be planted with dogwoods and viburnums for screening down the line and for bank stabilization. VELCO Reb. Exhibit TJB 1-3.

434. David Raphael has testified that the measures proposed by VELCO at this location will provide sufficient mitigation. Raphael Surr. pf. at 2.

Hollow Road (Mile 12.6)

435. Hollow Road is a minimally traveled, scenic gravel road. Structure 150 is close to the north side of the sharply curved road. A new 345 kV structure will likely be placed close to the road. Mature roadside trees will need to be removed north of the road. The south

side is sumac and brush. The aesthetic impact of the new line can be mitigated by retaining brush and low trees in the new clearing. VELCO Exhibit TJB-3 at 7.

Arnold District Road (Mile 13.8)

436. At this crossing, the 115 kV circuit is visible as it crosses the open scrub area to the north. Widening the corridor will remove some of the screening vegetation on the south side of the road, exposing more of structure 162 from the west. The north side of the road is open with mixed vegetation and wetland. To the south, a roadside hedgerow of mature trees to the east and mixed woods to the west provide a good screen for the proposed 345 kV structure. VELCO Exhibit TJB-3 at 7-8.

437. Mitigation measures will include matching the 345 kV structure to the 115 kV structure south of the road, placing it approximately 150 feet south of the road. This will be a sufficient distance to allow screen from the west by existing and supplemental vegetation on the steep embankment adjacent to the road. A span of 700 feet or longer will lead to the next structure north of the road. Plantings will consist of pines (to supplement and expand existing pines on the south embankment) and apple trees (along the north side of the corridor, as a continuation of the fence line to reduce sight lines to the north). With these measures and selective clearing under both circuits to the north and south, there will be no adverse impact. Boyle Reb. pf. at 5; VELCO Exhibit Reb. TJB 1-4.

Cram Road (Mile 15.7)

438. Cram Road is a low use gravel road in a transitional landscape of wetland brush and conifer. The corridor descends from a height of land to the south through hardwoods near the town and county line. Mitigation will include maintaining the vegetative brush at the road crossing when the corridor is widened and feathering the hilltop at poles 176 to 177 and to the south at mile 15.2, the Brandon/Leicester town line. Selective vegetation removal and right-of-way management will be continued for the full width of the right-of-way. VELCO Exhibit TJB-3 at 8-9.

439. Ms. Vissering, aesthetics expert for the ACRPC and the towns of Middlebury and New Haven, recommends that VELCO ensure that sufficient woodlands remain in this corridor to screen the line as it approaches the road and that VELCO leave low trees and shrubs near the road intact. These recommendations are in line with VELCO's selective vegetation removal and right-of-way management practices. As Ms. Vissering notes, the impacts in this location are not severe, due to limited exposure to views of the line. Exhibit ACRPC-JV-10.

Leicester-Whiting Road (Mile 16.2 to 16.7)

440. This section of the corridor leaves a wooded area at angle pole 187 and crosses a drainage way and agricultural fields on both sides of this road. VELCO Exhibit TJB-3 at 9.

441. Mitigation will include matching 345 kV and 115 kV spans from angle pole 187 to 190. A softwood screen on the edge of the wetlands to the southwest will help mitigate the existing and proposed structures from the west. Lower deciduous planting along the road under the distribution line in the VELCO right-of-way will further screen to the south. An existing large tree hedgerow to the north provides screening from the west. Roadside trees to the east on the north side will be supplemented to mitigate views from the east. A hedgerow in the road right-of-way on the edge of the adjacent farm field on the south side will mitigate views to the structures on the south side of the road. VELCO Reb. Exhibit TJB 1-5.

442. David Raphael has suggested additional mitigation in the form of street trees on both sides of the road. Exhibit DPS-DR-1 at 12; Raphael Surr. at 3.

443. Ms. Vissering also recommended planting street trees on both sides of the road, and she further proposed groupings of trees in the field to screen pole structures. Exhibit ACRPC-JV-10.

444. Mr. Raphael and Ms. Vissering's recommendations for street trees and groupings of large trees on the south side will likely interfere with the farmer's use of the agricultural field.

Planting shrubs instead of trees on the south side will provide screening without interfering with the agricultural field. Boyle Reb. pf. at 5.

Bullock Road (Mile 16.8)

445. To the south of this road crossing, the hilltop notch at mile 15.2 is still visible. To the north and south, the circuit is low in the landscape, crossing wetland on this straight, tree-lined, lightly traveled road. Mitigation will include keeping as much wetland vegetation on the north side of the road as possible and selectively clearing the entry into the woods at mile16.85. The screen will be managed for the full corridor width as it has been done under the existing 115 kV transmission line. VELCO Exhibit TJB-3 at 9.

Route 7 and West Salisbury Road (Mile 18.0 to 20.0)

446. On Route 7 south of West Salisbury Road, the proposed route follows the existing corridor, with poles located west of and matching the location of the existing 115 kV structures. These relatively short spans (roughly 500') allow the poles to be as low as ground clearance permits and placed adjacent to drainage ditches at the edge of active agricultural fields. From the northernmost ditch at the 115 kV pole 217 north, the spans vary from the 115 kV spans to accommodate the clearance at the OMYA 46 kV line and West Salisbury Road, both of which are diagonal crossings. The most visible portion of the corridor is for the first 2000' north of the Leicester River. There is no roadside intermediate vegetation for this section since agricultural fields extend to the Rt. 7 right-of-way. This allows a full view of the existing and proposed lines and the open agricultural landscape to the west. A topographic rise with vegetation on the western side of the fields limits these views to the middle-ground beyond the corridor for those drivers or passengers looking west out of the normal view of the road ahead. Further north, starting with VELCO 115 kV pole 216, a copse of trees extends roughly 1400' varying in depth up to 200' to the 115 kV pole 219. From pole 219 north, the proposed corridor is open and 115 kV pole 220 through 226 are in open landscape and generally visible from Rt. 7. VELCO Exhibit TJB DD-2 at Section 1.

447. At the West Salisbury Road crossing, Route 7 approaches the transmission line as close as 150'. VELCO proposes to plant in the open areas groups of shade trees in a natural arrangement along the Rt. 7 right-of-way. This will allow views into the fields from Rt.7, but will limit visibility of the conductors and cross-arms. Trees have been selected that are suitable for clay soils and are shade trees with clear stems initially up to six feet. This will allow sight lines under the tree canopy as the tree grows and, along with the intermittent openings between clumps of trees, will afford a view to the fields beyond. The choice of trees and their spacing allows for visual access that would not be possible if a hedgerow of shrubs were proposed. Approaching the West Salisbury Road intersection, the street tree clusters mitigate the aesthetic impact where the 46 kV line crosses under both circuits. VELCO Exhibit TJB DD-2 at Section 1.

448. VELCO proposes to match the 345 kV poles with the existing 115 kV poles through this section to reduce the visual impact. VELCO Exhibit TJB-3 at 9-10.

449. VELCO also proposes to plant trees along the south side of West Salisbury Road to provide the same function as described for Route 7, above. Since there are no overhead wires on the south side, VELCO recommends street trees in or near the town right-of-way. This will provide an effective mitigation for those descending the West Salisbury Road hill from the west. The north side of West Salisbury Road has extensive screening, including a large glacial boulder, at the approach to the VELCO right-of-way. Selective clearing is called for in the width of the right-of-way and vegetation remaining will be supplemented by low-growing trees under the existing utility line. Planting at the intersection will consist of taller shade trees since there are no clearance requirements other than providing safe sight distance for travelers on West Salisbury Road entering or crossing Route 7. These trees will, over time, obscure views to transmission structures south of West Salisbury Road for travelers southbound on Route 7. The 345 kV structures on either side of the 46 kV line and West Salisbury Road (poles 220 and 221 span the 46 kV line and poles 221 and 222 span the West Salisbury Road) are taller to clear the 46 kV line and the road. It is therefore important that these structures be

screened with plantings outside of the VELCO right-of-way in the vicinity of the intersection to block sight lines. If the OMYA 46 kV line were not the controlling limitation, the height of pole 220 could be lowered by 5 feet and pole 221 by 18 feet. VELCO Exhibit TJB DD-2 at Section 1.

450. CVPS has estimated that it would cost $430,000 to underground the 46 kV line. Tr. 11/8/04, Vol. I at 38 (Dunn).

451. The wet areas associated with the drainageway on the west side of Route 7 afford a likely location for screen planting from West Salisbury Road north to 115 kV pole 227, which is in a wooded section. The poles will be placed to avoid the active agricultural fields. Since these poles are generally at a higher elevation than Route 7, the screening trees will be in or near the Route 7 right-of-way to be most effective. The trees used for screening will be fast-growing and ones that provide winter screening through twig density (e.g., willows) or by leaf retention through the winter (e.g., swamp white oak). Approaching West Salisbury Road from the north on Route 7, the proposed plantings will block sight lines down the corridor. Like the area south of Route 7, the plantings in this area will be comprised of clusters of trees to define the highway corridor and yet allow some sight lines to the wetlands and fields beyond. VELCO Exhibit TJB DD-2 at Section 1.

452. At the north end of the fields, a plug of pine and hemlock will be used to provide continuity of the wood edge. The 345 kV right-of-way will be selectively cleared and, after planting the entire corridor, will be vegetatively managed to the top of the hill to offset the visibility of the right-of-way as it ascends the hill. This open corridor cut is particularly evident in the winter and will be more so with the corridor widened when these mitigation measures are undertaken. VELCO Exhibit TJB DD-2 at Section 1.

453. David Raphael has recommended additional hedgerow plantings along Route 7 both north and south of West Salisbury Road in order to improve screening of pole structures. Raphael DD pf. at 2-3.

454. In a hearing on November 9, 2004, however, Mr. Raphael acknowledged that the extensive hedgerow plantings that he recommended at this location were unrealistic and would replace one impact with another, cutting off the view of the open land. Tr. 11/9/04, Vol. II at 85 (Raphael).

455. Mr. Raphael has also admitted that he has not considered the cost, environmental impacts, or engineering implications of his proposal to relocate the line. Tr. 11/9/04, Vol. II at 40-43 (Raphael).

456. Mr. Raphael's plan to relocate the line to west would necessitate two angle structures near the intersection of Route 7 and West Salisbury Road, where they would be very visible from both directions on Route 7 and from West Salisbury Road. The tangent structures proposed by VELCO will be more simple visually and free of guy wires. Boyle Reb. pf. at 5-6.

Kelly Cross Road (Mile 20.5 to 20.9)

457. The 115 kV circuit stands over the driveway of a residence on the south side of Kelly Cross Road. A house was constructed adjacent to the west edge of the right-of-way and clearing for the 345 kV circuit will remove most of the woods that separate this residence from the corridor. On the north side of Kelly Cross Road, an effective hedgerow screens the 115 kV structure and the right-of-way as it heads north in open fields. The existing pole angle structure is visible from the driveway to the elementary school. VELCO Exhibit TJB-3 at 10.

458. The impact of the new line will be mitigated by selective clearing that will retain yard vegetation below 15 feet. VELCO will use the maximum span possible from the angle structure opposite pole 234 to the previous poles. A cedar hedgerow will be added along the lot line to parcel 1085-032, and pines will be planted along the existing fence line at Salisbury School to screen the line from the entry drive. VELCO Reb. Exhibit TJB 1-7.

459. Ms. Vissering has testified that she finds VELCO's proposed mitigation measures acceptable, but she also suggests additional plantings along the school driveway and around the homes. Vissering Surr. pf. at 4.

460. Given the screening capability on the north side of the road and VELCO's proposed mitigation, though, the impact of the line should be mitigated sufficiently without employing additional plantings such as Ms. Vissering suggests. Boyle Reb. pf. at 6.

Three Mile Bridge Road (Mile 24.0)

461. There is existing vegetation to the south of this crossing, between Middlebury River and Three Mile Bridge Road; the 115 kV corridor to the south is only visible when viewed perpendicular to the road at the crossing. This appears to be a natural area with a wooden footbridge to the east of the corridor. The corridor continues north through open agricultural lands. VELCO Exhibit TJB-3 at 11.

462. Mitigation at Three Mile Bridge Road will include matching pole 265 on the north side and providing the maximum possible span to the south across screen planting. VELCO will match the 345 kV spans with the 115 kV line at poles 265 and 268. Stream side planting will block the corridor view to the south, and low trees or shrubs in the town right-of-way on the north side will help block the poles next to the road. VELCO Reb. Exhibit TJB 1-8.

463. Ms. Vissering has proposed additional mitigation at this site in the form of shade trees along the north side of the road and white pine groupings in the VELCO right-of-way. Exhibit Middlebury JV-1 at 2; Vissering Surr. pf. at 4.

464. Ms. Vissering's planting recommendations will likely interfere with active agricultural land, and they are unnecessary given VELCO's recommendations. Boyle Reb. pf. at 6-7.

Three Mile Bridge Road to Route 125/Route 7 (Mile 24.0 to 24.6)

465. Along this section, the corridor follows the edge of the active agricultural field and is backgrounded by vegetation to the west. At mile 24.3 the corridor turns northeast toward

Route 7, where the existing 115 kV line comes into view for northbound travelers on Route 7. Approaching the turnoff to Route 116, the existing structure just west of Route 7 is skylined above background vegetation. If possible, the 345 kV pole will be placed in alignment with pole 271 so that it will be partially backgrounded by vegetation as seen from Route 7 south, and mostly screened from the north. VELCO Exhibit TJB-3 at 11.

Route 125/Route 7 Crossing (Mile 24.6 to 24.9)

466. The existing poles are very visible at these road crossings. The triangle area formed by nearby roads currently supports a stand of Elm and Poplar, which currently helps to background the existing 115 kV structure (272) from the south and screen it from the north. VELCO Exhibit TJB-3 at 12.

467. In its design detail filing, VELCO proposed utilizing taller poles at the 345 kV angle structure (274) and in the island (272), eliminating the need for the roadside 345 kV pole (273) originally planned. As a result, the Route 125 corridor will be improved. The visual impact of the taller island pole will be mitigated initially by the poplar and pine growth at the apex of the island and existing vegetation east of the corridor on the south side of Route 125. The angle structure 274 will be located well back from the road and will be partially screened by the street trees on the north side of Rt. 125. VELCO Exhibit TJB DD-2 at Section 2.

468. VELCO proposed two alternatives for distribution lines along the Route 125 corridor. The first alternative places approximately 565 feet of existing roadside distribution and telecommunications facilities underground. This would eliminate visual clutter and allow taller trees to be planted along the north side of Route 125. The second alternative retains the overhead distribution lines, which limits tree heights on the north side of Route 125 to 25' unless the trees are placed north of the Route 125 right-of-way. Retaining the overhead lines would have no effect on the height of the angle or island poles since the 46 kV line is the controlling factor for the height of these poles. The removal of the roadside distribution poles and wires as detailed above provides an

aesthetic benefit, but simulations show that the aesthetic impact of the existing distribution lines would be substantially mitigated in time as the street trees grow to their anticipated 25' mature height. VELCO Exhibit TJB DD-2 at Section 2.

469. CVPS has estimated that it would cost approximately $509,000 to place the distribution facilities underground; this would not include the cost of placing Verizon and Adelphia lines underground. Dunn/Harr DD pf. at 4.

470. CVPS estimates that it would cost an additional $353,000 to underground the 46 kV line. Tr. 11/8/04, Vol. I at 39 (Dunn).

471. Because the distribution lines in the Route 7 right-of-way are located approximately 100' from the highway at the intersection of Route 125 and approximately 50' from the gas station, removal of the Route 7 distribution lines would not provide effective mitigation here. The lines are below the road edge by 6 to 8 feet and are therefore somewhat backgrounded by island vegetation. Since the elevation of Route 7 is the controlling factor for clearance, the undergrounding of these distribution lines for aesthetic purposes appears to be of marginal utility in this location because a screen for the island structures will screen the distribution lines as well. Street trees will be planted to help mitigate the adverse impact of the taller island structure as seen from Route 7 and to direct the Rt. 7 driver's focus northerly on the highway and the upcoming intersection with Rt. 125. Taller trees can be planted between Route 7 and the distribution line, limited only by VTrans setback requirements. If the trees can be planted close to Rt. 7, they will be at a higher elevation and provide a better screen. If the trees must be planted further from Rt. 7, they will be lower in elevation and height and will be less effective. VELCO Exhibit TJB DD-2 at Section 2.

472. David Raphael has agreed with VELCO that the above recommendations will avoid an undue adverse impact, provided that the riser poles are set further back from Route 125. Raphael DD pf. at 3-4.

473. Ms. Vissering also proposes siting the riser poles further back from Route 125 and, throughout this section, recommends undergrounding the 46kV line to lower pole heights. Ms. Vissering agrees with VELCO's proposal to underground distribution, noting that the larger trees possible with undergrounded distribution will help screen structures from Route 7. Vissering DD pf. at 3-4.

474. However, Ms. Vissering has also testified the cost of undergrounding should enter into consideration of its reasonableness as a mitigation alternative. As discussed in the findings above, the cost to underground both the 46 kV line and the distribution would be significant. Tr. 9/22/04, Vol. 1 at 52-53 (Vissering).

Cady Road (Mile 25.5)

475. Cady Road is an open agricultural landscape with no screening at the roadside. VELCO Exhibit TJB-3 at 12.

476. Mitigation at this site will include matching the 115 kV and 345 kV spans in the open landscape. Plantings will be added out of the cropland to break up the landscape with islands of vegetation, and shade trees will be added to the road right-of-way on both sides. The existing pine stand south of the road will be selectively cleared and supplemented with additional pines. VELCO Reb. Exhibit TJB 1-10.

Quarry Road (Mile 27.8 to 28.0)

477. South of this crossing, the 345 kV line crosses over the 115 kV transmission line at pole 302 with a slight angle and proceeds to the New Haven substation on the east side of the 115 kV transmission line. The open landscape, the corridor, and the substation are partially screened by a roadside hedgerow of pines on the south side of Quarry Road. Softwood on the north side of Quarry Road will be removed if the offset of the 345 kV from the 115 kV is maintained at 80 feet. The area is made visually more complicated by an existing CVPS 46 kV line heading north out of the substation. VELCO Exhibit TJB-3 at 12-13.

478. VELCO's proposed mitigation will include plugging the gaps in the existing pine hedgerow on the south side of the road and extending it to the east. New pine islands will be created in the pasture land to the north to replace the existing island. Views from the west will be mitigated with cedar plantings near the edge of the existing 115 kV line. VELCO Reb. Exhibit TJB 1-11.

Painter Road Crossing (Mile 28.9)

479. At this crossing, the corridor follows the low drainage way and Painter Road drops under the corridor and rises again. Good roadside vegetation exists to screen the corridor. VELCO Exhibit TJB-3 at 13.

480. Mitigation will include matching 115 kV and 345 kV pole locations, along with selective clearing and vegetative management on both sides of the road. Boyle Reb. pf. at 8.

481. In addition to VELCO's mitigation proposal, David Raphael recommends plantings to plug the corridor on both sides of the crossing. Raphael Surr. pf. at 4.

482. Painter road should have sufficient cover to provide screening without additional plantings such as those suggested by Mr. Raphael. In the event that there is not sufficient screening after construction, VELCO has agreed to evaluate what further planting is needed at that time. Boyle Reb. pf. at 8.

Halpin Road (Mile 29.9 to 30.4)

483. This is a scenic back road with a few residences near the corridor. The angle structure at mile 29.95 is in a low area backgrounded by a maple woods. The widened corridor to the east will remove about 70 feet of this woods but the angle structure is expected to be backgrounded by the remaining woods because it will be set lower on the slope. The next pole (366) is at a fence line on the high point in the meadow and is visible for travelers southbound on Halpin Road and from the residences to the northwest fronting the road. It is likely that the new 345 kV structure would be on the height of land also, since one span to a roadside pole would be too great a distance. A span from a roadside

pole to angle structure 363 is likely. From the angle, the line heads north behind residences on the west side of Halpin Road before entering a wooded area at the New Haven town line. Heading north on Halpin Road, existing pole 366 is partially screened by roadside vegetation. The angle at pole 363 can be seen to the west at 45 degrees from the right-of-way. VELCO Exhibit TJB-3 at 13-14.

484. VELCO's proposed mitigation at Halpin Road will include matching the 115 kV and 345 kV poles to create a more orderly appearance. Matching the 345 kV pole to the 115 kV just north of the road will allow the line to span the distance to the angle structure, eliminating the need for an additional pole in the agricultural field. Boyle Reb. pf. at 8-9.

485. Views to the southeast will be minimized with a hedgerow of oak to the north and infill of the brush hedgerow with native plants. On the west side more hedgerow material will be planted under the line, with additional, strategically located pines and oaks to reduce the visibility of the crossing and angle structure. VELCO Reb. Exhibit TJB 1-12.

486. David Raphael agrees with VELCO's proposed mitigation measures but proposes additional mitigation plantings to screen individual back yards and the driveway crossing. Raphael Surr. pf. at 4-5.

487. VELCO's mitigation proposal, supported by both Jean Vissering and Mr. Boyle, should provide sufficient screening at this location without the need for additional measures. Vissering Surr. pf. at 7.

River Road (Mile 30.4 to 31.1)

488. In this section, the corridor traverses a ridge of white pine and hemlock dropping over River Road and crossing an agricultural field before reaching the New Haven River. From the west the new circuit is out of sight over the ridge. From the east, the tall corridor vegetation will screen the clearing. The road crossing is not particularly noticeable from either direction. VELCO Exhibit TJB-3 at 14.

489. VELCO's proposed mitigation will include selective clearing on the steep slope to the south. VELCO Exhibit TJB-3 at 14.

490. VELCO anticipates that it will be possible for the 345 kV line to span the agriculture field (skipping pole 353) with a pole at the field edge. If not possible, the poles will be matched in keeping with agricultural practices. Boyle Reb. pf. at 9.

Hunt Road (Mile 31.1 to 32.5)

491. Approaching Hunt Road, the line traverses woods and meadow out of sight of the road. At mile 32.3 the line becomes visible for several spans before crossing over Hunt Road in open agricultural fields at mile 32.5. Since active agriculture is practiced to the road edge, no screening can be planted. VELCO Exhibit TJB-3 at 15.

492. The aesthetic impact here will be mitigated by matching the pole structures where possible, slightly offset to place them together when viewed from adjacent houses. VELCO will work with homeowners to provide trees to block sight lines if they wish. Boyle Reb. pf. at 9.

493. Mr. Raphael recommends single pole structures in this corridor to avoid any additional visual impact from H-frame structures. Raphael Surr. pf. at 5-6.

494. Ms. Vissering, however, has specifically stated that single pole structures are not needed in this location. Vissering Surr. pf. at 7.

495. Mr. Boyle has also testified that single poles are unnecessary mitigation in this location. Boyle Reb. pf. at 9.

Vicinity of "Roland's Place" (Mile 32.5 to 34.9)

496. In this section, the line continues along the back edge of active agricultural fields as it heads north backgrounded on the east by a wet woods as seen from Hunt Road. Further north it follows a low wet area in the landscape where structures 311 - 313 are exposed to Town Hill Road to the west. VELCO Exhibit TJB-3 at 15.

497. Mitigation will include matching some of the 115 kV and 345 kV spans to accommodate the view from the height of the land near Roland's Restaurant on Route 7 and the nearby conserved land. Boyle Reb. pf. at 9.

498. VELCO also proposes selective vegetation removal and right-of-way management for the full width of the right-of-way. VELCO Exhibit TJB-3 at 15.

499. Ms. Vissering has testified that the proposed mitigation is sufficient in this location. Vissering Surr. pf. at 7.

Town Hill Road (Mile 34.9)

500. Heading north, the existing 115 kV structure is visible adjacent to the west side of Town Hill Road. Further west, a hedgerow hides the structures as they proceed north. VELCO Exhibit TJB-3 at 15.

501. Mitigation will include planting hedgerows along the roadside on the east side of the road on the embankment to the wetlands so as not to interfere with roadside distribution lines. The hedgerows will comprise shrub willow, viburnum, or dogwood for several hundred feet along the wetland. Boyle Reb. pf. at 9-10.

502. If possible, the 345 kV structures will be located to be backgrounded by tall trees on the east and behind the pine hedgerow on the west. Heading south, the west structure will be backgrounded by the pine hedgerow. VELCO Exhibit TJB-3 at 15.

503. Ms. Vissering recommends large trees be planted offsite to provide additional screening. Vissering Surr. pf. at 7.

504. VELCO's proposed hedgerows will be sufficient to mitigate the impact at this location without the need for additional plantings, provided that the hedgerows are maintained at the maximum height. Raphael Surr. pf. at 6.

Approach to New Haven Substation (Mile 34.9 to 35.5)

505. Approaching the New Haven Substation, the 115 kV line continues for six spans across open active agricultural fields until it reaches the substation over 1200 feet from the road.

The structures are visible in both directions. If possible, VELCO will work with the farmer/landowner to place poles to coincide with row cropping or match spans to minimize visual impact. VELCO Exhibit TJB-3 at 15-16.

New Haven to Queen City

506. The proposed 115 kV transmission line will generally follow the existing CVPS/GMP 46 kV and GMP 34.5 transmission line corridors between VELCO's New Haven and Queen City substations. Much of the route will follow the established railroad right-of-way. The rigid insulators supported in the delta configuration, especially without underbuild, present a relatively simple profile passing through the open landscape, similar to the existing profiles of the 34.5 kV and 46 kV lines. Boyle pf. at 10-11.

507. The 115 kV structures for this line will be more similar in design to the existing 34.5 kV and 46 kV structures that they will replace than the 345 kV structures, and are similar to distribution line structures and thus a more familiar scale to viewers. The location of this line, generally along the railroad, affords viewing by far fewer people than sections of the proposed 345 kV line. Boyle pf. at 12.

508. VELCO committed to using non-specular wire for the entire length of the 115 kV line. Dunn DD pf. at 3.

509. A review of all regional and local standards and goals which have relation to aesthetics, scenic beauty and/or utilities for the areas through which the proposed line will pass revealed no extant provisions that state specific standards which would be violated by the NRP proposal. Exhibit DPS-DR-1 at 135.

510. The proposed corridor actually represents an improvement over the existing GMP 34.5 kV corridor in several locations, it is largely confined to rural areas, passing through few residential areas, and it is generally not highly exposed to heavily traveled roads. Though the 115 kV poles will be taller than the existing poles, this will allow for larger spans and reduce the total number of poles in the corridor. Boyle pf. at 12-15.

511. Overall, the corridor will not have an unduly adverse impact on the aesthetics of the surrounding areas. Boyle pf. at 15; Boyle Supp. pf. at 8; Boyle Reb. pf. at 24.

Route 17 Crossing (Mile 0.1 to 0.2)

512. In this section, the 46 kV circuit to be replaced by the new 115 kV circuit crosses parallel and west of the existing 115 kV West Rutland to Williston circuit. This is an exposed agricultural landscape with a skylined existing 46 kV road crossing structure. VELCO Exhibit TJB-4 at 3.

513. VELCO has proposed two alternatives to mitigate the impact of the line as it crosses Route 17. The first alternative reroutes the proposed 115 kV line to a less sensitive crossing west of the existing 46 kV crossing so as not to cross Route 17 at the height of the land. The design of the relocated 115 kV line would include two angle poles, one north of the substation and one at the southwest corner of the field. The line would be located 75' off the existing hedgerow in a 150' right-of-way in an H-Frame configuration. The angle structures would be three pole angles with guys, and the two tangent poles would all be below 52', which would help them to blend into the background hedgerows. The longer span at the Route 17 crossing would allow setback from the traveler's cone of vision, requiring a slightly higher (56' structure) in the field north of Route 17. This structure would be mostly out of view east-bound and backgrounded by pines when traveling west. VELCO further proposes to move several structures on the New Haven to Williston line approximately 300 feet back from Route 17. VELCO Exhibit TJB DD-2 at Section 4.

514. In the first alternative, a grouping of swamp white oak would be clustered on both sides of VELCO's service drive near the highway to screen 115 kV pole 5 from eastbound travelers and to provide a background for those traveling west. No additional planting is recommended at this crossing to screen poles. Depending on the viewer position traveling westbound on Route 17, the trees background the line, except for pole 5 south of the crossing. VELCO Exhibit TJB DD-2 at Section 4.

515. The second alternative involves moving structures on the existing Williston circuit approximately 300 feet back away from Route 17, as mentioned above, and matching the structures on the proposed Vergennes 115 kV circuit with the new Williston circuit pole spacing. This is a cleaner solution with aesthetic benefits, keeping the structures of both circuits back approximately 300' from Route 17 (both north and south) and out of the cone of vision of travelers on Route 17 in both directions. The Vergennes circuit poles would be screened as are the Williston circuit poles: as one travels east past the VELCO service drive, they will be visible but out of the natural cone of vision. VELCO Exhibit TJB DD-2 at Section 4.

516. Ms. Vissering has recommended that both lines be undergrounded through this corridor. Vissering DD pf. at 8-9.

517. In lieu of undergrounding, Ms. Vissering has suggested routing both lines west to the edge of the field. Vissering DD pf. at 8-9.

518. Mr. Raphael has also proposed rerouting the lines to the west. Specifically, he recommends relocating both the new and existing lines so that they exit the New Haven substation on the west side and continue to the west a short distance and then north across Route 17 to rejoin the original routes. Exhibit DPS-DR-4.

519. Mr. Raphael's proposed route would stay within 50 to 75 feet of the tree line. Raphael DD pf. at 7.

520. Neighboring property-owners north of Route 17, however, have expressed their opposition to the proposal to route the lines west, as it would bring the lines closer to their homes. Tr. 11/9/04, Vol. II at 45-46 (Raphael).

521. Neither Mr. Raphael nor Ms. Vissering have offered any evidence regarding the potential cost, design implications, or environmental impacts of rerouting both the new and existing lines. **Cite?**

522. Furthermore, Mr. Raphael has admitted that the additional guy wires and poles necessary to reroute both lines would have an impact on the utilization of the agricultural lands through which the lines would run. Tr. 11/9/04, Vol. II at 49 (Raphael).

Lime Kiln Road (Mile 2.4)

523. The second road crossing north of the substation along the corridor is at Lime Kiln Road in New Haven, a paved bridge crossing over the tracks in an open agricultural landscape. Taller poles are needed to clear the existing distribution line, and there is little opportunity to screen these structures because of the open landscape. They will be most noticeable to people traveling south on Lime Kiln Road. Boyle Supp. pf. at 2-3.

524. To mitigate the aesthetic impact of the new line, pole heights will be kept as low as possible. If possible, the 115 kV pole will be set north of GMP pole 18 to avoid placing a tall 115 kV pole at the height of the land at the west end of the bridge. Plantings will also be provided between Lime Kiln Road and the 115 kV pole west of the bridge. Boyle Reb. pf. at 11.

525. Ms. Vissering agrees with VELCO's proposed mitigation at this location. Vissering Surr. pf. at 9.

Plank Road Crossing (Vergennes Reroute Mile 0.9)

526. The road crossing at Plank Road in New Haven is an area of transition from agricultural to residential land use. From the east, the line will be well screened on both sides of the road with brush and trees. As one approaches the tracks from the east, the screen opens to the left but the poles along the track will be in the driver's peripheral vision. A tall pole on the north side of Plank Road will be necessary to clear the existing distribution line, which is already high because of railroad clearance requirements. The new 115 kV pole will be somewhat mitigated by an existing fifty foot high hedgerow of trees to the north of the crossing on the east side of the tracks. There will be some backgrounding from the west as well as a screen from the east. This is an on-grade crossing with stop

signs which requires the driver's attention. There are no residences in the immediate vicinity. Boyle Supp. pf. at 3.

527. Mitigation will include utilizing reduced pole heights and routing the line over to the east side of the railroad tracks at the Plank Road clearing. The east side of the tracks will offer better screening for the line. Boyle Reb. pf. at 11-12.

South Middlebrook Road (Vergennes Reroute Mile 1.4 to 1.5)

528. At the road crossing over the bridge on South Middlebrook Road in Ferrisburgh, the railroad is in a relatively deep cut with homes on both sides of the track to the east of the road. One house on the west side of the tracks is approximately one hundred feet from the proposed line. This is a suburbanizing landscape with houses along both sides of the dirt road. The railroad is flanked with brush and a few trees and the bridge is narrow enough to require the driver's attention. Boyle Supp. pf. at 3.

529. The line will continue to be routed east of the railroad tracks from the Plank Road crossing. A pole will be placed approximately 100 feet back from the road midway down the slope in the railroad right-of-way, and it will need to be tall enough to clear the distribution line on the west side of the bridge. The line will cross over the bridge diagonally to a new structure in the railroad right-of-way near the top of the slope on the south of the tracks, and then it will proceed west on the south side of the tracks to Monkton Road. Boyle Reb. pf. at 11-12.

530. VELCO's proposed mitigation includes planting 5 pines at the top of the embankment south of the tracks and east of the road to screen the angle pole on the north bank as viewed heading north toward the bridge. VELCO will also plant street trees in the road right-of-way where it will not conflict with the distribution line north of the bridge on the east side. Boyle Reb. pf. at 12.

Monkton Road (Vergennes Reroute Mile 2.5 to 2.6)

531. Continuing to follow the railroad, the line crosses Monkton Road in Ferrisburgh. The railroad crossing is on grade with warning lights. There is a house on the west side of the tracks necessitating an angle structure to move the line from the southwest side to the northeast side of the road/railroad intersection. The line will cross on two relatively tall poles in order to clear distribution and telephone lines. The transmission line needs to cross the railroad at this location because of another house and barns on the south side of Monkton Road and east of the railroad. There is good screening on the Monkton Road approaches in both directions. Mitigation will include selective clearing and careful pole placement to minimize skylining. Boyle Supp. pf. at 3-4.

Reed Road (Vergennes Reroute Mile 2.7)

532. In the vicinity of Reed Road, the originally proposed reroute ran on the north side of the railroad corridor, the side closest to the Reed Road residences. To mitigate the impact to these houses and avoid a 40 foot tall Norway spruce hedgerow, the line will be rerouted north of Monkton Road to angle across to the south side of the tracks around mile 2.7, and it will continue west for one span before returning to the north side. Boyle Reb. pf. at 12-13.

Route 7 (Vergennes Reroute Mile 2.8 to 2.9)

533. The corridor crosses Route 7 in an open stretch of highway. Boyle Supp. pf. at 4.

534. There is a new telephone line on the west side of the highway. Boyle Reb. pf. at 13.

535. VELCO's proposed mitigation measures will include planting roadside trees and utilizing lower poles if possible; if the telephone line requires more clearance than that required to cross the highway, VELCO will underground it if it is feasible to do so. Boyle Reb. pf. at 13; VELCO Reb. Exhibit TJB 2-2.

Route 22A (Vergennes Reroute Mile 3.4 to 3.5)

536. South of Route 22A, the line runs on the east side of the tracks to the industrial complex that includes Kennedy Brothers and the grainery in the City of Vergennes. After passing the grain elevator, an angle structure will support the conductors that cross over Route 22A just south of the railroad trestle. This span would be approximately 450 feet to the take off pole into the Vergennes 115 kV VELCO substation located near Kayhart Crossing. Boyle Supp. pf. at 4.

537. David Raphael has testified that additional roadside plantings and screening should be considered in this area. Exhibit DPS-DR-10 at 31.

538. Ms. Vissering also recommended that foreground plantings be considered along Route 22A if there is room. Vissering Surr. pf. at 10.

539. Given the industrial nature of the south side of Route 22A, though, additional mitigation such as the plantings suggested by Mr. Raphael and Ms. Vissering will be unnecessary to avoid an adverse impact. Boyle Reb. pf. at 13.

South Slang (Little Chicago Road Reroute Mile 0.7 to 0.8)

540. The line will follow the existing 34.5 kV corridor across the Slang. The west side of the Slang is growing up to thick brush and trees since it is no longer pasture. The Slang area is not a generally visible area. Its primary access is up the Slang from the north via water. The Slang terminates about 1500' south of the transmission line crossing, where Otter Creek descends through a rocky gorge which can be seen from the railroad bridge at Little Chicago Road. A viewshed analysis of the area using orthophotos and topography indicates that there is a limited viewshed from surrounding areas. VELCO Exhibit TJB DD-2 at Section 5.

541. The proposed VELCO 115 kV structure will be about 80 feet from the water's edge versus the approximately 20 feet with the existing GMP Pole. Pole 22 on the east bank of the Slang will be in the approximate location of the existing GMP pole about 40 feet

from the east edge of the Slang. The horizontal array of conductors will be less obtrusive than stacked conductors for boaters on the Slang. Selective clearing and vegetative management is planned from pole 17 to pole 23, removing only danger trees. VELCO Exhibit TJB DD-2 at Section 5.

542. VELCO will also install a raised wooden platform at the top of H-frame structure on the west side of the Slang to allow the osprey to build a new nest atop the new structure without interfering with the safe operation of the 115 kV line. The existing nest would be removed when it is unoccupied (November through February) in preparation for construction of the new line. Dunn/Harr Surr. pf. at 6.

543. Mr. Donovan recommends that the line be placed underground and underwater as it crosses the Slang. Donovan DD pf. at 1-4.

544. Mr. Donovan has acknowledged that he has not evaluated the cost, environmental or technical implications of his proposals. Tr. 11/9/04, Vol. I at 69 (Donovan).

Round Barn Farm Neighborhood (Mile 9.8 to 10.3)

545. As the line nears the Round Barn Farm subdivision, VELCO will mitigate the potential for aesthetic impact by using the shortest poles possible, allowing the line to more closely relate to the tree line as seen from the development. Boyle Reb. pf. at 14.

Town Line Road (Mile 13.3 to 13.4)

546. Town Line Road is an infrequently traveled road serving three or four residences to the west of the tracks. VELCO Exhibit TJB-4 at 9.

547. At Town Line Road, the existing 34.5 kV carries a distribution line 6 spans or approximately 1500 feet. VELCO will use the shortest poles possible in this area. Using short poles in this area will require nearly as many spans as the current 34.5 kV line, but it will keep the line low for the first half mile in Charlotte. This will minimize the visual impact on the open field located between South Greenbush Road and the tracks (GMP pole 315 to 309) that was recently purchased by the Charlotte Land Trust. A taller pole

will be required at the crossing, however, to clear the Town Line Road distribution circuit. Boyle Reb. pf. at 15.

Thompson's Point Road (Mile 14.9)

548. At the point where the corridor will cross, Thompson's Point Road is separated by a hedgerow from Greenbush Road. Existing vegetation to the west provides a background for the taller poles that may extend above the hedgerow. The crossing pole will not have to clear a distribution line since it is underground in this location. VELCO Exhibit TJB-4 at 9.

549. To mitigate any aesthetic impact, VELCO will use lower poles from GMP pole 302 (mile 14.3) to the Thompson's Point Road crossing, a distance of 3000 feet, bringing the tops of the poles below the trackside tree line (visible across Land Trust conserved property as viewed from South Greenbush Road). At Thompson's Point Road, taller structures will resume with the south side pole set back from the road edge 70 to 100 feet. This pole would be screened from the west by five bur oak trees along the edge of the right-of-way. Boyle Reb. pf. at 15.

Ferry Road/Waldorf School (Mile 16.5 to 17)

550. Mitigation proposals for this segment of the Project will be included with VELCO's December 17, 2004 filing.

Greenbush Road (Mile 18.2 to 18.3)

551. At the crossing over Greenbush Road, the existing 34.5 kV line continues along the railroad track, while Greenbush Road drops under the railroad trestle. At present the distribution lines following Greenbush Road are very visible because taller poles are required to clear the train tracks and the existing GMP 34.5 kV conductors. VELCO Exhibit TJB-4 at 10.

552. To mitigate additional visual impact from the 115 kV line, VELCO will use lower poles from approximately mile 18.0 to 18.8, minimizing exposure from north Greenbush Road

and conserved land to the east and west. The location of the first pole north of the underpass will likely be placed near GMP pole 239 so that vegetation at Holms Creek will block the view of the line as one descends North Greenbush Road toward the underpass. VELCO will locate the 115 kV pole in the vicinity of GMP pole 242 so it will not be a focal point when exiting the parking area that serves the Charlotte Nature Park. VELCO will also consider crossing the tracks north of the bridge between GMP pole 239 and 238 and following the east side of the tracks. Boyle Reb. pf. at 16.

Bostwick Road (Mile 20.4)

553. At the Bostwick Road crossing, the existing GMP 34.5 kV pole at the bridge over the railroad is high enough for the 12.5 kV feed from the north to clear the roadway. The two 12.5 kV poles crossing the tracks easterly to feed the Wake Robin transformer on the southeast corner of the bridge are sky-lined heading in both directions on Bostwick Road. The hedgerow south along the tracks is tall enough to screen the spacer cable heading south, but the top of the 115 kV poles will exceed the tree height. The view north of the bridge is screened or backgrounded by mature trees. VELCO Exhibit TJB-4 at 11.

554. VELCO's proposed mitigation at this location will include the undergrounding of distribution lines in the vicinity of the bridge with under-bridge conduits to the east as well as to the north that GMP is currently installing. The distribution line will continue south of the bridge to a riser pole and then travel several spans as it currently does to serve a barn complex to the west. Lower 115 kV pole heights will be utilized at the Bostwick Road crossing and through Meach Cove. The poles on the north side of the bridge will be backgrounded by mature maples on the west side of Bostwick Farm Road. The maximum span, consistent with lower poles, will place the riser pole south of Bostwick Road behind the row of maples on the south side of Bostwick Road. Boyle Reb. pf. at 17.

555. VELCO proposes to supplement the trees on the west side of Bostwick Farm Road with ash and red oak or pin oak to match the existing roadside plantings. Tr. 11/8/04, Vol. II at 69-70 (Boyle).

556. From the east, the pole on the south side of Bostwick Road (Pole 37) will be masked by new foreground trees that will fill the gap in the existing roadside planting. Four trees of 3-3.5 caliper and matching species will be set at the same spacing as the existing trees; although set several feet below the road, the tree crowns at 20-22 feet will provide substantial mitigation by blocking the line of sight to the riser pole 37, which is 70 feet tall. From the west, the first pole north of Bostwick Road, pole 38(1), will be visible; it could be moved north to lessen its visibility, but it would be taller. VELCO Exhibit TJB DD-2 at Section 7.

557. David Raphael is in agreement with the mitigation measures proposed by VELCO; he notes that the fact that the line does not affect the westward view for travelers, whose view does not open up until after clearing the bridge, assures that the Quechee test will be met in this location. Raphael DD pf. at 11-12.

Fletcher Lane Reroute / Meach Cove (Mile 21.5 to 22.0)

558. To avoid the Fletcher Lane neighborhood, the corridor will be rerouted from the originally filed route to the west side of the McCabe Brook wetland behind the houses. The line will depart the 34.5 kV corridor at mile 21.56 and head northwest for two spans. The line will then angle north-northwest along the edge of the wetland, finally turning to the northeast to rejoin the existing corridor at mile 22.0, north of the Davis Park neighborhood. The visual impacts of the 115 kV line be minor since the area is predominantly a wetland associated with McCabe Brook. The entire Fletcher Lane bypass will require limited clearing because of low growing wetland species. The angles of the proposed line as well as the alder vegetation, which is close to Harbor Road and above eye height, will make it difficult to see the poles from Harbor Road. Boyle Supp. pf. at 6-7.

559. Lower poles will be used in Meach Cove, reducing any impacts to Shelburne Museum and Shelburne Farm. Boyle Reb. pf. at 17.

560. David Raphael has testified that VELCO's proposal will successfully mitigate the impact of the line, provided that VELCO utilize careful pole placement and minimum possible pole heights and that the corridor undergo the least amount of clearing necessary. Raphael Surr. pf. at 9 and 14.

561. Furthermore, the Department for Historic Preservation stated that, though the proposed line will be visible from limited portions of Shelburne Farms, the Shelburne Museum and the Meach Cove Trust property, the proposed line will have a minimal and limited impact on the significant views of or from these resources. This is due to the fact that views of the proposed line from the resources will be intermittent and largely obscured by vegetation, and, in many cases, there exists modern construction that constitutes more visible and eye-attracting intrusions on the landscape. 11/15/04 DHP letter to Board at 5.

562. Ms. Henderson-King has not made any recommendations as to how to improve the proposed corridor beyond the suggestion that the line be undergrounded from mile 20.3 to the South Burlington town line. She has presented no testimony on the cost or environmental and technical feasibility of her proposal. Henderson-King pf. at 42-43.

Harbor Road (Mile 22.0 to 22.7)

563. The area around the crossing of Harbor Road into the Shelburne substation is wetland, with existing distribution on the north side of the road. To mitigate the impact of the 115 kV line, the distribution line to the Arbors will run to the west off Harbor Road rather than double circuit under the 115 kV line. This will allow a lower 115 kV pole to be set further back on the south side of the road, and it will avoid distribution crossing the road. There will be wetland plantings up to 15 feet in height on the south side of the road crossing to screen the view south. VELCO Reb. Exhibit TJB 2-6.

Bay Road (Mile 23.9 to 24.1)

564. This section, paralleling Bay Road, is exposed to travelers on Bay Road and to the residences on both sides of Bay Road. The distribution lines create most of the visual clutter in this area. VELCO Exhibit TJB-4 at 14.

565. VELCO has proposed two options to mitigate the aesthetic impact of the 115 kV line along Bay Road. The first option would place the distribution facilities underground for this section of Bay Road, and the second would underbuild the distribution circuit on the proposed 115 kV structures. VELCO Exhibit TJB DD-2 at Section 8.

566. The preferred aesthetic solution, if cost is not considered, is to underground the distribution lines on the west side of Bay Road from Bay Field Drive, on the north, to a riser pole south of Bay Road near the railroad underpass. Conduits to pad mounted transformers on the east side of Bay Road would allow the optimum location and height of transmission poles. Underground distribution would be closer to the road in the right-of-way. This option would be a marked improvement to the area. 115 kV pole 35 would be placed 15 feet south of Bay Road, and the riser pole would be 10 to 12 feet southwest of the transmission pole to serve GMP distribution west to GMP Distribution pole 18 and western Bay Road. A street light would be located on pole #35 to replace the existing light on the GMP pole. Screening for the selectively cleared area would be reinforced by hemlock planting in the corridor around these poles. A row of 19 flowering crabapples would be planted along the roadside to screen views of the line. These would be set back from the road edge 15 feet and are likely to be under the transmission line or the underbuild option. A plug of Amur Maackia would be planted as a plug at the railroad underpass. VELCO Exhibit TJB DD-2 at Section 8.

567. In the underbuild option, the distribution line on the transmission poles would start at VELCO 115 kV pole 36A and proceed three spans to the south to pole 35 on the south side of Bay Road. The underbuild would depart pole 35 to a riser pole. The underbuild alternative requires that the transmission pole be taller at the curve of the road. This pole

(35) would also carry the street light necessary to light the curve and the underpass. The mitigation plantings would include Amur Maackia and crabapple trees as discussed above, since the proposed crabapples would not interfere with distribution clearance. Poles south of Bay Road would be planted with 10 hemlocks starting at 6 to 7 feet to plug the corridor. Selective clearing and vegetative management for the corridor south of pole 35 in both options is proposed. VELCO Exhibit TJB DD-2 at Section 8.

568. While the first option with underground distribution is a better aesthetic alternative, the underbuild option also satisfies the Quechee Test and is less expensive than undergrounding the distribution lines. VELCO Exhibit TJB DD-2 at Section 8.

569. Underbuilding the distribution lines would cost approximately $73,900, not including the cost of relocating the Adelphia and Verizon lines. It is estimated that undergrounding the distribution lines would cost $492,000, not including the cost of undergrounding Adelphia and Verizon's lines. Dunn/Harr DD pf. at 7.

570. Adelphia estimates that it would cost approximately $25,000 to underground its facilities in this section of Bay Road. Tr. 11/8/04, Vol. I at 40 (Dunn).

571. Either of the mitigation proposals above will meet the criteria of the Quechee test in this area. VELCO Exhibit TJB DD-2 at Section 8.

572. David Raphael initially testified that either Bay Road proposal would satisfy the Quechee test. Raphael DD pf. at 12-13.

573. Mr. Raphael subsequently changed his opinion and testified that the underbuild option would not be sufficient to avoid an undue adverse impact, due primarily to increased pole heights. Mr. Raphael acknowledged, though, that he had performed no sight lines, studies, or simulations to inform his change of opinion, and that he had not examined VELCO's design detail filings to determine which poles would increase in height and how much taller they would be. Mr. Raphael also opined that the cost of undergrounding the distribution lines would be reasonable, even while admitting that he did not, in fact,

know what the incremental cost of undergrounding would be. Tr. 11/9/04, Vol. II at 35-39 (Raphael).

Mariner's Bay to Palmer Court (Mile 24.2 to 24.8)

574. From Mariner's Bay, the line runs north on the east side of the railroad tracks with little impact until it reaches the houses at the end of Lakeview Drive and Palmer Court. The 115 kV upgrade will reduce the number of poles in this segment, due to the larger span widths. Mitigation in this section will include careful pole placement, recognizing that higher structures will be required to cross over distribution lines at Champlain Drive (mile 24.5) and Palmer Court (mile 24.8). The poles will be set back from the crossing 50 to 70 feet, removing them generally from the westbound travelers' cone of vision at these crossings and still allowing them to clear distribution lines. VELCO Exhibit TJB-4 at 14.

Wild Rose Circle (Mile 24.8 to 25.2)

575. In this section, the line passes by Wild Rose Circle, a trailer park, and a recently completed assisted living project before entering the commercial and industrial district of South Burlington. Careful pole placement and selective vegetation management near residences and at road crossings will prevent adverse aesthetic impact. VELCO Exhibit TJB-4 at 15.

Queen City Tap (Mile 25.2 to 25.4)

576. The line passes commercial and industrial properties on either side of Pine Haven Shores Road before approaching the angle structure at the Queen City Tap. At this point, the proposed line will join the existing steel double davit arm poles and replace the existing 34.5 kV circuit on the eastern side davits. Mitigation in this section will include careful pole placement and selective vegetation management, recognizing the railroad clearing and sight distance at Pine Havens Shore Road. VELCO Exhibit TJB-4 at 15.

Granite-Barre Line Reconductoring

577. The proposed Granite-Barre reconductoring will not have an undue adverse visual impact. The reconductoring, which will involve retrofitting the "H-frame" structures with cross brace members, will result in a visual change, but it is a relatively minor change to an already existing transmission line. Boyle pf. at 24.

NRP Substation Upgrades

West Rutland Substation

578. Though there is some visibility from local roads, the West Rutland substation is generally backgrounded against the hillside from Whipple Hollow Road and Pleasant Street. The proposed upgrade will not create an adverse visual impact. The addition of two breakers and disconnect switches at this previously expanded 345 kV substation facility will not be visually noticeable. The spruce and pine planting recommended in the PSB Docket No. 6479 Certificate of Public Good and executed in 2003 will add screening to the substation. Boyle pf. at 15; VELCO Exhibit TJB-3 at 3.

579. David Raphael suggests that additional screening of the substation is necessary. Exhibit DPS-DR-1 at 11; Raphael Surr. pf. at 2.

580. VELCO has proposed additional screening. In addition to the evergreen plantings approved by the Board in Docket No. 6479, VELCO has recommended supplementing the evergreen plantings north of the substation to break the view of the 345 kV structures exiting the north side. VELCO Exhibit TJB-3 at 3.

New Haven Substation

581. The proposed New Haven substation improvements "fit" in the context of the existing use, and the additional screening that is planned should adequately mitigate the visual impacts. The current substation site was originally chosen, in part, because of its location under an existing transmission corridor (the Middlebury to Essex 115 kV circuit), and because the existing landscape could effectively minimize the impact on aesthetics.

There is currently a hedgerow to the north and some screening to the south of the substation. The existing vegetation, which is not fully mature, partially screens the substation from views from Route 17 and Town Hill Road to the east. The site was planned to be depressed, so that the horizon line from the north and east of the lot would be higher than the grade at the south end of the site. This land form lowers the site below normal lines of sight and, coupled with the vegetative screen, minimizes the visual impact from Route 17. Boyle pf. at 15-17.

582. In choosing the existing substation site, four sites were selected for study and were carefully analyzed. The current site was chosen specifically because it presented the best options to effectively minimize any effect on aesthetics. Docket No. 3494, Order 8/31/71 at Finding No. 3.

583. With the Project upgrade, the site will expand to the east and south of the existing substation yard and will utilize a low profile "A frame" for the 345 kV circuit. The 345 kV yard expansion will remove most of the existing softwood screen to the south. Since the new yard will be on grade with the existing yard, it will also be in 7-8 feet of cut on the north side and fill on the south side. Boyle pf. at 16.

584. Mitigation at the site will include berms (10 to 12 feet in height) on the east and south sides, with plantings from 5 to 16 feet in height. The plantings, in addition to the berm height, will provide a substantial screen from Town Hill Road to the southeast. The northern hedgerow will be supplemented with cedar, and the hardwood screen to the north of the 345 kV expansion will be underplanted with hemlock to provide a winter screen. The existing screening material and new proposed screen plantings will further reduce the apparent height of the proposed "A frame" structure. VELCO Reb. Exhibit TJB 1-13A.

585. In its design detail filing, VELCO expanded its proposed mitigation to address concerns of New Haven and DPS with respect to views of the substation from the New Haven Village and Town Hill Road. The plantings on the east side of the substation will be

extended northerly, and VELCO will introduce additional hemlocks as an understory in the existing hedgerow. To further mitigate the view from Town Hill Road, VELCO proposed planting 40 street trees at 40 feet on center. The street trees would be patmore ash, a proven dense dark green canopy hybrid of green ash, which is a native tree and has been used successfully on roadsides and is adaptable to the Addison County clay. These will offer a roadside screen of the substation and the existing and proposed circuits west of Town Hill Road. A sight-line test performed by VELCO from Route 17 indicated that the existing hedgerow is about 50 feet tall and screens most of the substation expansion from that location. Additionally, 15 willows will be planted in the drainageway northeast of the substation at the east end of the field fronting on Route 17. This willow hedgerow will be at right angles to views from the village area and in time will tend to reinforce the deciduous hedgerow north of the substation. Willows will be used because their dense twiggy branches provide an effective winter and summer screen and should readily adapt to the wet soils of the drainage way. VELCO Exhibit TJB DD-2 at Section 3.

586. Ms. Vissering agrees with the proposed berm on the south side to screen views from Town Hill Road. However, Ms. Vissering suggests that moving the substation west and south would offer better mitigation options. Vissering DD pf. at 7-8.

587. While Mr. Raphael has testified that moving the substation would improve aesthetic mitigation options, he has stated that he is unsure that it would result in a significant reduction of aesthetic impacts. Mr. Raphael opined that the existing substation can be sufficiently mitigated and that the aesthetic benefit of moving the substation should be weighed against the additional cost. Raphael Surr. pf. at 6-7.

588. Mr. Boyle also testified that moving the substation would provide some aesthetic improvements, but that the current site can be sufficiently mitigated so as not to create an undue adverse impact. Mr. Boyle agreed with Mr. Raphael that the cost of moving the substation should be weighed against the aesthetic benefits. Boyle Reb. pf. at 10.

589. The cost of moving the New Haven substation to the site suggested by Ms. Vissering would be between $1.8 and $2.3 million. Dunn Surr. pf. at 6.

590. The approximate cost of the mitigation currently proposed for the New Haven substation would be $100,000. Tr. 11/8/04, Vol. II at 21 (Dunn).

Vergennes Substation

591. The new Vergennes substation lot is a flat plateau mostly screened by softwoods and hardwoods to the south and west, offering excellent screening from Route 22A and the surrounding area. The angle structure at the tracks will fit in with the existing grain elevator. Because of the road curvature and a proposed evergreen planting near the top of the highway embankment west of Route 22A on the proposed site, the substation will be well screened from 22A. The substation can be screened from the proposed railroad station/commuter lot on the east side of the tracks by existing and proposed vegetation west of the tracks. The GMP 34.5 kV line, which connects to the existing GMP Vergennes Substation, would exit the substation northerly for two spans, then angle to the west ninety degrees to follow an east-west lot line and a driveway for approximately 1600 feet to the existing 34.5 kV GMP corridor on Botsford Road. Boyle Supp.pf. at 4-5.

592. Mitigation of the substation will include selective clearing and screen planting along the east and north sides. VELCO Reb. Exhibit TJB 2-3 & 2-4.

593. The substation will be placed as far south and west on the parcel as practicable to ensure that screen planting is effective from Route 22A and that the substation is adequately screened from the relocated historic train station. Boyle Reb. pf. at 13.

Ferrisburgh Substation

594. The proposed upgrade of the Ferrisburgh substation will not create an adverse visual impact. The existing Ferrisburgh substation is located on the north side of Long Point Road, just west of the railroad tracks. The substation is currently completely exposed from both directions, since it is not screened. To the east is a parking lot associated with

another industrial building and to the west is open agricultural land. Adding the 115 kV equipment will increase the substation area to the north, south, and west into an existing agricultural field. The control building is proposed at the rear of the yard, and the new substation will be a low profile design. Boyle pf. at 18-19.

595. VELCO has proposed planting a white cedar hedge around the perimeter fence to partially screen the substation from the east and west. Maintaining the hedge at 12 - 14 feet, all but the new 58 foot "A frame" take-off structure will be screened, which will be a visual improvement to the current situation. An industrial light grey color will reduce the visual impact of the control building. Since the majority of the equipment is below 20 feet tall and is simpler and lower in profile than the existing 34.5 kV lattice structures, which will be removed, the overall appearance should be an improvement. Although somewhat exposed, the proposed configuration will be neater than the present condition of the 34.5 kV yard. Boyle pf. at 18-19.

596. Swamp white oak will also be planted in the foreground to provide some winter as well as summer screen. VELCO Reb. Exhibit TJB 2-5.

Charlotte Substation

597. The Charlotte substation will be relocated north to a new site adjacent the railroad at mile 17.0, which is approximately 850 feet north of the existing substation. The relocation of the substation will put it out of the cone of vision for travelers on Ferry Road. In its new location, it can be readily screened with planting to the southwest of the substation. The substation will also be backgrounded by topography and vegetation. The removal of the existing substation will allow for flexibility in the location of GMP's 12.5 kV distribution poles as they serve east and west along Ferry Road. Boyle Supp. pf. at 6.

598. VELCO will move the substation west, consistent with wetland limitations, to allow for a suitable evergreen screen along the east side to address the concerns of the town and the Lynrick Road neighborhood to the east. Boyle Reb. pf. at 16.

599. Mr. Donovan agrees that the proposed relocation of the substation, with mitigation planting, will be less visible than its present site. Donovan Supp. pf. at 3-4.

600. Mr. Donovan proposes, however, that the substation be relocated to another site south of Ferry Road and the Waldorf School. Donovan Reb. pf. at 2.

601. The Town of Charlotte has failed to perform any environmental, archaeological or historical analysis of its proposed substation site, nor has it considered how distribution lines would be routed from the proposed site or what the potential aesthetic impact of the substation would be. Tr. 6/11/04, Vol. I at 64-65 & 68 (Bloch).

602. To place the substation in a barn-like structure, gas-insulated switchgear would be used and the overhead transmission line would transition underground to enter and exit the building. Burns and McDonnell has estimated that it would cost approximately $800,000 more than the estimated cost of the relocated Charlotte substation. Given the availability of other mitigation measures and the additional cost, placing the substation within a building would be an unjustified expenditure of ratepayer money. Dunn Reb. pf. at 15.

Shelburne Substation

603. The existing Shelburne substation site is adjacent to Harbor Road, approximately ¾ of a mile west of Shelburne village. The site is approximately 45 feet from the edge of the pavement and is bounded on the east by a small stream and wetland. The north and west sides of the site are screened by dense vegetation, consisting of underbrush and small trees. The historic and culturally significant "Ticonderoga Haul Road" to the north of the substation currently provides the route for the existing GMP 34.5 kV circuit. The southwest corner of the substation is screened by vegetation. The south side of the site is a gravel pull-off area for access to the site. The south and east are exposed to travelers on Harbor Road. Boyle pf. at 20-21.

604. The substation will be expanded and reconfigured to avoid conflicts with the Ticonderoga Haul Road recreation path. The new substation arrangement reduces some of the visual clutter by introducing electrical cabinets and underground electrical

connections, and due to the proposed changes there will be more opportunity to provide concealment from the recreation path to the west and from Harbor Road on the south. Mitigation will include plantings to screen the yard from the east, the road frontage to the south and the recreation path on the west. These plantings will consist of wetland species on the east side along McCabe Brook and evergreen plantings in the six to eight feet range on the south and west sides. Boyle Supp. pf. at 7.

605. As the line leaves the substation (mile 22.3) up to mile 22.6, pole heights will be minimized so as not to exceed the height of the background vegetation along the Nature Conservancy wood line. Boyle Reb. pf. at 17-18.

Queen City Substation

606. The existing Queen City substation site is situated on the corner of Queen City Park Road and Central Avenue in South Burlington. The area to the north is industrial. To the south there is a stand of deciduous trees and a residential community. GMP's Queen City substation is located across the tracks to the east. The VELCO Queen City substation is separated from Central Avenue to the west and Queen City Park Road to the north by deciduous trees. A foot trail runs just to the north along the Queen City Park Road and Central Avenue frontage. The substation area will expand north, south and east. The incoming 115 kV lines from Williston and New Haven will both enter the substation from the east. The ring bus will be of lattice construction about 50 feet tall. The vegetative screening around the yard will substantially screen the new facility from the two adjacent streets. The Water District recently (2000) installed a cedar hedge along the south property line which screens the substation from the views from the south. They also planted a row of cranberry viburnum, a native deciduous shrub that will grow to 10 feet tall, on the north side of the clearing. These plantings should provide a sufficient visual screen. Boyle pf. at 21-23; Boyle Supp. pf. at 7.

607. If visual openings are apparent post-construction, VELCO will add plantings to improve screening. Boyle Reb. pf. at 18.

VELCO Williston Substation

608. The Williston substation site is vegetated on the east side by a dense screen of mature pines that provide a screen from residences on the Route 2A frontage. The west side is screened by a wooded slope of evergreen trees only broken under the 115 kV tap. To the north is the clearing under the 115 kV line from the Essex substation. On the southeast corner there is a hedgerow of young trees and underbrush. This area opens to a field and clearing under the 115 kV lines coming in from the south. The substation is also partially visible from a few houses on Chaloux Lane, a residential development southwest of the site. The exposure to these views is not significant. Modifications to the electrical equipment will consist of an expansion of the 115 kV bus to a three-position ring bus. The existing control building will be doubled in length using the same material and color to accommodate new protective equipment. The modifications proposed will require expanding the enclosure fence by about 44 feet to the north, 34 feet to the south, and 57 feet to the west. The existing hedgerow located on the east side of the substation provides an immediate screen for most of the expansion from residences to the east along Route 2A. Additional plantings on the south side of the substation will provide a screen from the residences on Chaloux Lane, and a supplemental planting on the east side will reinforce the existing softwood hedge. VELCO Exhibit TJB-5 at 1-2.

609. The proposed upgrade of the VELCO Williston substation will not create an adverse visual impact. Boyle pf. at 23-24.

VELCO Essex Substation

610. The Essex substation was recently expanded to include a FACTS device in the southeast corner of the substation yard. Proposed modifications to the electrical equipment include one new 115 kV breaker with associated disconnect switch and 115 kV bus work. No expansion of the substation is required, and the minor addition of 115 kV equipment will not be visually significant. No mitigation is needed since the small area of expansion is already substantially screened by pines. VELCO Exhibit TJB-5 at 2.

611. The proposed upgrade of the VELCO Essex substation will not create an adverse visual impact. Boyle pf. at 23-24.

VELCO Granite Substation

612. The existing Granite substation is a low profile design, with a stand of trees partially screening the substation from Town Road 30. Two transmission lines enter the substation from the southeast, and although an evergreen screen has been planted in the corridor adjacent to Baptist Street, some of the plantings have since died. To the southwest there is an open field where the expansion will occur. To the northwest there is a steep bank, sloping down to a stand of deciduous and evergreen trees. Proposed modifications to the electrical equipment consist of the expansion of the 115 kV yard to a six-position ring bus, expansion of the 230 kV yard and the addition of a FACTS device PAR and capacitor banks. The existing control building will be doubled in length using the same material and color to accommodate new protective equipment. The modifications proposed will require expanding the enclosure fence by approximately 188 feet to the southwest. VELCO Exhibit TJB-5 at 2-3.

613. There are very few neighbors and an existing buffer screens expansion to the south. Baptist Street, a gravel road with two neighbors in proximity, has sparse screening comprised of mostly deciduous trees that provide a poor screen in the winter. The Gagnon residence is to the southeast of the substation and the Dexter residence is to the south. The greatest potential visual impact of the proposed expansion is to the Gagnon property. The relocation of the 230 kV line will create a diagonal clearing at nearly right angles to the line of sight to the substation from the Gagnon property. It will extend the existing clearing for the existing 230 kV line nearly 200' south when measured parallel with Baptist Street. There are a few large trees in this section that will need to be removed, but lower trees will be retained. VELCO Exhibit TJB DD-2 at Section 9.

614. The mitigation plan for the substation was developed by VELCO in collaboration with the Gagnons and Dexters. The selectively cleared 200 foot right-of-way for the 230 kV

line will be mitigated by interplanting trees among the retained tree stems in the town road right-of-way. Hemlocks have been proposed along this section because they are shade tolerant. In the opening under the 115 kV Chelsea lines, which has some existing, effective screening, 12 more spruce will be planted to block right angle views into the substation. At the Dexter property, VELCO has proposed an 8 foot cedar stockade fence that blocks sight lines to the substation from the house. This will counter the self pruning in the mature spruce grove on the south end of the VELCO parcel. It will also provide additional sound mitigation. VELCO Exhibit TJB DD-2 at Section 9.

615. In order to reduce noise impacts and provide further screening for Mr. Dexter, VELCO has proposed a berm along the south side of the substation site in addition to the stockade fence. Tr. 11/8/04, Vol. I at 26 (Dunn).

616. Along Mr. Gagnon's north property line, a staggered row of 8 to 10 foot tall Norway Spruce will be planted, and, closer to Mr. Gagnon's house, five 10 to 12 foot river birch will be planted. On the adjoining property, belonging to Mr. Gagnon's uncle, three 14 to 16 foot pin oaks will be planted, effectively screening not only the substation from Mr. Gagnon's view but also the existing 230 kV crossing pole and the 115 kV pole that enters into the substation from the east. Tr. 11/8/04, Vol. II at 43 (Boyle).

617. VELCO has stated that it will plant further trees or develop other mitigation options should the Gagnons and Dexters have complaints following construction. Tr. 11/8/04, Vol. I at 34 (Boyle).

618. David Raphael has testified that VELCO's proposed plans provide sufficient mitigation to address the potential for visual impact at this substation. Raphael DD pf. at 13.

VELCO Hartford Substation

619. The Hartford substation is a low profile design, and it is not visible from any of the surrounding roads or from any residences. To the north of the substation is a relatively flat area that is sparsely wooded. A 115 kV transmission line enters the substation from this direction. To the east is a steep embankment that appears to be a ledge. A steep

slope under the transmission lines is open to the east. To the west, a steep bank slopes down and is heavily wooded with both evergreen and deciduous trees. There is a residential housing project at the bottom of the slope, but the substation is not visible because it is screened by the dense evergreen vegetation on the slope. VELCO proposes to add a new 115 kV capacitor bank and breaker. The existing control building will be increased in length using the same material and color to accommodate the new protective equipment. The modifications proposed will require expanding the enclosure fence by 35 feet to the east. No mitigation measures are required because the site will not be visible from surrounding roads and residences. VELCO Exhibit TJB-5 at 3-4.

620. The proposed upgrade of the VELCO Hartford substation will not create an adverse visual impact. Boyle pf. at 23-24.

VELCO Blissville Substation

621. The Blissville substation site is bounded on the north and west by a wetland. To the west there is a flat area between the edge of the wetland and the existing fence where the expansion will occur. VELCO proposes to install a 115 kV/ 180 MVA PAR device and associated equipment. The modifications proposed will require expanding the enclosure fence by approximately 65 feet to the west. The existing control building will be increased in length using the same material and color to accommodate new protective equipment. No screen planting is required since this is a remote site with no nearby residences or roads. VELCO Exhibit TJB-5 at 4.

622. The proposed upgrade of the VELCO Blissville substation will not create an adverse visual impact. Boyle pf. at 23-24.

Substation Lighting

623. Only the substations that require expanding the enclosure fences will require modifications to the existing lighting plans. The lights will be 70-watt high-pressure sodium floodlights or luminaires. The fence-mounted lights will be installed 9 feet high, just above the barbed wire. The exterior wall-mounted lights for the expanded control

buildings will be placed near the doorways. Several lights at each substation may be switched by a photo-eye. This will provide enough lighting to allow VELCO personnel to enter the substations and get to the control buildings safely at night. Boers pf. at 40-41.

624. Under normal circumstances, VELCO will have very limited nighttime lighting on at each substation. This lighting will only illuminate the front entrance to the substation and the entrance to the control building. If the control building is sufficiently far from the entrance to the substation, lights will be installed to illuminate the road from the substation entrance to the control building. The lights over the substation entrance, the control building and the inward-pointed lights all will be shielded and will be pointed in a downward position to illuminate the small area directly in front of where the light is mounted. These lights will not be bare bulbs and they will not result in glare or light pollution from the site. Dunn Reb. pf. at 13.

625. If there is emergency repair work or service restoration work that needs to be done at the substation at night, VELCO will turn on the remaining on-site lighting to provide a safe and effective workplace for VELCO personnel. Dunn Reb. pf. at 13.

626. VELCO cannot predict what federal laws or regulations may be implemented with respect to homeland security that might impact lighting of its substations or other facilities, but VELCO will comply with all federal laws and regulations with regards to lighting. Dunn Reb. pf. at 13.

627. At the Board's request, photometric plans were prepared for the New Haven and Granite substations. Both plans demonstrated that there will be no aesthetic impact from the minimal lighting planned for the substations. VELCO Exhibit TJB DD-2 at Section 3 and Section 9.

628. Mr. Raphael stated that the Granite substation lighting would not be a concern for him if the fence lights were only on for emergencies and were shielded. Tr. 11/9/04, Vol. II at 113 (Raphael).

629. Mr. Raphael also testified that the lighting planned for the New Haven substation will not result in an adverse impact. Raphael DD pf. at 6.

630. Ms. Vissering agreed that the lighting planned for the New Haven substation will not result in an adverse impact. Vissering DD pf. at 7.

Undergrounding Proposals

631. There are several locations where one or more of the aesthetics experts contends that the Board should take into consideration the option of undergrounding transmission lines. Based on findings 416 through 630 above and 632 through 667 below, it is evident that 1) the proposed transmission lines can be sufficiently mitigated through generally available options to avoid an undue adverse impact without placing the line underground, and 2) the cost, reliability, and aesthetic tradeoffs associated with the current technology for placing 115 kV and 345 kV lines underground are such that undergrounding is not a reasonable mitigation option for this project.

Cost Recovery (PTF) for Undergrounding

632. On July 31, 2003, ISO-NE and NEPOOL filed the "One Hundredth Agreement Amending New England Power Pool Agreement" (the "Transmission Cost Allocation" amendments or "TCA" amendments) with the Federal Energy Regulatory Commission ("FERC"). VELCO Cross ISO-13.

633. This filing replaced the "15.5" cost allocation review process with the new "Schedule 12" approval process. LaForest Surr. pf. at 2.

634. Under Schedule 12C, if the costs of the project increase by 10% or the design of the project is "materially changed," the applicant must resubmit its proposal for review by ISO-NE to determine if the changes are "localized costs." VELCO Cross ISO-13, Schedule 12C of Tariff.

635. A "Localized Cost" is defined as "the incremental costs resulting from a RTEPO2 Upgrade...that exceeds those requirements that the System Operator deems reasonable

and consistent with Good Utility Practice and the current engineering design and construction practices in the area in which the transmission upgrade is built." VELCO Cross ISO-13, Definition 1.45A.

636. Because undergrounding would constitute a "material change" in the original proposal, ISO-NE would review the NRP anew to determine if the underground is a Localized Cost. LaForest Surr. pf. at 3-5; Tr. 2/17/04, Vol. I at 29 (Whitley); Tr. 2/26/04, Vol. II at 106-107 (Wies).

637. ISO-NE would review the Project regardless of whether the Board orders that the incremental cost of undergrounding be borne solely by Vermont ratepayers. According to the definition of "Localized Cost," it is ISO-NE's sole decision to determine whether undergrounding is a Localized Cost. Tr. 9/22/04, Vol. I at 110-111 (LaForest); VELCO Cross ISO-13, Definition 1.45A.

638. ISO-NE is likely to determine that undergrounding is a Localized Cost because (1) its Planning Procedure 4 states that a "Project [that] includes underground transmission cable, which is selected (a) at the direction of a local or state siting board, or (b) to address other local concerns, and the cost of overhead transmission lines is less expensive, taking into account all relevant costs," is an illustration of a Localized Cost, and (2) ISO-NE has stated, in reference to a proposal to underground transmission lines in Connecticut, "Because this is a customized alternative being designed to meet the unique preferences of Connecticut, it is unlikely that the additional cost can be justified as having regional benefit and therefore would not be eligible for regional cost sharing." VELCO Exhibit DL Surr-2 at 14; VELCO Exhibit DL-Surr. 5.

639. The only underground transmission line in Vermont, the PV-20 line, does not receive regional cost support and is paid for solely by the ratepayers of Vermont. Tr. 2/26/04, Vol. II at 90, 97 (Wies); VELCO Board Exhibit 3.

640. Thus, while the NRP, as it currently is proposed, remains a PTF eligible project, it is unlikely that any undergrounding of the transmission lines would be eligible for regional

cost allocation because those underground sections will likely be considered localized costs. Mertens pf. at 17; Tr. 2/17/04, Vol. I at 29, 44 (Whitley).

Environmental Impact of Undergrounding

641. Undergrounding transmission lines in the various areas proposed by the parties would contradict VELCO's efforts to avoid sensitive natural areas and to minimize impacts. An overhead powerline's impacts to wetlands, natural areas and agricultural soils are relatively minor, given that transmission lines can often span and avoid sensitive areas, that transmission structures have a small footprint, and that transmission lines do not represent a conversion of land use. Placing a line underground requires a much greater amount of soil disturbance and restoration versus the limited footprint of a pole structure powerline. Rowe Surr. pf. at 5.

642. Additionally, the equipment and related footprint necessary for the points where 345 kV transmission lines transition from above ground to underground, and vice versa, more closely resemble a substation rather than simple pole structures and can measure up to approximately 200 feet x 300 feet. Environmental and archaeological impacts of those transition points would be similar to those of a substation, requiring excavation, grading, fencing, and an access road. Rowe Surr. pf. at 5-6.

643. Detailed environmental, archaeological and aesthetic analyses would be necessary to determine the potential site impacts, design and location of each station. It is possible that more undergrounding would be necessary at road crossings to avoid locating the transition stations in naturally sensitive areas and away from roadside views. Considering the impacts from undergrounding both an existing and proposed powerline for a significant distance through areas identified as environmentally sensitive, along with impacts from transition stations and their access roads, also assumed to be located in these sensitive areas, one can no longer assume this Project would have minor impacts. Rowe Surr. pf. at 5-6.

644. Overhead transmission projects can also often avoid areas identified as archaeologically sensitive by spanning. When these areas are unavoidable, archaeological investigations are required within the area of potential impact, resulting from the installation of poles, for example. If undergrounding is proposed in broad areas of archaeological sensitivity, the entire area of potential disturbance must be archaeologically excavated, a far more intrusive process. Rowe Surr. pf. at 5-6.

645. Because undergrounding the 345 kV and 115 kV lines presents new and potentially more significant impacts on sensitive natural and archaeological resources, VELCO would need to undertake additional environmental and archaeological assessments to address the underground segments. Wetland delineations and archaeological investigations are seasonal endeavors and cannot be performed during winter months and wet spring conditions. Delaying this work would delay the filing of reports and permit applications. Rowe Surr. pf. at 6.

345 kV Line Undergrounding

646. In rebuttal testimony for the Addison County Regional Planning Commission, Ms. Vissering recommended undergrounding the proposed 345 kV line at West Salisbury Road/Route 7 (miles 18 to 20) and the Route 125/Route 7 crossing (mile 24.6 to 24.9). Vissering Reb. pf. at A12.

647. The length of 345 kV line that Ms. Vissering proposed to underground totaled 2.0 to 2.5 miles for both sites. Rowe Surr. pf. at 3.

648. Designing intermittent underground sections of a 345 kV transmission line requires careful consideration and planning. The design would depend upon and be subject to extensive system and operability studies, as well as consideration of the siting impacts associated both with the underground cables and the transition stations. Dunn Surr. pf. at 4.

649. The design considerations necessary to place the lines underground would likely result in further delays of the CPG process. Boers Surr. pf. at 10.

650. VELCO has expressed strong reservations about the additional cost of undergrounding sections of the 345 kV line. In the absence of a specific design proposal from Ms. Vissering and the ACRPC, VELCO asked David Boers of Burns & McDonnell to evaluate cost based on recent 345 kV underground design efforts undertaken by the utilities in southwest Connecticut. Burns & McDonnell has been involved with that effort on behalf of Connecticut Light & Power ("CL&P"). Based upon that review, Mr. Boers estimated that the cost to construct 345 kV underground cable at the "low end" of the scale for a potentially acceptable level of reliability required by VELCO would be approximately $4 to $6 million per mile. The total cost of undergrounding the approximately 2.0 miles of 345 kV transmission line recommended by Ms. Vissering could cost between $18.4 and $31 million ($8.4 to $12 million for the two miles of underground cable and $10 to $19 million for four transition stations). This would be $17.6 to $30 million more than the approximately $790,000 for the overhead 345 kV construction proposed at these locations, not including the potential costs associated with directional drilling that might be required in sensitive areas and under roads. Dunn Surr. pf. at 4-5; Boers Surr. pf. at 3.

651. Jay Williams testified on behalf of the Department that the estimated cost for undergrounding 1.5 miles of 345 kV line proposed by Ms. Vissering would be between $6.8 and $9.8 million in Salisbury and $4.1 to $5.2 in Middlebury, for a total of $10.9 to $15 million. Williams Surr. pf. at 3-4.

652. In addition to the construction costs, the cost of an archaeological study for an underground transmission line could be 30 to 50 times higher than for an overhead line. Mr. Douglas Frink testified that proposals to underground transmission facilities will significantly increase the cost of the archaeological studies, increase the time required to complete these studies, and increase the impact on archaeological properties. The amount of impact that a pole and access road to that pole is significantly smaller than the impacts of undergrounding. Tr. 8/4/04, Vol. I, at 21-22, 40 (Frink). Dunn Reb. pf. at 9.

653. In a hearing before the Board on September 22, 2004, Ms. Vissering testified that the cost of undergrounding should enter into consideration of its reasonableness as a mitigation alternative. Tr. 9/22/04, Vol. 1 at 52-53 (Vissering).

654. In addition to cost concerns, there would be aesthetic drawbacks to intermittent undergrounding of a 345 kV line. At a minimum, both ends of an underground 345 kV cable system would require an overhead dead-end structure to terminate the line, overhead shield wires, and an underground termination structure to support the 21 feet tall cable termination fixtures. Additionally, both ends of the underground cable would require a transition station. For the lowest-cost underground cable system to meet VELCO's reliability standards, the transition station layout would need to accommodate the ultimate installation of a 2 x 3 underground circuit termination configuration that allows isolation of either underground circuit. In addition, the transition station would require three shield masts, three disconnect switches, seven surge arrestors, seven pedestal mounted current transformers and a small control building (approximately 10' x 10') to house a remote fault location and recording capability that would allow the control center to quickly identify the faulted cable. This type of 345kV transition station would require a fenced and graded site approximately 155 feet x 230 feet. An all-season access drive would have to be constructed to the site. Boers Surr. pf. at 9.

655. On evidence of the significant increase in cost and concerns with reliability associated with undergrounding the 345 kV line, along with the potential aesthetic impact of the underground transition structures and the sufficiency of available mitigation for overhead construction, Ms. Vissering concluded in her design detail testimony that undergrounding the 345 kV line is not warranted to mitigate the proposed project. Vissering DD pf. at 5-6.

115kV Line Undergrounding

656. There have been several proposals put forth to underground sections of the 115 kV line. These include:

- Ms. Vissering's proposal to underground the line for approximately 0.5 miles from the New Haven Substation north across Route 17 (mile 0.0 to 0.5). Ms. Vissering also initially proposed to underground the existing 115 kV West Rutland to New Haven line at Route 7 in Salisbury and Route 125/Route 7 in Middlebury. Vissering Reb. pf. at A12.
- Mr. Donovan's proposal to underground the 115 kV line as it crosses the Slang in Ferrisburgh. Donovan DD pf. at 3.
- Ms. Henderson-King's proposal to underground the 115 kV line from mile 20.3 to the South Burlington Town Line. Ms. Henderson-King has expressed particular concern that undergrounding occur at the Bostwick Road crossing and at Bay Road. Henderson-King pf. at 42-43; Henderson-King DD pf. at 2-6.

657. VELCO has expressed concern about the reliability of underground 115 kV transmission both from an operational perspective and from a long term outages perspective. In terms of operational issues, VELCO believes that the introduction of an underground line segment in the New Haven to Queen City line may introduce increased operational complexity because of the possible inability to reclose this line due to concerns about subjecting the underground cable to fault current. If automatic reclosing cannot be used on this line, then temporary faults (e.g., lightning strikes) will impose customer outages that last for many minutes and perhaps longer, rather than the few seconds that is typical of lines that have automatic reclosing. Dunn Reb. pf. at 7.

658. There is also potential for long term outages in the event of a fault on the underground cable. This concern is heightened by the recommendations by the towns of Charlotte and Shelburne to have underground segments south of the Charlotte substation and north of the Shelburne substation. The particular concern is a situation where the underground segment fails south of Charlotte and then there is a subsequent failure on the segment north of Shelburne. In this scenario, while a low probability event, both towns would be

out of service until repairs are completed, which could be days or even weeks. The use of a four cable underground design would mitigate this concern. Dunn Reb. pf. at 7-8.

659. As with the 345 kV line, the cost of undergrounding 115 kV transmission is a serious consideration. The underground 115 kV line has been estimated to be five to eight times the cost of the overhead line. Dunn Reb. pf. at 8.

660. In the three locations recommended by Ms. Vissering alone, comprising approximately 3.0 miles of 115 kV line, the cost to underground is estimated to be around $7.2 million, versus $140,000 for overhead construction.[39] Dunn Surr. pf. at 5.

661. These cost estimates do not include the cost of special underground construction techniques (e.g., horizontal direction drill "HDD") that might be needed as an alternative construction technique to mitigate the potentially substantial environmental impacts associated with open trench construction. VELCO has calculated that HDD would increase the cost of underground transmission construction considerably. Dunn Reb. pf. at 8-9.

662. The cost of an archaeological study for an underground transmission line would likely be 30 to 50 times higher than for an overhead line. Mr. Douglas Frink testified that proposals to underground transmission facilities will significantly increase the cost of the archaeological studies, increase the time required to complete these studies, and increase the impact on archaeological properties. The amount of impact from a pole and access road to that pole is significantly smaller than the impacts of undergrounding. Tr. 8/4/04, Vol. I, at 21-22, 40 (Frink). Dunn Reb. pf. at 8-9.

663. Mr. Donovan has testified that a reasonable person would consider cost in evaluating whether a generally available mitigating step should be taken to reduce the aesthetic impacts of a project. Donovan DD pf. at 6.

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[39] Of the 3 miles of the 115 kV line that Ms. Vissering is recommending should be placed underground, 2.5 miles of it is existing, overhead 115 kV line that is not part of NRP and has been in place for over 30 years; the overhead construction cost represents only 0.5 miles of actual construction. Dunn Surr. pf. at 5.

664. David Raphael has testified that a reasonable person would opt for the least expensive measure to accomplish necessary mitigation. Raphael Surr. at 15.

665. Ms. Vissering testified that the cost of undergrounding should enter into consideration of its reasonableness as a mitigation alternative. Tr. 9/22/04, Vol. 1 at 52-53 (Vissering); Tr. 7/29/04, Vol. 2 at 84-89 (Vissering).

666. Mr. Boyle has testified that cost must be taken into account in assessing the reasonableness of available mitigation. Tr. 7/29/04, Vol II at 84-85 (Boyle).

667. Given the reliability concerns, unjustifiable increase in cost, environmental impacts, and availability of other mitigation to avoid an undue adverse impact, undergrounding the proposed 115 kV line in the locations discussed above is not a reasonable option for mitigation.

Discussion re: 248(b)(5) and 6068(a)(8); Aesthetics, Scenic or Natural Beauty of the Area

Based on the above findings, the Board should conclude that this proposed project will not have an undue adverse effect on the aesthetics or scenic and natural beauty of the area. In reaching this conclusion, the Board should rely on the Environmental Board's methodology for determination of "adverse" and "undue adverse" effects on the aesthetics and scenic and natural beauty as outlined in the so-called Quechee analysis. Re: Quechee Lakes Corporation, #3W0411-EB and 3W0439-EB, Findings of Fact, Conclusions of Law, and Order (Nov. 4, 1985) and the Board's subsequent Memorandum of Decision on Reconsider Motions (Jan. 13, 1986); 30 V.S.A. § 248(b)(5).

The Quechee analysis is a two-part test to determine (1) whether the project will have an adverse aesthetic effect, and, if so (2) whether the adverse effect is undue. Id.; *see also*, Re: Barre Granite Quarries, LLC, Application #7C1079 (Revised)-EB, Findings of Fact, Conclusions of Law, and Order at 79-82 (Dec. 8, 2000). A proposed project would have an adverse impact on the aesthetics of the area if its design is out of context or not in harmony with the area in which it is located. If a project "fits" its surroundings and context, it will not have an adverse aesthetic effect. Re: John J. Flynn Estate and Keystone Development Corporation, Land Use

permit Amendment #4C0790-2-EB, Findings of Fact, Conclusions of Law, and Order at 23-26 (May 4, 2004). If it is found that the aesthetic impact of the proposed project would be "adverse," the determination of whether such impact would be "undue" turns upon whether the proposed project: (1) violated a clear written community standard intended to preserve the aesthetics or scenic beauty of the area, or; (2) if it would offend the sensibilities of the average person or be "shocking", or; (3) if generally available mitigating steps were not taken to improve the harmony of the proposed project with its surroundings. Barre Granite, *supra* at 80-82. This Board's assessment of whether a particular project will have an "undue" adverse effect based on these three standards will be significantly informed by the overall societal benefits of the project.[40]

The determination of whether a proposed development "fits" within a landscape is somewhat subjective, as evidenced by the diverse opinions submitted by the aesthetics experts in this docket. However, there is guidance. In order "[t]o determine whether the Project is adverse in terms of aesthetics – whether it will 'fit' [the] context of [the] area where it will be located – the Board first must determine what that context is." Flynn Estate and Keystone Development, *supra* at 24. In that recent case, involving the proposed construction of a 148-unit condominium project on 40 acres off the Sunset Cliff Road near Appletree Point in the City of Burlington, the Environmental Board stated that it was appropriate to view the context of the project "within the larger framework of Burlington's New North End residential area," rather than in the 40-acre undeveloped parcel for which it is proposed. Id. The Environmental Board concluded that the project fit the context of the larger area and was thus not "adverse." Id. In its discussion of aesthetics in this 2004 decision, the Board quoted with approval what has been stated in prior decisions back to 1986:

> "Criterion 8 was not intended to prevent all change to the landscape of Vermont or to guarantee that the view a person sees from his or her property will remain the same

[40] The Board will consider, for example, the possible reduction in the need for a power plant, transmission investments, or other social costs. PSB Docket #6793, Town of Stowe Electric Department, May 5, 2003 Order.

> forever. Change must and will come, and criterion #8 will not be an impediment. Criterion 8 was intended to insure that as development does occur, reasonable consideration will be given to the visual impacts on neighboring landowners, the local community, and on the scenic resources of Vermont."

Id. at 25, quoting Re: Okemo Mountain Inc., #2W5051-8-EB, Findings of Fact, Conclusions of Law, and Order at 9 (Dec. 18, 1986) and citing several subsequent decisions.

In this case, while many of the proposed upgrades are sited in scenic areas, the transmission lines and substation upgrades largely follow the path of existing utility corridors. Several of the opposition witnesses have argued that these existing facilities do not "excuse" the intrusion of a new line or substation upon the landscape. Though the presence of existing transmission elements may not automatically lead to the conclusion that a new line will fit in the visual context, the Quechee Lakes decisions provided clear guidance regarding treatment of existing visual features:

> "We are directed by the language of Criterion 8 to evaluate a proposed project's impact on scenic beauty, natural beauty and aesthetics as they currently exist in the area wherein the project will be located. In evaluating an area's aesthetics we must be cognizant of all features, both natural and man-made, which contribute to existing scenery: we do not have the freedom to ignore existing visual intrusions."

Re: Quechee Lakes Corporation, #3W0411-EB and 3W0439-EB, Memorandum of Decision at 4 (Jan. 13, 1986).

This does not suggest that a new transmission line next to or in place of an existing line cannot create an adverse impact upon the aesthetics of an area – in certain locations, when viewed in a narrow context, the aesthetic impact of building a larger line or substation can be adverse. However, the Board should be cognizant that while, for instance, a portion of a condominium project may be deleted because it cannot be reasonably mitigated, the subject infrastructure must be continuous. Further, in light of the foregoing precedent, and given the existing visual intrusions in this corridor, the Board should be skeptical of arguments contending

that the proposed upgrades to transmission lines will be "shocking" or "offensive" to the average person and thus undue. Looking at the project as a whole, there clearly is nothing aesthetically shocking or offensive about a utility line within an existing utility corridor.[41]

The determination under criterion 8 thus hinges on whether the project violates clear written community standards intended to preserve the aesthetics or scenic beauty of the area or fails to take generally available mitigating steps. In regards to community standards, the Environmental Board has stated that "the board intended to encourage towns to identify scenic resources that the community considered to be of special importance: a wooded shoreline, a high ridge, or a scenic back road, for example." Re: Town of Barre, Land Use Permit Application #5W1167-EB, Findings of fact, Conclusions of Law, and Order at 21 (June 2, 1994). The Environmental Board cautions that standards applying "generally to the community at large rather than specific scenic resources in the project area" do not rise to the level of a "clear, written community standard." *Id.*

As set out in the findings above, a review of all local and regional standards and goals which have relation to aesthetics, scenic beauty and/or utilities for the areas through which the proposed line will pass revealed no extant provisions that state specific standards which would be violated by the NRP proposal. The Charlotte Town Plan states that "[i]t is the objective of the Town that all utilities will be underground" (P. 48); "the Town seeks to protect public roads with high scenic value by placing utility transmission lines underground" (P. 99); and that "the Town will explore ways to encourage underground placement of utility transmission lines" (P.99).[42] As Mr. Raphael pointed out in his initial report, though, Charlotte's objectives and policies do not constitute an absolute requirement that undergrounding be exercised, leaving open other

[41] Additionally, there is a policy in this state that, in general, electric transmission lines should be built in railroad corridors "to minimize the amount of land condemnation and maximize the effective use of land taken." Delaware & Hudson Railway Co. v. Central Vermont Public Service Corp., 134 Vt. 322, 324 (1976); see also 30 V.S.A. § 2513; Proctor v. Central Vermont Public Service Corp., 116 Vt. 431 (1951). With a few necessary diversions, the 115 kV transmission line follows the railroad corridor from New Haven to Queen City.

[42] It is fairly clear that the reference to "transmission" lines in Charlotte's Town Plan was a drafting error or misunderstanding, and that the intended reference was to distribution lines.

options for mitigation. DPS Exhibit DR-1 at 135. Moreover, in connection with its consideration of overall societal benefits, the Board should note that the cost of undergrounding the electrical service to homes and buildings is generally far less costly than undergrounding transmission lines and is paid by the individual user or a limited universe of users, as opposed to impacting rates statewide. Accordingly, the Board should conclude that the project will not violate any clear written community standards intended to preserve the aesthetics or scenic beauty of the project area.

The bulk of the testimony that has been submitted on aesthetics addresses the question of whether VELCO has taken generally available mitigating steps. The mitigation measures detailed in the findings above have been developed with the input of several expert landscape architects and have been modified to address, to a reasonable degree, the concerns of interested parties. There are, however, three broader issues that have arisen from the dialogue concerning mitigation and continue to be points of contention. They concern appropriate mitigation for land of an agricultural nature; appropriate mitigation for more developed areas; and the reasonableness of undergrounding transmission lines as a means of aesthetic mitigation.

It is undisputed that the proposed line will pass across scenic agricultural land. As Ms. Vissering notes, "the open vistas and working agricultural landscape in Addison County are unique in Vermont and perhaps all of New England." Vissering Reb. pf. at 18. It follows that the measures carried out to mitigate the proposed project should be designed to preserve these unique qualities of the landscape. The experts have differed, though, on the degree to which those measures should screen views of the transmission line as it crosses open landscape.

The working agricultural landscape demands different considerations than a scenic wilderness area or a residential area would. In In Re Blittersdorf, the Board issued a Certificate of Public Good for a wind turbine 93 feet in height in a rural area of Charlotte, agreeing with the Charlotte Zoning Board's assessment that "barns, silos, farm machinery, tall telephone poles and other large working structures with moderate noise impacts are more common in a rural environment than in a residential area." In Re Blittersdorf, CPG NM-11, May 26, 2000 Order at

17. Similarly, it is not uncommon or shocking to see transmission lines crossing a working, agricultural landscape, and, indeed, in the case of this project, transmission lines already exist along the proposed corridor. While it is appropriate to match new structures with existing structures to reduce visual impact and to supplement and retain as much of existing vegetation as possible, it would be neither appropriate nor logical to screen views of the working agricultural landscape in the name of protecting the same. Street trees and extensive plantings to screen pole structures are thus not a reasonable means to mitigate the impact of the project in most open, agricultural areas.

In more developed areas, this Board faces a different question. The majority of the sensitive areas on which the parties have filed additional design detail are sensitive due to the existing visual "clutter," including transmission lines, distribution lines, telephone wires, and railroad tracks. Though the mitigation in these more developed locations must be designed and scrutinized with care, the question of determining whether there is an undue impact becomes less difficult. A consideration of reasonable, generally available mitigation must take into account the existing state of the landscape: VELCO is required under the Quechee test to take reasonable steps to mitigate any additional impact created by the proposed project, not to improve the aesthetics of an area that is already heavily impacted. In some of these areas, such as Bay Road in Shelburne, it is clear that the mitigation proposed by VELCO will in fact represent an aesthetic improvement to the area; in other developed areas, the mitigation proposed is sufficient to prevent additional, adverse aesthetic impact.

Remaining is the question of whether undergrounding is a reasonable option for any of the locations at which it has been proposed. Setting aside the potential aesthetic impacts of the transition stations, it is clear that placing the transmission line underground could represent an aesthetic improvement over aboveground construction in many areas. The question is whether and to what extent cost, reliability, and other concerns may factor into consideration of undergrounding as a means of aesthetic mitigation. Ms. Henderson-King has argued against considering cost, contending that the Environmental Board and District Commissions do not consider cost in evaluating the reasonableness of a mitigation option, but that this Board can, in

making a final determination, decide that a particular measure is unaffordable. See Tr. 8/6/04, at 20-21. The Vermont Supreme Court's decision in In Re Stokes Communications Corporation, to which Ms. Henderson-King likely refers, notes that "in some circumstances mitigating steps may be unaffordable or ineffective. In those circumstances, it is within the [Environmental] Board's discretion to grant or deny a permit." In Re Stokes Communication Corporation, 164 Vt. 30, 39 (1995). Moreover, the Vermont Supreme Court has recognized that, under the police power, "any permit conditions the Board imposes must be reasonable." In re Quechee Lakes Corp., 154 Vt. 543 at 550 n.4.

While this Board employs the basic standard set out in Quechee Lakes, its procedure and interpretation differ significantly from the Environmental Board. Unlike the Environmental Board, this Board must consider the overall societal benefits of a project in determining whether it will have an "undue" adverse effect based on the three standards set out above. Petition of Town of Stowe Electric Department, Docket # 6793, May 5, 2003 Order at 17. This Board, then, is willing to consider extrinsic factors in deciding upon the reasonableness of proposed mitigation. As the Board has discussed recently, there are two ways in which this can be accomplished: "we could either (1) consider the project's overall societal benefits in the course of applying the Quechee test, as we have regularly done, or (2) conduct the Quechee analysis without regard to the project's benefits and then give the Quechee results "due consideration" along with the project's benefits, in determining whether there is an undue adverse impact under Section 248(b)(5)." Petition of UPC Wind Management, LLC, Docket #6884, April 21, 2004 Order at 21. This Board concluded that "[h]owever the order in which these factors are considered, either way, the project's benefits are relevant to determining whether there is an undue adverse impact." *Id.* In this case, then, it follows that it would be appropriate to weigh societal benefits in determining the reasonableness of proposals for undergrounding Project elements.

In the so-called Queen City Tap case in 1972, this Board considered proposals to underground a 115 kV transmission line in South Burlington. Finding that undergrounding was not warranted at that time, the Board stated:

> "the Board is continually hearing petitions for rate increases in which the public strongly protests higher rates. To many Vermonters of limited means, the cost of such essential service, such as electricity, is a very important element in their economy and one that the Board is bound to consider in rate cases and, we believe, also in these cases."

Despite the passage of thirty years, the Board's characterization at that time still holds true: maintaining reasonable electric rates is a significant societal benefit that the Board must consider. In this case, given the substantial incremental cost of undergrounding over other mitigation options, as well as the likelihood that Vermont ratepayers will bear most if not all of that cost, this Board must seriously weigh the expense against the aesthetic benefits of undergrounding. Considering cost alongside concerns of decreased reliability and additional environmental impacts, and also noting that the Project can be sufficiently mitigated by other means, placing the subject transmission lines underground is not a generally available means of mitigation that a reasonable person would choose in these locations.

Given the facts of this case and the discussion above, this Board should find that to the extent that the project may pose an adverse effect in some locations, it would not be undue because: (a) no clear written community standard regarding aesthetics is violated; (b) there is no convincing evidence that the project improvements would be offensive to the average person, and (c) the Petitioners have committed to taking generally available mitigating steps.

Historic Sites

668. The impact on archaeological resources and historic sites will not be undue, as supported by findings 669 through 689, below.

Archaeological Resources

669. VELCO hired Archaeology Consulting Team, Inc. ("ACT") to assess the potential impacts that the NRP might have upon historic archaeological properties. ACT conducted a Phase 1A archaeological site sensitivity or resource assessment ("ARA") of the area of potential effect ("APE") for each of the substations and the three transmission corridors

proposed to be upgraded as part of the NRP. Frink pf. at 2-6; Frink Supp. pf. at 2; VELCO Exhibits DSF 2 through 5; VELCO Exhibit DSF Reroute-1;VELCO Cross Dillon 1.

670. The ARAs were used to provide VELCO with planning information and assist the Vermont Division for Historic Preservation ("DHP") in its determination of the effect on potential historic properties for the proposed undertaking. The locations identified pursuant to the ARAs were then located on the Project orthophotos, Exhibits VELCO TD-4, TD-5, and TD-7 through 19, for the power line corridors and the substations. Frink pf. at 6.

671. In addition, to the extent that the area of proposed substation expansions overlapped with locations ACT identified as having either known historic properties or a high probability of encountering significant archaeological historic properties, ACT conducted Phase 1B site identification studies, which includes on-site field work. The Phase 1B studies are intended primarily to confirm the presence or absence of archaeological historic properties and the integrity of these archaeological deposits. If sites are identified, measures will need to be taken in accordance with the DHP Guidelines for Archaeological Studies, to avoid identified sites (such as flagging and redesign around any identified sites), or where they cannot be avoided, to mitigate the impact by recovering significant data. Frink pf. at 6, 9-10; Frink Supp. pf. at 4; Tr. 6/10/04, Vol. II at 66-67 (Frink).

672. All work was conducted in accordance with the DHP's Guidelines for Archaeological Studies, Section 106 of the National Historic Preservation Act of 1996, as amended, Executive Order 11593, and the National Advisory Council on Historic Preservation Procedures for the Protection of Historic Properties (36 CFR Part 800). Frink pf. at 6.

673. Based upon its review of the Project and ACTs reports, the DHP, on June 29, 2004, issued a letter stating its determination that the Project will not have an undue adverse effect upon any archeological resources, if the following conditions are met:

(a) All known archaeological sites and archaeologically sensitive areas in the estimated Area of Potential Effect (APE) shall be marked on Project plans and identified as not-to-be-disturbed buffer zones. Petitioners shall also conduct archaeological resource assessments on any project component not currently within the estimated APE to identify any known sites and archaeologically sensitive areas. Any such assessments must be reviewed and approved by the Division and all known sites and archaeologically sensitive areas must be mapped and identified as not-to-be-disturbed buffer zones;

(b) Topsoil removal, grading, scraping, cutting, filling, stockpiling, logging or any other type of ground disturbance is prohibited within the buffer zones prior to conducting all appropriate archaeological studies. All Project contractors will be fully notified about the buffer zone restrictions;

(c) Archaeological studies to identify or evaluate sites will be carried by a qualified consulting archeologist in all archaeologically sensitive and known site areas to be impacted by the Project. The archaeological studies will be scheduled accordingly so that mitigation measures that may be necessary can be satisfactorily planned and accomplished prior to construction;

(d) All archaeological studies and assessments must be conducted by a qualified consulting archeologist and should follow the Division's Guidelines for Conducting Archaeological Studies in Vermont. Petitioners' archaeological consultant must submit any scope of work to the Division for review and approval;

(e) Archaeological sites within the Project area will not be impacted until any necessary mitigation measures have been carried out. Mitigation may include but is not limited to further site evaluation, data recovery, redesign of one or more proposed Project components, or specific conditions that may be imposed during construction, such as installation of construction barriers or protective matting, etc.;

(f) Proposed mitigation measures must be discussed with and approved by the Division prior to implementation, and a copy of all mitigation proposals must be filed with the Board. The archaeological studies will result in one or more final reports, as appropriate, that meet the Division's Guidelines for Conducting Archaeological Studies in Vermont. Copies must be submitted both to the Division and to the Board; and

(g) Any new or revised Project plans should be submitted to the Division for review as soon as they become available. ANR 8, at 3-6; Dillon pf., at 4; Dillon reroute pf., at 3-4. On June 29, 2004, DHP issued a determination letter concluding that "the NRP will not have an undue adverse effect on any archaeological resources."

ANR Cross VELCO Exhibit 8; VELCO Exhibit DSF-Reb-1.

Above Ground Historic Sites

674. VELCO hired T.J. Boyle and Associates, aesthetic experts, and Hugh Henry, architectural historian, to conduct a viewshed analysis of the Project's potential impacts upon above ground historic sites and to recommend mitigation measures. This was the first time DHP requested this type of viewshed analysis for a long, linear upgrade such as the proposed transmission line upgrade. Boyle pf. at 1; Boyle/Henry Reb. pf. at 1; Tr. 6/10/04, Vol. II at 142-43 (Erlich).

675. The results of their analysis are contained in two separate reports, one for the West Rutland to New Haven 345 kV transmission line corridor, and the second for the New Haven to Queen City 115 kV transmission line corridor. Although a handful of sites were identified where the Project may have an adverse impact, the consultants recommended pole locations and screening that would adequately mitigate such impacts. Boyle/Henry Reb. pf. at 2; Exhibits VELCO CROSS-Ehrlich 1-2.

676. With the exception of VCSE, no party challenged the findings and recommendations contained in the Henry and Boyle reports. VCSE submitted testimony of Liz Pritchett, an architectural historian, who alleged that the Project upgrades will have an adverse impact on three properties located in Shelburne: the Shelburne Farms, Shelburne Museum and the Meach Cove Real Estate Trust ("Meach Cove").[43] Ms. Pritchett testified that Shelburne Farms, Meach Cove and Shelburne Museum are part of a historic landscape. No other evidence was introduced demonstrating this and no common plan is apparent. Pritchett Surr. pf. at 6-24.

677. The proposed 115 kV transmission line will pass through a small approximately 1.5 mile section of land along the eastern edge of the Meach Cove parcel. There will be no physical impact on Shelburne Farms or Shelburne Museum. Pritchett Surr. pf. at 6-24; Tr. 10/20/04, Vol. I at 30-31 (Pritchett).

[43] Boyle and Henry did find that there would be an adverse effect at Harbor Road Bridge in Shelburne. The DHP disagreed with this determination and found that the Project would not have an adverse impact on that bridge. 11/15/04 DHP Letter of Concurrence, at 5.

678. The exiting 34.5 kV transmission line, which runs through the Meach Cove property, was built not long after 1914 when the Webbs and Meaches granted the Burlington Traction Company easements to construct the line. Tr. 10/20/04, Vol. I at 57 (Pritchett); VELCO Cross Pritchett Surr. 3; VELCO Cross Pritchett Surr. 4.

679. The Meach Cove parcel, consisting of 1,045 acres spanning from Route 7 to the east and Lake Champlain to the west, is not a National Historical Landmark, nor is it on the national register of historic properties. Pritchett Surr. pf. at 18; Tr. 10/20/04, Vol. I at 31 (Pritchett).

680. Terrence Boyle and Hugh Henry identified two historic structures on the Meach Cove property that may be affected by the 115 kV line: a c.1937 aircraft hanger and a c.1936 horse barn. The 115 kV line will run in the same vicinity as the existing 34.5 kV line. The 34.5 kV line is screened by deciduous and coniferous trees. The 115 kV line will have somewhat taller poles but they will remain largely hidden by the trees. Boyle and Henry conclude that the effect is not adverse. VELCO Cross-Ehrlich 2 at 50.

681. Shelburne Museum is not a National Historic Landmark, nor is it on the national or state register of historic properties. The Museum consists of many structures that are not individually eligible for listing on the registers because they have been moved from their original locations. The S.S. Ticonderoga, a steam ship used on Lake Champlain that was retired in 1950 and relocated to the grounds of Shelburne Museum, is a National Historic Landmark. Tr. 10/20/04, Vol. I at 31 (Pritchett); VCSE LP Surr. 9, at 30.

682. Ms. Pritchett has described the S.S. Ticonderoga, which is visible from the ridge along the Breeding Barn in Shelburne Farms, as "anachronistic." "Anachronistic conditions" are when "features which never coexisted historically in a landscape are placed together today." Pritchett Surr. pf., at 16; Tr. 7/29/04, Vol. II at 156-57; Tr. 10/20/04, Vol. I at 31, 59-60; DPS Cross 183; VELCO Exhibit Reb. TJB-3.11; VCSE Exhibit LP Surr. 9, at 30.

683. The transmission line will be located nearly a half mile from the S.S. Ticonderoga. More important, there are exiting distribution lines, on the property of Shelburne Museum, in

the foreground of the view to the west that substantially distract any future partial view of the proposed transmission line. Pritchett Surr. pf., at 16; Tr. 7/29/04, Vol. II at 156-57; Tr. 10/20/04, Vol. I at 31, 59-60; DPS Cross 183; VELCO Reb. Exhibit TJB-3.11; VCSE Exhibit LP Surr. 9, at 30.

684. Shelburne Farms is a National Historic Landmark. The current design of Shelburne Farms is based on a "conceptual plan" by Frederick Law Olmstead. This conceptual plan included portions of the Meach Cove parcel that are west of the existing railroad; not land where the Project is currently proposed. Olmstead's plan for Shelburne Farms was only partially implemented. Pritchett Surr. pf., at 8; Tr. 10/20/04, Vol. I at 33-34; VCSE Exhibit LP Surr. 6, at I.5.

685. Shelburne Farms has "borrowed" landscapes, views that are not part of the property but contribute to the overall atmosphere of the property, mainly to the west. This includes views of Lake Champlain and the Adirondacks in New York State. The view to the east is not generally considered borrowed landscape. For example, included in this view to the east from the Breeding Barn is the S.S. Ticonderoga, which Ms. Pritchett has described as "anachronistic." Tr. 10/20/04, Vol. I at 36-37, 59-60; VCSE Exhibits LP Surr. 5; VCSE LP Surr. 6; and VCSE LP Surr. 9.

686. Of the 1300 acres that encompass Shelburne Farms, there are very few locations from which the proposed 115 kV transmission line will be visible. In fact, it will not be visible from places on Shelburne Farms where many people visit, with the exception of the walking trails. However, the walking trails were listed as "non-contributing" factors to the property in the National Historic Landmark Nomination document. As for structures on the property, the proposed transmission line will only be visible from the very highest points (i.e. the roof) of the Dairy Barn and the Breeding Barn. The Dairy Barn has been relocated from its original location. The line will not be visible from any main roadways in Shelburne Farms. Furthermore, where the line is visible, it will be well below the skyline. Tr. 10/20/04, Vol. I at 38-41, 94, 101; VCSE Exhibit LP Surr. 5, at 47-48.

687. In total, there are 54 non-contributing resources on the Shelburne Farms parcel. There are only 28 contributing resources. There are 14 non-contributing private residential leaseholds (most built or modernized in the last decade) located on the Shelburne Farms property. These residences have been described as visually prominent and distracting from the historical landscape. These residences include the Opel House, a "modern private residence" that features "a series of rectangular forms with elliptical arched roofs and numerous windows." The Opel House is a non-contributing resource on the Shelburne Farms parcel. Tr. 10/20/04, Vol. I at 52-54 (Pritchett); VCSE Exhibit LP Surr. 5, at 17, 45, 47-48; and VCSE Exhibit LP Surr. 6, at IV.15.

688. On November 15, 2004, DHP issued a letter concurring with VELCO's consultants that "the proposed Northwest Reliability Project will have no adverse effect to historic resources provided [certain] conditions are met." 11/15/04 DHP Letter of Concurrence, at 5-7.

689. The DHP conditions are as follows:

> (a) In the area of Shelburne Farms, the Shelburne Museum and the Meach Cove Trust property, the new poles and lines will follow the same general route, placement, height and span of the existing poles and lines as is shown on the maps submitted as evidence. Particular care will be taken in the placement of poles and lines so as to minimize visual impact;
>
> (b) To the extent possible, the poles and lines will be placed so as to take advantage of the existing vegetation and landscape to minimize the visibility of the line over the entire length of the line;
>
> (c) Clear-cutting in the areas near historic resources should be kept to a minimum, to the extent possible. Whenever possible, the cutting should be tapered so as to appear less harsh;
>
> (d) The mitigating measures for placement of poles and lines contained in the reports and testimony of Terry Boyle and Hugh H. Henry, VELCO Cross Ehrlich-1

& 2, shall be followed for the rest of the Project outside the Shelburne area, as set forth in the Division's November 15, 2004 letter;

(e) As agreed to during early discussions between Petitioners and the Division, Hugh H. Henry will complete Historic Sites and Structures Survey forms for the recently identified historic properties.

11/15/04 DHP Letter of Concurrence, at 5-7.

Discussion Re: Historic Sites Evaluation

The test for evaluating a project's impacts upon historic sites involves a three-part analysis: "(a) whether the Project site is or contains an historic site; (b) whether the Project will have an adverse effect on the historic site; and (c) whether any such adverse effect will be undue." Re: Manchester Commons Associates, #8B0500-EB Findings of Fact, Conclusions of Law and Order at 11 (Environmental Board, September 29, 1995). The tests for aesthetics and historic sites tests are different and are applied independently. Re OMYA, Inc. and Foster Brothers Farm, Inc., Findings of Fact Conclusions of Law and Order, No. 9A0107-2-EB, at 25-31 (Environmental Board, May 25, 1999).

A "historic site" is defined by 10 V.S.A. § 6001(9) as follows:

> "Historic site means any site, structure, district or archeological landmark which has been officially included in the National Register of Historic Places and/or the state register of historic places or which is established by testimony of the Vermont Advisory Council on Historic Preservation as being historically significant."

OMYA sets forth the guidelines for determining whether a project is adverse and undue as follows:

> "Important guidelines in evaluating this fit include: (1) whether there will be physical destruction, damage, or alteration of those qualities which make the site historic, such as an existing structure, landscape, or setting; and (2) whether the proposed project will have other effects on the historic structure, landscape, or setting which are incongruous or incompatible with the site's historic qualities, including, but not limited to, such effects as isolation of an historic structure from

its historic setting, new property uses, or new visual, audible or atmospheric elements.

* * *

The "undue" quality of an effect on an historic site can be judged in several different ways. A positive conclusion on any one of the following guidelines can lead to a determination that an adverse effect is undue:

a. The failure of an applicant to take generally available mitigating steps which a reasonable person would take to preserve the character of the historic site.
b. Interference on the part of the proposed project with the ability of the public to interpret or appreciate the historic qualities of the site.
c. Cumulative effects on the historic qualities of the site by the various components of a proposed project which, when taken together, are so significant that they create an unacceptable impact.
d. Violation of a clear, written community standard which is intended to preserve the historic qualities of the site."

OMYA, Order, No. 9A0107-2-EB, at 40-41.

Non-Shelburne Sites

As Mr. Boyle and Mr. Henry have indicated, there are locations where the Project will have an "adverse" impact on historic sites. For example, Mr. Boyle and Mr. Henry determined that the proposed 345 kV line will have an adverse impact on the River Road House in New Haven. VELCO Cross Ehrlich-1, at 58. However, for all of the locations where there is an adverse impact, there are "generally available mitigating steps which a reasonable person would take to preserve the character of the site." In the case of the River Rd. House, Mr. Boyle and Mr. Henry have recommended that VELCO use a 900 foot span between pole structures in the new 345 kV line to keep the northerly pole structure as far from the house as possible. *Id.* VELCO has indicated that it will implement these mitigation steps for all of the adversely impacted locations. Because there are mitigating measures for all the adverse locations, and there are no violations of (b)-(d) of the test for unduly adverse impacts from the OMYA case, the Board should conclude that the impact of the Project on these areas outside of Shelburne will not be unduly adverse.

Shelburne Farms, Shelburne Museum and Meach Cove

It must first be noted that a transmission corridor has been present in the landscape of these three locations since the turn of the 19th century. It predates the existence of the Shelburne Museum. The existing transmission corridor was and is part of the context and landscape of these three locations.

As for Shelburne Farms, there will be no adverse impact. The Project will not be visible in the "borrowed" landscape to the west. In fact, the 115 kV transmission line will not be visible from any area on Shelburne Farms where people have visited in the past or are likely to visit in the future. The view to the east will be remote at best, and is more significantly impacted by existing distribution lines and the S.S. Ticonderoga, an anachronistic feature. The area that will be altered by the Project, out of the view of Shelburne Farms, is not part of the cultural "landscape" or "setting" of Shelburne Farms. By contrast, the landscape of Shelburne Farms is currently impacted by numerous non-contributing, distracting features, including modern residential structures located along the western edge of the property at the lakefront shoreline.

Similarly, the Project will not have an adverse impact on Shelburne Museum. There will be no significant alteration or damage to the landscape or setting. The transmission line will be almost one half mile away and will not be visible from most of the Museum. While the impact of the transmission line will be greatest on the view from the S.S. Ticonderoga, that view will not be adversely impacted. In the immediate foreground there is a visually distracting distribution line. The transmission line, which will be much further in the distance, will not be consistently visible and will be well below the skyline. The new transmission line will not be visually distracting of the views to the west.

The impact on Meach Cove is limited to a 1.5 mile section on the eastern corner, which will be shielded from view by deciduous and coniferous trees from historic structures on the property, and located in an area that clearly was not included in Mr. Olmstead's conceptual plan. Any adverse impact on Meach Cove will not be unduly adverse because there are reasonable mitigating steps, like pole placement and vegetative screening, that VELCO can and will use.

Furthermore, there will be no interference with the interpretation or appreciation of the historic qualities on Meach Cove, the cumulative impacts are not significant, and there is no violation of clear, written community standards.

Development Affecting Public Investments

[10 V.S.A. §6086(a)(9)(K)]

690. The Project will not materially jeopardize or interfere with the function, efficiency, safety, or the public's use, access to, or enjoyment of public resources facilities, services, or lands. By improving the reliability of electric service in northern Vermont, the Project will benefit any such public investments. The improvement of existing facilities will increase the reliability of electric service to Vermont utilities and their customers. Johnson pf. at 15.

Consistency with Resource Selection
Integrated Resource Plan
[30 V.S.A. § 248(b)(6)]

691. As a non-retail electric company, VELCO is not required to have an integrated resource plan. Docket No. 6852, Order of 9/16/03 at Finding No. 85; Docket No. 5778, Order of 3/12/96 at Finding No. 108.

692. In resource planning, this Board has urged Vermont utilities to pick the result which "is robust or optimum across a range of scenarios," which may mean choosing resource options that "may not be the least-cost solution under the most likely model." PSB Memo, Summary of the Public Service Board's August 21, 2002 , Workshop on Integrated Resource Planning at page 3."

693. VELCO's planning studies support the NRP as the most cost-effective and robust alternative to solving the northwest Vermont reliability problem. Findings 100 through 231, above.

Compliance With Electric Energy Plan

[30 V.S.A. § 248(b)(7)]

694. The DPS Vermont Twenty Year Electric Plan, December 1994, has been judicially noticed. "The overriding goals of [the] Plan are to meet Vermont's electric energy needs in a manner that is efficient, adequate, reliable, secure, sustainable, affordable, safe and environmentally sound, while encouraging the State's economic vitality and maintaining consistency with other state policies." The Plan specifically addresses Supply Resources, Transmission and Distribution and Demand Side Management. DPS Vermont Twenty Year Plan (1994) at 1-1 to 1-3.

695. The Twenty Year Electric Plan emphasizes diversity and balance in Vermont's supply resource portfolio. "Vermont must continue to evaluate and adjust its mix of supply resources so that it approaches optimum supply portfolio, including resources that are diversified and balanced" with respect to: size of facility (or contract); fuel type and price; location of source and transmission path; age of facility (or contract); operating cycle; contractual provisions; and other uncertainties. *Id.* at 4-1,3.

696. The Twenty Year Plan highlights Vermont's interconnections within and outside of New England, which allow Vermont to "take advantage of the system reliability benefits from a broad-based pool of generation supplies." *Id.* at 4-7.

697. The Twenty Year Electric Plan emphasizes a supply portfolio that is stable, diverse, secure and has low environmental impacts. *Id.* at 4-34 to 4-38.

698. For supply resources, the Twenty Year Plan makes the following relevant recommendations: (1) "Vermont should act to accelerate the cost-effective development and use of renewable resources in end use and electric production applications;" (2) "utility planners should be aware of trends in environmental regulation and test proposed least cost plans against various emission reduction standards;" (3) "better integrate renewable generation resources into traditional utility planning and purchasing decisions;" and (4) planners should recognize "the burden that inflexible supply

resources place on the system and encourage dispatchability whenever possible." *Id.* at 8-1 to 8-2.

699. The Twenty Year Electric Plan's discussion of DSM programs is not meant to be "a detailed blueprint for future development of DSM program activity." Rather, it "reaffirm[s] and elaborate[s] upon certain underlying principles of DSM program design and offers guidance for further DSM development." *Id.* at 6-20.

700. Pursuant to the Twenty Year Plan, utilities should design DSM programs that address "lost opportunities" for efficiency savings and "retrofit" efficiency upgrades. *Id.* at 6-21.

701. However, the Plan states that "cost-effectiveness of measures and programs as evaluated under the societal test is still the guiding principle for resource identification and evaluation...." "All such technologies should be analyzed according to their life cycle costs and benefits under the societal test, and market barriers to their acceptance identified and overcome in the most cost-effective manner possible." *Id.* at 6-7, 6-32, 6-36.

702. For transmission and distribution, the Twenty Year Plan makes the following relevant recommendations: (1) choose the "most cost effective solution to a power quality problem [which] is one that results in the least cost to society;" (2) utilities should "follow a prudent avoidance strategy for [EMF] risks;" and (3) the utility "should submit all spatial information pertaining to the proposal in a GIS or GIS compatible format." *Id.* at 8-3 to 8-4.

703. The DPS has determined that the proposed Project is consistent with the Vermont Twenty Year Electric Plan, in accordance with 30 V.S.A. § 202(f), provided the Project is constructed as described and consistent with the recommendations contained in the testimony of the DPS. DPS Determination under 30 V.S.A. § 202(f) (July 2, 2004).

704. The DPS has determined that the 1994 Plan "is clearly out of date, [and] there is good cause to permit the proposed action whether or not it complies with the 1994 Plan." Lesser pf. at 11-12.

705. The DPS has determined that the proposed Project complies with the Draft 2004 Comprehensive Energy and Electric Plan, released on December 4, 2003. The DPS found that the NRP investment has the "least-expected cost among different generation and DSM alternatives using probabilistic decision making framework outlined in Chapter 4" of the draft plan. Furthermore, the Department's determination that the proposed Project is consistent with the 1994 Plan's least cost planning requirements was based on the LaCapra Report and Dr. Lesser's analysis contained in his prefiled direct testimony. Lesser pf. at 50; Mertens pf. at 22; Tr. 9/22/04, Vol. II at 116-17 (Litkovitz).

706. The DPS has determined that the proposed Project is consistent with the "relevant engineering and transmission requirements" of the 1994 Twenty Year Electric Plan. Smith & Litkovitz Surr. pf. at 4; Exhibit DPS-GES&WSL-2.

707. The proposed Project is more cost-effective than combinations of other transmission infrastructure or DSM and local generation. Montalvo pf. at 11-12; Montalvo Reb. pf. at 15-16.

708. The NRP investments have a lower expected present value societal cost than any other resource alternatives, even in the absence of PTF consideration. Lesser pf. at 49.

709. The proposed Project improves the performance of Vermont's transmission system by five times. Planning Panel pf. at 36-39.

710. The proposed Project will provide access to stable, diverse and secure supply resources while having limited impact on environmental resources. Gilman/Briggs pf. at 3; Planning Panel pf. at 36-39, Whitley/Kowalski pf. at 22; Tr. 2/17/04, Vol. II at 111 (Whitley).

711. VELCO has designed the line in accordance with the prudent avoidance standard to minimize risks from EMF. Valberg pf. at 23-24; Exhibit DPS-VDH-3 at 37-38, 44-48.

712. As called for in the Twenty year Plan, VELCO utilized GIS in planning the proposed Project. Exhibit DPS-GES & WSL-2 at 3.

Discussion re 30 V.S.A. § 248(b)(7)

Title 30, Section 248(b)(7) requires that the "purchase, investment or construction:... is in compliance with the electric energy plan approved by the Department under Section 202 of this title, or that there exists good cause to permit the proposed action." Pursuant to 30 V.S.A. § 202(f), the Department has made the determination that the proposed Project is consistent with the 1994 Twenty Year Electric Plan. In the past, this determination has been sufficient for the Board to find that the proposed Project is in compliance with the Twenty Year Plan. See Docket No. 6792, 7/17/03 Order at 30; Docket No. 6839, 10/22/03 Order at 28. However, there is other evidence that the proposed Project is in compliance with the Plan. The DPS has concluded that the Project is consistent with the engineering and transmission requirements of the Plan. Furthermore, the DPS has specifically found that the proposed Project has "the least-expected cost among different generation and DSM alternatives using the probabilistic decision making framework outlined in Chapter 4 [of the Draft 2004 Comprehensive Energy and Electric Plan]." Although this last finding is in the context of the 2004 draft plan, it responds to the primary requirement for DSM and supply resources in the 1994 Plan, cost-effectiveness. The Board is required by statute in its permitting process to "consider the Department's determination of [the project's] consistency with the Plan along with all other factors required by law or relevant to the Board's decision on the proposed action." 30 V.S.A. § 202(f). The Department's determination that the proposed Project is consistent with its own Electric Plan is highly persuasive that the Project is actually in compliance with that Plan.

There is substantial evidence beyond that of the Department that demonstrates that the proposed Project is in compliance with the Twenty Year Electric Plan. The Project provides access to a diverse and balanced supply portfolio that includes renewable resources. The Project provides a strong interconnection to New England and other regions outside of New England. The Project provides stable, diverse and secure electrical service to the ratepayers of Vermont while minimizing environmental impacts. Further, it is the most cost-effective solution to the major reliability problem in northwest Vermont, in comparison to local generation and DSM. In

short, the Project is fully consistent with, and in fact, furthers the paramount objectives of the Plan.

Furthermore, a project can satisfy the (b)(7) requirement if there is "good cause to permit the proposed action." VELCO has demonstrated that there are urgent reliability concerns in northwest Vermont that could adversely affect the electric service of the entire State of Vermont and beyond. Even if there were no evidence that the proposed Project was in compliance with the Twenty Year Electric Plan, this Project is the most cost-effective solution to those reliability concerns and this Project should be approved whether or not it is consistent with the Plan.

Thus, the proposed Project satisfies the Section 248(b)(7) criterion.

Outstanding Water Resources

[30 V.S.A. § 248(b)(8)]

713. The Project does not involve a facility affecting or located on any segment of water designated outstanding water resources by the Vermont Water Resources Board. Gilman/Briggs pf. at 4; Gilman/Briggs Supp. pf. 5/20/04 at 4.

Existing Transmission Facilities

[30 V.S.A. §248(b)(10)]

714. The proposed project can be served economically by existing or planned transmission facilities without undue adverse effect on Vermont utilities or customers. It will have no adverse affect on Vermont customers or utilities and in fact will improve reliability of existing services. See findings 100 through 256, above.

III. COMMENTS OF THE PUBLIC

Many members of the public commented on this proceeding, in both the public hearings and in letters to the Board. The following are areas of concern that the public raised in their comments:

(1) The aesthetic impacts, including noise, of the Project, the need for undergrounding portions of the transmission line;

(2) Perceived health risks from high voltage transmission line, including electromagnetic fields ("EMF") and the potential danger of downed transmission lines;

(3) The economic impact of the Project, including on tourism, property values and local tax bases;

(4) The need for the Project has been overstated and non-transmission alternatives have not been fully explored;

(5) Concern that regionalization of the transmission grid infringes on local control and independence, and that regional cost sharing is a net economic loss for Vermont;

(6) That the Project may cause damage to the environment, including global warming, air and water pollution, and threats to wildlife and its habitat ;

(7) Concern that the real purpose of the Project is to ship electricity from Quebec to Southern New England; and

(8) Concern about notice given to individual landowners.

Parties that spoke in favor of the Project emphasized the following points:

(1) Vermont is facing a severe reliability crisis;

(2) The Project will benefit Vermont's economy; and

(3) A reliable source of electricity is essential for such health services as hospitals.

All of the issues raised by the public are discussed in detail under the various sections of the Findings and are not repeated here.

IV. DISCUSSION RE: POST-CERTIFICATION SECTION 248 REVIEW

In this docket, Petitioners have submitted exhaustive evidence concerning the Project's design, as well as its potential impacts upon natural areas, historic sites and aesthetics. As plainly

demonstrated by the above detailed Findings of Fact, the weight of this evidence supports a Board conclusion that the Project meets all of the criteria of 30 V.S.A. § 248(b), and that a CPG should be issued finding that the Project will promote the general good of the state. Nevertheless, following issuance of the Board's Order and CPG, Petitioners will undertake certain standard construction and permitting activities associated with the Project as to which this Board will likely want to retain jurisdiction in the form of CPG conditions relating to post-certification compliance filings and review.

Post-certification Section 248 review of electric transmission upgrades has been standing Board practice for at least thirty years, going back to the VELCO 115 kV line upgrade between Williston and South Burlington. *See In re Vermont Elec. Power Co., Inc.*, 131 Vt. 427, 306 A.2d 687 (1973); *City of South Burlington v. Vermont Elec. Power Co., Inc.*, 133 Vt. 438, 344 A.2d 19 (1975). *See also In re Petition of Twenty-Four Vermont Utilities,* 159 Vt. 339, 359, 618 A.2d 1259, 1307 (1992) . The CPG issued by the Board to VELCO in that case authorized a general as opposed to a specific route for the 115 kV line, and with its issuance of the final order approving the construction of the 115 kV line, the Board conditioned the CPG so that the Board "retained jurisdiction over the matter so it could review the detailed plans and approve them before VELCO began the clearing and construction of the line." The CPG also provided that the final design plans were to be submitted to the other parties in the proceeding and they were to be given two weeks in which to comment to the Board upon them. *In re Vermont Elec. Power Co., Inc.,* 131 Vt. At 431, 306 A.2d at 689. *Id.*

In ratifying this type of post-certification Section 248 review approach, the Vermont Supreme Court expressly rejected arguments that the Board order lacked sufficient specificity for compliance with the dictates of 30 V.S.A. § 248, particularly the criterion that requires the Board to find that construction "will not have an undue adverse effect on esthetics, historic sites, air and water purity, the natural environment, and public health and safety." *Id.,* 131 Vt. At 434-35, 306 A.2d at 691-92:

> *"In making the argument that 30 V.S.A. § 248 requires the Board to certify a specific route, the appellants overlook the fact that nowhere in the statute is the*

> *procedure employed by the Board prohibited. The appellants also overlook the practical side of the Board's procedure because in this instance the cost to VELCO, and eventually the consumer, to prepare detailed construction plans for each alternative with variations in advance of their approval would be unreasonably excessive.*
>
> ***
>
> *By attacking the post-certification procedure employed by the Board, the appellants ignore the fact that it is an accepted practice of the Board and administrative tribunals generally. In the instance of a 30 V.S.A. § 248 proceeding this procedure affords the parties an opportunity to comment to the Board on the plans submitted by VELCO, and further hearing is not precluded should a comment be made which warrants a hearing. For these reasons, appellants' contention must fail."*

Id.

Most recent CPGs issued by this Board for electric transmission projects include standard clauses requiring that (1) a project be constructed in accordance with the evidence and plans submitted in the proceedings and in accordance with all applicable permits and approvals, (2) prior to construction, petitioner must obtain all necessary permits and approvals, and (3) prior to construction, petitioner must submit detailed construction plans to the Board for its review and approval, showing all facilities to be constructed, pole locations, and clearing.[44] In addition, the Board's standard CPG conditions also often require that following construction, petitioners must submit a detailed landscaping and vegetation management plan and arrange for a Board site visit following completion of construction and landscaping to review the facilities.[45]

Petitioners suggest that the Board follow this standard practice in this docket, and adopt the CPG conditions set forth in Appendix B attached hereto. This process has worked very well in the numerous recent VELCO transmission projects that have been approved by this Board. The post-certification process for review and approval of final design detail prior to construction

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[44] *See, e.g.,* CPGs issued in Docket Nos. 6252, 6473, 6479, 6793, 6839, and 6852. This is by no means a complete list of all Section 248 CPGs issued for electric transmission facility upgrades, but the CPGs are representative of the Board's current practice.

[45] *Id.*

is the most cost-effective and efficient process for review and approval of major transmission upgrades like the NRP. Given the amount of attention that this Project has received by the parties, particularly as to potential aesthetic impacts in some locations, Petitioners have modified the standard conditions to provide an opportunity for comments and, where good cause is shown, a hearing on such plans. *See* paragraphs 3 and 15 of Appendix B.

V. FINDINGS SPECIFIC TO GREEN MOUNTAIN POWER CORPORATION

Green Mountain Power Vergennes Bypass Proposal

Presently Vergennes is served by a 46 kV line from the New Haven substation to the Vergennes substation and a 34.5 kV line from the Queen City substation, also terminating at the Vergennes substation. The original configuration of the NRP proposed by VELCO was a115 kV line with its source at New Haven terminating at the existing GMP Vergennes substation. A second 115 kV line with its source at Queen City would also terminate at the Vergennes substation. The Vergennes load would therefore be immune to any single outage that would occur on the 115 kV line. During the course of negotiations after the filing, VELCO agreed, at the request of the city of Vergennes, to reroute the 115 kV line around the downtown, which required GMP to design a radial line to feed load at the existing Vergennes substation.

The proposed Vergennes bypass will allow the removal of the existing 46 kV line and will connect the existing 34.5 kV line with the new proposed VELCO substation in the vicinity of Kayhart Crossing. That this proposal is reliable and consistent with GMP's Integrated Resource Plan is supported by ___ through __ below.

715. The present configuration serving Vergennes is a 46 kV line with termination at the Vergennes substation, and a 34.5 kV line with its source at the Queen City station, which also terminates at the Vergennes substation. Cecchini pf. 2/6/04 at 2.

716. A fault on the New Haven to Vergennes 46 kV line would result in a Vergennes load outage for approximately 20 minutes about 90% of the time. Approximately 10% of the

time, during high loads, full restoration of the Vergennes load would be delayed until the 46 kV line is restored, typically 5 to 8 hours. The Queen City to Vergennes 34.5 line cannot support the Vergennes load during high load periods. Cecchini pf. 2/6/04 at 2.

717. Reliability of the existing configuration is good, the outage recurrence interval on the Vergennes line is 3.37 years. Cecchini pf. 2/6/04 at 2.

718. The Vergennes bypass configuration proposes that the 115 kV line between New Haven and Queen City bypass Vergennes and that Vergennes be served from the new substation in the vicinity of Kayhart Crossing by means of a 1.6 mile radial 34.5 kV line to the existing GMP Vergennes substation. Cecchini pf. 2/6/04 at 3.

719. The existing 34.5 kV line from the Vergennes substation to a point along Botsford Road approximately 900 feet north of the Vergennes/Ferrisburgh line would remain unchanged. A new segment of 34.5 kV line, approximately ½ mile long, would be built from the new proposed VELCO substation. Cecchini pf. 2/6/04 at 3.

720. The reliability of the proposed Vergennes bypass configuration would be very good. The recurrence interval for a fault on the 1.6 mile radial feed would be 12.65 years, which is an improvement over today's existing configuration in terms of outage frequency. Cecchini pf.2/6/04 at 3.

721. The load would typically be restored within 5 to 8 hours when a fault occurs on a section of the line accessible by line truck. There is approximately 870 feet of proposed line which would not be accessible by line truck, however, the recurrence intervals for fault on the 870 foot section of line is estimated to be 123 years. Cecchini pf 2/6/04 at 3-4.

722. Right of way clearing and pole maintenance will be given appropriate attention. Typical materials needed for line repair will be stored at GMP's Vergennes service center. In addition, GMP will develop procedures to make use of the Vergennes diesel generator black start capability to mitigate the length of outages. Cecchini pf. 2/6/04 at 4.

723. GMP presently serves twelve locations, which loads are served on a radial 34.5 kV line. Six are shorter than the 1.6 miles of radial line proposed in this project, and six are longer than the proposed Vergennes bypass. Tr. 6/14/04 at 89.

724. Of the twelve loads served by radial line, seven have less load than the Vergennes load and five have more load than the Vergennes load. Tr. 6/14/04 at 95-96.

725. Once the NRP is complete, the substation at Kayhart Crossing will have breakers looking both north and south so that the load at Vergennes would be essentially immune to any outage on the 115 kV line. Tr. 6/14/04 at 96.

726. The reliability of the proposed radial feed to Vergennes is appropriate for the size of the load. Cecchini pf. 2/6/04 at 4.

727. The proposed 34.5 kV pole line would be constructed on poles approximately 50 feet above the ground with some poles being taller at corners required by topography. Construction would be similar to the poles on the existing 34.5 kV line. Cecchini pf. 2/6/04 at 5 and GMP Exhibit TC-Supp(1)-1.

728. The proposed Vergennes bypass is consistent with Green Mountain Power's most recently approved Integrated Resource Plan (IRP). Denis pf. 7/2/04 at 4 and GMP Exhibit DD-Reb-1.

729. GMP's IRP provides that its transmission and distribution system should be integrated with long term transmission plans and that reliability is a major factor in selection of distribution planning alternatives. The proposed Vergennes reroute is consistent with these planning criteria. Denis pf. 7/2/04 at 5.

730. The bypass proposal is designed to integrate GMP's distribution service into VELCO's transmission to serve the region. The Vergennes bypass is not a project for which it is necessary or appropriate to employ efficiency planning or simulation models because the line is proposed to accommodate bulk transmission system needs. On this basis, the

reroute proposal is consistent with the principles of resource selection contained in GMP's IRP. Denis pf. 7/2/04 at 5.

731. At the conclusion of the construction of the Vergennes bypass, the existing 46 kV line to the Vergennes substation would be removed. Tr. 6/14/04 at 99.

VI. CONCLUSION

The Chittenden County area is, for better or worse, not the same place it was twenty or thirty years ago, and it will never be again. Infrastructure, such as highways, water systems and telecommunications, have all been constantly upgraded. Transmission system upgrades have been deferred but, as the evidence shows, such deferrals cannot go on much longer without serious reliability risk.

Under 30 V.S.A. § 248(b)(3), this Board must find that the Project will "promote the general good of the State." The statute also requires the Board to find that the construction of the Project will satisfy each of the ten criteria set forth in 30 V.S.A. § 248(b)(1) through (10). The following findings and discussions, which are based upon the record evidence and applicable law, address in detail each of the ten Section 248(b) criteria and, as to each, support the conclusion that the Project satisfies the criteria.

The overwhelming weight of the evidence in this proceeding shows that the NRP is an essential reliability project that is needed to protect and promote the public good of the State of Vermont and its residents. VELCO respectfully requests this Board to approve the NRP as proposed by VELCO and GMP, and issue an Order and CPG in the form attached hereto as Appendices A and B, authorizing construction of the Project.

DATED at Montpelier, Vermont this 24th day of November, 2004.

VERMONT ELECTRIC POWER COMPANY, INC.
AND
GREEN MOUNTAIN POWER CORP.
By: Primmer & Piper, P.C.

_____

Kimberly K. Hayden
421 Summer Street
St. Johnsbury, VT 05819
802-748-5061
Khayden@primmer.com

APPENDIX A - PROPOSED ORDER

FINAL ORDER

IT IS HEREBY ORDERED, ADJUDGED AND DECREED by the Public Service Board of the State of Vermont that:

1. The Joint Petition of Vermont Electric Power Company, Inc. and Green Mountain Power Corp. for a Certificate of Public Good authorizing construction of the proposed Northwest Vermont Reliability Project, in accordance with the evidence and plans submitted in this proceeding, will promote the general good of the State of Vermont under 30 V.S.A. § 248, and a certificate of public good to that effect shall be issued.

Dated at Montpelier, Vermont, this 14th day of January, 2005.

s/Michael H. Dworkin)

)

s/David C. Coen)

)

s/John D. Burke)

OFFICE OF THE CLERK

Filed: _____, 2005

Attest: s/Susan M. Hudson

Clerk of the Board

NOTICE TO READERS: This decision is subject to revision of technical errors. Readers are requested to notify the Clerk of the Board (by e-mail, telephone, or in writing) of any apparent errors, in order that any necessary corrections may be made. (E-mail address: Clerk@psb.state.vt.us).

Appeal of this decision to the Supreme Court of Vermont must be filed with the Clerk of the Board within thirty days. Appeal will not stay the effect of this Order, absent further Order by this Board or appropriate action by the Supreme Court of Vermont. Motions for reconsideration or stay, if any, must be filed with the Clerk of the Board within ten days of the date of this decision and order.

APPENDIX B - PROPOSED CERTIFICATE OF PUBLIC GOOD

Entered: 1/14/05

CERTIFICATE OF PUBLIC GOOD ISSUED

PURSUANT TO 30 V.S.A. SECTION 248

IT IS HEREBY CERTIFIED that the Public Service Board of the State of Vermont this day found and adjudged that the construction of the Northwest Vermont Reliability Project ("Project") by Vermont Electric Power Company, Inc. ("VELCO") and Green Mountain Power Corporation ("GMP") (collectively the "Petitioners"), will promote the general good of the state, subject to the following conditions:

1. Construction, operation, and maintenance of the Project shall be in accordance with the plans and evidence submitted in this proceeding.

2. Petitioners shall obtain and comply with all conditions and requirements of all necessary permits and approvals and with all applicable statutes and regulations.

3. Prior to the commencement of construction of any individual portion of the Project, Petitioners shall submit to the Board, for its review and approval as to that section of the Project, detailed construction plans showing all facilities to be constructed, pole locations, and clearing. Any Party wishing to comment to the Board upon such construction plans must do so, in writing, within seven (7) days of Petitioners' filing. The Board shall not hold any additional hearings upon such plans unless it determines that there is good cause to hold a hearing, in which case it will conduct a hearing within fourteen (14) days of any Party filing comments upon the Petitioners' plans. In deciding good cause, the Board will consider, among other things, whether the plans involve a substantial and material change from the record evidence in this proceeding; whether that they would, if implemented, cause a material violation of any of the substantive criteria of Section 248(b); and provided that the Party requesting any such hearing demonstrate a legally cognizable interest in the issues raised which could not have reasonably

anticipated during the evidentiary proceedings that have already been conducted in this docket. Further provided that the timing of any such hearings and Board determinations thereon shall give due consideration to the limitations posed by the Project construction schedule and the impacts upon electric reliability associated with any delay in Project construction.

4. Prior to commencement of construction, Petitioners shall apply for and obtain a General Permit for Stormwater Runoff from Construction Sites ("CGP") from the Agency of Natural Resources ("ANR"). In conjunction with the CGP application, Petitioners shall prepare Erosion Prevention and Sediment Control Plans ("EPSCPs") in accordance with ANR's recommendations and the ANR's Erosion and Sediment Control Plan Checklist. All EPSCPs shall be submitted to ANR and subject to ANR's approval.

5. In accordance with ANRs recommendations, VELCO shall make full use of temporary bridges during construction. Prior to commencement of construction of any culvert or permanent bridge installation in streams with drainage areas greater than one square mile, Petitioners shall apply for and obtain as to that section of the Project, a Stream Crossing Permit from ANR.

6. Prior to the commencement of construction of any individual portion of the Project in wetlands, Petitioners shall apply for and obtain as to that section of the Project:

    1. Conditional Use Determinations from the ANR for any Project impacts to Class Two wetlands and their 50-foot buffer zones.
    2. A US Army Corps of Engineers permit ("404" permit) for the Project's wetland impacts.

7. Prior to commencement of construction of sanitary facilities at the New Haven, Queen City and Granite substations, Petitioners shall apply for and obtain Water Supply/Wastewater Disposal Permits from the Vermont Department of Environmental Conservation.

8. Prior to commencement of construction at the Granite substation, Petitioners shall apply for and obtain a Stormwater Discharge Permit from the ANR for the substation's newly designed stormwater collection and discharge system.

9. Prior to commencement of clearing and construction in the identified rare and irreplaceable natural areas, Petitioners shall submit a clearing and protection plan to the Vermont Nongame and Natural Heritage Program for review and approval.

10. In consultation with ANR's Fish & Wildlife Department, Petitioners shall arrange to obtain development rights to and permanently preserve 86 acres of deer habitat, which may include the 42 acres of land currently owned by VELCO by the end of 2005.

11. Prior to commencement of clearing and construction of any individual portion of the Project, Petitioners shall flag and fence the populations of the six identified threatened or endangered species as well as the populations of the seven rare species identified in ANR's testimony located in that area of the Project. Prior to commencement of clearing and construction in an area where an identified threatened or endangered plant cannot be avoided, VELCO will apply for and obtain an Endangered Species Permit from ANR.

12. VELCO shall comply with the terms and conditions set forth in its Department of Agriculture permit for application of herbicides in VELCO's transmission line rights-of-ways. Petitioners shall not apply any herbicide upon lands owned by Meach Cove Real Estate Trust in the Town of Shelburne, Vermont, and upon property of any landowner who has, pursuant to the procedures of PSB Rule 3.640, requested that they not be used.

13. Prior to commencement of construction of the 345 kV line, VELCO shall finalize arrangements for an Indiana Bat License Agreement. The License will allow DF&W to conduct Indiana bat studies and roost tree enhancements on private property adjacent to the transmission line corridor for a period of 5 years.

14. Petitioners shall install and maintain plantings in accordance with the following:

    (a) Petitioners will install plantings, except as discussed in (b)-(j) below, in accordance with the rebuttal testimony and exhibits of Terry Boyle, VELCO Rebuttal TJB-1 & 2;

_____(b) At the Granite Substation, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 4, line 13 through 16) and VELCO Exhibit TJB DD-2, Section 9, dated September 14, 2004;

(c) At the New Haven Substation, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 3, line 11 through 13) and VELCO Exhibit TJB DD-2, Section 3, dated September 14, 2004;

(d) At the West Salisbury Rd./Route 7 crossing in Salisbury, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 3, line 2 through 4) and VELCO Exhibit TJB DD-2, Section 1, dated September 14, 2004;

(e) At the Route 125/Route 7 crossing in Middlebury, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 3, line 6 through 9) and VELCO Exhibit TJB DD-2, Section 2, dated September 14, 2004;

(f) At the Route 17 crossing in New Haven, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 3, line 17 through 21) and VELCO Exhibit TJB DD-2, Section 4, "Route 17 Crossing Alternative" [this is the straight across plan], dated September 14, 2004;

(g) At the Slang crossing in Ferrisburgh, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 3, line 23 through 24) and VELCO Exhibit TJB DD-2, Section 5, dated September 14, 2004;

(h) At the Ferry Rd. crossing in Charlotte, Petitioners will install plantings as recommended by Mr. Boyle in _____ prefiled testimony and VELCO Exhibit _____;[46]

[46] The specific proposal for the Ferry Rd. crossing in Charlotte shall be addressed in separate briefs due on December 17, 2004.

(i) At the Bostwick Rd. crossing in Shelburne, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 4, line 4 through 6) and VELCO Exhibit TJB DD-2, Section 7, dated September 14, 2004; and

(j) Along Bay Rd. in Shelburne, Petitioners will install plantings as recommended by Mr. Boyle in his September 14, 2004, prefiled testimony (page 4, line 8 through 11) and VELCO Exhibit TJB DD-2, Section 8, dated September 14, 2004.

15. Within sixty (60) days of the completion of construction, Petitioners shall submit to the Board, for its approval, plans showing proposed vegetative screening. Any Party wishing to comment to the Board upon such plans must do so, in writing, within thirty (30) days of Petitioners' filing. If the Board in its discretion deems it necessary, it will conduct a hearing within sixty (60) days of any Party filing comments upon the Petitioners' vegetative screening plan. The Board shall not hold any additional hearings upon such plans unless it determines that there is good cause to hold a hearing, taking into consideration, among other things, whether the plans involve a substantial and material change from the record evidence in this proceeding; whether that they would, if implemented, cause a material violation of any of the substantive criteria of Section 248(b); and provided that the Party requesting any such hearing demonstrate a legally cognizable interest in the issues raised which could not have reasonably anticipated during the evidentiary proceedings that have already been conducted in this docket.

16. Within thirty (30) days of the completion of installation of all landscaping, Petitioners shall arrange a site visit with the Board and any interested Parties to review the effectiveness of the aesthetic mitigation measures, as installed. All plantings and landscaping shall be completed within one (1) year of Board approval.

17. Petitioners shall maintain in a healthy, growing condition all plant material installed as part of the Project or pursuant to this CPG . Should any of this plant material die or fail to thrive sufficiently to provide the intended aesthetic mitigation, Petitioners will replace it with the same material, or similar material that accomplishes the same mitigation if the original material is unavailable or determined not to be suited to the particular location

within which it was planted. Any such replacement shall occur as soon as reasonably practical.

18. With respect to archaeological resources, Petitioners shall comply with the following conditions of the Division for Historic Preservation (the "Division") as contained in its June 29, 2004 letter to the Board in this docket:

(a) All known archeological sites and archeologically sensitive areas in the estimated Area of Potential Effect (APE) shall be marked on Project plans and identified as not-to-be-disturbed buffer zones. Petitioners shall also conduct archeological resource assessments on any project component not currently within the estimated APE to identify any known sites and archeological sensitive areas. Any such assessments must be reviewed and approved by the Division and all known sites and archeologically sensitive areas must be mapped and identified as not-to-be-disturbed buffer zones;

(b) Topsoil removal, grading, scraping, cutting, filling, stockpiling, logging or any other type of ground disturbance is prohibited within the buffer zones prior to conducting all appropriate archeological studies. All Project contractors will be fully notified about the buffer zone restrictions;

(c) Archeological studies to identify or evaluate sites will be carried by a qualified consulting archeologist in all archeologically sensitive and known site areas to be impacted by the Project. The archeological studies will be scheduled accordingly so that mitigation measures that may be necessary can be satisfactorily planned and accomplished prior to construction;

(d) All archeological studies and assessments must be conducted by a qualified consulting archeologist and should follow the Division's Guidelines for Conducting Archeological Studies in Vermont. Petitioners' archeological consultant must submit any scope of work to the Division for review and approval;

(e) Archeological sites within the Project area will not be impacted until any necessary mitigation measures have been carried out. Mitigation may include but is

not limited to further site evaluation, data recovery, redesign of one more proposed Project components, or specific conditions that may be imposed during construction, such as installation of construction barriers or protective matting, etc.;

(f) Proposed mitigation measures must be discussed with and approved by the Division prior to implementation, and a copy of all mitigation proposals must be filed with the Board. The archeological studies will result in one or more final reports, as appropriate, that meet the Division's Guidelines for Conducting Archeological Studies in Vermont. Copies must be submitted both to the Division and to the Board; and

(g) Any new or revised Project plans should be submitted to the Division for review as soon as they become available.

19. With respect to above-ground historic resources, Petitioners shall comply with the following conditions of the Division as contained in its November 15, 2004, letter to the Board in this docket:

(a) In the area of Shelburne Farms, the Shelburne Museum and the Meach Cove Trust property, the new poles and lines will follow the same general route, placement, height and span of the existing poles and lines as is shown on the maps submitted as evidence. Particular care will be taken in the placement of poles and lines so as to minimize visual impact;

(b) To the extent possible, the poles and lines will be placed so as to take advantage of the existing vegetation and landscape to minimize the visibility of the line over the entire length of the line;

(c) Clear-cutting in the areas near historic resources should be kept to a minimum, to the extent possible. Whenever possible, the cutting should be tapered so as to appear less harsh;

(d) The mitigating measures for placement of poles and lines contained in the reports and testimony of Terry Boyle and Hugh H. Henry, VELCO Cross Ehrlich-1

& 2, shall be followed for the rest of the Project outside the Shelburne area, as set forth in the Division's November 15, 2004 letter;

(e) As agreed to during early discussions between Petitioners and the Division, Hugh H. Henry will complete Historic Sites and Structures Survey forms for the recently identified historic properties.

20. This Certificate shall not be transferred without prior approval of the Board.

Dated at Montpelier, Vermont, this fourteenth day of January, 2005.

_____	)	
	)	PUBLIC SERVICE
	)	
_____	)	BOARD
	)	
	)	OF VERMONT
_____	)	

OFFICE OF THE CLERK

FILED:

ATTEST:_____

Clerk of the Board

NOTICE TO READERS: This decision is subject to revision of technical errors. Readers are requested to notify the Clerk of the Board (by e-mail, telephone, or in writing) of any apparent errors, in order that any necessary corrections may be made. (E-mail address: Clerk@psb.state.vt.us)

Appeal of this decision to the Supreme Court of Vermont must be filed with the Clerk of the Board within thirty days. Appeal will not stay the effect of this Order, absent further Order by this Board or appropriate action by the Supreme Court of Vermont. Motions for reconsideration or stay, if any, must be filed with the Clerk of the Board within ten days of the date of this decision and order.