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	)	Technical Hearings held at Montpelier, Vermont *(See Appendix A)*

Order entered:

PRESENT: Michael H. Dworkin, Board Chairman
David C. Coen, Board Member
John D. Burke, Board Member

APPEARANCES: *(See Appendix B)*

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I. INTRODUCTION

A. The Proposal Before Us

The Vermont Electric Power Company, Inc. ("VELCO") and Green Mountain Power Corporation ("GMP") (collectively, the "Petitioners") have proposed the following transmission upgrades:[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;
- The replacement of existing 34.5 kV and 46 kV subtransmission lines with an approximately 27-mile 115 kV transmission line between New Haven and South Burlington, Vermont, passing through the municipalities of New Haven, Vergennes, Ferrisburgh, Charlotte, Shelburne, and South Burlington;
- The reconductoring of VELCO's existing 5.6-mile 115 kV transmission line between Williamstown and Barre, Vermont;
- Upgrades to the following eight existing VELCO substations: West Rutland, New Haven, Queen City (South Burlington); Blissville (Poultney); Essex (Williston); Granite (Williamstown); Hartford; and Williston;
- Upgrades to, or reconstruction of, the existing GMP Ferrisburgh, Charlotte, and Shelburne substations;
- The construction of a new 115/34.5 kV substation in Vergennes and associated 1.6-mile 34.5 kV subtransmission line from the new substation to the existing Vergennes substation.

B. Overview of Today's Order

In today's Order, the Vermont Public Service Board ("Board") finds that increased electric demand in northwestern Vermont, both in the recent past and expected in the future, make it necessary to strengthen the transmission grid serving that area in order to achieve and maintain desirable levels of reliability. The Order reaches that conclusion after considering an extensive record, five key elements of which are noted in this Overview.[2]

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1. A more detailed project description is included in Appendix D. Collectively, these upgrades are referred to as the "proposed Project" hereinafter.

2. The Hearing Schedule, List of Appearances, and Procedural History of this Docket are included as Appendices A, B, and C, respectively.

The initial issue before us is the importance of the real-world problem that VELCO's proposal is designed to address. The Board has concluded that under the present circumstances (and despite concerns about VELCO's past performance, which we address below) the proposed Project addresses a real problem. Over the last twenty years, northwest Vermont has seen a significant increase in its demand for electricity, particularly its demand for electricity on hot summer days. Growth patterns suggest that this demand will continue to expand. Yet, the area is presently served by the same four high-voltage electric transmission lines that have been in place (without systematic improvements) for more than two decades. Two of these transmission lines are susceptible to extended outages. During those hours in the summer when northwest Vermont's electric demand is highest, and hydro generation is at its lowest levels, the failure or unavailability of two of the four transmission lines could cause customers in that region, and possibly beyond, to lose electric service. This risk will increase rapidly as demand increases. In a society less dependent upon electricity (in terms of the economy, public health, and vital infrastructure), the level of risk inherent in the current system may have been acceptable, but we have clearly come to a time when increased demand upon an unimproved system would create greater risk than is appropriate for people who live in a complex and interdependent society, built upon an expectation of reliable electricity.

A second key issue before us is the potential to avoid or defer the proposed Project through active pursuit of alternatives. We have considered both alternative transmission investments and efforts to ease the problem through non-transmission investments. Technical problems or excessive costs make alternative transmission upgrades undesirable. Non-transmission alternatives are not available for many of the proposed upgrades, including the 115 kV line. For the remaining upgrades that might be replaced by non-transmission alternatives, the most attractive would require the occurrence of both: (i) a major reduction in expected demand (achieved through increased spending for energy efficiency); and (ii) building and fueling at least three new midsize 40 MW bulk generation power plants in Chittenden County. Although unprecedented in Vermont, the efficiency investments appear feasible and desirable. However, the timely availability of the necessary new generating plants and the facilities to fuel them is *at best* uncertain. No party has emerged that is willing to take responsibility for that construction, and analysis of the environmental effects of such an

installation has not even been outlined. Thus, we conclude that some version of the proposed Project before us is needed.

A third area of inquiry has been an examination of the mitigation efforts that we should require in order to offset or minimize any undue adverse effects of the necessary construction. We have looked into these on both project-wide and site-specific levels. On a project-wide basis we are requiring mitigating measures such as use of low-reflective wire. In addition, we have considered specific mitigation measures at several locations and are implementing a post-certification process that will ensure a potential for additional reductions in the site-specific impacts of the proposed Project. Based on existing site reviews we are already requiring numerous mitigation measures, including re-location of many poles, lowering of many poles, substantially increased vegetative screening, low-noise equipment in some substations, the placement of approximately 1.4 miles of new 115 kV line underground in the Bay Road area close to the shore of Lake Champlain in Shelburne, the relocation of the proposed expanded substation near New Haven, and submission of an improved VELCO proposal for the 115 kV line near Ferry Road in Charlotte. Additional mitigation measures may be required, if justified in specific post-certification reviews.

As part of its analysis, the Board has given specific consideration to assertions that the electromagnetic fields ("EMF") that will result from the proposed Project will produce undue adverse health effects. We have examined, with both care and sympathy, all the factual evidence and expert testimony in the evidentiary record and have concluded that the overall state of scientific knowledge is best expressed in the report of the National Institute of Environmental Health Sciences, stating that: "[t]he scientific evidence suggesting that ELF-EMF [extremely low frequency EMF, such as is produced by transmission lines] exposure poses any health risk is weak." In particular, EMF levels drop rapidly to extremely low levels with even small increases in distance from transmission lines. As a result, the Board is continuing Vermont's policy of "prudent avoidance." In practice this means "policies that limit magnetic field exposure whenever this can be done for a small investment of money and effort." However, we are not persuaded that prudent avoidance requires a general policy of placing all transmission lines underground, regardless of local conditions and cost. Instead, the Board has considered EMF

issues as one, limited, factor in the multi-factor determination of whether to place any specific sections of a line underground on a site-specific basis.

In a fifth major point, the Board notes that this case has demonstrated significant flaws in the planning processes at VELCO, the entity that owns and manages bulk transmission facilities in Vermont. Those flaws fall into at least two categories: (i) deficiencies in forecasting expected electricity demand on a seasonal and region-wide level, leading to a need to consider and install new facilities closer to the time that they are essential than desirable; and (ii) deficiencies in the early consideration of a range of feasible alternatives (such as focused intense efficiency efforts), leading to the present situation in which transmission construction must be chosen as the least-cost reliability solution, despite the fact that an earlier, greater, effort at efficiency might have opened up alternatives. In order to make sure that this situation does not recur in the future, the Board is opening a new investigation, focused on improving VELCO's forecasting abilities, translating those improvements into information for the rest of society, and re-considering the least-cost planning and implementation responsibilities of VELCO and its owners.

In sum, as part of our consideration of all factors listed in 30 V.S.A. Sec. 248 (including the incorporation of almost all of Act 250's substantive criteria into that statute), we have examined the necessity for, and the alternatives to, the proposed Project. We have also looked into the impact the proposed Project would have on the natural environment, the health and safety of Vermonters, and the orderly development of the region. We have concluded that the Project, as proposed, would create undue adverse effects, but that, with appropriate conditions, those impacts can be mitigated to a point where they will not be undue. These elements, and others discussed below, lead us to issue a carefully conditioned certificate of public good to the Petitioners.

II. NEED

A. Introduction

We begin with a consideration of the need for this proposed Project, because in the absence of need no other elements of the proposal would have to be addressed.

Northwest Vermont is presently served by four high-voltage electric transmission lines. No one line can serve all of that region's load, and two of these lines are susceptible to long-term outages. During those hours in the summer when northwest Vermont's electric demand is highest, and hydro generation is at its lowest levels, the failure or unavailability of two of the four transmission lines could cause customers in that region, and possibly beyond, to lose electric service.

In this proceeding, the Petitioners are seeking approval to install a fifth transmission line into northwest Vermont. Its primary purpose is to increase the reliability of service, reducing the number of hours subject to outage risks.[3]

Before the Board may approve the proposed Project, Section 248(b)(2) requires that it must find that the proposed Project:

> is required to meet the need for present and future demand for service which could not otherwise be provided in a more cost effective manner through energy conservation programs and measures and energy-efficiency and load management measures, including but not limited to those developed pursuant to the provisions of sections 209(d), 218c, and 218(b) of this title.

In order to judge the Project's compliance with this criterion, we must answer three fundamental questions:

1. What is the need for present and future demand for service?
2. Is the proposed Project required to meet that need?
3. Is it probable that the need could be met more cost-effectively through other alternatives?

We address these questions in the subsections that follow. As a result of our analysis of these questions, we have reached the following conclusions.

First, Vermont needs a bulk transmission system that very rarely fails, because our society has become increasingly dependent on the electric grid. We conclude that, regardless of national or regional reliability standards, it is in the best interests of *Vermont* to design our transmission system so that its operators are not placed in situations where they must make difficult decisions when two failures (i.e., two contingencies) occur. While it may be unlikely

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3. A secondary benefit would be to reduce congestion costs paid by Vermont utilities and, ultimately, by their ratepayers.

that Vermont's bulk transmission system will suffer two significant, concurrent failures at a period of high demand, the evidence in this proceeding strongly supports our conclusion that the risk cannot, and must not, be ignored. Not only has Vermont in the recent past come close to shedding load as a result of such a double contingency, but also the Highgate Converter station — a critical element of the bulk transmission system that serves northwestern Vermont — relies on a technology that is susceptible to a serious failure that could disable the facility for many months.

Second, Vermont's bulk transmission system, as it presently exists, fails to meet the double-contingency reliability standard at current load levels. Given reasonably projected future levels of demand, the goal of double-contingency survivability will not be achieved for an increasing number of hours of the year.

Third, given these first two conclusions, doing nothing is not an option. This Board has an obligation to ensure that Vermont's electricity consumers receive "adequate service."[4] While the legislature did not define "adequate," we think it is clear that adequacy of electric service is a relative and dynamic standard, such that a level of service that may have been "adequate" in years past might no longer meet that standard today, given the pervasiveness of modern technology in the home and workplace for which electricity is essential.

Fourth, with the proposed Project, Vermont's electric system will be capable of meeting Vermont's reasonably projected reliability needs — but only for a limited number of years. The load forecasts in evidence all indicate that even with the proposed Project, additional resources will be needed within the next decade.[5]

Fifth, there is no cost-effective alternative to the proposed Project that is reasonably assured of timely implementation. The only alternative that might be more cost-effective — Alternative Resource Configuration ("ARC") number 5 — would still require the construction of many of the proposed transmission upgrades, including the 115 kV line from New Haven to Queen City. ARC 5 would also require the construction of three, 40-MW bulk generation

4. 30 V.S.A. § 219.

5. Those additional resources might take the form of traditional supply facilities, but could also include distributed generation and demand-side resources.

plants[6] in the Burlington area, and unprecedented levels of efficiency investment and achievement. Although unprecedented for Vermont, the efficiency component of ARC 5 appears attainable; the three necessary new power plants do not.[7] The failure of any significant generation to be seriously proposed, let alone constructed, in the Burlington area speaks volumes. While market prices have spurred the construction of many thousands of megawatts of generation elsewhere in New England, no one has come forward with concrete generation proposals for northwestern Vermont. From this we conclude that local generation is unlikely to be developed on the scale and, more importantly, schedule that would be necessary to avoid the proposed Project.

Sixth, unless cost-effective demand-side management[8] and local generation are pursued aggressively, VELCO will soon be back before this Board seeking approval for additional reinforcements to the bulk transmission system. As VELCO and ISO New England, Inc. ("ISO-NE") both candidly acknowledge in their briefs, even with the proposed Project, Vermont will need to include demand-side measures and local generation in planning to meet future needs.[9] Yet, if VELCO maintains, as it has before us in this proceeding, that it does not pursue demand-side or generation alternatives,[10] then who can and should pursue those alternatives?

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6. A bulk generation plant is one that is of utility scale and connected at transmission-level voltage. Exh. VELCO MDM-2 at 47, 51. A 40-MW bulk generation plant would be larger than any existing generation facility in Vermont other than the Vermont Yankee nuclear power station and the McNeil generation plant.

7. The evidence before us demonstrates that demand-side measures alone are insufficient to meet Vermont's reliability needs. *See* Section II. 6, below.

8. The term "demand-side management" is an umbrella term that encompasses both (1) energy efficiency (also referred to as energy conservation), and (2) load response (also referred to as demand response). *See* tr. 8/4/04 (Vol. II) at 16–17 (Mallory).

9. VELCO Brief at 79–80; ISO-NE Brief at 25.

10. As VELCO's Project Manager for the proposed Project testified:

> MR. SINCLAIR: So what is your best understanding of the company's position on whether it has an obligation to provide DSM and local generation if it's the least cost Option for reliability needs in Vermont?
>
> MR. DUNN: Quite frankly, I don't know what our obligation is to do that. I don't know what is our position, our position is that *that's not something that VELCO does.*

Tr. 2/11/04 (Vol. II) at 33 (Dunn).

Notwithstanding these conclusions, we are deeply troubled that, in the present case, we have no viable option but to approve a transmission solution for a reliability problem that might have been either deferred or more cost-effectively addressed through demand-side measures or local generation, if there had been sufficient advance planning by VELCO and its owners. To avoid repeating this dilemma in a few short years, we have concluded that we should open a separate investigation into ways to ensure that cost-effective non-transmission alternatives are given full, fair, and *timely* consideration, and to determine methods for implementing (including funding) those non-transmission alternatives that bear lower societal costs than traditional transmission projects. In deciding to open this investigation, our fundamental goal is to make sure that VELCO does not come to us at the last minute (in terms of the horizon for transmission-system planning) for approval of a project that could have been deferred or displaced by more cost-effective alternatives.

In the current Docket, VELCO has sought to excuse its failure to aggressively pursue non-transmission alternatives, asserting both legal arguments and practical difficulties. The new investigation that we will open will test the validity of these asserted legal and practical impediments, and will seek to develop ways to overcome any such impediments.[11] In the investigation we will also revisit the Board's previous determination not to require VELCO to prepare an integrated resource plan,[12] and we will assess whether deficiencies in VELCO's load forecasting has contributed to a lack of timely consideration of non-transmission resources. In this new investigation, it may also be appropriate to consider whether Vermont's Energy Efficiency Utility could be funded to play a significant role in implementing least-cost solutions to transmission constraints.[13] We also intend to address the extent, if any, to which Vermont's distribution utilities have been, and should be, undertaking their planning and other associated activities (such as issuance of Act 250 "ability to serve" letters) in conjunction with VELCO's

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11. The Vermont legislature has established integrated least-cost planning as the clear policy of this state. *See* 30 V.S.A. §§ 202a, 218(b), 218c, 248(b)(2) and 248(b)(7). Section 248(b)(2) specifically requires us to consider energy-efficiency and load management measures that are "not limited to" those that are developed pursuant to 30 V.S.A. §§ 209(d), 218c, and 218(b), suggesting that we should not be limited in our consideration to just those demand-side measures that Vermont's distribution utilities are required to implement under those sections.

12. *See* Docket No. 5778, Order of 3/12/96, at 22.

13. This might include the modification or removal of the statutory cap on the amounts collected through the Energy Efficiency Charge.

planning. Finally, it appears likely that this investigation should also consider, or at least coordinate with, planning efforts of Vermont's distribution utilities and the Vermont Department of Public Service ("Department") concerning alternatives for replacing the existing Hydro-Quebec and Vermont Yankee power purchase contracts, which will largely expire over the next decade.[14]

Findings

1. The proposed Project is now required to meet the need for present and future demand for service which could not otherwise be provided in a more cost effective manner through energy conservation programs and measures and energy-efficiency and load management measures, including but not limited to those developed pursuant to the provisions of 30 V.S.A. §§ 209(d), 218c, and 218(b). However, many elements of the Project *might not have been* required, *at this time*, to meet the need for present and future demand for service. This need might well have been provided in a more cost effective manner through energy conservation programs and measures and energy-efficiency and load management measures, including but not limited to those developed pursuant to the provisions of 30 V.S.A. §§ 209(d), 218c, and 218(b) had VELCO seriously considered implementation of conservation and efficiency measures and local generation earlier in its planning process. This finding is supported by Findings 2 through 108, below.

B. Reliability Standards

Findings

2. Pursuant to the restated NEPOOL agreement, VELCO's transmission system must meet design and operating reliability criteria of the North American Electric Reliability Council ("NERC"), Northeast Power Coordinating Council ("NPCC") and New England Power Pool ("NEPOOL"). Planning Panel pf. at 3.

14. The Hydro-Quebec contract includes several schedules which expire at different times, with most of the power entitlements under the contract expiring by the end of 2015.

3. NERC was formed in reaction to the Northeast blackout in 1965 and charged with the responsibility of promoting the reliability and adequacy of bulk electric supply systems in North America. Exh. VELCO Cross Blohm Surr-33; exh. DPS Cross 196 (Blackout Report) at 10.

4. Through its Engineering Committee, NERC established a set of planning and reliability standards for system operators to follow. The pertinent[15] NERC Planning Standards relating to the ability of the interconnected transmission systems to withstand probable contingencies are:

> S2. The interconnected transmission systems shall be planned, designed, and constructed such that the network can be operated to supply projected customer demands and contracted firm (non-recallable reserved) transmission services, at all demand levels, under the conditions of the contingencies as defined in Category B of Table I [Event resulting in the loss of a single component].
>
> The transmission systems also shall be capable of accommodating planned bulk electric equipment maintenance outages and continuing to operate within thermal, voltage, and stability limits under the conditions of the contingencies as defined in Category B of Table I [Event resulting in the loss of a single component].
>
> S3. The interconnected transmission systems shall be planned, designed, and constructed such that the network can be operated to supply projected customer demands and contracted firm (non-recallable reserved) transmission services, at all demand levels, under the conditions of the contingencies as defined in Category C of Table I [Event(s) resulting in the loss of two or more (multiple) components]. The controlled interruption of customer demand, the planned removal or generators, or the curtailment of firm (non-recallable reserved) power transfers may be necessary to meet this standard.
>
> The transmission systems also shall be capable of accommodating planned bulk electric equipment maintenance outages and continuing to operate within thermal, voltage, and stability limits under the conditions of the contingencies as defined in Category C of Table I [Event(s) resulting in the loss of two or more (multiple) components].

Exh. NH Rebuttal 8 at 9–10, 13.

5. The requirement in the NERC standards that a region's interconnected bulk power system be capable of continuing to provide service even after the sudden loss of one critical transmission line or other critical power supply component is referred to as the N–1 criterion.

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15. NERC Planning Standard S1 is a standard for no contingencies (all facilities in service), and Planning Standard S4 is an evaluation of risks and consequences for extreme contingencies.

Tr. 7/30/04 (Vol. II) at 58–59 (Smith); Blohm pf. sur. at 2.

6. The NERC Planning Standards also state:

> The Regions, subregions, power pools, and their members have the primary responsibility for the reliability of the bulk electric supply in their respective areas. These entities also have the responsibility to develop their own appropriate or more detailed planning and operating reliability criteria and guides that are based on the [NERC] Planning Standards and which reflect the diversity of individual electric system characteristics, geography and demographics for their areas. Therefore, all electric industry participants must also adhere to applicable Regional, subregional, power pool, and individual member planning criteria and guides. In those cases where Regional, subregional, power pool, and individual member planning criteria and guides are more restrictive than the NERC Planning Standards, the more restrictive reliability criteria and guides must be observed.

Exh. NH Rebuttal 8 at 4–5.

7. NERC defers to the regions, subregions, power pools and their members the primary responsibility of ensuring the reliability of bulk power supply in their respective regions. Exh. NH Rebuttal 8 at 4.

8. The NPCC is an organization whose mission is to promote the reliable and efficient operation of the interconnected bulk power systems in northeastern North America through the establishment of criteria, coordination of system planning, design and operations, and assessment of compliance with such criteria. Smith pf. at 11.

9. The NPCC membership agreement requires all NPCC members to design and operate their bulk power systems in full compliance with the NPCC Criteria Guides and Procedures. The NPCC's membership includes, though is not limited to, ISO-NE and all of the transmission owners in the northeast United States, including VELCO. The NPCC also requires each member to notify the Council of any changes that are planned that could impact compliance with the standards. Smith and Litkovitz reb. pf. at 3.

10. Section 5.0 of NPCC Document A-2 requires:

> The portion of the bulk power system in each Area and of each member system shall be designed with sufficient transmission capability to serve forecasted loads under the [contingency] conditions noted in Sections 5.1 and 5.2. These criteria will also apply after any critical generator, transmission circuit, transformer, series or shunt compensating device or HV dc pole has already been lost, assuming that the Area generation and power flows are

> adjusted between outages by use of ten-minute reserve and where available, phase angle regulator control, and HV dc control.

Exh. VELCO Planning-10 at 4–6.

11. NEPOOL is an association of entities that are engaged in the electric power business in New England. The NEPOOL members, referred to as Participants, include investor-owned utility systems, municipal and consumer-owned systems, joint marketing agencies, power marketers, load aggregators, generation owners and end users. Smith pf. at 11.

12. Section 3.0 of NEPOOL Planning Procedure No. 3 states:

> The New England interconnected bulk power supply system shall be designed with sufficient transmission capacity to integrate all resources and serve area loads under the [contingency] conditions noted in Sections 3.1 and 3.2. These requirements will also apply after any critical generator, transmission circuit, transformer, phase angle regulating transformer, HVDC pole, series or shunt compensating device has already been lost, assuming that the area resources and power flows are adjusted between outages, using all appropriate reserve resources available in ten minutes and where applicable, any phase angle regulator control, and HVDC control.

Exh. VELCO Planning-9.

13. Thus, both NPCC and NEPOOL standards specify that power systems are to be designed and operated in a manner that maintains stable and secure operation, after experiencing a contingency, even at a time when the system is already in a degraded state from the loss of a major transmission element or other major resource. This concept is often referred to as the N–2 criterion. This criterion, when observed over the last 40 years, has resulted in highly reliable operation of power systems within the NPCC region. Smith and Litkovitz reb. pf. at 3.

14. The N–1 and N–2 reliability criteria are deterministic standards, meaning the system is designed to withstand the failure of its most critical element(s), regardless of the probability of any element being lost. Exhs. VELCO Planning-6, 9, 10; tr. 9/21/04 (Vol.) II at 41–43 (Whitley).

15. The NPCC issues sanctions for any instance of non-compliance with its reliability standards. Sanctions imposed by the NPCC are letters to appropriate parties. The parties that become addressees of a given letter depend on the level of non-compliance. As the level of non-compliance increases, the addressees increase in number and importance and range from functional group managers to State and Provincial regulatory agencies, to the North American

Electric Reliability Council President, Federal Energy Regulatory Commission, U.S. Department of Energy, and State Governors and Legislatures. Smith and Litkovitz, reb. at 3.

16. In addition to being required, the N–2 standard is appropriate for northwest Vermont, based on the characteristics of the resources in northwest Vermont and the severity of the contingencies that ISO-NE studies show. Tr. 9/21/04 (Vol. II) at 56–57, 59–60, 66–67 (Whitley).

17. Reliability standards less restrictive than the N–2 criterion may be appropriate for other regions of the United States, but are not appropriate for New England. This is because New England has few interconnections (three) with other regions, those interconnections are relatively inflexible, and the mix of resources in New England further limits the region's ability to respond to problems. Tr. 9/21/04 (Vol. II) at 60–61 (Whitley).

18. If Vermont operated under the NERC N–1 reliability standard, operating procedures to shed firm load in Vermont would have to be instituted to protect the grid from cascading outages due to a second contingency. Tr. 9/21/04 (Vol. II) at 57 (Whitley).

19. The NPCC and NEPOOL have established an additional standard known as the resource adequacy criterion. This criterion states that resources will be planned and installed such that the probability of disconnecting non-interruptible customers due to a resource deficiency is no more than once in ten years, on average. "Resources" are defined to include generation, power purchases from neighboring systems, and demand-side measures for reducing load, such as conservation, demand management, and interruptible load. Montalvo pf. at 3; exh. VELCO Planning-9 (Section 2. and Appendix A); exh. VELCO Planning-10 (Section 3.0).

20. The NEPOOL resource adequacy criterion applies to the New England region as a whole, to ensure that there will be sufficient resources overall to meet the region's demands. Tr. 9/21/04 (Vol. II) at 36 (Whitley).

21. The NEPOOL and NPCC's N–2 and resource adequacy standards are intended to work together to ensure that there is an adequate supply and that the transmission system is capable of delivering that supply. Exh. VELCO MDM-2 at 16.

Discussion

We begin with the observation that the choice of reliability standards is, indeed, a choice. For New England, regional authorities and market participants have adopted the N–2 criterion. Some regions of the United States choose to apply only the single contingency standard,[16] while elsewhere an even more stringent N–4 criterion applies.[17]

New Haven and Conservation Law Foundation ("CLF") urge the Board to consider the merits of the less stringent N–1 reliability standard. Under an N–1 standard, the urgency to install the 345 kV line and the new 115 kV line would lessen. The Board could then further explore other alternatives to the proposed Project such as generation, energy efficiency, load response and transmission technologies that could potentially provide increasing amounts of electricity. New Haven also argues that while industry reliability standards are important, they are not mandatory. And, even those reliability standards that do apply to Vermont, according to New Haven, do not mandate a particular investment in Vermont's transmission system.[18]

CLF also argues that NEPOOL's N–2 criterion should not be followed because the double-contingency is an "unlikely" event.[19] CLF asserts that the probability that the combination of potentially adverse events[20] included in VELCO's critical load study to justify the proposed Project is "extremely rare. [21] CLF criticizes VELCO for not estimating the statistical probability of these adverse events occurring simultaneously. Although there has been no statistical analysis, CLF assumes that the probability of these events happening all at the same time is "less than a few hours per decade."[22]

We conclude, based on the evidence in the record, that the N–2 and resource adequacy criteria are appropriate standards by which to judge the reliability of Vermont's bulk power system. This conclusion is based on two independent rationales. First, at various levels of

16. Tr. 9/21/04 (Vol. II) at 93 (Whitley); CLF Initial Brief at 5–6.
17. Tr. 9/21/04 (Vol. II) at 93–94 (Whitley).
18. New Haven Initial Brief at 69.
19. CLF Brief at 25.
20. The combination of events include outages at both the Highgate converter and PV20 line, adverse water conditions (i.e., low) at each of the northwest Vermont regional hydroelectric facilities, 1,000 MW flowing over tie-lines from New York to New England, 65 MW of northwest Vermont generation available, and no other emergency generation available. Planning Panel pf. at 18–19; exh. VELCO Planning-6.
21. CLF Brief at 25.
22. CLF Brief at 25; Chernick pf. at 11–12.

oversight (e.g., FERC,[23] ISO-NE and NEPOOL), VELCO is expected to comply with the N–2 standard.

Second, and more important to this Board, we conclude that the N–2 and resource adequacy standards are appropriate to assure Vermonters will be provided with reliable electric power, now and in the near future.[24] Operating and maintaining a reliable electric transmission infrastructure and power supply delivery system is vital to Vermont's economy and a 21st century society:

> 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 . . . .[25]

Less restrictive reliability standards may be appropriate for other regions of the United States. For example, the Tennessee Valley Authority's ("TVA") service territory has 51 tie lines with its neighbors and sufficient fast-start generating units within its service boundaries to recover rapidly from line failures. For the case of TVA, adherence to NERC's N–1 reliability standard is reasonable.[26] Vermont, on the other hand, has far less operational flexibility to manage outages. The entire New England grid, including Vermont, is dependent on three bulk transfer interconnection lines: the New York, Hydro-Quebec and New Brunswick interconnections that provide system security in case internally generated power is insufficient. More specifically, the Northwest Vermont area is served by four bulk transmission lines, two of which are susceptible to a long-term outage, which would subject the region to unacceptable risks of voltage collapse if the N–2 criterion is not followed.[27] Additionally, generation and load response resources, which will be discussed in more detail in subsequent sections of this Order,

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23. The N–2 criterion is implicitly referenced (but nonetheless required) as a condition under the FERC approved NEPOOL open access tariff (NOATT). Tr. 9/21/04 (Vol. II) at 77–79 (Whitley).

24. Although under NEPOOL requirements the resource adequacy criterion is applied to the New England region as a whole, resource adequacy as a principle of sound system design should also be followed within Vermont's borders.

25. Exh. DPS Cross 196 (Blackout Report) at 5.

26. Tr. 9/21/04 (Vol. II) at 60 (Whitley).

27. Tr. 9/21/04 (Vol. II) at 56–57 (Whitley); Planning Panel pf. at 4.

are insufficient and unable to respond with adequate speed in the event of a double contingency in Northwest Vermont.

Denying or delaying the proposed Project until the completion of a probabilistic assessment to define the outer bounds of system reliability would not promote the public interest, for several reasons. First, a probabilistic analysis of system reliability represents an exceedingly difficult task with challenges that have not yet been successfully overcome.[28] Second, transmission system operators must continually provide power even if the probability of multiple system failures are remote.[29] Third, the probability of a combination of potentially adverse events occurring simultaneously is not as remote as CLF asserts. Although catastrophic events occur infrequently, once they do they tend to lead to double and triple contingencies fairly quickly. Thus, a combination of events can occur because they are linked to an underlying cause, such as hot summer weather or a transmission failure.[30]

Consequently, regardless of any obligations that VELCO may bear under the NOATT and the NEPOOL agreements, we find, pursuant to 30 V.S.A. § 219, that the N–2 and resource adequacy standards are appropriate for ensuring Vermonters "reasonably adequate" electric service now and in the future. As we discuss in Section II.C, the northwest Vermont region is currently served by an aging transmission infrastructure that has not been upgraded in two decades, and in some areas even longer. VELCO simply does not have, but should have, the operational flexibility to manage planned and unplanned outages. In addition to the aging infrastructure, the rapid growth in demand that has occurred over the last several years, especially in the northwest Vermont area, necessitate greater attention to reliability, not less.[31]

C. Existing Transmission System Deficiencies

Findings

22. The northwest Vermont area currently faces reliability deficiencies due to weak transmission links with the northeastern bulk transmission system and a lack of local generating

28. Tr. 9/21/04 (Vol. II) at 39–43 (Whitley).
29. Tr. 2/17/04 (Vol. II) at 83–85 (Whitley).
30. Tr. 2/17/04 (Vol. II) at 91 (Kowalski); LaForest Blackout pf. at 3.
31. Demand levels are discussed in Section II.D of this Order.

resources and distributed resources. As peak demand for power in the region increases over time, existing deficiencies are expected to worsen. Exh. New Haven Rebuttal 23 at Section 1.4.4, p. 14.

23. The northwest Vermont region is currently served via four transmission paths and 20 power generation facilities. Exh. VELCO-MDM-2 at 20–21; G. Parker pf. at 2–3.

24. One of the four transmission paths transports power from Canada and is connected to the Highgate "HVDC converter," which was installed in 1985. The HVDC converter is, in turn, connected to a single 115 kV line ("K21") which runs south to serve the northwest Vermont region. Smith pf. at 9; exh. VELCO MDM-2 at 20; G. Parker pf. at 6.

25. The Highgate Converter is the most critical resource in Vermont because it serves a large percentage of the load in Vermont. In 2001, Highgate provided approximately 20% of the state's peak load and approximately 40% of the peak demand in northwest Vermont. G. Parker pf. at 6; Planning Panel pf. at 3.

26. In 1997, the Converter output was reduced for nearly 900 hours (i.e., approximately 10 percent of the year) for transformer repairs. In 1998, the supply from Hydro Quebec was unavailable (resulting in no output from the Converter) for over 300 hours due to a major ice storm that destroyed the transmission lines in Quebec which serve the converter. Several additional, shorter duration, outages to the converter's transmission line and its breakers have occurred since 1998. G. Parker pf. at 6.

27. The Highgate Converter itself has not suffered a major unexpected outage to date. However, it is susceptible to a valve hall fire which could require six months or more to repair, because spare parts are no longer made. During such an outage, the facility would be totally unavailable to the VELCO transmission system in northwestern Vermont. G. Parker pf. at 6; Smith pf. at 9; tr. 9/21/04 (Vol. II) at 60–61 (Whitley).

28. A second transmission path, a 115 kV line known as the PV20 line, imports power from New York. The PV20 line, which was installed in 1957, is connected to two Phase Angle Regulators ("PAR"), one of which is located in Plattsburgh, New York, and has a history of outages. The second PAR was recently installed in the summer of 2004 and is located at VELCO's Sandbar substation in Vermont. The PV20 line has historically experienced several

long-term outages due to an ice storm, and due to several failures of the Plattsburgh PAR.[32] G. Parker pf. at 2– 6.

29. The PV20 circuit contains both submarine and underground cable sections, which upon failure, would require several weeks or longer to reconfigure or repair. Smith pf. at 8.

30. A third 115 kV transmission path installed in 1958 (the "K26" line) transports power to northwest Vermont from the Granite substation in Williamstown, Vermont. Power is brought in from New Hampshire via the 230 kV "F206" line, which was constructed in 1971 and extends between the Granite substation and Comerford, New Hampshire. G. Parker pf. at 2.

31. The fourth transmission path, installed in 1969, supplies northwest Vermont with power from the south over another 115 kV line (the "K30/K63" line) from West Rutland to New Haven, and continues north to Essex via Williston. G. Parker pf. at 2.

32. VELCO's existing transmission system already experiences some hours of each year when it is not capable of meeting ISO-NE's N–2 reliability criterion. VELCO's load flow analysis demonstrates that, at peak load, the current Vermont transmission system could not withstand the loss of both the Highgate converter and the PV20 line (the two worst contingencies) without loss of load in northwest Vermont, due to the remaining lines exceeding thermal capacity or suffering voltage collapse. Planning Panel pf. at 5, 9.

33. A voltage collapse is a series of system behaviors that result in insufficient voltage and, as a consequence, loss of load. The extent of voltage collapse is difficult to predict for any one set of circumstances, but the direct impact is loss of load. Planning Panel pf. at 8–9.

34. 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 situation creates a domino effect with overloads cascading until load and generation come into balance or the entire interconnection shuts down. Under severe conditions, equipment damage and load disconnection can occur quickly without sufficient time for operator intervention. Planning Panel pf. at 9–10.

35. If a PV20 outage were to cause voltage collapse, load disconnection of an unknown magnitude (but probably greater than 150 MW) would be needed in the northwest Vermont area

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32. Installation of the second (Sandbar) PAR should significantly reduce the probability of an outage due to a failure of the Plattsburgh PAR. *See* Docket No. 6852, Order of 9/16/03.

to prevent the 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 facilitate such a load-shedding pattern. Even more optimistically, 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 Panel pf. at 8–9.

36. During the August 14, 2003, blackout, Highgate and PV20 tripped within one minute of each other, along with 130 MW of generation and 140 MW of load, due to low voltage propagating from New York. With the power flows redistributed after the initial losses, it is likely that the Granite to Essex 115 kV line would have exceeded its thermal capacity had VELCO not been able to bring the Highgate converter back on-line (with the ties to the New York grid remaining open) within 15 minutes of the initial event. LaForest Blackout pf. at 3, 11–12.

37. Despite state-wide growth in the demand for electric power over the last decade, VELCO has not built any significant transmission lines since the 1970s and 1980s. The incremental upgrades since that time are not capable of sustaining the existing or future reliability of the Vermont transmission network. G. Parker pf. at 2, 8–9; Planning Panel pf. at 2.

38. 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, loss of either the PV20 line or the Vermont Yankee-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.

39. At today's load levels and under a reasonable set of generation assumptions,[33] the long-term outage of either the PV20 line or the Highgate converter, followed by any of a number of contingencies, will lead to widespread problems due to the inability of the remaining transmission lines to support the load. The area of impact is likely to include all of northwest Vermont and possibly extend further into Vermont. The impacts would include severe sags and possible collapse of voltage. Severe sags down to roughly 85% and below would cause

33. In the discussion that follows, we address CLF's assertion that these assumptions were not in fact reasonable.

extensive tripping of "customer side" residential, commercial and industrial equipment. Voltage collapse would cause complete loss of load over the area impacted. Restoration from the voltage collapse would be a complicated process requiring up to 24 hours before service could be fully restored to all customers. Smith pf. at 9–11.

40. Vermont's existing transmission system begins to experience deficiencies at the 700 MW to 800 MW load level. Dunn pf. at 12; exh. VELCO Planning-6.

41. With Highgate out of service, McNeil in-service, 15 MW of hydroelectric generation, and no elements of the proposed Project in service, the existing system would be exposed to possible voltage collapse at a Vermont load of approximately 825 MW. Exh. DPS-VELCO-Cross-18, No. 27a.

42. If nothing is done to correct the existing reliability problems, by the time the Vermont summer peak reaches 1,100 MW (forecast for between 2006 and 2009), loss of the West Rutland to Middlebury 115 kV (K-30) line or the Granite to Barre 115 kV (K-26W) line would be a contingency that could result in voltage collapse. The K-30 line contingency, the worse of the two, could cause voltage collapse at loads as low as 1,050 MW 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 12–13; exh. VELCO Planning-6; Chernick pf. at 13; Finding 55, below.

43. VELCO retained LaCapra Associates ("LaCapra") to evaluate the capability of existing generation and demand-side resources to meet the NPCC/NEPOOL loss of load probability ("LOLP") of no more than once in ten years (the NPCC/NEPOOL resource adequacy criterion). LaCapra's study demonstrated 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 16.5 days per ten years in 2008, and to 73.0 days per ten years in 2011. Montalvo reb. pf. at 5–6.

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

45. The existing transmission system in northwest Vermont has a transfer capability of approximately 384 MW. Generating resources located within northwest Vermont have a Peak

Load Carrying Capability ("PLCC")[34] of 116 MW. Therefore, the northwest Vermont power system, which is comprised of transmission and generating facilities and demand-response measures, has the capability to reliably serve up to 500 MW of peak demand. Exh. VELCO MDM-2 at 25.

46. Northwest Vermont's peak demand load in 2002 was 564 MW. VELCO thus fell 64 MW short of complying with the resource adequacy standard in 2002. Exh. VELCO MDM-2 at 25.

47. Peak demand in northwest Vermont is expected to continue growing. The expected growth in demand would increase the amount by which the system falls short of satisfying the resource adequacy standard, as follows:

	Net Forecasted Peak Load Demand (MWs)	NWVT Existing Transmission import capability (MWs)	NWVT Existing Generation Load Carrying Capability (MWs)	Net Power Deficit (MWs)
2002	564	384	116	(64)
2005	589	384	116	(89)
2008	635	384	116	(135)
2011	672	384	116	(172)

Exh. VELCO MDM-2 at 26 (Table 5).

Discussion

At current load levels, and below, northwest Vermont does not meet the N–2 reliability criterion (i.e., a power outage could result from the loss of two of the four transmission lines serving northwest Vermont). If nothing is done to correct these existing reliability problems,

34. Peak Load Carrying Capability ("PLCC") is a system tool used to establish a region's resource needs. Under the PLCC calculation, as used by NEPOOL and VELCO for planning purposes, the minimum amount of capacity, including reserves that must be installed, is determined as a function of expected load (net of economic or emergency load reduction programs), the capacity ratings and forced outage rates of the region's generating facilities, the transmission import capability of the region and the desired reliability level. Exh. VELCO MDM-2 at 21–22. (The desired reliability level is the LOLP of no more than one day in ten years.)

northwest Vermont would be susceptible to a power outage for the loss of one transmission line by the time the state-wide summer demand peak reaches 1,100 MW (forecast for between 2006 and 2009). In addition, VELCO's resource adequacy study predicted that, beginning in 2004, the frequency of disconnecting firm load would be greater than the once in tens years allowed by the New England resource adequacy standard. As peak demand for power increases, northwest Vermont is exposed to an increasing risk of power outages.

Based on these two different types of reliability analyses, we conclude that the power delivery system in place today fails to provide the desired level of reliability for serving current peak demand levels in northwest Vermont.

The increase in forecasted net requirements for power, along with non-compliance with the N–2 criterion, have led ISO-NE to identify the northwest Vermont region as an area of heightened concern that is more susceptible to power outages than other areas of the country.[35] ISO-NE and other market participants first identified the proposed Project in 2001 as a high priority project that is needed to boost reliability of the regional grid. ISO-NE has since stated that all components of the proposed Project should be "completed as soon as practical." The reason for the added concern is "due to weak interconnections with the bulk transmission system and a lack of generating resources and distributed resources in the region." As peak demand for power increases in northwest Vermont, the existing deficiencies are likely to worsen.[36] At demand levels that were experienced in 2002 (564 MW), northwest Vermont did not meet the resource adequacy criterion. While VELCO has been able to serve the region's needs, in so doing it has exposed customers to increased risk of power interruptions and relied on expensive peaking units.

CLF contends that the proposed Project is not necessary given that VELCO has, in recent years, been able to rely successfully on internal Vermont peaking units and temporary generators to meet the demand for power. According to CLF, VELCO also failed to demonstrate that peaking units, temporary generators and other emergency procedures were insufficient to provide interim relief while distributed resources could come on line.[37] To underscore its

35. Tr. 9/21/04 (Vol. II) at 59–61 (Whitley).
36. Mertens pf. at 6.
37. CLF Brief at 11.

assertions, CLF points to the testimony of VELCO's consultant, who stated that "VELCO operators could likely implement emergency procedures that would allow them to run the transmission system so as to serve load for a couple of years until additional transmission, generation or demand-side measures were implemented."[38]

We find CLF's arguments to be unpersuasive. The temporary generators and peaking units that CLF refers to include oil and diesel-fired generating units located in northwest Vermont. It is not reasonable to assume that these existing local combustion turbines and small diesel generating units will be available on a daily basis, at a high duty cycle, and for increasingly extended periods. These units can only run for a limited number of hours per year due to emissions requirements, and have been unreliable in the past. Some units have tripped shortly after they have started, while others have been unavailable due to ongoing major or minor failures. These smaller generating units cannot be expected to run for a significant number of hours without exposing them to mechanical failures. Relying on temporary and expensive fossil-fuel generators to maintain system reliability is not a sound policy.[39]

It is similarly unwise to rely on emergency peaking and temporary generation units for interim relief while waiting for additional distributed resources to come on line. Distributed resources would likely take up to seven or more years before they are fully implemented and have a significant impact on reducing peak demand in northwest Vermont.[40] Because these measures take time to implement, the northwest Vermont system would, under CLF's recommendation, be operated at a less than acceptable margin of safety and would expose Vermonters to greater risks of power disruptions than is acceptable.

Furthermore, CLF has misconstrued the testimony of VELCO's witness regarding the implementation of emergency procedures to serve load until demand-side measures could come on line. In the section of the prefiled testimony cited by CLF, VELCO's witness was summarizing the results of the stress tests that were conducted to assess the viability of various alternative resource configurations and compare them to the proposed Project. The main thrust of the witness' testimony on this issue was that under a high peak demand growth scenario, the

38. Montalvo pf. at 9.
39. Smith pf. at 8–10; Planning Panel pf. at 18–20.
40. Exh. VELCO OEI–1 at 6.

proposed Project was still the preferred option. The relevant parts of the testimony not noted by CLF were that, if Vermont's peak demand were to increase more than expected, the:

> physics of the power system would favor the [proposed Project]. Transmission elements are limited 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 run the transmission system so as to serve load for a couple of years until additional transmission, generation or demand-side measures were implemented.** The generation-based ARCs are capacity limited and would not be able to serve load above the 1,200 MW critical load level while additional infrastructure was added to the system."[41] (Emphasis added).

VELCO's witness was not recommending the use of emergency procedures until additional infrastructure was added. Instead, VELCO's witness was stating that generation-based alternatives were capacity-limited and, therefore, unable to reliably serve higher load levels. VELCO's witness continued to state that the proposed Project could provide reliable power under the high growth scenario even if it were necessary to implement short-term emergency procedures in the event that portions of the transmission lines exceeded thermal and voltage constraints.

Based upon the above findings of fact and discussion, the Board concludes, given the existing generation capability and demand-side management activities in northwest Vermont, that the existing transmission system fails to provide the desired level of reliability for northwest Vermont. Given that the deficiencies of the system will increase as peak demand increases, the next section addresses the rate at which demand is expected to grow. Subsequent sections discuss the ability of the proposed Project and of various alternatives to address the existing transmission deficiencies.

D. Present and Future Demand for Service:

Findings

48. The following graph illustrates Vermont's historical and projected peak electrical demand:

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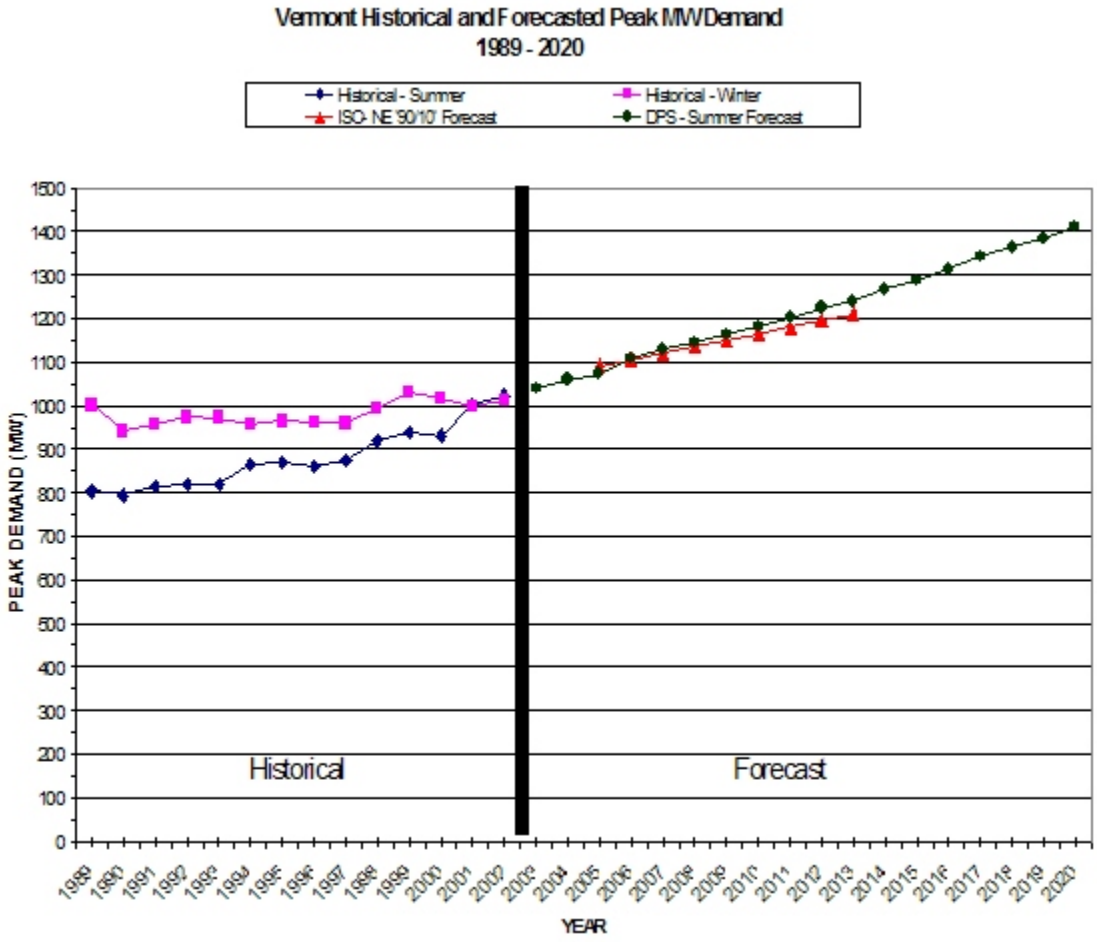
41. Montalvo pf. at 9.



Planning Panel pf. at 16–18; exh. VELCO MDM-Reb.-1 at 3.

49. Prior to 2002, Vermont was a winter-peaking state, meaning that the electric peak demand was higher in the winter than in the summer. VELCO, at least prior to 1998, failed to realize and plan for the fact that summer peak was approaching winter peak and might soon exceed it. Technical Panel reb. pf. at 14; Finding 48, above.

50. Demand for electric power across VELCO's entire service territory has been growing at an average rate of 2.1% annually over the past ten years, reaching a peak of 1023 MW in the summer of 2002.[42] Exh. VELCO-MDM-2 at 18.

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42. Growth in customer demand includes approximately 30 MW of power in the upper Connecticut Valley area of southwestern New Hampshire. It is appropriate to include this demand since that area is electrically connected with and served as part of VELCO's transmission system. Exh. VELCO-MDM-2 at 18.

51. Peak demand for electric power in Vermont totaled 1002 MW in the summer of 2003, a summer that was marked by cooler weather compared to the summer of 2002. Tr. 6/15/04 (Vol. II) at 53–54 (McIntyre).

52. The forecast used by VELCO to predict future demand for service was the Department's statewide load forecast of August 5, 2002.[43] Planning Panel pf. at 17; VELCO Technical Panel, reb. pf. at 6.

53. The Department's forecast of statewide peak demand relied upon an "end-use" model, also known as the Energy2020 energy simulation program, that projects the peak from the ground up by looking at each sector of the economy (residential, commercial, industrial), the amount of electricity consumed in each of those sectors, the types of equipment that are used in each sector, the efficiency of the equipment used, and the forecasted number of devices and patterns of usage. Exh. CLF-35 at 13.

54. In 2003 and 2004, ISO-NE conducted independent studies of projected peak demand for Vermont. Montalvo reb. pf. at 8; exh. VELCO-MDM Reb.-1 at 3.

55. The results of the Department and ISO-NE studies are:

43. The Department forecast was adjusted upward to account for demand contributions from the Connecticut Valley area of New Hampshire and then adjusted downward by amounts equal to the estimated reductions in demand as a result of existing Efficiency Vermont and Burlington Electric Department demand-side management programs.

Year	2002 DPS Forecasted Vermont Peak Demand, Net of DSM	2003 ISO-NE CELT BASE 90/10 PEAK DEMAND FORECAST - MW (Vermont Statewide)[44]	2004 ISO-NE CELT BASE 90/10 PEAK DEMAND FORECAST - MW (Vermont Statewide)
2003	1038.5	—	—
2004	1060.0	—	—
2005	1073.3	1105	1092
2006	1108.6	1124	1106
2007	1129.9	1143	1121
2008	1145.2	1162	1135
2009	1163.5	1182	1150
2010	1181.8	1202	1165
2011	1202.1	1223	1180
2012	1224.4	1244	1195
2013	1239.9	—	1211
2014	1267.3	—	—
2015	1287.7	—	—
2016	1313.1	—	—
2017	1341.5	—	—
2018	1363.9	—	—
2019	1384.3	—	—
2020	1410.7	—	—

Planning Panel pf. at 17; exh. VELCO-MDM Reb.-1 at 3.

56. The 2002 Department and 2004 ISO-NE studies indicate that peak demand for power, net of demand-side management savings, is likely to exceed 1,100 MW in 2006.[45] Planning Panel pf. at 17; exh. VELCO-MDM Reb.-1 at 3.

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44. Loads include distribution losses and are net of incremental demand-side management savings.
45. The significance of the 1,100 MW load level is discussed in Section II.C, below.

57. Regardless of which forecast is used to estimate the expected future peak demand, all forecasts in evidence indicate that there is a significant probability that 1,100 MW of statewide demand will be reached, at the latest, by 2009. Tr. 6/15/04 (Vol. II) at 83 (McIntyre).

Discussion

As discussed above in Section II.C of this Order, VELCO's transmission system, which is already strained, will become increasingly less reliable as the demand for power approaches the statewide level of 1,100 MW unless steps are taken to either increase transmission capacity into the congested area of northwest Vermont or build generation and implement aggressive energy-efficiency measures in that area. Once Vermont reaches the 1,100 MW load level, northwest Vermont may not meet even the N–1 reliability standard, and would face an increased risk of widespread outages as demand increases above that level.[46] While many of the parties agreed that reliability may be degraded above the 1,100 MW level, they disagree over the timing of when the critical 1,100 MW level will be reached.

Based on its prediction that Vermont's economy will continue to expand at the current rate of growth, the Department asserts that peak demand for power will exceed the 1,100 MW level sometime during 2006 despite existing energy efficiency programs. ISO-NE also conducted an independent analysis of Vermont's future peak demand. It predicted peak demand will reach the 1,100 MW level sometime between 2006 and 2009 (depending on the edition and type of forecast).[47]

CLF, New Haven and the other opposing parties did not proffer independent forecast studies. However, each of these parties assert that load growth will be slow enough that critical components of the proposed Project, such as the 345 kV line, the new 115 kV line and the second dynamic reactive device, can be postponed.

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46. *See* Planning Panel pf. at 5–6. Also, as described in Section II.E, even if all other scheduled components of the proposed Project are in service, without the proposed 345 kV line northwest Vermont would not meet the N–2 standard at the 1,100 MW load level. Exh. Planning-6.

47. ISO-NE conducts annual forecasts of peak demand throughout the New England region. One forecast, the "50/50" forecast, assumes average weather conditions for forecasting purposes. A second forecast, the "90/10" forecast, assumes hotter than average summer temperatures for forecasting purposes.

CLF challenges the predictive power of the Department study and claims that ISO-NE's 50/50 forecast belies the urgency to construct the 345 kV line and Second Dynamic reactive device. Depending on the forecast used, CLF claims that the "1100 MW level is predicted to occur no sooner than 2007 and more likely several years later, even assuming Vermont does nothing further to increase investments in demand [side] management."[48]

CLF urges the Board to rely on ISO-NE's 50/50 2003 CELT forecast. The results of that forecast are:[49]

	ISO-NE October 2003
2003	1,010
2004	1,040
2005	1,040
2006	1,060
2007	1,080
2008	1,090
2009	1,110
2010	1,120
2011	1,140
2012	1,160

The 2003 50/50 study predicts that peak demand will reach 1,100 MW sometime in 2009. Under the 50/50 forecast, ISO-NE expects that actual peak demand has a 50% probability of being equal to or greater than the forecasted peak demand. It is a method for ISO-NE to model expected outcomes assuming average summer weather conditions.[50] ISO -NE also conducts a more conservative estimate known as the 90/10 forecast. Under the 90/10 study, ISO-NE anticipates that the actual peak demand has a 90% probability of being equal to or less than the

48. CLF Initial Brief at 60.
49. Chernick pf. at 13.
50. Tr. 2/11/04 (Vol. II) at 116 (LaForest).

forecasted peak demand. It is a method for ISO-NE to model expected outcomes assuming above-average weather conditions (i.e., hotter than usual summer days).[51]

We find that the Department's August 2002 peak load forecast, which was used by VELCO, is the most reliable indicator of future demand levels that was submitted as evidence in this proceeding. The Department's forecast of future statewide peak demand is based on an "end-use" model known as the Energy2020 energy simulation program. This program estimates the total expected peak demand for power by examining each sector of Vermont's economy and the amount of electricity consumed in each of the sectors by assessing the types of equipment used, their efficiency and patterns of usage. The Energy 2020 program is a robust study that the Department has relied upon in its 20-year Vermont energy plans.[52] The Department's model incorporates changes in the overall economy in Vermont. Required inputs to the Energy 2020 model include outputs from the Regional Economic Model, Inc. ("REMI") econometric model, a software model of regional and state economies. Recent editions of economic reports (May 2004) that base their opinions on the REMI indicate that Vermont's economy is expected to expand over the next several years.[53] This leads us to conclude that the growth in demand will reach the 1,100 MW level sooner rather than later.

In concluding that the Department's forecast is a reliable indicator of future demand, we also find it probative that the Department's 2002 forecast results are similar to the 2003 and 2004 90/10 forecasts conducted by ISO-NE. In fact, *all* of the studies — including the 50/50 forecast — predict that the critical 1,100 MW level will be reached as soon as 2006 but no later than 2009. The confluence of independent studies around a fairly tight range of time strongly suggests to us that taking action designed to serve the anticipated 1,100 MW load level is the prudent course of action, especially in light of the fact that 2009 is well within the lead times necessary to plan, review and implement a project of this magnitude.[54]

We conclude that it would be inappropriate to rely on the 50/50 forecast advocated by CLF for transmission planning, as the results of such a study are just as likely to underestimate

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51. Tr. 2/11/04 (Vol. II) at 116 (LaForest).

52. Exh. CLF-35 at pp. 11–13.

53. Exh. DPS Cross 117.

54. Indeed, an important lesson from this proceeding has been that VELCO needs to plan further into the future than it has done for this proposed Project.

peak demand as they are to overestimate demand. Because the ISO-NE's 50/50 study is designed to predict the median expected peak demand under average temperature conditions during the summer months, it is a less conservative forecast of the possible outcomes than the Department's forecast. By definition the 50/50 forecast has a 50% probability of underestimating demand. This is not an appropriate basis upon which to design a bulk power system that must be capable of serving load levels that have a reasonable probability of occurring in the near future. It also is not the forecast used by NEPOOL's reliability committee.[55] Instead, the reliability committee relies on the more conservative 90/10 forecast.

CLF recommends that we delay components of the proposed Project based upon the belief that the 1,100 MW level may not arrive until 2010.[56] This belief, in turn, rests on the assumption that the relationship between the growth in energy (kWh) consumption and peak power demand (MW) is linear and constant over time. This assumption has not been tested and is without basis in the evidentiary record.[57] We cannot accept CLF's recommendation based on that untested premise. Moreover, Mr. McIntyre, an expert witness called at CLF's request, did not contradict the conclusions of the Department's 2002 forecast. While he suggested that there may be some cause for a limited amount of concern over some of the Department's conclusions,[58] Mr. McIntyre acknowledged that the Department did a "good job" in conducting its August 2002 forecast study.[59]

E. The Proposed Project as a Solution to the Transmission Deficiencies

Findings

58. In 1998, when it realized that Vermont's load was becoming summer-peaking, VELCO started its planning process to address reliability issues in northwest Vermont. Prior to filing its petition for the proposed Project in mid-2003, VELCO filed, and the Board approved, petitions for the Essex STATCOM, the Rutland Regional Reliability Project, and the Northern Loop Project. Technical Panel reb. pf. at 14–16.

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55. Tr. 2/20/04 (Vol. I) at 37 (Chernick).
56. Tr. 6/15/04 (Vol. II) at 28–30 (McIntyre).
57. Tr. 6/15/04 (Vol. II) at 29–30, 67 (McIntyre).
58. Tr. 6/15/04 (Vol. II) at 10 (McIntyre).
59. Tr. 6/15/04 (Vol. II) at 54 (McIntyre).

59. The proposed Project 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 would address thermal concerns on the northwest Vermont interface ties, and would also address voltage problems after major contingencies. Planning Panel pf. at 3–4.

60. ISO-NE has identified the proposed Project as one of two high priority projects in New England that need to be completed. The proposed Project was first recommended in the RTEP2002 report, which means the problem was identified and elevated for scrutiny prior to 2001. ISO-NE has since recommended that all the components of the proposed Project be "completed as soon as practical" (RTEP03 Report 9/23/03). NEPOOL has endorsed this conclusion by approving $156 million of construction as eligible for pool transmission facility ("PTF") treatment, and therefore eligible for regionalized cost support under the Restated NEPOOL Agreement and NEPOOL Open Access Tariff.[60] Mertens pf. at 6.

61. The elements of the proposed Project that are required to reliably serve *today's* load levels are the Sand Bar PAR, the Blissville PAR, the Hartford capacitors, the Essex K24 line breaker, the New Haven to Queen City 115 kV line, reconductoring of the Granite-to-Barre 115 kV circuit, the Granite PAR, the first phase of the Granite dynamic reactive device, and a 230/115 kV transformer plus fixed capacitors at Granite. This group of upgrades comprises roughly two-thirds of the estimated Project cost. Planning Panel pf. at 24; exh. Planning-6 at 14; Smith pf. at 9.

62. Assuming that the elements of the proposed Project listed in the preceding finding are in place, and the Northern Loop Project and New Hampshire upgrades[61] are in service, the additional elements of the proposed Project needed to reliably serve load levels up to 1,200 MW include the additional 345 kV line from West Rutland to New Haven, and the second phase of

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60. Vermont would pay all of the non-PTF costs, and approximately 4.09% of the PTF costs. Dunn pf. at 16.

61. The New Hampshire upgrades are the White Lake to Saco Valley 115 kV (Y-138) line, and the Fitzwilliam 345/115 kV autotransformer and associated southwest New Hampshire 115 kV line reconductoring. Planning Panel pf. at 14–15, 25.

the Granite dynamic reactive device. Smith pf. at 9; Planning Panel pf. at 25; exh. Planning-6 at 14.

63. With the assumption that the projects referenced above are in place, the New Haven-to-West Rutland 345 kV line is needed at the 1,100 MW load level to increase the overall transmission system strength and also to directly address the issue of overloaded transmission lines serving northwest Vermont. Voltage instability concerns due to contingencies involving the 340 line do not resurface until approximately 1,140 MW, at which time the Granite dynamic device would need to be expanded to provide further dynamic reactive control in the Vermont system. Planning Panel pf. at 25.

64. The 1,100 MW load level is the load level by which all elements of the proposed Project (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.

65. Potential elements of the proposed Project that could be deferred and still allow for VELCO to reliably serve load at some reduced levels are: (a) elimination of the second 75 MVAR unit of the Granite Dynamic reactive device, resulting in a reduced capability to 1140 MW; and (b) elimination of the 345 kV line from West Rutland to New Haven resulting in a reduced capability to 1,100 MW. The next stage of reduction would be the elimination of the first 75 MVAR unit of the Granite Dynamic reactive device which would reduce the capability to today's load levels. All other elements of the proposed Project are required to serve today's load levels. Smith pf. at 13–14.

66. There is one exception to the proposed Project providing reliable service up to 1,200 MW of statewide load. Throughout its critical load study, VELCO always assumed Highgate was out of service as the first (most critical) contingency because an extended outage of the Highgate converter could last up to six months, while an extended outage of the PV20 line is likely to last two to three weeks. Assuming all non-deferrable Project elements are in service, the second-most critical contingency is the loss of the PV20 line at today's load levels up to a statewide load level of 1,100 MW, at which time the West Rutland to New Haven 345 kV line is necessary to meet the N–2 criterion. Although the proposed Project would provide reliable service beyond 1,200 MW of statewide load for the Highgate-PV20 contingency combination in

either order of occurrence, once the West Rutland to New Haven 345 kV line is in service, the second-most critical contingency becomes the loss of the 340 line from Vermont Yankee to Coolidge at a statewide load level of 1,200 MW. However, with the PV20 out of service, and Highgate in service, the loss of the 340 line becomes a critical contingency at 1,165 MW. Planning Panel pf. at 18–19; Smith pf. at 13; tr. 2/27/04 (Vol. II) at 51–53 (Planning Panel).

Discussion

The proposed Project would meet the need for present and near-future demand for service.[62] The proposed Project would enable the bulk power system to provide reliable service to northwest Vermont (i.e., satisfy the N–2 contingency criterion) for all double-contingency scenarios up through 1,165 MW, and would provide reliable service up through 1,200 MW for all double-contingency scenarios in which the Highgate converter is the first contingency.

VELCO has sought to justify the 1,200 MW level on the grounds that Highgate is Vermont's most critical resource, and that, based upon its technology, it is susceptible to an extended outage.[63] VELCO has therefore introduced a probabilistic factor into the deterministic reliability analysis. The Department agrees that it is more reasonable to focus on the Highgate outage and the resulting ability of the proposed Project to serve 1,200 MW of load. In light of the strictly deterministic nature of the N–2 reliability standard, we conclude that the proposed Project would support reliable service for loads up to the 1,165 MW level.

We now turn to two issues raised by New Haven, CLF, Vermont Citizens for Safe Energy ("VCSE"), and Addison County Regional Planning Commission ("ACRPC") through

62. The issue of whether there are alternatives that could meet the demand for service in a more cost-effective manner is discussed in the following two sections.

63. Throughout its testimony in this docket, VELCO has characterized the proposed Project as providing reliable service up through statewide load levels of 1,200 MW, assuming that the first contingency is the Highgate converter. After the Department presented testimony that a first contingency involving failure of the PV20 line would reduce that reliability level to 1,165 MW, VELCO explained that the Highgate/PV20 contingency combination would be reliable up through 1,200 MW, but that above statewide load levels of 1,100 MW, the PV20 line followed by the 340 line (from Vermont Yankee to Coolidge) becomes the critical contingency combination at 1,165 MW. Smith pf. at 13; tr. 2/27/04 (Vol. II) at 51–53 (Planning Panel).

their witness, Robert Blohm. In its brief,[64] New Haven argues, in reliance on Mr. Blohm,[65] that "[t]he greater Vermont's reliance on long distance transmission, the greater its susceptibility to blackouts." Mr. Blohm's testimony presented no facts nor cited any studies, but instead simply stated that this was demonstrated by the August 14, 2003, blackout. While it makes intuitive sense that the longer the transmission line, the greater the chance of a fault on the line, there are many other factors that determine reliability, including the reliability of local generation, and Mr. Blohm did not provide any quantitative analysis on this or any other topic. Further, Mr. Blohm is an economist, does not have any formal engineering training, does not have any experience in bulk transmission system planning or analysis, and does not have any education, training, or experience in the performance of resource adequacy studies for the New England bulk power system.[66] Because Mr. Blohm lacks expertise on this topic and did not provide any quantitative analysis on this topic, the overwhelming weight of the evidence supports the Petitioners, who did present expert testimony and extensive quantitative analysis on this matter.

Second, New Haven argues that:

> After [Federal Energy Regulatory Commission] Order 888, wholesale transmission lines can no longer be constructed and kept for the use of the owner or its affiliates . . . VELCO cannot build the 345 kv line or 115 kV line and restrict its use to serve VELCO's Vermont owners . . . . Under Order 888, and ISO-NE's Open Access Tariff, wholesale transmission lines are open to bidders on a first-come, first-served basis.[67]

In making this claim in its brief, New Haven did not cite to any evidence in the record of this proceeding. The Department responded to this contention by noting that power flows are governed by the laws of physics, not by economics.[68]

We are not persuaded by New Haven's argument. New Haven attempts to rely on asserted *legal* obligations of transmission owners as a basis to conclude that the proposed Project will not provide *physical* reliability to northwest Vermont. Not only has New Haven failed to provide any evidentiary support for its claim other than Mr. Blohm's testimony (which, for the

64. New Haven Brief at 43 (paragraph 30).
65. Blohm sur. pf. at 21.
66. Blohm sur. pf. attached resume; tr. 10/20/04 (Vol. II) at 10–17 (Blohm).
67. New Haven Brief Re: Testimony of Robert Blohm at 2.
68. DPS Reply Re: Testimony of Robert Blohm at 1.

reasons stated above, we find unpersuasive), but the evidentiary record includes extensive engineering analysis demonstrating that the proposed Project would meet the present and near-term future need for service in northwest Vermont.[69]

F. Transmission-only Alternatives

Findings

67. VELCO and the other parties have evaluated various transmission alternatives, which are summarized in the table below and described in the findings following the table.

Alternative	Reliable (N–2) to statewide load levels lower than or equal to (MW)[70]	Cost relative to proposed Project	Citation
Proposed Project	1,200	N/A	Dunn pf. generally; Planning Panel pf. generally.
(1) Proposed Project, but without West Rutland to New Haven 345 kV line	1,100	Lower	Planning Panel pf. at 25; exh. TD-21.
(2) Same as (1), except double-conductor existing West Rutland to New Haven 115 kV line	1,100–1,140	Lower	Fagen pf.; Smith reb. pf. at 9–11.
(3) Same as (1), except add a second 115 kV circuit between West Rutland and New Haven	1,140	Lower	Exh. Planning-8 at III, 24.
(4) Same as (3), except add a second 115 kV circuit between Granite and Middlesex	1,200	About same	Exh. Planning-8 at III, 24.

69. *See*, for example, Planning Panel pf. generally; exh. VELCO Planning-6.

70. The proposed Project would be reliable to 1,200 MW if unavailability of the Highgate converter is the first contingency. However, if the PV20 line is the first contingency, the proposed Project would be reliable up to 1,165 MW. Smith pf. at 13; tr. 2/27/04 (Vol. II) at 51–53 (Planning Panel); exh. VELCO Planning-6. All alternatives are compared against the reliability level of 1,200 MW statewide load.

(5) Same as (4), except replace second West Rutland to New Haven 115 kV with 230 kV	1,200	About same, or slightly higher	Smith pf. at 29; tr. 7/30/04 (Vol. II) at 73 (Smith).
(6) Same as (4) except make Highgate converter redundant, and eliminate Sand Bar PAR, second Granite FACTS, and Granite to Barre 115 kV reconductor.	1,165	Substantially Higher	Exhs. Planning-6, Planning-8.
(7) Proposed Project, except replace proposed New Haven to Queen City 115 kV line with second 115 kV circuit from New Haven to Queen City via Williston, reconductor 34.5 kV line from Vergennes to Queen City, BED upgrades	1,200	Higher	Smith pf. at 20–22; tr. 2/11/04 (Vol. II) at 142–43, 153 (LaForest); exh. DPS Cross 11.
(8) Energize PV-20 line at 230 kV (no other upgrades)	Same as today's system with Highgate and PV20 modeled out of service as N–2	Lower	Exh. Planning-8 at 5–6.

68. Alternative (1), delaying construction of the 345 kV line, is not a viable option at this time because if all of the other reliability improvements were built immediately, VELCO's critical load study shows that the 345 kV line is still needed by a Vermont peak load of 1,100 MW, which is forecast to occur around 2006. VELCO Technical Panel reb. pf. at 3; Planning Panel pf. at 17.

69. Alternative (2), the proposed double-conductoring of the existing West Rutland to New Haven 115 kV line in lieu of constructing the proposed 345 kV line, would increase the thermal capacity[71] of the line. However, this alternative would only reduce the impedance of the West Rutland to New Haven corridor by approximately 20–30%, while the proposed 345 kV line

71. Thermal capacity is the ability of the line to carry electrical current up to the point at which the temperature increase due to current flowing in the line (in combination with ambient conditions) causes the line to physically expand and sag below the required NESC clearance.

would reduce the impedance by 90%. Therefore, the 115 kV line reconductoring would not solve voltage problems caused by contingencies elsewhere on the transmission system. The higher impedance of this alternative would also result in higher electrical losses than would the proposed 345 kV line. For this alternative to attain comparable reliability to the proposed Project, it would also require at least a second 115 kV line between Granite and Middlesex, and possibly other upgrades. This alternative would preserve the West Rutland to New Haven corridor for a future upgrade to 345 kV. Smith and Litkovitz reb. pf. at 10; tr. 2/11/04 (Vol. II) at 152–159 (Planning Panel).

70. Alternative (3), a second 115 kV line between West Rutland and New Haven in lieu of constructing the proposed 345 kV line, is similar to Alternative (2), above. Because Alternative (3) is a separate 115 kV circuit, it would result in an impedance reduction of approximately 50%, but would still result in a much higher impedance than the proposed 345 kV line. This alternative would require a second 115 kV line between Granite and Middlesex at a state-wide load level of 1,140 MW to achieve the same reliability as the proposed Project (see Alternative (4)). Exh. Planning-8 at 24; Smith and Litkovitz reb. pf. at 10–11.

71. Alternative (4), a second 115 kV line from West Rutland to New Haven and a second 115 kV line between Granite and Middlesex, is considered by VELCO to be the next-best alternative, after the proposed Project. This alternative would provide the same level of reliability as the proposed Project. However, this alternative would result in higher impedance (and therefore higher losses) than the proposed 345 kV line, would result in additional environmental impacts along the Granite to Middlesex corridor, does not offer substantial cost savings, and would not be an appropriate platform for future transmission upgrades.[72] Exh. Planning-8 at II, 24; exh. DPS Cross-7 at 2.

72. Alternative (5), constructing 230 kV rather than 345 kV between West Rutland and New Haven, would result in higher impedance (and therefore higher losses) than the proposed 345 kV line, would require additional voltage transformation from 345 kV to 230 kV at the West

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72. VELCO's long-range plans for upgrades to its transmission system to achieve reliability (i.e., comply with the N–2 reliability criterion) up to 1,540 MW include extending 230 kV between the Granite substation and the Plattsburgh (NY) substation, and extending 345 kV north from West Rutland via New Haven and Williston to a future Champlain substation in Essex, where 230/345 kV transformation would occur. Exh. DPS Cross 7.

Rutland Substation, and would limit the load serving capability of future system expansions. This alternative would likely cost slightly less than the proposed Project, although it would likely be reliable up through 1,200 MW. To achieve the same level of reliability as the proposed Project, a second 115 kV line from Granite to Middlesex would likely be necessary, and this additional upgrade would raise the cost of this alternative to slightly above that for the proposed Project. Smith pf. at 29; Smith and Litkovitz, reb. pf. at 7–8; tr. 3/5/04 at 147–148, 254 (Smith).

73. Alternative (6), making the Highgate converter redundant, is considered by VELCO to be the third-best alternative, behind the proposed Project and the 115 kV alternative described in Alternative (4). This alternative would cost substantially more than the proposed Project, and would be reliable up to 1,165 MW because if Highgate is always available, the PV20 would be the most critical first contingency. Planning Panel pf. at 40–41; exh. Planning-8.

74. Alternative (7), a second 115 kV line between New Haven and Queen City via Williston, along with reconductoring the 34.5 kV Vergennes to Queen City line, as well as upgrades to the Burlington Electric Department system, would provide the same reliability to northwest Vermont as the proposed 115 kV line between New Haven and Queen City via Vergennes. This alternative would cost more than the proposed Project, and would not be consistent with future transmission upgrades. In addition, due to current NESC electrical clearances, the new poles for the reconductored 34.5 kV line would be 50 to 60 feet tall, and would have a similar appearance to the proposed 115 kV structures. Smith pf. at 20–22; tr. 2/11/04 (Vol. II) at 142–145 (Planning Panel); exh. DPS Cross 11.

75. Alternative (8), upgrading the PV20 line to 230 kV would cost $90 million without any other upgrades. In addition to its high cost, this alternative would do nothing to improve the post N–2 contingency state of the Vermont transmission system because the double contingency combination of the Highgate converter and the PV20 line is the most critical contingency if the proposed West Rutland to New Haven 345 kV line is not in service. An upgrade of the PV20 line from 115 kV to 230 kV would only make this path the most limiting outage. Planning Panel pf. at 40; exhs. VELCO Planning-8 at 5–6, VELCO Planning-6.

76. In addition to evaluating the alternatives described above, VELCO, at the request of the Board, evaluated alternative conductor types to determine whether these technologies could result in shorter poles, longer spans, or smaller diameter conductor. The industry-standard

conductor is the aluminum conductor steel reinforced ("ACSR"). VELCO evaluated the aluminum conductor composite core ("ACCC") manufactured by the Composite Technology Corporation, the aluminum conductor composite reinforced ("ACCR") manufactured by 3M Corporation, and the aluminum conductor steel supported trapezoidal wire ("ACSS-TW") produced by the major conductor manufacturers in the United States. Dunn reb. pf. at 10–11, exh. TD Reb.-4; exh. DJB Supp.(1)-48.

77. The ACCC and ACCR (collectively, "ACC") conductor technologies both claim approximately twice the ampacity (electrical current carrying capability), and a reduction in conductor sag, when compared to a similar-sized ACSR. Therefore, a benefit of the ACC technologies is that they could be used to avoid the need to rebuild existing structures or to build new lines to meet increased power needs. In addition, if a new line must be built, use of the ACC technology could allow shorter poles, longer spans, smaller wire, or some balanced combination of these benefits. However, the ACC technologies are unproven and still in the "developmental stages," would require different spare parts, tools, and training, and would most likely cost more than the ACSR. Neither 3M nor CTC has published the cost of its ACC wires, although it appears that CTC expects the conductor cost to be approximately two to three times the cost of ACSR, and the installation labor to be about 110% of the cost of traditional ACSR installations. Exhs. DJB Supp.(1)-48, DJB Supp.(1)-49.

78. The primary advantage of the ACSS-TW over the ACSR is the ability of the ACSS-TW to operate at a higher temperature (thermal loading), which allows the ACSS-TW to carry much higher electrical current compared to ACSR of the same size (cross sectional area of aluminum). Therefore, for the same size conductor, the ACSS-TW would sag less than the ACSR for the same power flow. However, ice loading is the limiting factor in the Vermont environment. Under heavy ice loading conditions, the ACSS-TW would sag more than the ACSR, and would not result in shorter structures or longer spans. Using a smaller size ACSS-TW to achieve a similar ampacity as the ACSR would result in higher electrical losses, and would not result in shorter structures or longer spans. Dunn reb. pf. at 10–11; exh. TD Reb.-4; Smith reb. pf. at 6.

Discussion Re: Transmission-only Alternatives

As described in the above findings, the various transmission-only alternatives are inferior to the proposed Project. Most of the alternatives evaluated are a substitute for the proposed West Rutland to New Haven 345 kV line, but would not alter the need for the 115 kV line from New Haven to Queen City. Doing nothing is not an option at this time, because the proposed 345 kV line would be necessary at a statewide load level of 1,100 MW, assuming all other proposed Project upgrades (with the exception of the second phase of the Granite reactive device) are in service. The 1,100 MW statewide load level is projected to occur within a year or two of the date of this Order, and, as the next section describes, this is not a sufficient time period in which to implement efficiency or generation measures as a substitute.

Reconductoring the existing West Rutland to New Haven 115 kV line would add thermal capacity to the line, but, compared to the proposed 345 kV line, would only provide a small benefit in terms of avoiding voltage collapse on the line resulting from contingencies elsewhere on the transmission system. Therefore, reconductoring the line would only provide a minimal gain in reliability. A second 115 kV circuit would provide a slightly greater protection against voltage collapse, but still far less than that of the proposed 345 kV line. A 230 kV line instead of a 345 kV line would approach the reliability of the 345 kV line, would cost approximately the same, and would have a similar physical appearance to that of the proposed 345 kV line. All of these alternatives to the West Rutland to New Haven 345 kV line would require adding a second 115 kV circuit from Granite to Middlesex to increase the reliability of the alternative up to the same level as the proposed Project. The alternatives to the 345 kV line would all result in higher electrical losses than the 345 kV line, would result in environmental impacts to a third transmission corridor, and would have a similar or slightly higher cost than the proposed Project in order to achieve the same level of reliability as the proposed Project. In addition, the 115 kV and 230 kV alternatives to the 345 kV line would not be compatible with VELCO's long-term expansion plans for extending 345 kV from New Haven to Williston to a future Champlain substation in Essex. (Although future expansion may be inevitable, it could — and perhaps should — be delayed through proper planning.) If expansion of the transmission system is required at some time in the future, these alternatives would either limit the load serving

capability of future system expansions, or would require facilities to be torn down to accommodate the facilities required for the expansion.

Routing the proposed new 115 kV line through the Williston corridor and reconductoring the existing 34.5 kV line with larger wire would cost more than the proposed Project, and would not change the physical appearance of, or the aesthetic impacts to, the New Haven to Queen City corridor as compared to the proposed 115 kV line because the new 34.5 kV poles would be approximately the same height as the proposed 115 kV poles. In addition, this alternative would also limit any required future transmission expansion plans for the Williston corridor, or would require expansion of the Williston corridor or removal of one of the 115 kV lines to upgrade the transmission voltage in this corridor. Therefore, the Board concludes that this is not a viable alternative for providing a fifth transmission path into northwest Vermont while maintaining flexibility in the future for any required transmission expansions.

The alternatives of making the Highgate converter redundant and upgrading the PV20 line to 230 kV are likewise not viable alternatives. Both alternatives would cost substantially higher than the proposed Project to attain the same level of reliability, and would not mitigate the loss of the PV20 line, which is the most critical transmission element in terms of electrical impact on the system.[73]

For these reasons, the Board concludes that, of the transmission-only alternatives listed above, the proposed Project is the most cost effective and achieves the highest level of reliability.

Although the ACCR and ACCC technologies appear to have significant benefits over the industry-standard ACSR conductor, the fact that both manufacturers have warranty disclaimers severely limiting their liabilities does raise a significant concern.[74] In addition, it appears that no testing has been performed to address the expected life of the composite core materials when subjected to the environmental conditions and the extreme cycling of temperatures that the

73. The Highgate converter has been considered throughout this proceeding to be the most critical element serving northwest Vermont due to its potential for an extended outage of six months or more. However, the loss of the PV20 line has a larger electrical impact on the system. Planning Panel pf. at 40–41; exh. VELCO Planning-6.

74. Exh. DJB Supp.(1)-48 at 7; exh. DJB Supp.(1)-49.

conductors would be exposed to in Vermont.[75] In general, an investment may provide exploratory, research, or option value to ratepayers.[76] However, in the case of these new ACC technologies, it would be premature for this Board to require VELCO to install either of these technologies instead of the ACSR until there is a reasonable likelihood that they will perform at least comparably to the ACSR.

G. Alternative Resource Configurations

79. In its original Petition, VELCO evaluated five Alternative Resource Configurations ("ARC"), which all included a mix of transmission and generation. ARC 5 included energy-efficiency measures in addition to transmission and generation components. Exh. VELCO MDM-2 at 1, 3.

80. To assess demand-side management potential, VELCO retained Optimal Energy, Inc. ("Optimal"). Specifically, Optimal assessed the potential for investments in end-use energy efficiency improvements to reduce peak demand growth in northwest Vermont over the 2003 to 2012 time period. Optimal's study estimated future efficiency savings in four zones of the state: the "inner zone;" the" metro-area zone" (the inner and metro- area zones combined have been characterized as the Burlington area); the "northwest zone;" and the "northwest\central zone." Exh. VELCO OEI at 3.

81. Optimal's study estimates the following energy savings:

75. Exh. DJB Supp.(1)-48 at 7.

76. *See In Re : CVPS,* Docket 5132, Order of 5/15/87 at 133–134, 163.

Optimal Energy, Inc. Projected Savings from Transmission-Targeted Demand-Side Initiatives Cumulative Annual Summer Peak (MW) Reductions			
Year	Inner and Metro-Area Zones Total Residential\ Commercial & Industrial Customers	Northwest & Northwest\Central Zones Total Residential\ Commercial & Industrial Customers	Total OEI Savings - All Zones
2003	3.4	3.7	7.1
2004	10.8	11.2	22.0
2005	22.3	21.7	44.0
2006	36.3	36.1	72.4
2007	51.2	53.8	105.0
2008	63.4	69.6	133.0
2009	74.5	84.2	158.7
2010	83.8	96.9	180.7
2011	91.4	107.0	198.4
2012	97.3	115.3	212.6

Exh. OEI-1 at 6.

82. The demand-side savings that Optimal has projected are highly likely to be attainable. Plunkett/Mosenthal/Neme pf. at 6; tr. 2/18/04 (Vol. I) at 108–109 (Plunkett).

83. The farther the load reductions are from the Inner Metro zone, the less effect they have on displacing or deferring the proposed Project. Consequently, in assembling the alternative resource configurations, demand-side management was applied first to the inner metro zone, then to the outer metro zone, and so on until the residual need was satisfied. Montalvo reb. pf. at 12. Potential demand-side savings that Optimal identified in the inner and metro-area zones were included as a part of ARC 5 that VELCO evaluated. Exh. VELCO MDM-2 at 56; Finding 87, below.

84. Energy-efficiency savings located in the greater northwest Vermont and Northwest\Central zones (which include communities outside of the inner and metro zone)

would not increase reliability within the inner and metro-area zones of northwest Vermont (which includes the inner metro (i.e., Burlington) and metro-area communities), without additional generation in the inner and metro-area zones. Tr. 2/28/04 (Vol. II) at 17–18 (Plunkett); exh. OEI-1 at 3.

85. Even if the ARC study had included all of the demand-side savings identified by Optimal in all four zones, there would have been no change in the timing of the need for those elements of the proposed Project identified as non-deferrable. Nor would the timing of the need have changed for the 345 kV line and the Granite-to-Barre reconductoring. Montalvo reb. pf. at 13; exh. MDM-Reb-3.

86. For purposes of designing the ARCs, each ARC must include those elements of the proposed Project that provide voltage control, ensure system stability, or direct flows. Those elements cannot be reliably replaced with non-transmission alternatives, due to either cost or operational characteristics. For these reasons, each of the five ARCs includes the following elements of the proposed Project: the New Haven-to-Queen City 115 kV line; the Blissville PAR; Sandbar PAR; Essex K24 115 kV breakers; Hartford capacitors; and Granite capacitors. Montalvo pf. at 4–5.

87. In addition to the transmission elements of the proposed Project listed in Finding 86, above, the ARCs include the following components:

ARC 1: 180 MW of simple-cycle combustion turbines and approximately 15 MW of distributed generation installations.

ARC 2: 90 MW combined-cycle generator and 120 MW of combustion turbine.

ARC 3: 150 MW combined-cycle generator and 120 MW of combustion turbine.

ARC 4: 200 MW combined-cycle generator and 120 MW of combustion turbine.

ARC 5: three combined-cycle generators (120 MW total) and 74 MW of energy-efficiency-based peak demand savings.

Montalvo pf. at 5–6.

88. ARC 5 includes generation because demand-side measures alone could not address the reliability problems in northwest Vermont. It would take a number of years before the full

demand-side savings identified by Optimal could be accomplished; consequently, additional resources would be needed early on to address the deficiency in load-carrying capability in northwest Vermont. Consequently, 120 MW of generation are included as part of ARC 5. Montalvo reb. pf. at 12.

89. Each of the five ARCs would satisfy the resource adequacy criterion, and each is thus comparable to the proposed Project in reliability. Montalvo pf. at 5–6; exh. VELCO MDM-2 at 14–15.

90. The costs of these five ARCs were combined with potential energy-efficiency savings and program costs. The net cost of each ARC (including potential energy-efficiency savings and program costs) was then compared to the net cost of the proposed Project. Exh. MDM-2 at 14–15.

91. VELCO compared the net present value of each option's carrying costs, net variable costs to serve VELCO's load and the net societal costs to the net present value of the proposed Project's carrying costs, net variable costs and net societal costs. The net present value analysis spanned over the 2005–2016 time period, with a 2005 present value. Montalvo pf. at 6; exh. VELCO MDM-2.

92. The societal costs reflected in VELCO's analysis included monetized values for external environmental costs. Exh. VELCO MDM - 2 at 65–66.

93. The following table summarizes the cost comparisons (in $Millions) between the proposed Project and ARCs 1, 2, 3, 4 and 5, under the base case assumptions:

	Proposed Project	ARC 1	ARC 2	ARC 3	ARC 4	ARC 5
Installed cost	$126.0	$225.0	$266.0	$313.0	$340.0	$389.0
Present Value Carrying Costs (2005–2016)	$94.2	$185.7	$234.9	$274.4	$294.1	$306.7
Present Value of Net Variable Costs to Serve Vermont Load	$1,178.1	$1,130.3	$1,068.8	$1,023.4	$981.5	$1,067.6
Present Value of Total Societal Costs	$1,272.1	$1,310.9	$1,307.1	$1,303.6	$1,276.4	$1,206.4

Present Value of Total Societal Costs, adjusted for PTF Treatment	$1,187.2	$1,274.3	$1,271.1	$1,267.0	$1,239.7	$1,169.8

Exh. VELCO MDM- 2 at 67.

94. The present value of the expected total societal costs, without regard to Pooled Transmission Facility ("PTF") treatment,[77] of ARC 5 is approximately 5.19% less ($66 Million) than the present value of the expected total societal costs of the proposed Project. Montalvo pf. at 10–11 (Present Value cost Table).

95. ARCs 1, 4, 5 and the proposed Project were subjected to stress tests (that ARCs 2 and 3 were not subjected to) in order to further assess the cost effectiveness of the ARCs relative to the proposed Project. The stress test conditions included high and low peak demand load growth, high fuel prices, and low wholesale electric prices. Montalvo pf. at 6–8.

96. ARC 2 and ARC 3 were not subject to further stress tests. Because ARCs 2, 3 and 4 all included the installation of both Combustion Turbines and Combined Cycle generators, there would be no incremental value to stress testing ARCs 2 and 3, given that their respective performances were poorer than ARC 4. Exh. VELCO MDM-2 at 5.

97. The proposed Project has lower expected total societal costs than ARC 1 and ARC 4 under all stress cases. ARC 5 has lower expected total societal costs than the proposed Project under all stress cases except for the low load growth scenario. Exh. VELCO MDM-2 at 75–76.

98. VELCO developed a sixth ARC and compared it to the proposed Project. ARC 6 included approximately 12 MW of demand response, a portion of the energy-efficiency identified in ARC 5 and 180 MW of generation. Montalvo reb. pf. at 12.

99. The total societal cost of ARC 6 was between four and nine percent greater than the proposed Project under the base and stress case scenarios studied by La Capra. Exh. VELCO MDM Reb-6.

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77. Under existing NEPOOL agreements, designated projects, or portions of designated projects, are eligible for cost-sharing treatment among New England states. Each state's share of the cost of implementing investments designated as Pooled Transmission Facilities is equal to the proportional share of that state's MW peak demand to New England's system-wide share of total MW demand. Vermont's share of the proposed Project costs is estimated to be 4.1%. (Dunn pf. at 16).

100. ISO-NE has designated the proposed Project as a "Reliability Upgrade." The NEPOOL Tariff defines "Reliability Upgrade" 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 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.

Exh. NH Reb- 23; Whitley pf. at 10; Dunn pf. at 15.

101. ISO-NE designated the proposed Project as a "Reliability Upgrade" due to the absence of market responses that could potentially mitigate some of the reliability concerns in northwest Vermont. As a result of this designation, ISO-NE recommends completion of the proposed Project's components as soon as is practicable. Whitley pf. at 10; tr. 2/20/04 (Vol. I) at 79 (Chernick).

102. If the market does not respond with adequate solutions to a transmission problem, ISO-NE is responsible for providing a coordinated transmission plan (i.e., Regional Transmission Expansion Plan) that identifies appropriate upgrades for reliability and economic needs. Market responses include, but are not limited to, investment in generation, merchant transmission facilities, and demand-response programs. Whitley pf. at 7–9.

103. To date, no entity has come forward to propose the construction of electric power generation in northwest Vermont. Tr. 2/16/04 (Vol. I) at 79 (Chernick).

104. Power plants with the capacity to deliver 9,000 MW of power have been built in New England over the last four years. None of these power plant developers have chosen to locate the plants in northwest Vermont. The proposed Project could provide an additional path from that surplus capacity into the northwest Vermont load. The surplus capacity in New England may

have caused investors to be reluctant to invest in additional merchant generation in New England, because competition is so great. Tr. 9/21/04 (Vol. II) at 71–72 (Whitley).

105. The proposed Project has fewer expected implementation-related uncertainties than do any of the proposed ARCs. The uncertainties of implementing the ARCs include siting and building generation in northwest Vermont, as well as securing fuel supply and installing fuel-supply infrastructure. Exh. MDM-2 at 3, 9; Mertens pf. at 5.

106. Demand response programs, while helpful to the system, cannot provide for contingencies in the same manner as transmission or generation. Demand-response programs are not instantaneous and thus cannot be called upon in emergencies. Mallory reb. pf. at 8; tr. 9/21/04 (Vol. II) at 58 (Whitley).

107. Demand response can assist in meeting an area's peak demand on a short-term basis, but reliance upon demand response for extended duration is likely to lead to a poor response rate. Mallory reb. pf. at 12.

108. As noted in Finding 86, above, all of the ARCs included the proposed New Haven to Queen City 115 kV line, which is needed to resolve transmission deficiencies at a statewide load level of 785 MW (far below today's peak load levels). A total of 350 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 132–133, 137 (Planning Panel); exh. CLF Cross 13; exh. Planning-6.

Discussion

Based on the above findings, we conclude that construction of the proposed Project is the most cost-effective means of meeting the current and future demand for service in northwest Vermont. No other proposal presented in this case, including the generation, energy efficiency, and load response measures included in the various ARCs, can meet the expected need for service with an appropriate level of reliability in a timely manner. Our decision is influenced by the time constraints VELCO is operating under to improve the reliability of the bulk power system. The net power deficit in northwest Vermont currently stands at 64 MW and is expected

to increase to 135 MW in 2008.[78] As the power deficit continues to increase, Vermonters would be exposed to more outage-related risks than we find to be acceptable.

All of the Alternative Resource Configurations include many of the transmission components of the proposed Project, including the proposed 115 kV line between New Haven and Queen City.[79] All but one of the Alternative Resource Configurations have a total societal cost in excess of the proposed Project and therefore would not be a more cost-effective solution to the northwest Vermont reliability problems. ARC 5, on the other hand, has an estimated net present value total societal cost that is $66 million (5.19%) less than that of the proposed Project.[80] However, ARC 5 faces a greater number of implementation uncertainties, such as siting and building generation, securing fuel supply and installing fuel supply infrastructure. Due to these substantial uncertainties, we conclude that while ARC 5 may have a lower projected total societal cost than the proposed Project, it is not a viable alternative. There is not a reasonable likelihood that the generation component of ARC 5 — three 40-MW generating sations — could be implemented within the necessary timeframe.

CLF and other opposing parties also contend that VELCO was predisposed to a transmission-only solution.[81] As a result of VELCO's predisposition, according to these parties, insufficient attention was given to energy efficiency, demand response and generation alternatives. In short, the opposing parties contend that non-transmission alternatives are essential to least-cost planning, meet the need for current and future demand in a timely manner, and that the proposed Project is inconsistent with least-cost planning.

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78. Exh. VELCO MDM-2 at 26.

79. As noted in Finding 108, 475 MW of generation or load reduction would be needed to replace or defer the 115 kV line.

80. This cost differential ignores the PTF treatment of costs. The designation of many of the components of the proposed Project as PTF facilities means that a substantial amount of the proposed Project's costs would be paid by out-of-state entities. We reject the contention that, in assessing the cost-effectiveness of alternatives, we should discount the direct costs of the proposed Project by that amount that would be borne by those outside Vermont's borders. Over the years, Vermont has paid its share of pooled costs for projects outside this state. For the proposed Project, it is Vermont's turn to receive the benefits of pooled treatment. In the future, Vermont will likely be required to continue to pay its proportionate share for out-of-state projects. Thus, PTF treatment carries costs as well as benefits.

81. E.g., CLF Brief at 52.

The opposing parties are correct in claiming that a least-cost plan should carefully evaluate energy conservation, demand-response[82] measures and generation alternatives. However, the record evidence demonstrates that the non-transmission alternatives do not offer viable, timely least-cost solutions to the reliability needs of northwest Vermont.

CLF argues that the record indicates that "DSM ***alone*** can meet Vermont's reliability 'need' and in a timely manner, even assuming that the Board chooses to define need by deferring to NEPOOL's reliability criteria."[83] CLF contends that energy conservation programs could displace:

> 44 MW of the 89 additional MW anticipated to be needed in 2005,
>
> 133 MW of the 135 additional MW anticipated to be needed in 2008, and
>
> 212 MW of the 172 additional MW anticipated to be needed in 2012.[84]

CLF's argument merits careful attention, but is unpersuasive upon closer inspection. CLF compares VELCO's estimate for incremental power needs within the northwest Vermont region to Optimal's forecast of energy efficiency savings over a broader geographic area. VELCO describes the northwest Vermont region as encompassing Optimal's inner, metro-area and northwest Vermont zones, but *not* the Northwest/Central zone that is included in Optimal's forecast.[85] The demand-side savings from the Northwest/Central zone would have no material impact on the import capability of the system into northwest Vermont during summer peaks.[86]

Alternatively, CLF argues that the 74 MW of energy-efficiency savings that were proposed as a part of ARC 5 — *without* the generation component — are sufficient to delay the construction of the 345 kV line.[87] This assertion is based on a comparison of the anticipated energy-efficiency savings in the inner and metro-area zones to the overall statewide peak load. Here, CLF assumes that 74 MW of energy-efficiency savings in the inner and metro-area zones

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82. In this context, we define demand response (which is also often referred to by the parties as load response) as the ability of consumers to reduce consumption as directed by ISO-NE or, in response to real-time price signals, the ability of consumers to monitor and control their consumption. Exh. SHP-3 at 7–8.

83. CLF Reply Brief at 2 (emphasis in original).

84. CLF Reply Brief at 4–5. CLF projects that in 2012 energy-efficiency programs will produce a power surplus.

85. Exh. VELCO MDM-2, Appendix 2.

86. Montalvo reb. pf. at 13.

87. CLF Brief at 58.

is equivalent to 130 MW of load reduction in Vermont as a whole because the inner and metro-area zones constitute roughly 56% of the statewide load.[88] On the basis of this analysis, CLF asserts that if the energy-efficiency programs were implemented and achieved, the point at which VELCO anticipates statewide demand to reach the critical 1,100 MW level would be delayed and therefore the need to construct the 345 kV line can be postponed.

We do not accept CLF's argument because it fails to recognize the need for local generation that would exist before the full energy efficiency savings could be realized. To cover this shortfall requires the 120 MW of generation included in ARC 5.

During the rebuttal phase of this case, VELCO conducted a study of another alternative resource configuration (ARC 6) which included 12 MW of demand response in addition to the generation units that were a part of ARC 5 and 25% of the maximum achievable energy-efficiency savings proposed by VELCO's energy efficiency consultants. The amount of the demand response included in ARC 6 was equivalent to approximately 2% of northwest Vermont total peak demand.[89]

CLF asserted that while VELCO did consider this non-transmission alternative, VELCO, nonetheless, failed to evaluate the full potential of demand response as a means to postpone elements of the proposed Project.[90] CLF contends that, in order to fully explore the merits of demand response, VELCO should have surveyed and solicited large customers to determine if a "localized interruptible program would get enough response." [91] CLF asserts that VELCO was also obligated to determine which incentives would be necessary to "induce sufficient curtailment." And, finally, CLF claims that VELCO was obligated to evaluate additional measures that customers could implement, such as load shedding. According to CLF, because VELCO failed to perform these tasks, it failed to satisfy its statutory burden under Section 248(b)(2).

88. Chernick pf. at 15, fn. 8.
89. Montalvo reb. pf. at 14.
90. CLF Brief at 71.
91. CLF Brief at 72.

Demand-response programs are not instantaneous and thus cannot be called upon in emergencies.[92] Demand-response programs, while helpful to the system, cannot provide for contingencies in the same manner as transmission or generation.[93] Demand response can assist in meeting an area's peak demand on a short-term basis, but reliance upon demand response for extended duration is likely to lead to a poor response rate.[94]

CLF claims that a recent report indicates that experience in other regions demonstrates that a relatively small amount of price-responsive load can enhance system reliability.[95] We find CLF's assertion unpersuasive. While demand-response programs may have an impact on system reliability in other regions, there is no evidence in the record to conclude that similar successes can be attained in Vermont. Not only has CLF failed to present any evidence that Vermont has industries similar to those in other regions that have successfully implemented demand-response programs, but the evidence that is in the record indicates that Vermont does not have such industries.[96] Furthermore, according to the same report that CLF cites, ISO-NE and New England regulators have been successful in attracting only "modest enrollments" which have *not* had a significant impact on peak load reductions. [97] We thus conclude that, although demand-response programs can be a beneficial addition to the system, they cannot be relied upon to play a substantial role in addressing the reliability problem that is the subject of this Docket.

It appears that in analyzing the alternatives, neither VELCO nor the DPS included a ten percent risk adjustment factor for demand-side measures.[98] CLF contends that, as a result, the

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92. Mallory reb. pf. at 8.

93. Mallory reb. pf. at 8.

94. Mallory reb. pf. at 12.

95. CLF Brief at 70, citing exh. SHP-3 at 12.

96. The nature of Vermont's industrial customers limits the potential for a large-scale demand response program. Although Maine is a rural state like Vermont, the different composition of the industrial-customer base in the two states allows Maine to implement a much larger demand-response program than Vermont. Specifically, Maine has large paper mills which are much more flexible in their ability to curtail large amounts of load. The only industrial customer in Vermont that has a load of similar scale is IBM, which has an industrial process that is very sensitive to load curtailments. Tr. 2/12/04 (Vol. II) at 66-68 (Montalvo); tr. 2/17/04 (Vol. II) at 25, 34 (Whitley); tr. 2/19/04 (Vol. II) at 73 (Welch).

97. Exh. SHP-3 at 12.

98. The Department acknowledges this in its Brief (proposed finding 208, at page 98). In its Reply Brief, VELCO contends that its analysis was conducted "in accordance with the least cost planning standards adopted by this Board, . . ." VELCO Reply Brief at 7. However, in its Reply Brief VELCO relies on its proposed findings that state that its analysis included "societal costs," without specifically identifying the risk adjustment factor. *Id.*, citing VELCO's

(continued...)

Board has no other option but to reject VELCO's petition. CLF argues that by excluding the risk adjustment, VELCO and the DPS undervalued the benefits of the energy efficiency programs in ARC 5.[99] Had VELCO and the DPS complied with Board precedent[100] requiring the risk adjustment, CLF asserts, the "superior cost effectiveness of a DSM approach as compared to the [proposed Project] would be even more substantial"[101] than the estimated 5.19% differential that currently exists between ARC 5 and the proposed Project.

When considering the societal benefits and costs of various investments, Board precedent calls for equal treatment among energy efficiency, renewable energy and distributed resources with supply-side options.[102] We are convinced that additional opportunities for energy savings exist in Vermont, particularly if the statutory time horizon for assessing total life-cycle cost is the life of the opportunity under consideration.[103] We are also confident that renewable energy and distributed generation have a role to play in the development of energy resources.

We have considered equally the benefits and costs of all the alternative resources. We conclude that these resources could be implemented and sustained over a long period of time. However, even with aggressive demand-side program implementation, at least three new power plants would also be needed in the Burlington area. To date, no party has demonstrated that the construction of these power plants can be completed in a timely manner. Stated elsewhere in this Order, we do conclude that the proposed Project is the least-cost alternative that has fewer potential implementation hurdles and therefore can be in service before peak demand reaches the 1,100 MW level. The ten percent composite risk adjustment, established by the Board for use in cost comparisons, does not offset the implementation problems associated with power plant construction. Thus, even after application of the ten percent risk adjustment, we would be left

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98. (...continued)
proposed findings 190–231. VELCO's ARC analysis includes no mention of the risk adjustment. *See generally* exh. MDM-2. We conclude, based on the record before us, that there is no evidence that VELCO included the risk adjustment factor in its analysis.

99. CLF Reply Brief at 17.

100. *In re Investigation into Least-Cost Investments, Energy Efficiency, Conservation, and Management of Demand for Energy*, Docket No. 5270, (Vol. IV) at 9–10, 51 (April 16, 1990).

101. CLF Reply Brief at 15.

102. Docket No. 5270, (Vol. III) at 90, 91 (July 13, 1989), adopted by the Board, (Vol. IV) at 50 (April 16, 1990) (emphasis added).

103. *See* exh. OEI-1.

with VELCO's proposal as the least-cost plan with the greatest potential to serve the current and future need for service. The omission of the ten percent adjustment from the cost comparison has not affected the ultimate conclusion that we reach.

Conclusion

We agree with CLF that VELCO should be encouraging the implementation of demand-side management programs whenever they can cost-effectively displace or defer system upgrades. However, from the evidence before us, we conclude that demand-side measures alone cannot meet the need for service in northwest Vermont. Due to the relatively slow pace at which the demand-side savings would build up, an additional 120 MW of generation would be needed, in addition to aggressive demand-side programs, to address the reliability issues facing northwest Vermont.

While ARC 5 has a lower expected total societal cost, building and completing three generating facilities in northwest Vermont in a timely manner is an unlikely proposition, especially in light of the fact that no one has come forward to propose building a single power generator in the area. The northwest Vermont region *today* faces a net need for additional reliable power. Relying on the highly uncertain proposition that three generation plants will be built in the inner and metro-area zones of northwest Vermont — as ARC 5 and ARC 6 each would require — is not a viable option, and would present unacceptable risks of power outages. We conclude that the most cost-effective alternative that will meet the need for service and that has a reasonable likelihood of implementation is the proposed Project.

The same time constraints that dictate the approval of the proposed Project have also led us to conclude that we must open an investigation into VELCO's least-cost planning, as we stated in Section II.A of today's Order. Waiting to evaluate non-transmission options until it is too late to implement them represents neither sound public policy nor good utility planning practice.

We are also concerned that even a timely consideration of demand-side options will be of little effect if there is no entity charged with their implementation. Under current Vermont laws and policies, there appears to be an "efficiency gap" in which distribution utilities are relieved of their obligations to pursue all cost-effective efficiency investments on the condition that they

cooperate in good faith with the Energy Efficiency Utility.[104] However, the Energy Efficiency Utility, because of the statutory cap on its funding as set in 30 V.S.A. § 209(d)(4), is not provided with the funding necessary to make all cost-effective energy efficiency investments. Nor has VELCO stepped forward to fill that gap, citing instead a decade-old decision of this Board accepting an uncontested proposal that, at that time, did not require VELCO to prepare or implement a least-cost integrated plan.

Clearly it is time to seek again one or several ways of addressing this problem. Therefore, as we stated in Section II.A, we will open an investigation into the appropriate obligations for VELCO and Vermont's distribution utilities (both in their roles as load-serving entities and their roles as owners of VELCO).

III. LEAST-COST PLANNING

Introduction

We conclude that the proposed Project meets the principles of least-cost planning, which include the consideration of the environmental impacts of the Petitioner's decisions regarding alternatives. In past orders we have not required VELCO to produce a least-cost integrated plan. However, we are obliged by law to ensure that any proposed Project is consistent with the principles of least-cost planning. An analysis of these principles lead use to conclude that the proposed Project meets the statutory requirement of Section 248(b)(6).

Findings

109. GMP's least-cost integrated resource plan provides that, for its subtransmission system (primarily 34.5 kV), improvements are to be undertaken to promote two goals: "one, to serve immediate area growth; and two, to reinforce GMP's subtransmission system to interface with any proposed expansion or upgrades to VELCO's bulk transmission system." Exh. GMP DD-Reb-1 at 1.

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104. Docket No. 5980, Order of 9/30/99, Attachment A ("Memorandum of Understanding") at ¶ 15.

110. The proposed Vergennes Reroute is consistent with the principles of resource selection expressed in GMP's approved least-cost integrated resource plan. Denis reb. pf. at 4–5; exh. GMP DD-Reb-1.

111. The proposed Project is consistent with the principles of integrated least-cost planning, including consideration of the environmental impacts of resource alternatives. *See* findings in Section II.G.

Discussion

Section 248(b)(6) provides that, before issuing a certificate of public good for a company's proposed purchase, investment, or construction, the Board must find that the proposed action "is consistent with the principles for resource selection expressed in that company's approved least cost integrated plan."[105]

Of the two Petitioners, only GMP has an approved least-cost integrated resource plan. GMP's plan calls for GMP's subtransmission system to be upgraded to coordinate with improvements to VELCO's bulk transmission system. The Vergennes Reroute is consistent with this provision.

VELCO has not prepared a least-cost integrated resource plan. In the past, this Board has not required VELCO to do so, because VELCO is "a non-distribution utility whose capital expenditures are already subject to Board review."[106] Notwithstanding this Board precedent, New Haven contends that because VELCO is an electric utility regulated by the Board, it is required to have an approved least-cost plan, and that without a plan, VELCO cannot meet its burden under Section 248(b)(6) of proving the proposed Project's consistency with its plan.[107] ACRPC presents a similar argument: it contends that 30 V.S.A. § 218c requires VELCO to have

105. A separate statutory section — 30 V.S.A. § 218c — requires that "[e]ach regulated electric or gas company shall prepare and implement a least cost integrated plan for the provision of energy services to its Vermont customers." Section 218c further provides that the utility shall submit its proposed least-cost integrated plan to the Board, which may approve the plan if it complies with the least-cost planning requirements detailed elsewhere in the section.

106. Docket No. 5778, Order of 3/12/96, at 22.

107. New Haven Brief at 105.

a least-cost integrated plan, and that VELCO's failure to do so is sufficient reason for the Board to reject the proposed Project.[108]

We are not persuaded by New Haven's and ACRPC's arguments, because both the legislature and this Board have recognized that lack of an approved least-cost plan should not, by itself, preclude issuance of a certificate of public good for a proposed project. When the legislature amended Section 248 to add criterion (b)(6), it expressly provided that the statute as amended:

> does not prohibit the public service board from granting a certificate of public good under 10 V.S.A. § 248 for a utility which does not have an approved least cost integrated plan; provided that the board shall consider in its review under that section those environmental effects which the utility must consider in developing a least cost integrated plan.[109]

Consistent with this legislative intent, when utilities do not have approved integrated resource plans, the Board evaluates projects under Section 248(b)(6) according to their consistency with the principles of least-cost integrated planning.[110] Those principles include consideration of the environmental impacts of the utility's resource decisions.[111]

The Vermont legislature and this Board have thus both concluded that it is appropriate to allow for approval of projects in the absence of an approved integrated least-cost plan. This allowance makes practical sense, in that it permits the Board to approve projects that are needed, beneficial to the public, and consistent with least-cost planning principles, even if the utility in question does not have an approved least-cost plan.[112]

The proposed Project is consistent with the principles of least-cost planning because, as explained in Section II.G, it has the lowest overall societal cost, including environmental costs, of all the alternatives that are reasonably assured of timely implementation. Thus, regardless of

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108. ACRPC Brief at 4–5.

109. P.A. No. 259, § 8 (1992 Vt., Adj. Sess.).

110. Docket No. 5737, *Petition of Citizens Utilities Company re Baldwin Hydroelectric Project*, Order of 4/17/95 at 16–17.

111. *See* 30 V.S.A. § 218c(a)(1).

112. We do not wish to suggest that Vermont's utilities should blithely ignore their least-cost planning obligations. Instead, we are observing that, in those instances where the utility has not fulfilled those obligations, it would only make an undesirable situation worse to indiscriminately veto all resource options that come within the purview of Section 248, thereby depriving the utility of access to options to serve their customers in ways that might be far superior to the options that would remain.

whether VELCO is legally required to, or otherwise should, have a least-cost integrated resource plan,[113] we conclude that the proposed Project satisfies Section 248(b)(6).

IV. ELECTROMAGNETIC FIELDS

A. Introduction

The Board finds that the electric and magnetic fields ("EMF") that will result from the proposed Project are very unlikely to have an undue adverse effect on public health. It is not possible to state unequivocally that there will be *no* adverse health effects. Some epidemiological studies have found a weak correlation between EMF and childhood leukemia, despite the fact that no mechanism of causation has been found.

The National Institute of Environmental Health Sciences ("NIEHS") summarized the state of knowledge of EMF risks in a 1999 report whose conclusions have been reaffirmed by numerous subsequent studies on this issue:

> The scientific evidence suggesting that ELF-EMF [extremely low frequency EMF] exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects have been reported. No indication of increased leukemias in experimental animals has been observed.[114]

The same report clearly identified its findings regarding the carcinogenic potential of EMF:

> The National Toxicology Program routinely examines environmental exposures to determine the degree to which they constitute a human cancer risk and produces the "Report on Carcinogens" listing agents that are "known

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113. As we explain in Section II.A of this Order, we will be opening a separate investigation into ways to promote the appropriate inclusion of least-cost non-transmission alternatives in VELCO's planning.

114. NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, May 14, 1999, at cover letter. Introduced into the record as VELCO Cross DelPizzo-8. A report published by the NIEHS in 2002 reached identical conclusions.

> human carcinogens" or "reasonably anticipated to be human carcinogens." It is our opinion that based on evidence to date, [extremely low frequency] EMF exposure would not be listed in the "Report on Carcinogens" as an agent "reasonably anticipated to be a human carcinogen."[115]

The Board has received substantial evidence and public comment on this issue. We have heard testimony requesting that we deny the proposed Project, or at a minimum, require that the proposed transmission lines be placed underground, based upon the potential health impacts from EMF. We have also looked into this question with deep personal interest and concern. However, if we rely upon factual evidence — as we must, by law — and not merely expressions of concern, the necessary conclusion is clear. The sparse evidence that EMF may be linked to childhood leukemia is insufficient to outweigh the public benefits of the proposed Project. Instead, the Board will adopt the policy of prudent avoidance that the National Institute of Environmental Health Sciences and the Vermont Department of Health have endorsed. The substantial majority of the public health agencies that have analyzed this issue have concluded that the tenuous link between EMF and childhood leukemia is insufficient to require large-scale expenditures of funds to mitigate EMF levels from transmission projects such as the one before us.

Findings

112. Electric and magnetic fields produced by the proposed Project will not have an undue adverse effect on the public health or safety. This finding is supported by findings 113 through 152, below.

113. EMFs are invisible lines of force that surround any electrical device from one as small as a night light to one as large as a bulk transmission line or power plant. Electric fields are produced by voltage and are measured in units of volts per meter ("V/m"). Magnetic fields result from the flow of current through wires or electrical devices and are measured in units of gauss ("G") or miligaus ("mG"). Exh. Mark-2 at 4.

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115. Exh. VELCO Cross DelPizzo-8 at 37.

114. There are two general types of EMF, steady (or "direct current fields") and time varying (or "alternating currents fields"). It is time varying or alternating current fields that have been the source of the majority of the medical studies. EMF from transmission lines, distribution lines, and electric appliances is an alternating current field and has a frequency of 60 hertz ("Hz"). Valberg pf. at 4–5.

115. Exposure to magnetic fields can be reduced in a number of ways, most easily by increasing the distance from the power lines. Magnetic field levels decrease rapidly with even minor distance from a source. Other means exist, such as putting wires underground, or the measures noted in the finding above. Exhs. DPS-VDH-3 at 12, Mark-2 at 5.

116. Magnetic field levels can be reduced by increasing the voltage, thereby reducing the required current, and by configuring the conductors so that the magnetic fields from the different conductors cancel each other. Tr. 2/23/04 (Vol. I) at 33–34 (Valberg); exh. DPS-VDH-3 at 47.

117. Electric fields are shielded by conducting objects such as houses and trees. Electric fields are constant with voltage and do not change as load on power lines changes. Exh. DPS-VDH-3 at 11.

118. Concern about the health effects of EMF were first raised in 1979 by an epidemiological study that estimated EMF exposure and suggested that there was a link between EMF exposure and childhood cancer rates. Valberg pf. at 6.

119. Since that time there have been hundreds of studies produced on the health effects of EMF; the majority of which have shown neither causation nor correlation between any human or animal health issues and EMF levels typical of power lines; although a small number have suggested low-level correlation (but no clear causation) with childhood leukemia. Valberg pf. at 6–7; exh. VELCO Cross DelPizzo-8 at ii.

B. EMF Levels

120. Magnetic fields in the home typically average 0.6 mG and range from 0.1 to 4.0 mG over the course of the day. Electric fields in the home range from 0 to 0.01 kV/m. Exh. DPS-VDH-3 at 4.

121. The NIEHS has concluded that:

> Magnetic fields close to electrical appliances are often much stronger than those from other sources, including magnetic fields directly under power lines. Appliance fields decrease in strength with distance more quickly than do power line fields.

Exh. Mark-2 at 32.

122. In addition to the average magnetic fields typically experienced around a home, most people are exposed to significantly higher magnetic fields from household appliances. These exposures are typically of short duration. Following are the median magnetic field levels at a distance of six inches from the source of the field: electric razors – 100 mG; hair dryer – 300 mG; power saw – 200 mG; copy machines – 90 mG; vacuum cleaners – 300 mG. At a distance of one foot from the source of the field, the following levels represent the median magnetic field levels: video display terminal – 5 mG; window air conditioner – 3 mG; color television – 7 mG; fluorescent lights – 6mG; air cleaners – 35 mG. Exh. Mark-2 at 33–35.

123. The magnitude of the magnetic fields are proportional to the line current. Therefore, the magnetic fields will change with the line currents. Aabo pf. at 6.

124. The NIEHS has found that:

> Magnetic fields directly beneath overhead distribution lines typically range from 10 to 20 mG for main feeders and less than 10 mG for laterals. Such levels are also typical directly above underground lines. Peak EMF levels, however, can vary considerably depending on the amount of current carried by the line. Peak magnetic field levels as high as 70 mG have been measured directly below overhead distribution lines and as high as 40 mG above underground lines.

Exh. Mark-2 at 36.

125. The NIEHS has determined that:

> At distances of greater than 50 feet, the type of power lines [three-phase distribution or transmission lines] appeared to have little impact on the average exposure and only a minor impact on the number of individuals with the highest exposures.

Exh. VELCO Cross DelPizzo-8 at 33.

126. Overhead lines generally produce slightly higher levels of EMF directly beneath the lines then would be found directly above an underground line with the same current. In addition, EMF levels decrease more rapidly with distance for underground lines than for overhead lines with the same current. Aabo pf. at 6; exh. Mark-2 at 36.

127. For some areas along the proposed 345 kV and 115 kV transmission lines, the projected magnetic field levels are predicted to be lower in the early years after the proposed Project is in service than the magnetic fields currently generated by the existing lines. Other areas are projected to see increases in the magnetic field levels as soon as the proposed Project is in service. In the long run, the magnetic field levels for areas adjacent to the wires are expected to increase as electricity demand in the region increases. Exhs. DPS-VDH-3 at 24–27, DPS-VDH-5 at 7–9.

128. The existing 34.5 kV and 46 kV transmission lines along the proposed 115 kV corridor emit magnetic fields in the range of 2 to 45 mG with average loading at the edge of the right-of-way, and of 12 to 208 mG with maximum continuous loadings at the edge of the right-of-way, with no evidence of adverse health effects. White/Crist sur. pf. at 3.

129. The average magnetic field along the edge of the right-of-way for the proposed 115 kV line is projected to range from 14 mG to 42 mG, from initial construction of the proposed Project and 2012 (the EMF levels were modeled to 2012). Exh. DPS-VDH-5 at 27.

130. The magnetic field levels along the edge of the right-of-way for the proposed 115 kV line, for maximum continuous loading, is projected to range from 183 mG to 286 mG, between initial construction of the proposed Project and 2012 (the EMF levels were modeled to 2012). Exh. DPS-VDH-5 at 17.

131. The average electric field along the edge of the right-of-way for the proposed 115 kV line is projected to range from 0.28 kV/m to 1.72 kV/m. Exh. DPS-VDH-5 at 7–11.

132. The average magnetic field along the edge of the right-of-way for the proposed 345 kV line is projected to range from 3.3 mG to 4.9 mG, from initial construction of the proposed Project until 2012 (the EMF levels were modeled to 2012). Exh. DPS-VDH-3 at Appendix B, Table 2.

133. The magnetic field levels along the edge of the right-of-way for the proposed 345 kV line, for maximum continuous loading, is projected to range from 31 mG to 76 mG, from initial construction of the proposed Project until 2012 (the EMF levels were modeled to 2012). Exh. DPS-VDH-3 at Appendix B, Table 3.

134. The average electric field along the edge of the right-of-way for the proposed 345 kV line is projected to be 0.83 kV/m for the life of the proposed Project. Exh. DPS-VDH-3 at 24–25.

135. In an examination of the EMF levels generated by substations, the NIEHS found:

> In general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

Exh. Mark–2 at 36.

Discussion

The projected magnetic fields at the edge of the 345 kV right-of-way are lower than the magnetic fields at the edge of the 115 kV right-of-way for two reasons. The first, and most simple reason, is that the right-of-way for the 115 kV line is generally 100 feet wide, while the right-of-way for the 345 kV line is generally 250 feet wide. Because fields dissipate rapidly with distance, the distance to the edge of the right-of-way is significant.

The second reason that projected magnetic fields from the 345 kV line are lower than the magnetic fields from the 115 kV line can be explained by simple physics. Magnetic fields are produced by current. The power that flows through the lines is the product of current and voltage (power = current x voltage). Therefore, for two lines of different voltage to transport the same amount of power, the line with the higher voltage needs less current and thus produces lower EMF. In this case, if the 115 kV line and the 345 kV line were to carry the same amount of power, the 115 kV line would need to carry a significantly higher current, and therefore produce a greater magnetic field, than the 345 kV line. For any given size of wire, line current will increase with greater electrical demand; for example, when demand is increased by turning on electric heat or a television. Thus, end user efficiency, by reducing load on the transmission line, will decrease EMF.

C. Established Standards and Guidelines

136. The federal government has not established standards for occupational or residential exposure to EMF. Exh. Mark-2 at 46.

137. Six states have set standards for transmission line magnetic and/or electric fields. These standards are set out in the table accompanying this finding. These standards are not health-based, but are designed to ensure that EMF levels do not rise above the current levels, i.e., these standards are designed to maintain a local status quo.

State	Electric Field (on ROW)	Electric Field (edge of ROW)	Magnetic Field (on ROW)	Magnetic Field (edge of ROW)
Florida	8 kV/m (for lines of 69–230 kV)	2 kV/m		150 mG (maximum load) (for lines of 69–230 kV)
Minnesota	8 kV/m	—	—	—
Montana	7 kV/m	1 kV/m	—	—
New Jersey	—	3 kV/m	—	—
New York	11.8 kV/m	1.6 kV/m	—	200 mG (maximum load)
Oregon	9 kV/m	—	—	—

Exh. Mark-2 at 46.

138. The acute exposure standards set out in this finding have been established by some organizations.

Organization	Magnetic Field	Electric Field
International Commission on Non-Ionizing Radiation Protection ("ICNIRP")	833 mG	4.2 kV/m
American Conference of Governmental and Industrial Hygienists ("ACGIH")	10,000 mG (general worker) 1,000 mG (workers with cardiac pacemakers)	25 kV/m (general worker) 1 kV/m (workers with cardiac pacemakers)
Institute of Electrical and Electronics Engineers ("IEEE")	9,040 mG	5.0 kV/m

Exh. Mark-2 at 47.

D. Health Effects of EMF

139. Most laboratory evidence in animals and humans and mechanistic studies on cells fails to demonstrate a link between EMF and adverse health effects. Exh. VELCO Cross DelPizzo-8 at 9.

140. The NIEHS has found that:

> The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed.
>
> The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results. The human data are in the 'right' species, are ties to 'real-life' exposures and show some consistency that is difficult to ignore. This assessment is tempered by the observation that given the weak magnitude of these increased risks, some other factor or common source of error could explain these findings. However, no consistent explanation other than exposure to ELF-EMF has been identified. . . .

Exh. VELCO Cross DelPizzo-8 at ii.

141. The NIEHS has concluded that:

> Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. . . .

Exh. VELCO Cross DelPizzo-8 at ii.

142. Epidemiology is the science that studies the associations between exposure to a potentially hazardous substance and health effects. Epidemiological studies include the following limitations:

- Because such studies are not performed in the controlled confines of a laboratory, exposure to EMF must be estimated rather than directly recorded;
- There is the potential for bias (even totally unintentional and unrecognized bias) in the selection of cases and controls; and
- The presence of confounding variables (the distortion of the apparent effect of an exposure on risk, brought about by the association with other factors that can influence the outcome) can either artificially increase or decrease the risks.

Exh. VELCO Cross DelPizzo-8 at 10–12.

143. Some epidemiological studies have suggested that there is a weak correlation between EMF and childhood leukemia. However, the NIEHS has concluded that the "lack of positive findings in animals or in mechanistic studies weakens the belief that this association is actually due to power frequency EMF, but cannot completely discount the finding." Exh. VELCO Cross DelPizzo-8 at ii–iii.

144. The NIEHS believes that EMF exposure is not likely to be a health hazard. VELCO-Cross-DelPizzo-8 at 36.

145. Because of the weak association between EMF and childhood leukemia, the NIEHS has concluded that "EMF exposure cannot be recognized as entirely safe." Exh. VELCO Cross DelPizzo-8 at 36.

146. The World Health Organization has stated that, with respect to the potential link between power frequency EMF and childhood leukemia rates, "it remains possible that there are other explanations for the observed association between exposure to magnetic fields and childhood leukemia." Exh. VELCO Cross DelPizzo-3 at 7.

147. The International Agency for Research on Cancer has developed a five-tier system for classifying the carcinogenic potential of chemicals and compounds.

Group	**Classification**	**Examples**
1	the agent is carcinogenic to humans	tobacco, asbestos
2A	the agent is probably carcinogenic to humans	UV radiation, sun lamps

2B	the agent is possibly carcinogenic to humans	coffee, EMF, pickled vegetables
3	the agent is not classifiable as to its carcinogenicity to humans	*No examples provided*
4	the agent is probably not carcinogenic to humans	*No examples provided*

Exhs. VELCO Cross DelPizzo-6 at 74, VELCO Cross DelPizzo-2 at 2, VELCO Cross DelPizzo-4.

148. On the basis of the uncertainty surrounding the link between EMF and childhood leukemia, the International Agency for Research on Cancer has classified EMF as neither "carcinogenic" nor "probably carcinogenic" but "possibly carcinogenic to humans." That Agency's list of "possible carcinogens" includes coffee, gasoline engine exhaust, gasoline, progestins (birth control pills), phenobarbitol (sleeping pills), pickled vegetables and carbon black. Exh. VELCO Cross DelPizzo-4; tr. 2/23/04 (Vol. II) at 81–82 (DelPizzo); DelPizzo pf. at 3; exh. VELCO Cross DelPizzo-20.

149. Applying the same criteria used by the International Agency for Research on Cancer, the NIEHS concluded that the evidence was not strong enough to label ELF-EMF exposure as a "known human carcinogen" or "probable human carcinogen." The NIEHS concurred with International Agency for Research on Cancer that EMF should be listed as a possible human carcinogen based upon the "limited evidence of an increased risk for childhood leukemias with residential exposure and CLL (chronic lymphocytic leukemia) associated with occupational exposure." Exh. VELCO Cross DelPizzo-8 at 35–36.

150. The NIEHS found that:

> The National Toxicology Program routinely examines environmental exposures to determine the degree to which they constitute a human cancer risk and produces the "Report on Carcinogens" listing agents that are "known human carcinogens" or "reasonably anticipated to be human carcinogens." It is our opinion that based on evidence to date, [extremely low frequency] EMF exposure would not be listed in the "Report on Carcinogens" as an agent "reasonably anticipated to be a human carcinogen."

Exh.VELCO Cross DelPizzo-8 at 37.

151. In an analysis of the effect of EMF on medical devices, Dr. Valberg concluded:

> Despite the ubiquitous nature of public exposure to EMF from high-voltage transmission lines, no recorded cases of medical-device disruption by power-line EMF were identified either in the manufacturers' websites or in . . . an analysis of available data. There are no FDA-issued safety alerts, public health advisories, and notices addressing potential medical device interference from power frequency EMF.

Exh. Valberg Reb-1.

152. The NIEHS has concluded that the weak association between EMF and childhood leukemia is "insufficient to warrant aggressive regulatory concern." Exh. VELCO Cross DelPizzo-8 at 36.

Discussion

The evidence presented in this Docket leads us to conclude that there will be no undue adverse health effects from EMF as a result of this project. We recognize that there is concern about the effects of EMF but the analyses by public health agencies show no clear health effects and at best point to EMF as a potential, but uncertain, risk. It is for this reason that the NIEHS and IARC have not classified EMF as "carcinogenic" or "probably carcinogenic." However, some studies have indicated that there is a weak correlation between EMF and childhood leukemia. This uncertainty has led the NIEHS and IARC to classify EMF as "possibly carcinogenic," the same category that includes coffee and pickled vegetables.

The numerous studies on EMF show no correlation between EMF exposure from power lines and increased risk to the public, with the possible exception of childhood leukemia. Epidemiological studies have suggested that EMF exposure may be linked to an increase in childhood leukemia rates. Most health organizations believe that this link is tenuous due to the failure to find a mechanistic explanation for any health effects and the negative results from animal testing. In addition, there are basic limitations of epidemiology that preclude any certainty in the determination of a health risk.

In reaching our conclusion, we must balance the uncertainty with the potential adverse health effects of failure to implement the proposed Project. While the effect of chronic exposure to EMF at the levels that would result from the proposed Project is not certain, the health and safety effects of an unreliable electric system are obvious. Reliability is essential to the health and safety of Vermonters, from ensuring adequate health care at hospitals to functioning traffic

lights to prevent traffic accidents. This is an issue separate from the economic benefit of a reliable electric system (as discussed in Section VII of this Order). To take an obvious, but hardly exclusive, example:

> 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 hospitals' depends on electricity . . . . [116]

We do not completely discount the potential health risks of EMF. However, we place these potential risks in the context of the risks that people in a technological society face daily. Every-day activities such as walking across a street or simply driving a car present health risks. The possible risk from low-level EMF is simply one more risk that people incur by living in a society that is heavily dependent on electricity.

It is also important to note that transmission lines are not the only, or even primary, source of EMF exposure for most people. As finding 122 illustrates, we receive significant, albeit short in duration, EMF exposure from household and work-place electronic devices. Such exposures are typically higher than those experienced at the edge of the transmission line right-of-way at maximum continuous loading.

As noted above, several states have established standards for EMF exposure from transmission lines. These standards are not health-based and we do not adopt such standards. Portions of the existing 34.5 kV line currently exceed the New York and Florida standards for magnetic field levels during times of maximum continuous loading. Magnetic field levels are projected to grow with the proposed 115 kV line. The projected levels have been modeled at the edge of a 40-foot right-of-way for the proposed 115 kV line.[117] VELCO has proposed a 100-foot right-of-way for the majority of the proposed 115 kV line. The additional distance is very significant given the rapid rate at which EMF levels fall with distance, although no specific data was provided on EMF levels expected at the edge of a 100 foot right-of-way. It is therefore unclear what the magnetic field levels will be at the residences nearest to the proposed 115 kV line. It appears that there will be two residences within 100-feet of the proposed 115 kV line, excluding the Bay Road area, where we are requiring VELCO to place the proposed 115 kV line

116. Tr. 3/18/04 at 66 (Kimball).
117. Exh. DPS-VDH-5 at 5.

underground.[118] Given the swift drop-off in magnetic field levels as one moves away from the source, it is unclear whether at those two residences the magnetic field levels will be below both the Florida and New York standards. Nonetheless, as we discuss below, we are requiring VELCO, as part of the post-certification proceedings, to identify areas of relatively high EMF levels at nearby residences and propose mitigation measures for such areas.

The Department and DOH suggest that the policy of prudent avoidance, as outlined in the Department's 1994 20-Year Plan ("1994 Plan"), should be continued. The 1994 Plan defines prudent avoidance as:

> [A]doption 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.[119]

There are two important considerations that arise from the language of the 1994 Plan. The first is that the state of uncertainty that existed ten years ago has remained essentially unchanged. The vast amount of additional research that has occurred since that time has not increased our understanding of the risks of EMF either in terms of causation or correlation. In other words, researchers keep looking hard but they find little evidence that EMF does produce a health effect, and no evidence of reasons why it should.[120] Consequently, we cannot make policy choices with any greater degree of confidence in the outcome.

The second consideration that arises from the 1994 Plan's definition of "prudent avoidance" is the lack of clarity that that term entails. There is no suggested demarcation between small and large investments of money and effort to reduce EMF exposure or even suggestions as to prudent actions that could be taken.

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118. Exh. VELCO G&B-Supp(2)-5.

119. 1994 Plan at 5–12.

120. To underscore this point, a Georgia court, in a 1995 ruling on a trespass and tort claim involving EMF, stated:

> The scientific evidence regarding whether EMFs cause harm of any kind is inconclusive; the invasive quality of these electric fields cannot presently constitute a trespass. In reaching this conclusion, we do not close the door on the possibility that science may advance to a point at which damage from EMFs is legally cognizable and a trespass action may lie.

Jordan v. Georgia Power Company, 219 Ga.App. 690, 694–695 (1995).

Public utility commissions elsewhere in the United States have provided guidance as to what would constitute a low-cost option to mitigate EMF. The California Public Utilities Commission, in response to the scientific uncertainty surrounding EMF, required utilities to undertake low-cost mitigation measures. The California Commission defined "low-cost" as:

> in the range of 4% of the total project cost but specified that this 4% benchmark is not an absolute cap. [The Commission] found that, to be implemented, a mitigation measure should achieve some noticeable reduction in EMF but declined to adopt a specific goal for EMF reduction.[121]

The Colorado Public Utilities Commission, in a recent order, describes mitigation techniques such as increasing line clearance and careful line configuration as falling within the parameters of prudent avoidance. In a recent case the Colorado Commission determined that the expense of undergrounding a proposed line would not constitute prudent avoidance.[122]

The National Institute of Environmental Health Sciences does provide some specific guidance as to recommended regulatory action in response to current knowledge of EMF risk:

> The NIEHS suggest that the level and strength of evidence supporting . . . 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 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.[123]

Based upon the recommendations of the NIEHS, the Board finds that the policy of prudent avoidance, which we adopt, does not require a generic policy of placing transmission lines underground to avoid EMF exposure.

As mentioned previously, some public utility commissions have required utilities to take low-cost steps to mitigate EMF levels. Such an approach is reasonable, and we will require VELCO, as part of the post-certification proceedings, to identify areas of relatively high EMF levels expected at nearby residences and propose measures that might mitigate EMF exposure at

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121. 236 P.U.R. 4th 406 (Cal. P.U.C., August 19, 2004).
122. 2003 WL 22809342 (Colo. P.U.C., November 21, 2003).
123. Exh. VELCO Cross DelPizzo-8 at 37–38.

these locations. We will not require VELCO to place underground any portion of the project based upon the health effects of EMF. The weak evidence that EMF may pose a health risk is insufficient to require drastic regulatory action such as placing the upgraded transmission lines underground. Any such action would be based upon fear rather than knowledge and would have an unjustified impact on ratepayers

Mr. Simmons, in his brief, questions the findings of the National Institute of Environmental Health Sciences regarding the safety of EMF, in addition to the expertise of VELCO's witness on this issue and the Vermont Department of Health. We find nothing in the record that would lead us to doubt the findings of the National Institute of Environmental Health Sciences and the extensive review of the state of EMF research the institute conducted. In addition, we note that the conclusions of VELCO's EMF witness and the Vermont Department of Health appear to be consistent with the conclusions of the major health agencies who have rigorously studied this issue.

Mr. Simmons also questions the evidence presented by VELCO regarding the effect of EMF on medical devices, and in particular, criticizes VELCO and the Department for not retaining an expert on medical device design and operation. There are established EMF standards for people with pacemakers and the record shows that EMF levels from the proposed Project will be below these standards. There is no evidence in the record that standards have been established for other medical devices.

In its brief, VCSE makes several recommendations for conditions to impose upon VELCO in order to reduce exposure to EMFs. Its first recommendation is to require VELCO and other Vermont utilities to underwrite the costs of a rule-making to consider rules and policies to reduce EMF exposure. Considering the uncertainty in the knowledge of the health risks from EMF, and the fact that vast amounts have been spent by others in this area in recent decades without finding much, it is unlikely that such an action would produce meaningful results and we decline to impose such a condition.

VCSE has also recommended that the Board require VELCO to "purchase any structure and lands that fall within a right-of-way where measured EMF exposure exceeds 3 mG." Such a requirement would establish a chronic exposure standard for EMF, something that none of the numerous health agencies that have reviewed the state of knowledge concerning EMF have yet

done and the record before us does not support. VCSE does not provide any rationale for the establishment of a 3 mG standard. We do not presume that this Board, unlike those expert health agencies, has special knowledge to ascertain and issue such standards.

VCSE additionally argues that VELCO should be required to purchase any lands or structures frequently used by children under the age of 15 where they are exposed to EMFs resulting from the proposed Project. VCSE argues that such an action would be consistent with the policy of prudent avoidance. We reject this argument. Although the policy recommendations that arise from following prudent avoidance are unclear, under no credible reading can prudent avoidance be read as equivalent to a standard of zero additional exposure to any population group from EMF.

VCSE's last recommendation to the Board is that VELCO be required to issue a public health advisory and record such advisory in the "chains of title of current owners of record of properties that fall within the area of [overhead transmission line] generated EMF effect." Such a requirement would only serve to enforce the fears of EMF that appear to be based upon misinformation rather than reasoned judgment. Even if desired to impose such a requirement upon VELCO, VCSE fails to point to any authority of the Board to dictate such filings in the land records for private landowners, nor do we believe that many landowners would willingly record such a public health advisory in their deeds.

The recommendations of VCSE appear to be based on fear and uncertainty, rather than the findings and recommendations of international, national, and state health agencies that have extensively studied the EMF issue. It is true that there is a great deal of uncertainty as to any link between EMF and childhood leukemia. However, this uncertainty and the attendant fear should not trump all other factors in making regulatory decisions. As the Californian and American Medical Associations stated in an amicus brief for a case involving EMF risk:

> There can only be harm to society when uncorroborated, inaccurate and/or unproven beliefs which fuel public fear become institutionalized in precedential court rulings.[124]

The comments that we have received on this issue indicate that there has been a significant amount of misinformation promulgated by groups opposed to the project. Such

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124. Exh. VELCO Cross DelPizzo-13.

misinformation not only serves to perpetuate fear but is not helpful to the fact-oriented, impartial decision-making process that should decide cases of state-wide importance such as this project.

We have received a significant number of comments from the public expressing fear and worry concerning the potential health effects of EMF. We have examined the evidentiary record in this Docket, and we have researched state, federal, and public utility cases that have addressed EMF within the past 10 years to determine whether there is additional information, not in the evidentiary record, that might raise concern. There have been several cases where a court or administrative body has examined the impact of EMF. We have not found a single case that has determined that the EMF from transmission lines presents an unacceptable risk to the public or a private plaintiff. This review of case law reinforces two notions: (1) that actions such as requiring undergrounding of the transmission line are not justified by the state of knowledge of the health effects of EMF; and (2) that the state of knowledge on this subject has not materially advanced over the past ten years.

We have commented throughout this section on the level of uncertainty that has persisted over the years regarding the health effects of EMF. A utility must ensure compliance of its system with all relevant electric codes and reliability criteria and monitor the promulgation of such codes and criteria on a regular basis. VELCO has the same responsibility to ensure that its transmission lines do not present an unacceptable health risk to Vermonters. VELCO shall therefore continue to monitor the state of knowledge regarding health effects of EMF and report to the Board on an annual basis the results of such monitoring. Such a requirement should not constitute a burden but should instead be viewed as a minimum commitment to public health by a public utility.

V. SITE SPECIFIC ENVIRONMENTAL CRITERIA, INCLUDING ACT 250 CRITERIA

A. Introduction

We find that the proposed Project, as conditioned by this Order, will not have an undue adverse impact on the natural or built environment. We have examined the impact of the proposed Project on the natural environment and the health and safety of Vermonters pursuant to Section 248(b)(5). We include in this analysis the site specific criteria of Act 250, which include

aesthetics, historic resources, municipal services, water resources, soils, wildlife, and other natural resources discussed below.

We have concluded that the proposed Project will cause adverse impacts on some of the site specific criteria of Act 250. However, we are requiring VELCO to implement measures to mitigate these impacts prior to the construction of the proposed Project.

B. Aesthetics

(1) Introduction

The Public Service Board has adopted the Environmental Board's Quechee analysis for guidance in assessing the aesthetic impacts of proposed projects under Section 248. We have previously explained the components of the Quechee analysis as follows:

> In order to reach a determination as to whether the project will have an undue adverse effect on the aesthetics of the area, the Board employs the two-part test first outlined by the Vermont Environmental Board in Quechee, and further defined in numerous other decisions.
>
> Pursuant to this procedure, first a determination must be made as to whether a project will have an adverse impact on aesthetics and the scenic and natural beauty. In order to find that it will have an adverse impact, a project must be out of character with its surroundings. Specific factors used in making this evaluation include the nature of the project's surroundings, the compatibility of the project's design with those surroundings, the suitability of the project's colors and materials with the immediate environment, the visibility of the project, and the impact of the project on open space.
>
> The next step in the two-part test, once a conclusion as to the adverse effect of the project has been reached, is to determine whether the adverse effect of the project is "undue." The adverse effect is considered undue when a positive finding is reached regarding any one of the following factors:
>
> 1. Does the project violate a clear, written community standard intended to preserve the aesthetics or scenic beauty of the area?
>
> 2. Have the applicants failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the project with its surroundings?

> 3. Does the project offend the sensibilities of the average person? Is it offensive or shocking because it is out of character with its surroundings or significantly diminishes the scenic qualities of the area?[125]

Our analysis, however, does not end with the results of the Quechee test. Instead, our assessment of whether a particular project will have an "undue" adverse effect on aesthetics and scenic or natural beauty is "significantly informed by overall societal benefits of the project."[126]

In considering the individual and cumulative aesthetic effects of the proposed Project, we considered:

- The scope of the aesthetic impacts due to the magnitude of the project (35.5 miles of 345kV line, 27.1 miles of new 115 kV line, 5.6 miles of reconductored 115kV line, and 12 new or upgraded substations);
- The increased visibility of the project due to taller pole heights and more extensive right-of-way clearing compared to the existing transmission lines, and due to lighting and noise impacts at substations;
- The large number of municipalities, landowners, and other parties that would be affected by the project;
- The Project's effects on many particularly sensitive and significant locations where the scenic or natural beauty of the location, the nature of the views enjoyed by all Vermonters, other aesthetic and natural resources, and/or public investments in the location or those resources merit special consideration of both the locations and the aesthetic effects on those locations ("Key Sites"); and
- The effects on the rest of the locations in a section-by-section assessment of the project on those locations.

We must consider the Project as a whole and its cumulative aesthetic effects, and not review portions simply as if they were stand-alone projects. At the same time, we must also consider site-specific aesthetic effects.

Our analysis of the aesthetic impacts of the proposed Project follows. We begin with findings relating to the Project as a whole, followed by findings and discussion of specific locations along the proposed transmission lines as they run from south to north: the 345 kV line, which would run from West Rutland to New Haven, then the 115 kV line from New Haven to South Burlington. (We include the proposed substation upgrades at New Haven, Vergennes, Ferrisburgh, Charlotte, and Shelburne in the course of our review of the 345 kV and 115 kV

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125. *In re Petition of Tom Halnon*, CPG NM-25, Order of 3/15/01 at 10–11 ("Halnon").
126. *In Re: Northern Loop Project*, Docket 6792, Order of 7/17/03 at 28 ("Northern Loop").

lines.) We then present our findings and discussion on the aesthetic impacts of the proposed substation upgrades (with the exception of those that are addressed in the context of the 345 kV and 115 kV lines), followed by the proposed reconductoring of the existing Williamstown to Barre line.

After addressing these specific components and locations of the proposed Project, we address design alternatives for overhead lines and planting issues that should be carefully considered at locations throughout the proposed Project. Finally, we present our overall conclusions about the aesthetic impacts of the entire Project.

(2) The Project as a Whole

Findings

153. The proposed Project, with the modifications and conditions required in this Order, will not have an undue adverse effect on aesthetics or on the scenic or natural beauty of the area. This finding is supported by findings 154 to 403, below.

154. The proposed Project can be divided into four major components:

- Project Component One: 35.5 miles of new 345 kV line from West Rutland to New Haven that will run in a corridor adjacent to the existing 115 kV line (which will remain).
- Project Component Two: 27.1 miles of new 115 kV line from New Haven to South Burlington that will replace the existing 34.5 kV and 46 kV lines. The majority of the 115 kV line — 22.7 miles — will be located in the existing corridor, with the remainder to be located in a new corridor. Much of the proposed line would be within an existing railroad right-of-way. Also associated with this component of the proposed Project is a 1.6-mile 34.5 kV radial feeder to Vergennes.
- Project Component Three: 12 substation upgrades, including 2 new substations (Charlotte and Vergennes).
- Project Component Four: Reconductoring of 5.6 miles of the existing 115 kV line that runs from Williamstown to Barre.

Dunn pf. at 5, 7–12; Cecchini pf. at 2; exhs. TD-3 and TD-5; *see also* Appendix C to this Order.

155. For the entire length of both the 345 kV and the 115 kV lines, VELCO proposes the use of non-specular wire. This type of conductor is already dulled with a non-glare finish. Dunn/Harr DD pf. at 3; tr. 6/15/04 (Vol. I) at 60 (Boers).

156. The context of the Project, like the Project itself, extends across a wide area. Most of the Project's context is rural (farmland, forests, and small towns), but some is urban. The new transmission lines start in the forested Taconic foothills in West Rutland, cross through farms and villages in the Otter Creek Watershed and the Champlain Valley, run past the LaPlatte River and Shelburne Bay, and finish in South Burlington west of Route 7. The proposed substation upgrades would be located in a number of widely dispersed communities, including Poultney, New Haven, Charlotte, Williston, and Williamstown. Exh. DPS-DR-l at 3; Boyle pf. at 15–23.

157. The Project's context includes views to both the west and the east of the Adirondacks and the Green Mountains. These views are often set against open agricultural lands. In some locations, the vistas include views of or from Lake Champlain. In some areas there is a patchwork of wooded areas and open lands. In several locations, the views are from state roads such as Route 7 and Route 17 that travel along heights of land, which result in long distance views that are visible for extended periods. Exh. DPS-DR-l at 3; Vissering ACRPC pf. at 15; Vissering ACRPC/New Haven reb. pf. at 9.

158. The Project context includes existing transmission corridors, within which most of the proposed Project would be located. The proposed 345 kV line would follow the existing 115kV line corridor throughout the entire route from West Rutland to New Haven. The proposed 115kV line from New Haven to the Queen City substation in South Burlington would follow the existing 46 kV and 34.5 kV subtransmission lines in most areas. Exh. DPR-DR-1 at 3.

159. In several locations, totaling approximately 4.4 miles, the proposed 115 kV line would run through locations that do not have any existing transmission or subtransmission lines. However, these new locations are mostly within an existing railroad corridor. Exh. DPS-DR-l at 3; Dunn pf. at 11; Boers pf. at 23.

160. Vermonters are accustomed to the presence of power lines, both distribution and transmission, in many locations. Exh. DPS-DR-l at 3, 5.

161. The context of the project also includes the areas affected by proposed substation upgrades. Ten substations would be upgraded in their existing locations. A new substation would be constructed in Vergennes. In Charlotte, an existing substation would be replaced by a new substation in a different location. Dunn pf. at 8; Boers pf. at 1–2; exh. VELCO TD-3; exh. DPS-DR-1 at 5; *see also* Appendix C to this Order.

(3) The 345 kV Line – West Rutland to New Haven

The Potential Use of Underground Cable

Findings

162. The cost to construct 345 kV underground cable would be approximately $4 million to $6 million per mile. These costs include neither the costs of transition stations nor, if required, directional drilling in sensitive areas and under roads. Dunn sur. pf. at 4–5; Boers sur. pf. at 3; Williams sur. pf. at 3–4.

163. The use of underground cable for portions of the proposed West Rutland to New Haven 345 kV line would have the potential to adversely affect system stability and reliability. *See* Section VI.C.

164. In addition to cost and reliability concerns, there would be aesthetic drawbacks to intermittent undergrounding of a 345 kV line for short distances. Both ends of the underground cable would require, at a minimum, a structure to transition from underground to overhead. To achieve an acceptable level of reliability, one or both ends of the underground cable would require a transition station, which would resemble a substation, and would require a fenced and graded area ranging in size from 75 feet by 75 feet to approximately 155 feet by 230 feet, depending on the level of reliability desired. The transition stations would also require an all-season access drive. Boers sur. pf. at 9; Williams sur. pf. at 4; tr. 9/21/04 (Vol. I) at 72–74 (Boers).

165. The cost of the transition stations ranges from $1.2 million to $2.5 million per station, depending on the level of reliability desired. These costs for the transition stations are in addition to the costs of the underground cable mentioned above. Tr. 9/21/04 (Vol. I) at 28–29 (Williams); Boers sur. pf. at 9; tr. 9/21/04 (Vol. I) at 68 (Boers).

166. For comparison, the cost for 345 kV overhead line would be approximately $400,000 to $600,000 per mile. Boers sur. pf. at 3; Smith pf. at 16–17.

Discussion

The aesthetics witness for ACRPC initially proposed placing the 345 kV line underground in two locations: at West SalisburyRoad/Route 7 (mile markers 18 to 20) and the Route 125/Route 7 crossing (mile markers 24.6 to 24.9).[127] When presented with the significant increase in cost, concerns with reliability, and potential aesthetic impact of the underground transition structures, the ACRCP witness concluded that the use of underground cable for portions of the 345 kV line is not warranted as an aesthetic mitigation measure.[128] For those same reasons, we conclude that underground placement of sections of the 345 kV line is not a reasonable mitigation measure.

The 345 kV Line, Route, Pole Height and Design, and Right-of-way Clearing Findings

167. The proposed 345 kV line would run for approximately 35.5 miles, from the West Rutland substation to the New Haven substation, passing through West Rutland, Pittsford, Proctor, Brandon, Leicester, Salisbury, Middlebury and New Haven. Exh. DPS-DR-1 at 3; exh. DJB-8; Boers pf. at 7.

168. The 345 kV line would be constructed in an existing 115 kV transmission line corridor for the entire route. This corridor lies generally in rural forested or open areas. Exh. DPS-DR-1 at 3; exh. DJB-8.

169. From West Rutland to Middlebury, the new 345 kV line would be constructed on the west side of the existing 115 kV line; from Middlebury to New Haven, it would be constructed on the east side of the existing 115 kV line. Exh. DPS-DR-1 at 3; exh. VELCO DJB-8.

170. The existing 115 kV transmission line is an H-frame construction with towers 52 feet high and approximately 15 feet wide between the two poles on the structure. Exh. DPS-DR-1 at 3.

171. The current right-of-way clearing width maintained for the 115 kV line is 150 feet.

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127. Vissering Reb. pf. at 12.
128. Vissering DD pf. at 5–6.

Tr. 2/20/04 (Vol. II) at 139 (Dunn).[129] With the 345 kV line, VELCO proposes a clearing in the right-of-way approximately 250 feet wide. Exh. DPS-DR-1 at 3.

West Rutland Substation

Finding

172. The proposed upgrade of the West Rutland substation would not expand the size of the site. Dunn/Rowe pf. at 4–5. The upgrade of breakers and switches would not be visually noticeable. Boyle pf. at 15. The existing substation is somewhat visible, but is generally backgrounded against the hillside. VELCO proposes to supplement existing plantings with more evergreen plantings to provide additional screening. Exh. VELCO TJB-3 at 3.

Discussion

The proposed West Rutland substation upgrade would not have an undue adverse aesthetic effect.

Adjacent to Whipple Hollow Road, West Rutland, Proctor, Pittsford – Mile Marker 0.0 to 5.5

Findings

173. Whipple Hollow Road is a sensitive scenic area; lands on and adjacent to which the transmission corridor is located form a conservation district. The widening of the corridor, the subsequent cut on the hillside, and the doubling of structures would result in substantial and adverse aesthetic impacts. Exh. DPS-DR-1 at 9–10.

174. VELCO' s proposed mitigation is not sufficient. Exh. DPS-DR-1 at 9–10; tr. 9/22/04 at 46–47.

175. To sufficiently mitigate the adverse aesthetic impacts of the new 345 kV line, both of the following must be implemented in this segment:

- A single pole configuration, albeit higher, is needed to reduce the clearing for the corridor and the subsequent extent of the cut down the hill. The increased height of the single structure, which could be of naturally weathering Corten steel, would

129. Although the transcript indicates that 150 feet is the right of way for the "34.5" line, it is clear from the context that the "34.5" should be "345."

not be visible above the ridgeline, because the corridor is below the height of land to the east.

- Selective clearing and some additional plantings where the buffer is thin to allow as much buffer to remain (particularly near pole structures), will also help to mitigate the visual change.

Alternatively, as a separate option, reconstructing the existing 115 kV line as a single-pole line would represent a desirable mitigation measure and would allow both lines to be located within the existing corridor. Exh. DPS-DR-1 at 9–10; tr. 9/22/04 (Vol. I) at 46–47 (Raphael).

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Finding 175 to avoid an undue adverse aesthetic impact.

Whipple Hollow Road Crossing, Pittsford – Mile Marker 5.5 to 5.6

Findings

176. The 345 kV line crossing of Whipple Hollow Road will adversely impact a scenic area. With the addition of larger structures close to the roadside, the cumulative amount of utility infrastructure will result in an adverse impact. Exh. DPS-DR-1 at 10; Raphael sur. pf. at 2.

177. This area requires extensive landscape mitigation, without which an undue adverse aesthetic impact will result. VELCO' s proposed mitigation is not sufficient. Exh. DPS-DR-1 at 10; Raphael sur. pf. at 2.

178. To avoid an undue adverse impact in this location, VELCO must implement all of the following mitigation measures:

- Set the poles back from the Whipple Hollow Road crossing where, currently, a structure sits adjacent to the road.
- Create a short hedgerow or use street-type plantings to "plug" the road crossing on either side, which will de-emphasize the poles and the crossing.
- Provide additional screening for the Florence Substation, perhaps along the access road to the facility. The additional screening is warranted because the proposed 345 kV structures and lines, when added to the existing 115 kV facilities, increase the visual degradation of the area.

Exhs. DPS-DR-1 at 10-11; Boyle reb. pf. at 4-5; Raphael sur. pf. at 2.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Finding 180 to avoid an undue adverse aesthetic impact.

Brandon at Route 73 (Champlain St.) Crossing at Otter Creek – Mile Marker 12.0 to 12.3

Findings

179. The proposed 345 kV line crosses both Route 73 (Champlain Street) and Otter Creek in Brandon at Mile Marker 12.1. This crossing goes over and through a scenic river corridor and along a well-traveled road near the historic village center of Brandon. This area includes riverbank, meadow and hillside viewsheds, and presents a scenic river valley landscape. Exh. DPS-DR-l at 11.

180. Although there is an existing 115 kV line in the same location, the addition of the second larger pole structure will create an adverse aesthetic impact. The doubling of structures will create a much greater visual intrusion than the existing line on the valley landscape. The additional structure and associated lines as well as the clearing required will not fit within this landscape. The change in the landscape in this well-traveled corridor, without sufficient mitigation measures, would be shocking to the daily traveler initially upon seeing it. Exh. DPS-DR-l at 11.

181. The following mitigation measures, which VELCO has agreed to implement, are necessary to avoid an undue adverse aesthetic impact:

- Setting existing and proposed poles back from the road to the north; and
- Creating a short hedgerow as well as river bank plantings derivative of surrounding species on Otter Creek in the vicinity of the "cut."

Exh. DPS-DR-1 at 11; Boyle reb. pf. at 5; exh. VELCO TJB-Reb-I-3; Raphael sur. pf. at 2.

182. The relocation of structure 145, shown as a potential relocation by VELCO's aesthetic consultant, is necessary to adequately mitigate the aesthetic impact of the 345 kV line. Raphael sur. pf. at 2.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Findings 181 and 182 to avoid an undue adverse aesthetic impact.

Vicinity of Arnold District Road, Brandon, Mile Marker 13.6 to 14.0

Findings

183. This is a highly scenic area with a rolling pastoral landscape and open views. With the historic buildings in the vicinity, this area is classic Vermont landscape. The addition of the new poles and corridor with the increase in the width of the cut will adversely impact the aesthetics of this area. Unless adequately mitigated, this impact will be unduly adverse. Exh. DPS-DR-1 at 12.

184. All of the following mitigation measures are necessary and effective to avoid an undue adverse aesthetic impact:

- Move existing and proposed poles back from the roadside;
- Screen with hedgerows the cut descending from the north; and
- Plant street trees to complement the fenceline and distract and buffer the viewer from the line's impact.

Exh. DPS-DR-1 at 12.

185. At Arnold District Road, VELCO must plant large trees (not apple trees) continued to the north on both sides of the road, for approximately another 150 to 200 feet beyond the plantings proposed by VELCO. Raphael sur. pf. at 2.[130]

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Findings 184 and 185 to avoid an undue adverse aesthetic impact.

130. VELCO's plans do not fully implement these recommendations. Exh. TJB-1–4.

Vicinity of Leicester-Whiting Road, Leicester – Mile Marker 16.2 to 16.7

Findings

186. The area in the vicinity of the Leicester-Whiting Road, a highly traveled road, is open and agricultural in character. As with many of the road crossings in this section, the additional lines and H-frame poles approximately 27 feet higher will create a cumulative and adverse impact that is excessive and out of harmony with the surroundings. Exh. DPS-DR-1 at 12; Raphael sur. pf. at 3.

187. Adequate mitigation of the aesthetic impacts would include a section of hedgerow planting adjacent to the corridor crossing and trees lining the road (as in the classic row of maples along many Vermont roads). Also, screening of the side-by-side pole assemblies is necessary; the screening should be either at the poles to soften their presence, or off-site with permission from landowners. Exh. DPS-DR-1 at 12.

188. VELCO has not adequately implemented the foregoing mitigation measures. VELCO's proposed use of shrubs will not sufficiently screen the towers so close to the road; two acceptable alternatives would be use of columnar trees, or moving the distribution poles off the road to allow for full street trees. Also, VELCO has not included sufficient mitigation on the north side of the road. Finally, VELCO's proposed street tree planting should be extended further west in order to effectively screen the views of the existing and proposed H-frame structures. Raphael sur. pf. at 3.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Findings 187 and 188 to avoid an undue adverse aesthetic impact.

Near Route 7, Salisbury – Mile Marker 17.6 to 20.0

Findings

189. The proposed 345 kV transmission line would run from the Leicester-Salisbury line along Route 7 through open agricultural fields and wetlands. A large open wetland and meadow landscape will be impacted. Exh. DPS-DR-1 at 13.

190. Part of this section, near Mile Marker 18.5, includes a rare and irreplaceable natural area. Popp pf. at 7.

191. VELCO proposes to place 345 kV double-pole H-frame structures adjacent to the existing 115 kV double-pole H-frame structures, matching the placement of the two sets of poles and lines. Boyle DD pf. at Section 1; exh. VELCO TJB-3 at 9–10.

192. The existing 115 kV line intrudes into the Route 7 viewshed. The proposed second set of structures and lines would result in a considerable additional impact to the scenic qualities of this landscape. Exh. DPS-DR-1 at 13.

193. The proposed 345 kV transmission line in Salisbury would be offensive because it would significantly diminish the scenic qualities of the area. Tr. 11/9/04 (Vol. II) at 85 (Raphael); tr. 11/9/04 (Vol. I) at 46 (Vissering).

194. Just north of the Leicester River, the proposed corridor is especially visible from Route 7. The open fields extend to the Route 7 right-of way, which allows a full view of the existing 115 kV and proposed 345 kV lines and the open landscape to the west of the lines. Although a copse of trees screens the views for a short distance, the proposed corridor is open and very visible from Route 7. Near the West Salisbury Road crossing, the transmission line comes as close as 150 feet to Route 7. Boyle DD pf. at Section 1; exh. VELCO TJB DD-1-D1.

195. The crossing of West Salisbury Road would compromise the aesthetic qualities of this highly visible, open area. As proposed, the doubling of pole structures would be offensive to the average person. Without sufficient mitigation, the crossing would result in an undue adverse aesthetic impact. Exh. DPS-DR-1 at 13.

196. VELCO's proposed plantings along Route 7, both south and north of the West Salisbury Road intersection, would not sufficiently screen the two transmission lines, especially in winter. In the immediate vicinity of the intersection and on West Salisbury Road, the mitigation measures proposed by VELCO would be sufficient to avoid an undue adverse aesthetic impact. Exh. VELCO TJB DD-1-H3; Raphael DD pf. at 2–3.

197. The proposed transmission lines in Salisbury would be visible for a long stretch of Route 7, approximately 1.3 miles, in that location. Screening that entire length is not reasonable. Exh. DPS-DR-1 at 13; Raphael sur. pf. at 3; Raphael DD pf. at 3; tr. 11/9/04 at 85–86 (Raphael).

198. The only available mitigation measure that is both effective and reasonable is to move both lines to the west, from poles 207 to 226, so that they are closer to the edge of the open area along the treeline or through patches of woodlands to provide screening. This would provide an effective backdrop for the double set of poles. Any tangent structures could be located to the north of West Salisbury Road and effectively screened using willow-type plantings. Exhs. DPS-DR-1 at 13, DPS-DR-3; Raphael DD pf. at 3.

Discussion

Based on the above findings, we conclude that moving both the proposed 345 kV line and the existing 115 kV line to the west, from poles 207 to 226, is required to avoid undue adverse aesthetic impacts.

We reach this conclusion because the incremental and cumulative impacts of the proposed routing of the 345 kV line adjacent to the 115 kV line, in an open field and wetland, in an especially visible corridor right next to Route 7, would be shocking and offensive to the average person.[131] The two transmission lines in this open location are so out of character with the surroundings that they would significantly diminish the aesthetic qualities of the area, thereby creating an undue adverse aesthetic effect.[132]

We further conclude that VELCO's proposed location of the new 345 kV line fails to take generally available mitigating steps which a reasonable person would take to improve the harmony of the project with its surroundings.

Moving both lines to the west is a reasonable mitigation step in light of the cumulative impact of the two lines. It would reduce the adverse aesthetic effects by moving the lines away

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131. The Vermont Supreme Court has recognized the Environmental Board's authority to determine whether a project would be offensive. In re McShinsky, 153 Vt. 586, 592 (1990) ("By statute, the [Environmental] Board, not the average person in the community, is *required* to determine whether a development will have an undue impact on the aesthetics of an area. Further, in making that determination, the Board need not poll the populace or require vociferous local opposition in order to conclude that an average person would consider the project to be offensive.") (Emphasis added.) The same requirement applies to the Public Service Board in our review of aesthetics under Section 248, given that Section 248 expressly incorporates the aesthetics criterion of Act 250.

132. *See*, *Quechee Lakes Corporation*, Nos. 3W0411-EB and 3W0439-EB (Findings of Fact, Conclusions of Law, and Order, November 4, 1985) at 19–20; *The Van Sicklen Limited Partnership*, 4C1013R-EB (Findings of Fact, Conclusions of Law, and Order, March 8, 2002) at 38, 42; CPG NM-25, Order of 3/15/01 at 27, *citing In Re: Petition of David and Jan Blittersdorf*, CPG NM-11, Order of 5/26/00 at 20.

from the center of the field, away from Route 7, and closer to existing wooded areas that would provide some backgrounding screening.

Moving only the proposed 345 kV line and keeping the existing 115 kV line in its present location would provide insufficient mitigation. Even if the 345 kV line were moved to the west, its incremental aesthetic impacts when combined with the adverse aesthetic impacts from the existing 115 line would be undue. Because travelers on Route 7 would see both lines in an open field and wetland for extended durations, both lines should be moved.

Kelly Cross Road, Salisbury – Mile Marker 20.5 to 20.9

Findings

199. The sections of the proposed 345 kV corridor next to the residences along Kelly Cross Road and parallel to the Salisbury Elementary School are sensitive areas. Without additional mitigation measures, the proposed Project in this location, including the clearing of vegetation from the areas around the houses, would result in an undue adverse aesthetic impact. Exh. DPS-DR-1 at 14.

200. The following mitigation measures would, together, provide sufficient mitigation to avoid an undue adverse aesthetic impact:

- retention of the existing hedgerow at the school, extending it and adding evergreens; and
- extensive new screening and hedgerow plantings, both along the road to "plug" the opening and adjacent to the residences.

Exh. DPS-DR-1 at 14.

201. VELCO's proposed mitigation does not appropriately implement the foregoing recommendations. VELCO proposes, inappropriately, to remove plantings that are useful for screening under the current corridor. Exh. TJB-Reb-1–7; Raphael sur. pf. at 3–4.

202. Placing the proposed 345 kV line underground would present significant engineering problems, and thus does not constitute a reasonably available alternative. *See* Section VI.C of this Order.

Discussion

At Kelly Cross Road, the proposed 345 kV line would pass close to residences and the Salisbury Elementary School. Because engineering issues preclude underground placement of the 345 kV line, we will require VELCO to take the utmost care with vegetative management, such that only the absolute minimum clearing will be allowed. VELCO also must add extensive new plantings, to mitigate to the greatest extent practical the visual impacts of the 345 kV line.

An essential condition that accompanies our overall approval of the proposed Project is the requirement that the Petitioners present additional, site-specific details in a post-certification review process. (This process is described further in Section XII of this Order.) In the post-certification review process, VELCO will be required to demonstrate that at Kelly Cross Road, it has met the objectives outlined in the preceding paragraph.

Route 125 and Route 7 Intersection, East Middlebury – Mile Marker 24.5 to 25.0

Findings

203. The intersection in East Middlebury of Route 125 and Route 7 is both well-traveled and an important gateway to the Green Mountain National Forest and recreation areas, including Middlebury College's Breadloaf Campus and Snow Bowl Ski Area. This intersection leads to one of Vermont's designated scenic roads, although the designation does not begin until about a mile from this point. Exh. DPS-DR-1 at 14.

204. The 115 kV transmission line and distribution lines are present in this area. Exh. TJB-3 at 12.

205. This intersection also includes a number of irregularly placed buildings that degrades the landscape to some extent. Exh. TD-4 at 11.

206. Nevertheless, this location is sensitive to an increase in utility line construction and to any loss of existing vegetation. The addition of a new transmission line would create a cumulative, adverse aesthetic impact offensive to the average viewer. The increase in visual clutter would further deteriorate the aesthetics of this area and, without sufficient mitigation, would result in an undue adverse impact. Exh. DPS-DR-1 at 14–15.

207. For the 345 kV line, VELCO proposes two alternative designs. The first would place the existing roadside distribution and telecommunications facilities underground. This first

option would also use taller poles at an angle structure and, in the "island" bordered by Routes 7 and 125, eliminate a roadside pole. The taller pole on the "island" would be mitigated by tree growth at the apex of the island and existing vegetation east of the corridor on the south side of Route 125. VELCO's second design would retain the overhead lines. Exh. VELCO TJB DD-2 at Section 2.

208. Placing 565 feet of existing distribution and telecommunications lines underground would eliminate visual clutter and allow taller trees to be planted on the north side of Route 125. The taller trees would provide significant screening for the structures from Route 7. Exh. VELCO TJB DD-2 at Section 2; Vissering DD pf. at 3–4.

209. The additional aesthetic impacts of the proposed 345 kV structures and lines would be adverse and undue unless the distribution lines are put underground and the proposed riser structure is set back further from the road to reduce its prominence and visibility. The vegetative plug should remain in front of the new pole on the south side of 125. Raphael DD pf. at 3–4; Vissering DD pf. at 3–4.

210. Placing the distribution and telecommunications facilities underground and setting back the riser pole, in conjunction with the other mitigation for this area proposed by VELCO in its design detail testimony should be sufficient to avoid an undue adverse aesthetic effect. Raphael pf. at 3–4; Vissering DD pf. at 3–4.

211. It would cost over $500,000 to place the distribution facilities underground; this does not include placing the Verizon and Adelphia lines underground. Dunn/Harr DD pf. at 4.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Findings 209 and 210 to avoid an undue adverse aesthetic impact.

Painter and Halpin Roads in Middlebury and New Haven – Mile Marker 28.5 to 31.1

Findings

212. The addition of the higher 345 kV line with a much larger pole would add to the existing disharmony and further impact the open and residential character of this area. This would present an undue adverse aesthetic impact, unless sufficiently mitigated. Exh. DPS-DR-1 at 15–16.

213. Sufficient mitigation would include all of the following measures:

- Matching poles to create some degree of order and repetition;
- Keeping pole structures set back from crossings;
- Creating hedgerow and/or evergreen "plugs" at the crossings;
- Setting up street tree and possibly hedgerow plantings and individual screens at particular properties as necessary to mitigate the visual impacts in the sections adjacent to and crossing both Halpin Road and River Road in particular. These mitigation measures will need to be carefully located with the involvement and consent of landowners.
- Along River Road a hedgerow along the north side of the road for .2 to .3 miles is needed to change the focus of the viewer and to partially screen the line.

Exh. DPS-DR-1 at 15–16.

214. VELCO has not adequately implemented the foregoing mitigation measures in its plans. Raphael sur. pf. at 4–5.

215. VELCO has expressed concerns over plantings in agricultural fields. Those concerns are overstated, because the plantings can be placed at the edge of the right-of-way and designed so as to not lose any appreciable arable land. Any loss of maneuverability for farm vehicles should be minor, and offset by the benefit provided by the aesthetic mitigation. Raphael sur. pf. at 5.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Finding 213 to avoid an undue adverse aesthetic impact. While we are concerned about the impacts on agricultural operations from plantings, at this location we conclude that, on balance, those impacts are outweighed by the aesthetic benefits.

Route 7, New Haven

Findings

216. There are sweeping views from Route 7 near Roland's Place, a restaurant on top of a hill just south of Town Hill Road in New Haven. The expanded substation and new 345 kV line would be visible. Vissering pf. at 12. These views of open landscape from a high point are of concern, and there is conserved land nearby. Boyle reb. pf. at 9.

217. Planting a few large massings of evergreens west of some of the structures would be a reasonable mitigation screening measure. Vissering pf. at 12.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Finding 217 to avoid an undue adverse aesthetic impact.

Town Hill Road, New Haven – Mile Marker 35.0 to Substation

Findings

218. Town Hill Road serves as a gateway to New Haven Village, and is one of the most visually sensitive locations on the 345 kV line. At the crossing of Town Hill Road, the existing 115 kV transmission line and existing distribution lines result in a cluttered roadside. The additional cumulative aesthetic impacts from the second, larger set of poles and conductors for the proposed 345 kV transmission line would be adverse. Boyle pf. at 9; exhs. DPS-DR-1 at 16–17, 20, exh. DPS-DR-3; Raphael DD pf. at 4–5.

219. To avoid an undue adverse impact on aesthetics, the following mitigation measures must be implemented:

- Screening is needed along individual properties in the Hunt Road vicinity. One potential mitigation option for this entire section would be to design the 345 kV line with new single poles with sufficiently short spans and a clustered conductor array to prevent it from being much higher than the existing line. Alternatively, two side-by-side single poles would be a preferable mitigation option; this would limit the right-of-way impacts and partially address issues regarding proximity to homes.
- Roadside screening and hedgerows are required along the crossings and near them on both Hunt Road and Town Hill Road.

Exhs. DPS-DR-1 at 17, DPS-DR-3; Raphael DD pf. at 4–5.

Discussion

For the reasons stated in the above findings, the 345 kV line must incorporate the mitigation measures described in Finding 219 to avoid an undue adverse aesthetic impact.

Our decision concerning the location of the expanded New Haven substation has implications for the route of the lines from Town Hill Road to the substation. That decision is discussed below.

The 115 kV Line – New Haven to South Burlington

The 115 kV Line – Route, Pole Height and Design, and Right-of-way Clearing

220. The proposed 115 kV line would run for approximately 27.1 miles, from the New Haven substation to the Queen City substation in South Burlington, passing through New Haven, Vergennes, Ferrisburgh, Charlotte, Shelburne, and South Burlington. Dunn pf. at 9; Boers pf. at 18–19.

221. The new 115 kV transmission line would replace an existing 46 kV subtransmission line from New Haven to Vergennes and a 34.5 kV subtransmission line from Vergennes to the Queen City substation. The first 1.2 miles of the 6.5-mile 46 kV line is owned by CVPS. The remainder of the 46 kV line and all of the 34.5 kV line are owned by GMP. Dunn pf. at 9.

222. For most of its length, the line would be constructed in the existing 34.5 kV and 46 kV transmission corridors, but in some locations it would be in areas that do not have a transmission line. Much but not all of the line is next to a railroad track. Exh. DPS-DR-l at 3; Boers pf. at 18–19.

223. Between 20 and 100 feet of additional right-of-way clearing will be needed along the proposed 115 kV line between New Haven and South Burlington. Boers pf. at 18–30; Boers sup. pf. at 9–11.

224. Additional clearing beyond the clearing for the 34.5 and 46 kV lines will be needed for the 115 kV, resulting in the loss of current buffers and screening in place today for the existing lines. For the 115 kV line, the right-of-way clearing would generally be 150 feet, but would vary

in some locations. Exh. DPS-DR-1 at 5; exh. Boyle VELCO TJB DD 8-B; VELCO exh. RJ-5 at 4.

225. VELCO will need to acquire 100-foot-wide easements for the 115 kV line to replace the existing GMP and CVPS easements. Dunn pf. at 12; Boers supp. pf. at 9-10.

The Potential Use of Underground Cable

Findings

226. The total cost to construct 115 kV underground cable using a four-cable design would be approximately $2.2 million to $2.9 million per mile. These costs include the costs of transition structures, but not directional drilling if required in sensitive areas and under roads. Assuming a cost of approximately $300,000 per mile for 115 kV overhead construction, the incremental cost would be in the neighborhood of $1.9 million to $2.6 million. Exhs. Aabo-DD-1, DD-4; exh. DJB-Supp(1)-47; Smith pf. at 21.

227. Horizontal direction drilling for the underground 115 kV construction would cost approximately $300/foot more than open trench construction costs. Typical boring lengths under watercourses could be in the range of 200 to 300 feet, averaging $75,000 in additional costs at each location. Jack-and-bore methods are more costly and are typically used where space is not available for horizontal direction drilling methods. Exh. DJB-Supp(1)-47 at 4, as corrected in tr. 6/15/04 (Vol. I) at 73–74 (Boers).

228. The use of underground cable for short lengths of the proposed 115 kV line from New Haven to Queen City would not significantly nor adversely affect system stability and reliability if a four-cable design is utilized and if a system study, including electromagnetic transience analysis, is performed. *See* findings in Section VI.B.

Discussion

We do not find the costs of placing the 115 kV line underground (two to three cents per mile of line per month for thirty years) to be justified for the entire 27 miles of the 115 kV line. However, there are certain areas, such as along Bay Road in Shelburne, where the site specific impacts of the proposed Project require as drastic a measure as placing the 115 kV line underground to comply with the statutory requirements of Act 250. Based on the above

findings, we conclude that underground placement of sections of the 115 kV line could constitute a reasonable measure to mitigate aesthetic impacts, but only if the substantial cost is warranted by the specific circumstances. Based on our review of the evidence, and for the reasons discussed below, we conclude that such circumstances are presented in the Bay Road area of Shelburne and, possibly, in the Ferry Road area of Charlotte.

Vicinity of Route 17 and Substation, New Haven – Mile 0.0 to 0.4

Findings – General

229. The new proposed 345 kV line would run parallel to the existing 115 kV line through visually sensitive open areas, including areas visible from Town Hill Road heading to and from the town center, until the line ends at the expanded substation. Exh. DPS-DR-1 at 16–17, 20; Vissering reb. pf. at 7–8.

230. VELCO proposes to expand the existing substation just south of Route 17. The proposed substation would be greatly increased in size, both horizontally and vertically, compared to the existing substation. Boers pf. at 6; exh. DPS-DR-1 at 19.

231. VELCO proposes to construct a new 115 kV line heading to South Burlington. This line would be in addition to the existing 115 kV line heading to Williston. Under VELCO's proposal, two sets of 115 kV structures would run north from the existing substation and be highly visible crossing Route 17. Exh. DPS-DR-1 at 19; exh. VELCO DJB-7; tr. 11/9/04 (Vol. II) at 51–52 (Raphael).

232. The Route 17 crossing area is a well-traveled gateway to the Green Mountains, as well as to New Haven Village. Exh. DPS-DR-l at 19; Raphael DD pf. at 6.

Findings – New Haven Substation

233. The existing VELCO New Haven substation fenced area is approximately 0.88 acres. Boers pf. at 6.

234. The proposed modifications to the New Haven substation would require expanding the enclosure fence by approximately 30 to 86 feet to the north, 409 feet to the east, and 220 feet to the south. 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 toward the south. Boers pf. at 6; exh. DJB-7.

235. If the substation is expanded as proposed, the maximum height of the tallest structures, the tubular steel A-frame dead-end structures, will increase from an existing height of 53 feet to a proposed height of 84 feet above the expanded substation yard. Exhs. VELCO DJB-6, DJB-7; exh. VELCO TJB DD-2 at Section 3-C.

236. The mitigation proposed by VELCO on the south and east sides of the substation expansion consists of a berm, plantings on the berm, and street trees along Town Hill Road. The proposed berm would be 10 to12 feet high, with its highest elevation at 415 feet, which is approximately 11 feet above the elevation of the proposed substation yard (404 feet). The proposed plantings would be from 5 to 16 feet high initially. After five years these plantings would be 20 to 22 feet for the deciduous trees and 12 to 16 feet for the softwoods. Exh. VELCO TJB DD-2 at Sections 3-B, 3-D, 3-D1.

237. The mitigation proposed by VELCO on the north side of the substation expansion consists of additional plantings in an existing hedgerow. In addition, because the land generally slopes from north to south with the expanded substation to be cut into the existing grade on the north side, VELCO proposes constructing a vertical wall from the proposed substation yard (elevation 404 feet) to meet the existing grade (which varies in elevation between 412 and 415 feet). Exh. VELCO TJB DD-2 at Sections 3-D, 3-D1.

238. As part of the mitigation plantings at the expanded substation, VELCO proposes to plant white spruce directly underneath the 115 kV (north side) and 345 kV (south side) lines. VELCO also proposes to plant Eastern white pine on the berm directly underneath the proposed 345 kV line entering the substation from the south. In addition, VELCO proposes to plant Canadian hemlock on the north side, directly underneath where VELCO plans a future 345 kV line to exit the substation and proceed north to Williston. These three evergreen species would be planted at heights of 4–5 or 6–7 feet. Exh. VELCO TJB DD-2 at Sections 3-D, 3-D1.

239. The vastly increased size of the substation, the significant increase in height of some structures at the substation, and the height and mass of the 345 kV structures would have a substantial adverse impact on the views from both Town Hill Road and Route 17. Town Hill

Road is one of the most visually sensitive locations on the 345 kV line. Exh. DPS-DR-1 at 19; Vissering reb. pf. at 3–8; Boyle pf. at 9.

240. VELCO's proposed substation expansion immediately adjacent to a highly scenic location at the height of land will create undue aesthetic impacts. The substation "will be of a massive scale that will overwhelm this scenic landscape." Vissering reb. pf. at 2; exh. NH Vissering Reb-1 at 2–3; Vissering DD pf. at 8–9.

241. The mitigation proposed by VELCO for the expanded New Haven substation and proposed 115 kV crossing of Route 17 is not sufficient to avoid undue adverse effects on aesthetics. Attempts to screen the substation through the use of large berms could create an even greater eyesore. Raphael DD pf. at 4; tr. 11/9/04 (Vol. II) at 106–111(Raphael); exh. NH Vissering reb.-1 at 2–3; Vissering DD pf. at 8–9.

242. New Haven proposes an alternative substation location to the south and west of the existing substation. This alternative location was selected by the Town to move the substation farther from the Village of New Haven, to reduce visibility from Route 17 and Town Hill Road, and to reduce any potential noise impacts. Sparling reb. pf. at 5; exh. Sparling A; Vissering reb. pf. at 11–12, Vissering DD pf. at 7.

243. The alternative substation location proposed by New Haven appears to be about 1,000 feet further south of Route 17 than VELCO's proposed location, and approximately 1500–2000 feet southwest of VELCO's proposed location, and therefore approximately 1500–2000 feet farther from the Village center. Exhs. Sparling A and B.

244. New Haven's alternative substation location is at a lower height of land than VELCO's proposed location. The elevation of VELCO's proposed substation location is 404 feet, while New Haven's alternative substation location is shown to be at approximately 350 feet in elevation. Exh. VELCO TJB DD-1 at 3-D1; exh. Sparling A.

245. The owner of the location proposed by VELCO also owns the location proposed by New Haven. New Haven was informed by that owner, Mr. Boise, that he is willing to sell the alternative location land to VELCO. Sparling pf. at 2, 5.

246. New Haven's alternative location would reduce the apparent scale of the substation because of the mature backdrop of trees, the lower elevation, and being farther back from Route

17. It would also greatly improve the possibilities for screening the substation. Exh. NH Vissering reb.-1 at 4.

247. Moving the substation to the southwest would mitigate adverse aesthetic effects from the transmission lines, both the 345 kV line entering the substation from the south and the 115 kV line leaving the substation to cross Route 17. With a relocated substation, both lines would be moved west, closer to the edge of existing woods, where they would be less noticeable than in the middle of the fields. Exh. NH Vissering reb.-1 at 4; tr. 11/9/04 (Vol. I) at 58–59 (Vissering); Raphael sur. pf. at 6–7; Raphael DD pf. at 4–5; tr. 11/9/04 (Vol. II) at 61 (Raphael).

248. VELCO is considering a future upgrade to 345 kV for the existing 115 kV line that runs from the New Haven substation to Williston. By moving the existing 115 kV line to the west, New Haven's proposed substation location would mitigate the adverse impacts on aesthetics and open agricultural land. Sparling reb. pf. at 6; Vissering reb. pf. at 4; Smith pf. at 18–19; Smith reb. pf. at 6–7.

249. The total cost of relocating the existing and proposed New Haven substation facilities to the site suggested by New Haven would be between $1.8 and 2.3 million. A rough estimate for the cost of the mitigation proposed by VELCO for the substation expansion in the existing location is approximately $100,000. Dunn surr. pf. at 6; tr. 11/8/04 (Vol. II) at 21 (Dunn).

250. If the substation is not moved to New Haven's proposed location, and instead is expanded at the existing location as VELCO has proposed, there would be reasonably available mitigation measures in addition to those proposed by VELCO. Significant additional screening on the north side of the substation would be needed to avoid undue adverse aesthetic impacts. Additional screening would also be needed on the south and east sides of the substation if it were expanded in the existing location. Raphael DD pf. at 4–6; tr. 11/9/04 (Vol. II) at 106–111 (Raphael); Vissering DD pf. at 7–8; exh. DPS-DR-1 at 17.

Findings – Existing and Proposed Transmission Lines

251. An existing 46 kV line to Vergennes also crosses Route 17 near the 115 kV crossing. As part of the proposed Project, the 46 kV line would be removed and replaced by the new 115 kV line to South Burlington. Dunn pf. at 9.

252. A second existing 46 kV line emerges from the north of the existing substation, immediately turning sharply to the right (east) toward Bristol. This line does not cross Route 17 in the same area as the existing 115 kV line to Williston. This second 46 kV line would remain. Exh. VELCO TJB-2 at Section 4-B.

253. VELCO has presented two options for the manner in which the two 115 kV lines would cross Route 17, a "side-by-side" option and a "separation" option. Dunn/Harr DD pf. at 4–5; *see* Findings 254 and 256, below.

254. VELCO's first option for the Route 17 crossing would place the two 115 kV lines side-by-side. This side-by-side option keeps the new 115 kV line in VELCO's original proposed location, parallel to the existing 115 kV line to Williston. Under this option, VELCO would match the locations of the two sets of structures but move the structures on both lines that are nearest Route 17 back away from the highway (on both the north and south sides of Route 17). Exh. VELCO TJB DD-2 at Section 4; Dunn/Harr DD pf. at 4–5 and exhs. VELCO Dunn/Harr DD-7, DD-8.

255. If implemented, VELCO's side-by-side option would be offensive and shocking, and would not adequately mitigate the adverse aesthetic impacts from both sets of structures. Its adverse aesthetic impact would be undue if the Department's mitigation recommendations are not followed. Exh. DPS-DR-10 at 6; *see* Finding 259.

256. VELCO's second option for the Route 17 crossing would separate the two 115 kV lines by moving the new 115 kV line to the west of its original proposal. Under this separation option, the new line would take a sharp turn to the west as it exits the substation and then a sharp turn to the north "to follow the hedgerow at the edge of the field," 200 feet from the treeline. VELCO proposes to move only the new line, keeping the existing 115 kV line to Williston in its present location. Exh. VELCO TJB DD-2 at Section 4, Dunn/Harr DD pf. at 4–5; exhs. VELCO Dunn/Harr DD-7, DD-8.

257. Under VELCO's separation option, the separated lines would appear at the rise of the highway and against open fields. The new structures would be visible to eastbound travelers as the road rises up and the vegetation on the side of Route 17 gives way to open fields. The new line would also be visible to westbound travelers because the structures would not be backgrounded against the western treeline. Even with the poles set back further from the road at

the height of land, the visual impact will be unduly adverse. Raphael DD pf. at 7; Raphael sur. pf. at 7–8.

258. VELCO's separation option would require three, offensive and shocking angle structures, each consisting of a 3-pole H-frame. One angle structure would be 61 feet tall and two would be 52 feet tall. The angle structures would be visible to westbound travelers and would not be backgrounded by the existing treeline. Dunn/Harr exh. DD-7; Raphael DD pf. at 7; Raphael sur. pf. at 7–8.

259. At the Route 17 crossing, the Department recommends moving both the new and the existing 115 kV lines to the west, closer to the treeline (50 to 75 feet from the trees, rather than 200 feet as VELCO proposes). Moving both lines in this manner would reap two significant benefits. First, the structures would be viewed by travelers on Route 17 at a lower point, rather than at the height of land. Second, for the westbound viewer, there would be a background of trees as a result of the structures being located nearer the treeline. Exhs. DPS-DR-1 at 19–20, DPS-DR-4; Raphael DD pf. at 7.

Discussion

At this location in New Haven, the proposed Project would result in multiple adverse aesthetic impacts: the proposed expansion of the substation in the existing location as viewed from Route 17, from Town Hill Road, and from the village; the other cumulative impacts on Route 17 from the new 115 kV line and the existing 115 kV line (discussed below); and the aesthetic impacts associated with the potential future upgrade of the 115 kV line to Williston. Taking all these factors together, we conclude that the proposed Project would have a substantial adverse aesthetic impact on the area, and that the Village of New Haven would bear an unusually heavy share of the burdens of the proposed Project. These excessive burdens on a single community necessarily informs our consideration of the appropriate mitigation measures for this area.[133]

We start with the relevant circumstances surrounding the proposed substation expansion. VELCO proposes expanding an existing substation located in an agricultural landscape. The

133. *In re: Champlain Oil Company*, No. CUD-94–11 (V.W.R.B, Oct. 4, 1995) at 9 (direct and cumulative impacts can result in undue adverse effect on aesthetics).

existing substation is less than one acre in size and its structures reach approximately 53 feet in height. The proposed expansion would increase the substation to nearly eight times its original size to 6.8 acres, and to increase the height of tubular steel structures to over 80 feet in height. The proposed substation would be out of context and not in harmony with the area in which it is located. While Vermont viewsheds regularly include distribution and transmission lines, the same cannot be said of substations, especially of this size.

The measures proposed by VELCO for an expansion of the substation in its present location would not sufficiently mitigate the aesthetic impacts. The height of the substation facilities would increase from 53 feet high to 84 feet high, and a ten-foot berm or wall with five to sixteen-foot plantings would do little to screen the substation structures from Route 17 for many years, if ever.[134]

Based on the evidence before us, there appears to be a reasonably available measure that would substantially mitigate the adverse aesthetic impacts of the substation expansion: moving the entirety of the substation to the approximate location proposed by New Haven. While the estimated cost of moving the substation is substantial, so are the aesthetic benefits. Moving the New Haven substation to the south and west would effectively mitigate the undue adverse aesthetic effects of the expanded substation. Not only would the substation be farther from Town Hill Road, Route 17, and the Village of New Haven, but it also would be approximately 50 feet lower in elevation. The existing mature trees in that area that would remain after construction would provide further aesthetic mitigation.

Moving the substation also mitigates the potentially undue adverse aesthetic effects of the crossing of Route 17 that are presented by the cumulative impact of the proposed 115 kV line to South Burlington and the existing 115 kV line to Williston. Moving the substation south and west would dictate moving both of those lines west. This would remove the lines from the height of land at Route 17, where the adverse aesthetic impacts of the combined sets of lines would be undue, to a somewhat lower elevation. It would also move them closer to existing

134. The Department's proposed mitigation of constructing a gradual rise of land over the approximately 400–500 feet between Route 17 and the proposed substation would require an excessive amount of soil disturbance and would likely require the removal of all existing vegetation between Route 17 and the existing substation. We do not find the Department's mitigation proposal in this location to be viable.

vegetation on the western edge of the fields both south and north of Route 17; this would provide some backgrounding to mitigate the visual presence of the lines.

At this time, we do not know the exact location of the site proposed by New Haven,[135] do not know the extent of clearing of the existing stand of mature trees that would be required, and do not know the environmental or archeological conditions of the site. Thus, at this time we cannot approve the construction of the substation at the site proposed by New Haven.

Nonetheless, based on the evidence before us, the alternate substation location does appear to represent a reasonably available mitigation measure. VELCO's failure to fully explore it, and adopt it if feasible, would render undue the adverse impact of expanding the substation in its present location.[136]

Accordingly, VELCO must fully explore the feasibility of moving the expanded New Haven substation to the south and west, to the general area proposed by New Haven. The specific location and footprint of the relocated substation must be determined following appropriate technical, environmental, archeological, and aesthetic analysis in a post-certification proceeding. That proceeding will also review the locations and extent of clearing, locations and types of screening from additional vegetation or other screening measures such as berms, and other aesthetic mitigation that might be needed. The relocation of the existing lines and proposed lines at the substation would also be addressed during this proceeding, as would the removal of the existing substation and the aesthetic remediation of the existing site.

VELCO should provide timely notice and opportunity for comment in its evaluations and design for the relocated substation for New Haven, the Addison County Regional Planning Commission, the Department of Public Service, and affected landowners.

If, and only if, as a result of this analysis the Board determines that New Haven's proposed alternative location is not appropriate, we would allow VELCO to implement its

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135. New Haven's alternate substation location exhibits were hand-drawn, and an exact location for the proposed alternate site cannot be ascertained without an environmental assessment.

136. New Haven's proposed location for the substation has not been evaluated for environmental and archaeological conditions. Thus, we cannot yet determine with any certainty whether the location is, in fact, a reasonably available alternative to the existing substation site. However, given the substantial adverse aesthetic impacts of expanding at the existing substation location — impacts that would be largely avoided with New Haven's proposed location — we conclude that VELCO must study New Haven's proposed location and adopt it if it is, in fact, an appropriate site for the expanded substation.

proposed expansion at the existing substation location, with additional aesthetic mitigation beyond that which VELCO has proposed. We have concluded in today's Order that, overall, the proposed Project will promote the general good of the state. Therefore, even though we have found that VELCO's proposed substation expansion at the existing site would result in an undue adverse aesthetic impact, when weighed with the societal benefits of the Project, we would approve the substation expansion at the location of the existing substation, because it is integral to the success of the Project as a whole, if there were no viable alternatives.

VELCO has expressed concern about potential delay in the construction of the 345 kV line if the New Haven substation is relocated.[137] While the Board is cognizant of potential delays due to additional investigations and engineering related to relocating the substation, for the reasons discussed above the relocation is sufficiently important to promote the public good that we cannot allow VELCO's proposed expansion without fully considering what appears to be a far superior alternative. VELCO could have sought to present evidence rebutting the alternative location that New Haven has urged for nearly a year. VELCO did not do so.

Turning to the existing and proposed 115 kV transmission lines, based on the above findings, we conclude that the aesthetic impacts of the lines will be sufficiently mitigated by the relocation of the lines to the west. As we noted in our discussion of the substation, moving the substation would require relocation of both lines to the west, where the lower elevation and existing vegetation would mitigate the visual impact of the lines. The specific location of each line would be determined in a post-certification proceeding, as would the clearing, screening, and other aesthetic mitigation that might be required.[138]

Vergennes Reroute (Ferrisburg, Vergennes) – Mile Marker 3.0 to 7.0

Findings

260. VELCO's Vergennes Reroute Proposal represents a significant improvement over the original proposal. The Reroute would avoid the Otter Creek Basin and the neighborhoods between the basin and the Comfort Hill area. The original proposal would have imposed

137. VELCO Reply Brief at 25.

138. Additionally, in designing the line relocation, VELCO must involve landowners who may be potentially affected by the lines' relocation.

significant aesthetic impacts on those locations. Exh. VELCO TD-Sup(1)-1; exh. DPS-DR-10 at 8.

261. The City of Vergennes prefers the Reroute Proposal, because it believed that relocation of the transmission line and substation upgrade would address matters that the City believed to be more important.

> CHAIRMAN DWORKIN: [W]e are aware that along the falls line of the Champlain Valley in places like Otter Creek and Middlebury and in the salmon hole in Winooski and Burlington border, there have been places that used to be cluttered with electric lines that have been cleaned up significantly. And in the most basic sense we are only wondering whether the proposal here represents a missed opportunity. And anything you can do to help advise us on that would be of interest.
>
> THE WITNESS [Mr. Perry]: Well, I don't think it's a missed opportunity in view of what we were facing. At the time that Green Mountain Power had — actually it was Green Mountain Power, who indicated that they might want to clean up the distribution lines around where it crossed Main Street. We were looking at a more serious matter, and that is the transmission lines, and going into the basin. And the significantly larger substation in the basin. And that was more important than eliminating a few distribution lines which have been there for a long time.

Tr. 6/11/04 (Vol. I) at 31–33 (Perry).

262. The proposed new Vergennes radial feed should not have an undue adverse impact on aesthetics. Boyle sup. pf. at 4–5; exh. DPS-DR-10 at 12, et seq.

Discussion

The Vergennes Reroute would result in less aesthetic impact than VELCO's original proposal, and we therefore adopt the Reroute as part of the project as approved in today's Order. (We do not approve VELCO's *original* proposal through Vergennes.) Two specific locations — the Route 7 crossing at Reroute Mile Marker 2.8 to 2.9, and the proposed Kayhart Crossing substation — require aesthetic mitigation measures beyond those proposed by VELCO. These two locations are discussed in the sections that immediately follow.

Route 7 Crossing, Vergennes – Reroute Mile Marker 2.8 to 2.9

Findings

263. With the Vergennes Reroute, the proposed Project would cross Route 7 near the boundary between Vergennes and Ferrisburgh. This area features an open landscape, with some existing large commercial development. Vissering sup. pf. at 10.

264. A new telephone line to the west of the highway may affect the height of VELCO's proposed transmission poles. If the telephone line requires more clearance than that required to cross the highway, VELCO would place the telephone line underground if technically feasible. Boyle reb. pf. at 13.

265. VELCO has proposed insufficient aesthetic mitigation for this area. To avoid an undue adverse impact, the transmission poles should be set back further from Route 7, and VELCO's plans should incorporate additional roadside street tree plantings combined with groupings of evergreens. Vissering sup. pf. at 10.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Finding 265 to avoid an undue adverse aesthetic impact.

New GMP Vergennes Substation at Kayhart Crossing, Vergennes, Reroute Mile Marker 3.5

Findings

266. The Petitioners originally proposed an expansion of the existing GMP Vergennes substation. After meetings with Vergennes officials and residents, the Petitioners modified the proposal as part of the Reroute filing. Under the modified proposal, the existing substation in Vergennes would remain unchanged and a new substation would be built in the northeast corner of Vergennes near the railroad bridge at Kayhart Crossing, off Route 22A. Dunn sup. pf. at 3–4; Vissering sup. pf. at 3; exh. DPS-DR-10 at 31.

267. The proposed new substation can be reasonably well screened from view. The new location is preferable aesthetically to the original proposal because it is near industrial uses and further from homes and historic downtown Vergennes. Vissering sup. pf. at 3.

268. The Petitioners' proposed mitigation is not sufficient to avoid an undue adverse aesthetic impact. Additional screening, long spans, and careful pole placement to the periphery of traveler's views are necessary to provide adequate aesthetic mitigation. Exh. DPS-DR-10 at 31.

Discussion

For the reasons stated in the above findings, the new GMP substation at Kayhart Crossing line must incorporate the mitigation measures described in Finding ? to avoid an undue adverse aesthetic impact.

Vergennes, Ferrisburgh – Mile Marker 7.0 to 12.7

Findings

269. VELCO's proposed Ferrisburgh Reroute (Little Chicago Road) lies within this section of the proposed Project. The Ferrisburgh Reroute generally represents an aesthetic improvement over VELCO's original proposal in that it would have less impact on residences. Exh. DPS-DR-10 at 8.

Discussion

The Ferrisburgh Reroute would result in less aesthetic impact than VELCO's original proposal, and we therefore adopt the Reroute as part of the project as approved in today's Order. (We do not approve VELCO's *original* proposal in the Little Chicago Road area.)

Ferrisburgh at the South Slang – Little Chicago Reroute Mile Marker 0.7 to 0.9

Findings

270. The south end of Hawkins Bay, just north of the mouth of Little Otter Creek in Ferrisburgh, is an area known locally as the Slang. Heindel pf. at 5.

271. The Slang is a waterway and wetland surrounded by vegetation and full of wildlife. The west side is growing up to thick brush and trees. Heindel pf. at 7; exh. VELCO TJB DD-2 at Section 5.

272. Primary access to the Slang is by water from the north. Exh. TJB DD-2 at Section 5;. Recreational boaters can view the scenic resources of the Slang. Heindel pf. at 7.

273. The proposed Project would cross the South Slang between the Little Chicago Reroute Mile Markers 0.7 and 0.9. This crossing would be in the same location as an existing GMP 34.5 kV line. Exh. VELCO G&B Supp(2)-5 at Sheet 5.

274. The proposed Project includes H-frame wood structures 61 feet tall on either side of the Slang, with single wood or corten steel poles for the tangent structures. VELCO proposes to place the structure that would be closest to the west bank approximately 80 feet back from the water. The existing GMP structure on the west bank is 20 feet back from the water and is 35.6 feet tall. The proposed pole on the east bank would be in the approximate location of the existing GMP structure, which is 40 feet from the water. The span crossing the Slang would be approximately 645 feet. Dunn/Harr DD pf. at 5–6; exh. VELCO TJB DD-2 at Section 5; exh. VELCO Dunn/Harr DD-9.

275. The project as proposed includes selective clearing and vegetative management from pole #17 to pole #23. In this area; only danger trees would be removed. Exh. VELCO TJB DD-2 at Section 5.

276. From the Slang, there are essentially no views of man-made features except for the existing 34.5 kV line. Heindel pf. at 7.

277. Compared to the existing 34.5 kV line, the proposed 115 kV poles and conductors will be larger and more visible, resulting in a greater adverse impact on the scenic qualities of the Slang. Heindel pf. at 7.

278. To avoid undue adverse aesthetic effects on the Slang, native plantings must be added along the banks of the Slang. The plantings would de-emphasize the pole structures and, eventually, help screen them from boaters. Additionally, the extent of the proposed clearing must be minimized to retain more existing vegetation which will help screen the 115 kV structures. Raphael DD pf. at 8; tr. 11/9/04 (Vol. II) at 62–65.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Finding 278 to avoid an undue adverse aesthetic impact on the Slang.

GMP Ferrisburgh Substation Upgrade and Long Point Road Crossing, Ferrisburgh – Mile Marker 12.7

Findings

279. As part of the proposed Project, GMP will expand its Ferrisburgh Substation by 0.33 acres with some new structures. Improved screening is needed for both the substation and the routing around the existing substation. Boyle pf. at 18–19; exh. DPS-DR-1 at 24.

280. The 115 kV line crossing at Long Point Road adjacent to the Ferrisburgh Substation is aesthetically sensitive. Without appropriate mitigation, the crossing will create an undue, adverse aesthetic impact. Exh. DPS-DR-1 at 24.

281. To avoid an undue adverse aesthetic impact at the substation and road crossing, the proposed Project must incorporate the following mitigation measures:

- Maintenance of as much of the existing vegetation as possible; some offsite screening should be placed west of the substation and east and west of Long Point Road, which will require property owner permission (particularly at the substation and at Long Point Road).
- Substation screening on all sides is necessary along with plantings as Long Point Road approaches the corridor from both directions.
- At road crossings, provide judicious and well-placed screening to distract and buffer the viewer from the visual impacts of the poles, lines and substation.

Exh. DPS-DR-1 at 24–5.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Finding 281 to avoid an undue adverse aesthetic impact.

Thompson's Point Road Crossing, Charlotte – Mile Marker 14.9

Findings

282. The proposed 115 kV line would cross Thompson's Point Road in an aesthetically sensitive location. Exh. DPS-DR-1 at 25.

283. To avoid an undue adverse impact on aesthetics, the proposed transmission poles must be set back from the crossing, with perpendicular screening along the roadside; also, street tree plantings must be added on both sides of the road. Exh. DPS-DR-1 at 26; Raphael sur. pf. at 8.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Finding 283 to avoid an undue adverse aesthetic impact.

Ferry Road Crossing, Charlotte – Mile Marker 16.5 to 17.1

Findings

284. Ferry Road in Charlotte presents significant challenges in designing a crossing for the 115 kV line. Tr. 12/2/04 (Vol. II) at 16 (Dunn).

285. Ferry Road near the proposed crossing travels through an open landscape. Exh. DPS-DR-10 at 6.

286. One constraint in siting the 115 kV transmission line in the Ferry Road area is the location of the Waldorf School property, adjacent to the railroad tracks. The existing transmission corridor passes through the Waldorf School property. Exh. VELCO TD-5 at 8.

287. The Waldorf School is a high school with an enrollment of 100 students and support personnel of approximately 35 to 40 people. Emerson pf. at 3.

288. The landscape includes the Knowles Farm, which has been conserved to preserve "the scenic and aesthetic resources of a rural landscape" along Ferry Road. *See* Finding 501.

289. Ferry Road is traveled by many visitors to the state who use the ferry; it is also a gateway to the village. Exh. DPS-DR-10 at 6.

290. Three options for an overhead transmission line crossing Ferry Road have been presented in this docket. The first, in VELCO's original June 2003 filing, would have the

115 kV line cross Ferry Road to the west of the Waldorf School. The line would then run along Ferry Road to the existing substation. Exh. DPS-DR-1 at 102–103; exh. VELCO TD-5 at 8.

291. The second overhead option, presented in VELCO's Reroute filing in February 2004, relocated the line crossing to the west of the original route, and just to the east of the access drive for a small business park. (The February Reroute filing also proposed a new location for the Charlotte substation, as discussed below.) Boyle sup. pf. at 5–6.

292. The third overhead option, included in VELCO's Design Detail testimony in September 2004, proposed the line crossing Ferry Road between the Waldorf School and the railroad tracks. South of Ferry Road, the line would cross back and forth over the railroad tracks one time. Exhs. VELCO Dunn/Harr DD-10, DD-11.

293. VELCO presented two versions of the Design Detail option. In one version, the existing distribution line along Ferry Road would remain entirely overhead. In the other version, one span of the distribution line would be placed underground, where the 115 kV transmission line would cross Ferry Road. Dunn/Harr DD pf. at 6; exhs. VELCO Dunn/Harr DD-10, DD-11.

294. Several residences are located south of Ferry Road and east of the railroad tracks. Under VELCO's Design Detail proposal, the transmission lines would come as close as 60 feet to the residences (35 feet from an outside deck). The vegetative clearing for the line would result in the loss of brush and trees that provide against the winter winds. Durett pf. at 1; Poulin pf. at 1; Hughes pf. at 2.

295. Each of the three overhead options would have an adverse impact on aesthetics.

- The first would have significant adverse effects on views from several locations, including views from conserved lands.
- The Reroute option would place the line in an important open space area where it would be difficult to screen.
- The third Design Detail option would remove most of the substantial vegetative buffer between the residences and the line, which also buffers them from the railroad tracks and institutional land uses west of the tracks.

Exhs. DPS-DR-1 at 26; DPS-DR-10 at 6–7.

296. Other overhead alternatives for crossing Ferry Road were being considered by VELCO as of the December 2, 2004, hearings concerning Ferry Road. All of these alternatives would place the 115 kV line to the west of the railroad tracks. Tr. 12/2/04 (Vol. II) at 18, 22 (Dunn).

297. It is possible that another overhead design might be developed that would allow the line to be constructed in the Ferry Road area without undue adverse impacts on aesthetics. Failing this, it may be necessary to place the 115 kV line underground for a short distance in this location. Raphael DD pf. at 10; tr. 12/2/04 at 125 (Raphael).

298. There are no technical reasons why an underground 115 kV line could not be built across Ferry Road. An underground line in that location will most likely not have any undesirable "ripple effects" on other areas of the proposed Project. Tr. 12/2/04 at 20, 70 (Dunn).

299. The Charlotte Town Plan, adopted March 5, 2002, includes the following provision in Section 4.4.6 (Special Features):

> Ubiquitous overhead utility lines for power, telephone and cable television have the impact of diminishing the Town's scenic vistas, views and general landscape quality. These are important services, but the vision for an aesthetically beautiful Charlotte includes the replacement of overhead lines with underground lines and requires the installation of new lines underground.

Exh. DR-16.

300. Immediately before the quoted language, Section 4.4.6 of the Plan identifies specific important scenic views, vistas, and roads, including the views heading east on Ferry Road. Tr. 12/2/04 at 161–162 (Donovan).

301. Pursuant to Section 4.4.6 of the Town Plan, the Town conducted a survey to identify Charlotte's scenic roads and prepared a map of "Public Roads with High Scenic or Conservation Values." Ferry Road east of Lake Road is identified on that map. Exh. JD-3.

302. Section 5.8.12 (Utility Distribution Policies and Strategies) of the Charlotte Town Plan states the Town's "policies" include:

> 1. New or replacement electrical, telephone, cable and other utility lines, are encouraged to be located underground. In particular, the Town seeks to protect public roads with high scenic value by placing utility transmission lines underground. Placing transmission lines underground reduces their negative impacts to the landscape and potentially reduces long term maintenance costs.
>
> 2. The Town supports co-location of utility lines in existing rights of way in order to reduce impacts to scenery. New utility transmission line infrastructure should be located within existing rights of way unless the greater public good is better served by placing them elsewhere.

3. The Town will continue to require underground utility lines within subdivisions as a condition of approval.

Exh. DB-2 at 99.

303. The following text in that section of the Town Plan, called "strategies," states that: "The Town will explore ways to encourage underground placement of utility transmission lines, including, installation of empty conduit during road construction and re-construction projects." Exh. DB-2 at 99.

Discussion

We first address whether the Town of Charlotte has a clear, written community standard intended to preserve the aesthetics or scenic beauty of the Ferry Road area. Under Section 248(b)(5), we are to give "due consideration" to certain Act 250 criteria. As part of the Quechee test under Act 250's Criterion 8, the aesthetic impact of a proposed Project is reviewed for conformance with clear, written community standards such as might be contained in a town plan.

Based on the above findings, we conclude that the language in Section 4.4.6 of the Town Plan that identifies specific important scenic views and roads, including the views heading east on Ferry Road, and the Town's map of "Public Roads with High Scenic or Conservation Values" together demonstrate a clear, written community standard intended to preserve the aesthetics or scenic beauty of the Ferry Road area. This standard is, accordingly, entitled to due consideration in this docket.[139]

We also conclude that the Town Plan provisions regarding underground placement of new power lines do not present "a clear, written community standard" as that phrase has been interpreted under Quechee. These provisions in the Town Plan are not clear and consistent. While Section 4.4.6 of the Plan related to scenic views calls for new lines to be placed underground, Section 5.8.12 merely encourages underground placement.

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139. When there are such clear and specific town standards to protect scenic resources of special importance (rather than generalized language), we will consider them. *Halnon*, NM-25, Order of 3/15/01at 22, fn. 5.

The Board is not, however, required to find that a project complies with such standards or to condition approval of a project upon compliance with the standards. Under Act 250, a project must comply with a town plan under Criterion 10; Section 248 does not incorporate Act 250's Criterion 10. Compare 30 V.S.A. § 248(b)(5) with 10 V.S.A. § 6086(a)(10). Thus, while we will consider these town standards with high respect, the general good of the state must still be an ultimate criterion.

We now turn to the issue of whether VELCO's various overhead proposals for crossing Ferry Road would have undue adverse impacts on aesthetics, giving due consideration to the Town of Charlotte's written community standard and the other relevant factors. Based on the findings set forth above, we conclude that each of the overhead crossing alternatives presented to date present significant design challenges (including, for some alternatives, impacts on the Waldorf School) for which VELCO has not been able to provide acceptable solutions.[140]

There is credible evidence that a Ferry Road crossing can be designed that is not unduly adverse, either through an alternative overhead crossing *west* of railroad tracks or, perhaps, by an underground crossing.

As one condition of our overall approval of the proposed Project, the Petitioners must work with the parties and any additional affected landowners in a post-certification proceeding to determine if an acceptable overhead crossing of Ferry Road can be designed. The burden lies with VELCO to propose an overhead alternative that comports with the Section 248 requirements. As VELCO itself acknowledges in its brief, should it be unable to design an appropriate overhead alternative, it will need to place the 115 kV line underground in this area.[141]

Charlotte Substation – Mile Marker 16.9 to 17.0

Findings

304. The proposed Project includes a new Charlotte substation north of Ferry Road, near the railroad tracks and a commuter train station. After completion of the new substation, the existing GMP Charlotte substation directly adjacent to Ferry Road would be abandoned. Boers sup. pf. at 4.

305. The existing Charlotte substation is aesthetically intrusive to adjacent residences on Ferry Road. Exh. DPS-DR-10 at 6.

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140. A particularly serious design challenge is presented by the location of the Waldorf School relative to the railroad and existing transmission corridor.

141. VELCO Ferry Road Brief at 11.

306. The proposed substation would be about 1.7 acres, with a fenced area 175 feet by 95 feet. Access to the site would (presumably) be through the recently closed Vermont Railroad commuter station property. Boers sup. pf. at 5.

307. The new substation location would result in an adverse aesthetic impact. It would be visible to travelers heading east on Ferry Road. Donovan pf. (Charlotte) at 7.

308. To avoid an undue adverse aesthetic effect, significant additional suitable screening is needed to address the visibility of the new substation in this location. GMP should use a mix of species and some irregularity in plant placement as opposed to purely linear and single species planting plans. Exh. DPS-DR-1 at 26; Raphael DD pf. at 6.

309. The new substation would also present an aesthetic intrusion at the residences on Lynnrick Road. An undue adverse effect on these residences could be avoided through proper screening and appropriate measures to address any lighting impacts. Tr . 6/17/04 (Vol. I) at 82–83 (Raphael).

Discussion

The Town of Charlotte has proposed a different location for the new substation — south of Ferry Road in a presently wooded area owned by Greenwood America.[142] Although at New Haven we are requiring the Petitioners to consider thoroughly an alternative substation proposed by that town, we reach a different conclusion in Charlotte.

The circumstances relating to the Charlotte substation significantly differ from those presented by the New Haven substation. At New Haven, the proposed Project would result in multiple and cumulative impacts from the expanded substation, the numerous transmission lines including the more visually intrusive 345 kV line, and multiple viewpoints (Route 17 and Town Hill Road). The substantial weight of the evidence demonstrated that adequate mitigation of these impacts would require moving the substation, if feasible.

Circumstances are different with the new Charlotte substation. The aesthetic impacts, while adverse, are fewer and less severe. The substantial weight of the evidence demonstrates that if appropriate mitigation measures are implemented, the new Charlotte substation would not

142. Bloch sup. pf. at 5.

result in an undue adverse aesthetic impact. Thus, we do not find a need for the Petitioners to explore alternative locations for this substation, but the Petitioners must incorporate the mitigation measures described in Findings 308 and 309.

Vicinity of Greenbush Road, Charlotte – Mile Marker 18.0 to 19.6

Findings

310. The proposed 115 kV line runs along the vicinity of Greenbush Road, which is a sensitive area and a scenic route. Exh. DPS-DR-1 at 25.

311. Additional mitigation may be necessary, including setting the poles back from the railroad, lowering pole heights, and planting screenings. Exh. DPS-DR-1 at 26.

Discussion

For the reasons stated in the above findings, as part of the post-certification review , VELCO must carefully consider incorporating the mitigation measures described in Finding 311.

Our findings and discussion on the especially sensitive location along North Greenbush Road near the railroad bridge and underpass at Mile Marker 18.2 to 18.4 follow.

North Greenbush Road near the Bridge, Charlotte – Mile Marker 18.2 to 18.4

Findings

312. In the area of North Greenbush Road and the nearby conserved lands west of Route 7 (Charlotte Nature Park and Demeter Property and trails), the visual impact of the 115 kV line can be mitigated by setting the poles back from the crossing, planting screening at the crossing and along the road, and pole placement (and if necessary lowering pole heights) designed to reduce adverse aesthetic impacts from the Demeter Park. Exh. DPS-DR-1 at 26; Raphael sur. pf. at 8.

313. The poles must be located to minimize their visibility from the Charlotte Nature Park and from the Demeter Park, which is observed from the brow of the hill west of Route 7 toward the panorama of fields and the Adirondacks. This section of the 115 kV line should be planned on paper, and then confirmed in the field by a method of testing actual proposed pole locations to ensure that existing screening is used to the greatest effect possible. VELCO should include

the Town and affected landowners in this process. Raphael sur. pf. at 8–9; exh. DPS-DR-1 at 26.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Findings 312 and 313 to avoid an undue adverse aesthetic impact. The post-certification review process must include careful analysis of pole heights and placement in the area of Greenbush Road, including planning and field testing as described in the findings.

Bostwick Road Bridge and Meach Cove Trust Property, Shelburne, Mile Marker 20.3 to 20.8

Findings

314. VELCO's mitigation plan for this area includes a combination of placing distribution lines underground and street tree plantings. Exh. VELCO TJB DD-2 at Section 7.

315. Traveling northeast along Bostwick Road, there are lines of existing small trees which effectively mitigate the existing power line and will continue to do so if the proposed 115 kV line is constructed. Raphael sur. pf. at 9.

316. At the Bostwick Road bridge, the line affects the westward view of travelers, but not unduly so. Viewers do not experience broad, expansive views until they have cleared the bridge, because of orientation and vegetation on both sides. Raphael DD pf. at 11.

317. While the 115 kV line as proposed in the area of the Bostwick Road bridge crossing and the Meach Cove Trust property will result in an adverse aesthetic impact, the impact will not be undue if the following mitigation measures are taken: careful pole placement; lower pole heights; retention of as much vegetation at the edge of corridor as possible; and plantings. Raphael DD pf. at 12; exh. DPS-DR-1 at 26–27.

318. There are mature trees on Bostwick Farm Road, the entry onto the property from Bostwick Road, that would be removed under VELCO's proposal, resulting in adverse aesthetic impacts. Davis DD pf. at 2.

319. Tree retention should be maximized in this area, with exceptions made, if necessary, to standard practice for right-of-way clearing width and the removal of critical buffering trees. A

qualified arborist should assess the health of the trees. Tree removal should be limited to diseased or otherwise compromised trees. If necessary, critical screen trees should be cabled or guyed (rather than removed) to keep them from falling onto the conductors. VELCO also should assess the planting of a "vegetative plug" or screening at Meach Cove Road's east side at Bostwick Road. Raphael DD pf. at 11.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Findings 317 and 319 to avoid an undue adverse aesthetic impact.

VELCO should continue discussions with the Meach Cove Trust representatives regarding the appropriate clearing and mitigation in this sensitive location. Representatives from the Town of Shelburne should be included in the discussions.

Shelburne – Mile Marker 20.9 to 22.0

Findings

320. Lower pole heights for the 115 kV line in this area would reduce the visual impacts from Shelburne Museum and Shelburne Farms. Boyle reb. pf. at 17.

321. The 115 kV line as proposed would have no visual effect on any building or structure at Shelburne Farms. The view of the proposed 115 kV line will not be prominent from Shelburne Farms. Henry and Boyle reb. pf. at 3; tr. 10/20/04 at 38 (Pritchett).

322. There will be only a distant, limited view of the 115 kV line from the S.S. Ticonderoga at the Shelburne Museum. The adverse aesthetic effects from the proposed 115 kV poles and conductors as viewed from the top deck of the Ticonderoga at the Shelburne Museum would not be significantly greater than the effects from the existing poles and conductors. Exh. VELCO-Cross-Ehrlich 2 at 56.

Discussion

For the reasons stated in the above findings, the 115 kV line must incorporate the mitigation measures described in Finding ? to avoid an undue adverse aesthetic impact.

This section of the 115 kV line is sufficiently sensitive that it must be planned on paper at a design detail level, and then confirmed in the field by a method of testing actual proposed pole locations to ensure that existing screening is used to the greatest effect possible. Existing vegetative screening must remain to the fullest extent possible.

VELCO must include the Town and affected landowners in this process, including the Meach Cove Real Estate Trust.

GMP Shelburne Substation Upgrade at Harbor Road, Shelburne – Mile Marker 22.1

Findings

323. The existing GMP Shelburne substation is on Harbor Road, adjacent to a footpath called the Ticonderoga Haul (or "Ti-Haul") Road. It is visible to travelers on Harbor Road. Boyle pf. at 20–21; Henderson-King/Lalley pf. at 12.

324. The proposed upgrade would expand the substation to the north. The substation would increase in size to about 0.46 acres. Boers sup. pf. at 5–6.

325. The proposed substation upgrade avoids conflicts with the Ti-Haul path, adds screening of the substation from the Ti-Haul path to the west and from Harbor Road to the south, and minimizes pole height as the line leaves the substation heading north so as not to exceed the height of background vegetation. Boyle supp. pf. at 7; Boyle reb. pf. at 17–18.

Discussion

Based on the above findings, we conclude that the proposed upgrade of GMP's Shelburne substation will not have an undue adverse impact on aesthetics. In the post-certification review proceedings, the Petitioners must demonstrate that they have appropriately and effectively implemented the measures described in Finding 325.

Bay Road Area to Windmill Bay Road Crossing, Shelburne – Mile Marker 23.8 to 25.1

Findings – General

326. The Bay Road area is an aesthetically sensitive area. It is an especially challenging area in which to design an overhead transmission line because of limited screening opportunity, the number of people and amount of traffic passing through the area, residential views, the railroad, the shoreline itself, and Shelburne Bay views. Raphael tr. 11/9/04 at 97; Boyle pf. at 14; exh. VELCO TJB-4A, Photos 41 to 44.

327. Shelburne Bay and the LaPlatte River basin are visually sensitive due to their low elevations along the shoreline and their prominent locations in the landscape. Views from the Bay include large trees close to the shoreline. Henderson-King/Lalley pf. at 33; exh. GHK-5.

328. From Mile Marker 23.76 just south of Bay Road to the Shelburne-South Burlington border, there is limited area available for additional right-of-way. This is in part because of the residential development in that area. Boers pf. at 28.

329. For the proposed overhead 115 kV line, some selective clearing will be required in the Bay Road area from Mile Marker 23.76 heading north to the Shelburne-South Burlington town line. Boers pf. at 29.

330. Pole heights in this location are important, because even a few feet of height can make a substantial difference in the extent to which the structures would be visible from the Lake. Tr. 11/9/04 (Vol. I) at 75–76 (Raphael).

331. The proposed Project would be within the easterly views of people engaged in recreation activities on the Bay. The visibility would be even greater with significant right-of-way clearing. Henderson-King/Lalley pf. at 32; Henderson-King sup. pf. at 9.

Findings – The Bay Road Crossing, Pole Heights and Design, and Clearing

332. The proposed Bay Road crossing is just east and north of the railroad bridge and underpass between Mile Marker 23.8 and 23.9. Existing distribution and utility poles and lines come together at that point and are essentially on the shoulder of Bay Road. This is a very tight area that is visually cluttered. Henderson-King/Lalley pf. at 16; exh. VELCO TJB DD-2 at Sections 8-B, 8-C1, 8-D1; exh. VELCO TD-5 at 12.

333. VELCO proposed two mitigation options for the Bay Road crossing:

> The first option is to place 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.
>
> In the second 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.

Exh. VELCO TJB DD-2 at Section 8.

334. The average existing pole height in the area is 35.6 feet. Exh. VELCO DJB-Supp(1)-21; exh. DPS-DR-1 at 3.

335. Some of the proposed transmission poles would be nearly double the existing pole height in the area of the Bay Road crossing if the proposed underbuild option were accepted. Exhs. VELCO Dunn/Harr DD-14, DD-15.

336. In addition to taller pole heights, the design of the proposed transmission poles and conductors in the Bay Road area would differ from the existing transmission poles and conductors. Exh. VELCO TJB DD-2 at Sections 8-B6, 8-B7; exh. VELCO DJB-Supp(1)-21.

337. VELCO's proposed right-of-way clearing just below pole #35 would remove the existing treeline on the south side of Bay Road at this visually sensitive crossing just east of the railroad bridge. Travelers heading south on Bay Road will see this clearing and the proposed structures "head on." That clearing would result with poles that would be prominent and skylighted in the center in the cut. Exh. TJB DD-2 at Section 8; exh. DPS-DR-1 at 29; Tr. 11/9/04 (Vol. II) at 77 (Raphael).

338. VELCO's proposed plantings mitigation for higher poles and clearing in the Bay Road crossing are low hemlocks and crabapple trees. This proposed mitigation would be ineffective. Exh. VELCO TJB DD-2 at Section 8; Henderson-King DD pf. at 6–7.

Findings – The Residential Neighborhoods North of Bay Road

339. North of Bay Road to the east of Shelburne Bay is a densely settled residential area. The railroad tracks are in very close proximity to existing residences. Henderson-King/Lalley pf. at 16–17.

340. The existing 34.5 kV transmission line poles in the residential neighborhoods north of Bay Road are 35.6 feet tall. These pole heights are at or beneath existing treeline; the poles are

not visible from Lake Champlain. Exh. VELCO DJB-Supp(1)-21; exh. DPS-DR-1 at 3; exh. GHK-12.

341. Proposed pole heights in the residential neighborhoods north of Bay Road are as high as 70 feet tall. Many are 65.5 feet tall. Exhs. VELCO Dunn/Harr DD-14, DD-15.

342. There is no facility of comparable height or scale to the proposed poles in these neighborhoods. Henderson-King/Lalley pf. at 29.

343. In most areas of the dense residential neighborhoods north of Bay Road, there is existing vegetation (both evergreen and deciduous) that helps to screen the existing poles and lines. This screening protects both the views from the lakeshore and from the homes. Henderson-King/Lalley pf. at 17.

344. Mature stands of trees buffer the houses in this area near Lakeview Drive, Palmer Court, Wild Rose Circle, and Penny Lane. The trees provide screening both from the existing lines and from the railroad. Henderson-King/Lalley pf. at 18; exh. GHK-14.

345. These mature trees would be removed 50 feet on both sides of the poles to provide clearance for VELCO's proposed right-of-way. Henderson-King/Lalley pf. at 18.

346. Removal of the mature trees in the wooded railroad corridor north of Bay Road would increase the perceived scale and visibility of the proposed 115 kV line, compared to the existing conditions. Henderson-King/Lalley pf. at 31; exhs. GHK-12 and GHK-13.

347. From Mile Marker 24.2 to 25.4, the proposed 115 kV line would be located east of the railroad and pass within 50 feet of existing houses. The existing transmission line right-of-way in this area is less than 35 feet. Henderson-King/Lalley pf. at 17–18.

Findings – Community Standards

348. The Town of Shelburne has established clear, written community standards intended to preserve the aesthetics or scenic beauty of the Bay Road area. These standards are found in an "important views" study, in the Town Plan, and in the Zoning By-Laws. Henderson-King/Lalley pf. at 16, 34, 36–38.

349. The Town of Shelburne conducted an "Important Views Study" in 1990 that identified the most important viewsheds in the Town. These views include views north and east from the

state boat access at the southern end of Shelburne Bay, views east from the Shelburne Bay Park, and views southeast from Shelburne Bay. Henderson-King/Lalley pf. at 36–37; exh. GHK-7.

350. The Town of Shelburne Comprehensive Plan was adopted on April 13, 1999. In the section on natural and visual resources, at page 13, the Plan states:

> The quality of Lake Champlain as a water resource and natural area, place for recreation and as a scenic resource shall be protected; and
>
> There shall be no development that would cause alterations to the Town's open lands, shorelines, ridgelines, or roadside views in such a way that would intrude upon or diminish the scenic beauty of Shelburne.

Henderson-King/Lalley pf. at 38.

351. The Town Plan also provides at page 16 that "a vegetated buffer of at least 100 feet deep" shall be maintained along each side of the LaPlatte River and at the shoreline of Lake Champlain. Exh. VELCO RDBG-Reb-8.

352. The Town of Shelburne Zoning Bylaws establish a Lakeshore Overlay District to protect the Lake Champlain lakeshore from degradation. The District affects all lands with 500 feet of the high water elevation of the Lake. Henderson-King/Lalley pf. at 39.

353. The proposed Project north of Bay Road is in the Lakeshore District. Wild Rose Circle is located in the Lakeshore Zoning District. Henderson-King/Lalley pf. at 39; exh. GHK-12.

Discussion

Based on the findings above, we conclude that the proposed 115 kV line in the Bay Road area would create undue adverse impacts on aesthetics and the scenic beauty of this area. Most notably, the transmission line as proposed by VELCO would lie uncomfortably close to Lake Champlain, a quintessential Vermont resource. The line would clearly be out of character with its lakeshore and residential surroundings. Although the line would be located in an existing transmission corridor, the proposed new poles would be substantially taller than those presently in place. The new 115 kV poles would protrude above the tree line, unlike the existing poles. The new 115 kV line would result in the cutting of vegetation that provides essential screening for nearby residences and for views from the lake.

The specific identification of views north and east from the state boat access, views east from the Shelburne Bay Park, and views southeast from Shelburne Bay in the" Important Views

Study" constitute a clear, written community standard for purposes of the Quechee analysis. So do the Shelburne Town Plan's provision that Lake Champlain is a scenic resource to be protected, the Plan's provision for a 100-foot vegetated buffer zone along the LaPlatte River and the Lake Champlain shoreline, and the Lakeshore Overlay District.[143] These standards thus merit due consideration in determining whether the proposed Project would result in an undue adverse effect under Section 248(b)(5).

The proposed 115 kV line would violate these clear, written community standards. As explained in the findings, the transmission line would significantly detract from the identified views, and degrade the scenic resource and lakeshore of Lake Champlain.

Due to its scale and its lack of adequate screening, the proposed 115 kV transmission line would be shocking and offensive both to residents and to visitors. An overhead 115kV line and the related clearing would be offensive to drivers and passengers where the proposed Project crosses Bay Road.

The Petitioners have failed to take a generally available mitigating step that a reasonable person would take: placement of the 115 kV line underground. If we were to limit our review under Section 248(b)(5) only to aesthetic considerations, we would not be likely to conclude that underground placement would be required for this specific area. However, we have been specifically directed by the legislature to consider a number of factors. These factors converge in the Bay Road area to present challenges for siting an overhead 115 kV transmission line that cannot be overcome in a manner consistent with the requirements of Section 248(b)(5). Thus, our consideration of these factors leads us to conclude that placing the 115 kV line underground in this area, for approximately 1.3 miles, is not only reasonable but necessary.[144]

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143. The Plan's statement calling for "no development that would . . . diminish the scenic beauty of Shelburne" is not such a standard because it would prohibit development that caused merely adverse effects and because it is not sufficiently specific as to which scenic resources in Shelburne merit protection. *Halnon*, NM-25, Order of 3/15/01 at 22 fn. 5.

144. The conditions presented here — especially the close proximity of Lake Champlain — are not duplicated elsewhere in the proposed Project area. In fact, the only other bulk transmission line for which we have required underground placement was also located at Lake Champlain. *See In Re: VELCO PV20 Transmission Line*, Docket 5778, Order of 3/12/96 ("PV20 Order").

First, the area is located on the shoreline of Lake Champlain.[145] The Vermont legislature has directed us to give special attention to projects that are proposed for shoreline areas.[146] This added layer of protection for shorelines dictates that we not accept impacts that, but for the project's location on the shoreline, might not rise to an undue level. Of particular concern is the failure of the proposed 115 kV line to meet the screening requirements of the shoreline criterion.

Second, in the area of Bay Road and to the north the proposed Project enters a congested, built, increasingly urban environment, with a heavy concentration of housing. The proposed 115 kV line would be placed in close proximity to the residential areas. The residents would suffer the aesthetic consequences of substantially larger poles and of the wider clearing necessitated by the upgraded line.

Third, this is not only an area of high visual significance, but also one that has received significant public investment (due, no doubt, to its visual and natural qualities) and that the Town of Shelburne has sought to protect through specific, clear, written community standards. As we state in Section V.C, we are required to review the impact of the proposed Project on the public's use and enjoyment of public investments such as Shelburne Bay (criterion 9K of Act 250). This examination includes an analysis of the visual impacts of the proposed Project. In our analysis under this Act 250 criterion, we have determined that the proposed Project, as designed, will have a substantial adverse impact on the public's use and enjoyment of Shelburne Bay.

Fourth, there are essentially no available opportunities to reroute an overhead transmission line through the area, because of the unique set of constraints related to the dense residential neighborhoods and Shelburne Bay. The route cannot be moved to the west because of the Bay; it cannot be moved to the east because of the numerous homes and other residential structures (and, farther east, the widened Route 7).

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145. In relevant precedent, the Environmental Board consistently has defined "shorelines" as extending beyond the immediate water's edge. *See*, e.g., *Re: EPE Realty Corporation and Fergessen Management, Ltd., No. 3W0865-EB at 23 (Environmental Board, November 24, 2004).*

146. The majority of the Act 250 criteria, including 10 V.S.A. § 6086(a)(1)(F) (Shorelines), are incorporated into the Section 248 review through Section 248(b)(5).

These considerations, taken in combination, lead us to conclude that the only viable location for the 115 kV line in this area is underground.[147] The incremental cost of placing this 1.3-mile section of the line underground would be between approximately $2.5 million and $3.4 million.[148] We anticipate that these costs would be eligible for PTF treatment, because the use of underground cable in these circumstances appears to meet the criteria for PTF eligibility outlined by VELCO's witness, Mr. Wies.[149] However, even if the added costs were borne entirely by Vermont ratepayers, they would add only about two to three percent to the total cost of the proposed Project.[150]

For these reasons, we condition our approval of the proposed 115 kV transmission line on its placement underground for approximately 1.3 miles in the Bay Road area. The underground cable would run from about Mile Marker 23.8 just south of the railroad crossing at the Bay Road to about Mile Marker 25.1, north of Windmill Bay Road. The exact start and stop points for undergrounding would be determined in a post-certification proceeding based on appropriate engineering and aesthetic analysis involving affected residents and the Town. VELCO will also need to evaluate whether any archaeological or environmental issues might present significant problems for an underground design. If such problems are encountered, VELCO must bring them to our attention, along with all reasonable measures that it has identified to address the problems.

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147. The proposed 115 kV line would run close to residences in this densely settled area. Underground placement will reduce potential EMF levels near these residences, which is a positive, but not crucial, factor. While, for the reasons stated in Section IV, we do not find there to be sufficient basis to require underground placement due to EMF issues alone, in the Bay Road area the underground placement that is required for other reasons has the added benefit of furthering the policy of prudent avoidance of EMFs.

148. We recognize that an additional cost of between $2.5 million and $3.4 million is a significant cost, and that there may be as-yet unknown issues, such as archaeological resources, that would create some problems in placing the line underground in this area. This line is not scheduled to be constructed until Fall 2006. Technical Panel reb. pf. at 9. Thus, if VELCO can develop a significantly more creative alternative design for an overhead line than has been previously submitted that addresses our concerns, VELCO may request that we reconsider our decision to place this portion of the line underground.

149. Tr. 2/26/04 (Vol. II) at 85–100 (Wies).

150. While the incremental cost to the proposed Project of placing all of the proposed new transmission lines (both the proposed 35.5-mile 345 kV line and the proposed 27-mile 115 kV line) underground would be in the neighborhood of $250 million (see Findings 162, 166, and 226), the more limited incremental cost of approximately $3 million for the 1.3-mile segment in the Bay Road area is justified by the special circumstances presented in this location.

We do not require that the existing distribution and other utility lines in that area be placed underground. With the new transmission line placed underground, there would be no adverse aesthetic impacts that would justify requiring relocating the distribution, telephone and cable lines underground. In fact, because the underground cable will replace an existing overhead transmission line, the scenic qualities of the Bay Road area will be improved over existing conditions even without placing the remaining utility lines underground.[151]

VELCO Queen City Substation, South Burlington, Mile Marker 27.1

Findings

354. VELCO's existing Queen City substation is located at Queen City Park Road and Central Avenue in South Burlington. To the north is an industrial area. To the south are a stand of deciduous trees and a residential area. GMP's Queen City substation is to the east. A wooded area with foot trails is to the west. Boyle pf. at 21–23.

355. As part of the proposed Project, VELCO's Queen City substation would increase in size, from 0.8 acres to 1.5 acres, by expanding to the north, south, and east. Boyle pf. at 21–23; exh. DPS-DR-1 at 30.

356. The proposed Queen City substation upgrade would have an undue adverse aesthetic effect unless extensive screen plantings are creatively placed on at least three sides of the substation, in order to screen the substation from the traveled way. Exh. DPS-DR-1 at 30–31.

Discussion

For the reasons stated in the above findings, the upgrade of VELCO's Queen City substation must incorporate the mitigation measures described in Finding 356 to avoid an undue adverse aesthetic impact.

151. Given the improved aesthetics of the area with the transmission line being placed underground, the Town of Shelburne may wish to consider an effort to place the remaining, non-transmission lines underground along this stretch of Bay Road.

(4) Substations

Finding

357. The proposed Project includes the construction of two new substations and upgrades at ten existing substations. The two new proposed substations are GMP substations at Kayhart Crossing (in Vergennes) and in Charlotte. The existing substations for which upgrades are proposed are:

> VELCO's West Rutland, New Haven, Queen City/South Burlington, Williston, Essex, Hartford, Poultney/Blissville, and Granite/Williamstown Substations; and
>
> GMP's Ferrisburgh and Shelburne Substations.

Dunn pf. at 5; Boers pf. at 4.

Discussion

The aesthetic issues related to the West Rutland, New Haven, Vergennes, Ferrisburgh, Charlotte, Shelburne, and Queen City substations are discussed above in the section-by-section review of the proposed 345 kV and 115 kV transmission lines. Findings and conclusions for the remaining substations are set forth below.

Blissville Substation in Poultney

Finding

358. The existing Blissville substation in Poultney is 0.76 acres. The upgrade would expand the size to 0.93 acres and move the fence 65 feet to the west. It would also add equipment and increase the length of the existing control building. The site is remote with no nearby residences or roads. No screening is required for the upgrade. Boers pf. at 39–40; exh. VELCO TJB-5 at 4.

Discussion

The proposed Blissville substation upgrade would not have an undue adverse aesthetic effect.

Hartford Substation

Finding

359. The existing Hartford substation east of the intersection of Route 5 and Interstate 91 is 0.71 acres. The upgrade would expand the size by moving the fence by 35 feet to the east. The existing substation is not visible from nearby roads or residences. The proposed upgrades would not be visible. Boers pf. at 37–38; exh. VELCO TJB-5 at 3-4.

Discussion

The proposed Hartford substation upgrade would not have an undue adverse aesthetic effect.

Granite Substation in Williamstown

Findings

360. The Granite substation is located on 24.5 acres southwest of the intersection of Martin Road and Baptist Street in Williamstown. Boers pf. at 34.

361. VELCO proposes to upgrade the substation, which would result in expanding the site from 4.72 acres to 6.66 acres. The expansion would occur to the southwest, with the enclosure fence expanding by 188 feet. Boers pf. at 35–36.

362. There are two homes that would be affected by the proposed upgrade. The two residences closest to the Granite substation are the Gagnon residence to the southeast of the substation and the Dexter residence to the south. Exh. VELCO TJB DD-2 at Section 9.

363. The greatest visual impact would be to the Gagnon residence. The relocation of the 230 kV line would create a diagonal clearing at nearly right angles to the line of sight to the substation from the Gagnon's property. The existing clearing would be extended by nearly 200 feet to the south. Exh. VELCO TJB DD-2 at Section 9.

364. VELCO has developed mitigation plans in collaboration with the Gagnons and Dexters. The aesthetic impacts of the cleared 200-foot right-of-way for the 230 kV line would be mitigated by interplanting trees among the retained tree stems in the town road right-of-way. In the opening under the 115 kV Chelsea lines, VELCO would plant 12 spruce trees to screen views into the substation. Exh. VELCO TJB DD-2 at Section 9.

365. At the Dexter property, VELCO proposes to construct an 8-foot cedar stockade fence to block sight lines from the house to the substation. The fence would provide both visual and sound mitigation. VELCO would also construct a berm along the south side of the substation to reduce noise impacts and provide further visual screening. Exh. VELCO TJB DD-2 at Section 9; tr. 11/8/04 (Vol. I) at 26 (Dunn).

366. At the Gagnon property, VELCO would plant:

- a staggered row of Norway spruce at the north property line that would be 8 to 10 feet tall at planting;
- five river birch trees that would be 10 to 12 feet tall at planting; and
- at the adjoining property belonging to Mr. Gagnon's uncle, three pin oaks that would be 14 to 16 feet tall at planting.

Tr. 11/8/04 (Vol. II) at 43 (Boyle).

367. VELCO has agreed to plant additional trees or provide other mitigation options if the Gagnons or the Dexters have complaints following construction of the substation upgrade. Tr. 11/8/04 (Vol. I) at 34 (Dunn).

368. The proposed Granite substation upgrade provides sufficient mitigation for the potential visual effects of the upgrade. Raphael DD pf. at 13.

Discussion

Based on the above findings, we conclude that the proposed Granite substation upgrade would not have an undue adverse aesthetic effect. This conclusion expressly relies upon VELCO's representations that it will address any post-construction complaints by the Gagnons or the Dexters.

Williston Substation

Findings

369. The existing Williston substation is about 1,000 west of Route 2A. The proposed upgrade would expand the site from 0.52 acres to 1.06 acres. Boers pf. at 33.

370. VELCO acknowledges that vegetative screening does not always survive. Plantings in an evergreen screen at the Granite substation have died. Exh. VELCO TJB-5 at 2–3.

Discussion

The proposed Williston substation upgrade would not have an undue adverse aesthetic effect.

Essex Substation

Finding

371. The upgrade at the Essex substation east of Route 2A in Williston would occur inside the existing fence. The added equipment would not be visually significant. The area of the upgrade is substantially screened by pines. No aesthetic mitigation is needed. Boers pf. at 32; Boyle pf. at 23–24; exh. TJB-5 at 2.

Discussion

The proposed Essex substation upgrade would not have an undue adverse aesthetic effect.

(5) Substation Lighting

Findings

372. Under normal circumstances, only limited night-time lighting would be on at a VELCO substation. This lighting would be limited to only the front entrance to the substation and the entrance to the control building. If the control building is far from the entrance to the substation, VELCO would also install lights to illuminate the road from the substation entrance to the control building. The lights would be shielded and pointed downward, illuminating only the small area directly in front of the light. Dunn reb. pf. at 13.

373. If there is emergency work that needs to be done at night, VELCO would turn on the remaining on-site lighting. Dunn reb. pf. at 13.

374. For the proposed expansions of existing substations, the existing lighting would change only if, and where, the enclosure fences would be expanded. Boers pf. at 40–41.

375. The substation lights would be 70-watt high-pressure sodium floodlights or luminaries. The fence-mounted lights will be installed 9 feet high, just above barbed wire. The exterior

wall-mounted lights for the expanded control buildings will be near the doors. 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.

376. To minimize light trespass and night sky glow, VELCO should reduce lighting levels (i.e., wattage), use aggressive cutoff technology and light source shielding, install sufficient screening, and use non-reflective ground surface material. Raphael sup. pf. at 62.

377. VELCO did not provide a complete lighting plan for its proposed expanded Granite substation. VELCO did provide photometrics for a pole-mounted light and a building-mounted light, but has not shown what lighting effects would occur from the lights mounted on the fencing. This information is important when residences are close to the substation and the level of screening is not extensive, as is the case at the Granite substation. Raphael DD pf. at 13; tr. 11/9/04 (Vol. II) at 54–59.

Discussion

In the course of the post-certification review proceeding, VELCO must provide a sufficient amount of lighting information (in a fashion that can be readily understood) for those substation upgrades where residences are close to the substation or where the level of screening is not extensive. These would include the Charlotte, Ferrisburgh, South Burlington, Shelburne, New Haven, and Granite substations. VELCO must provide this information to affected towns and residents, to the Department, and to the Board.

(6) Reconductoring of Existing 115 kV line Barre to Williamstown

Findings

378. The proposed Project includes reconductoring 5.6 miles of existing 115 kV line from the Barre substation to the Granite substation in Williamstown. There would be no additional clearing. Boers pf. at 36; Dunn pf. at 9.

379. The reconductoring involves retrofitting the H-frame structures with cross-brace members. This would represent a relatively minor visual change to the existing transmission line. Boyle pf. at 24.

Discussion

The proposed reconductoring will not have an undue adverse aesthetic effect.

(7) Overhead Design Alternatives and Planting Issues Applicable Throughout the Proposed Project

Findings

380. For the 115 kV transmission line, there are design alternatives available in addition to the single pole design proposed by VELCO. These alternatives can be employed to reduce the aesthetic impacts of the 115 kV line where needed. Smith pf. at 23–24; Smith DD pf. at 4–5.

381. The first 115 kV design option reduces the span length. If one assumes that the 61-foot poles in VELCO's original proposal correspond to a span distance of 430 feet, reducing the span to 300 feet, with no other changes, can reduce the required pole height to 55 feet. Smith pf. at 23–24; Smith DD pf. pf. at 4–5.

382. The second 115 kV design option reduces the pole height above the topmost phase conductor attachment. In areas where spans are 300 feet or less, for both delta and vertical configurations, an additional 6 feet of pole could be eliminated above the brace attachment of the top insulator. Smith pf. at 23–24; Smith DD pf. at 4–5.

383. Reducing the height above the top attachment by 6 feet would change the lightning shield angle from approximately 30 degrees to approximately 45 degrees. While a 45 degree shield angle offers somewhat less lightning protection, 45 degrees is the level employed on the H-frame construction presently used on most of the VELCO system. Given that the VELCO system experiences lightning outages on the order of one per mile per 100 years, the increased shield angle, for a few spans in selected areas, should not have a significant adverse impact on reliability. Smith DD pf. at 4–5.

384. The third 115 kV design option reduces the vertical distance between the conductors on the same side of the pole for delta-configured structures. Where spans will be 300 feet or less, there is less concern with conductor motion due to wind-induced galloping and ice release. In these locations, for the proposed delta configurations the vertical distance between the

conductors on the same side of the pole can be reduced from 12 feet to 8 feet, thereby reducing the required pole height by 4 feet. Smith pf. at 23–24; Smith DD pf. at 4–5.

385. The three 115 kV design options can be combined on the same structures. Smith pf. at 23–24.

386. The fourth 115 kV design option increases the pole height, thereby increasing the height of conductors above the ground, if needed, to reduce the removal of trees needed for visual screening. Smith pf. at 23–24.

387. The fifth 115 kV design option is to use Corten steel in locations where pole color is important. The Corten poles provide long-term consistency of color where it is important that the poles blend with the surrounding view. Smith pf. at 23–24.

388. The second and third options for 115 kV structure design can be applied over short segments of the line. Before implementing the second and third options, VELCO should evaluate their impacts on ice unloading, wind galloping, and lightning protection. Smith pf. at 25; tr. 11/9/04 (Vol. II) at 14 (Smith).

389. For the 345 kV transmission line, in locations where reducing corridor width is necessary to address aesthetic impacts, several design alternatives are available. Smith pf. at 26–29; exh. DPS-GES-2(a) to 2(c).

390. The first 345 kV design option reduces the clearance between the new proposed 345 kV H-frame and the existing 115 kV circuit. By more closely spacing the circuits, the corridor width can be reduced by up to 25 feet while maintaining the low profile H frame design. Cost would not be affected. A possible disadvantage that merits further investigation is the impact on maintenance. Smith pf. at 26–27.

391. This first 345 kV option could be employed either in limited sections or in more extensive portions of the line, because there is no significant cost impact. Smith pf. at 26–29.

392. The second 345 kV design option uses a single pole delta configuration for the 345 kV circuit. Under this design option, the corridor width can be reduced by up to 60 feet, assuming a level terrain cross-section perpendicular to the line. Danger trees would require additional consideration. Smith pf. at 26–27.

393. Under the second 345 kV design option, poles would be significantly taller if spans are the same length as for H-frame construction. The added pole height could be reduced by shortening the spans. Smith pf. at 27.

394. The estimated cost for the second 345 kV option would be somewhat greater than for VELCO's proposed design. Smith pf. at 27.

395. The second 345 kV design option could be employed in specific locations where further corridor reduction is desired. Smith pf. at 28.

396. The third 345 kV design option uses a single-pole vertical configuration. Under this design option, the corridor width can be reduced by up to 90 feet, assuming a level terrain cross-section perpendicular to the line. Poles would be even taller than those in the second kV design option. Due to the added pole height, and cost, the third option should not be used except in locations where only a few structures are required. Smith pf. at 27–29.

397. The fourth 345 kV design option uses a single-pole delta configuration for the 345 kV circuit and rebuilds the 115 kV circuit to a single-pole delta configuration. This design potentially eliminates the need to widen the corridor, while providing the reduced pole height of the second 345 kV option. Smith pf. at 27–29.

398. The fourth 345 kV option would increase costs by approximately $250,000 per mile over the second and third options. In locations where substantial corridor reduction or aesthetic improvement is needed, the fourth option could be used, but only on a limited basis due to its substantial cost impact. Smith pf. at 28–29.

399. The four 345 kV design options could be applied to some portions of the circuit while retaining VELCO's proposed design for the other portions. Smith pf. at 28.

400. Where vegetative screening is to be employed, the Petitioners should consult the Plant Materials Guide presented by the Department's witness on aesthetics. The guide provides a wider range of options for effective landscaping. The plant materials listed in the guide will offer more diversity, and more options with regard to height and density for screening, buffering and habitat values, than those offered by VELCO's proposed screenings. Exh. DPS-DR-1 at 147.

401. VELCO must explore the use of cultivars of the listed species to provide options where screening is required but height is an issue. Exh. DPS-DR-1 at 147.

402. VELCO must employ the tallest shrubs possible where screening is proposed under lines. Exh. DPS-DR-1 at 147–49; Raphael sur. pf. at 10–11.

403. VELCO's proposal for a one-year guarantee of plantings is not sufficient. The plantings are essential elements of aesthetic mitigation, and accordingly, VELCO must ensure that they will be established satisfactorily and maintained over the lifetime of the proposed Project. Raphael sur. at 10; tr. 9/22/04 (Vol. I) at 36–40 (Raphael).

Discussion

In the development of its detailed plans for the post-certification review process, the Petitioners must carefully consider the design options and planting recommendations described in the above findings.

More generally, VELCO and GMP must work closely on developing design details and the final construction documents with the parties in the docket affected in those locations and with affected landowners, towns, and regional planning commissions that have not participated as parties in this proceeding. *This requirement applies to the entirety of the proposed Project, including those locations not specifically addressed in the Order.*[152]

We expect VELCO to pay particular attention to the scenic qualities and natural resources specific to each location along the proposed Project. This is the Vermont way, and the better that VELCO adheres to this ethic, the swifter the post-certification review process will be.

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152. For the areas not specifically addressed in today's Order, VELCO and GMP should fully consider the recommendations for aesthetic mitigation proposed by Department witness David Raphael. Based on our review of the record, we have found Mr. Raphael's analysis and recommendations to be thoughtful, comprehensive, and unbiased (even though we may not have adopted all of his recommendations at the locations that we have specifically addressed in this Order).

This general endorsement of Mr. Raphael's aesthetic recommendations is qualified as follows in the case of adding plantings such as trees, hedgerows, or vegetative plugs in (or adjacent to) active agricultural fields to mitigate the adverse effects of the proposed Project. Based on the conflicting testimony of the aesthetic experts in this docket and considering the wide variety of agricultural locations and views involved in this project, we conclude that the decision whether or not to include such plantings should be made on a case-by-case basis that includes timely consultation with the affected landowners and an appropriate level of aesthetic analysis given the sensitivity of a particular location. Any disputes among the parties regarding such plantings would be resolved in the post-certification proceedings discussed more fully in other parts of this Order.

(8) Conclusion

Criterion 8 of Act 250 does not guarantee that views of the landscape will not change.[153] It does, however, require that as development does occur, reasonable consideration will be given to the visual impacts on neighboring landowners, the local community, and on the specific scenic resources of Vermont.[154]

In today's Order, we do not deny the proposed Project in its entirety because of aesthetic impacts, but we do require modifications and mitigation in certain more sensitive locations. Without those modifications and mitigation measures, the adverse aesthetic impacts would be undue. In reaching this conclusion, we have given due consideration to whether the effects of the proposed Project in a location would be offensive, fail to apply reasonable mitigation measures, or violate a clear, written community standard intended to preserve scenic resources.[155] We conclude that VELCO has not proposed sufficient mitigation measures for some areas where the proposed project will have adverse aesthetic impacts. In addition, at least for some areas, VELCO has failed to demonstrate that mitigation proposed by other parties would be unreasonable.

With respect to the New Haven substation in particular, the Petitioners have failed to adequately consider an alternative location. We would not require an applicant to exhaustively explore every mere suggestion by a party of some alternative. But New Haven has urged VELCO to consider an alternative location for almost a year (since January of 2004); yet, by the close of evidence in December of 2004, VELCO had not provided evidence beyond a summary statement concerning extra costs and possible problems with the alternative location. Without a "more comprehensive assessment of a reasonable range of alternative sites" with "comparisons of problems and costs outlined for each," VELCO has failed to demonstrate that the real costs of moving the substation would significantly exceed the aesthetic benefits.[156]

At the Ferry Road crossing, VELCO has failed to date to provide a design that complies with the requirements of Section 248(b)(5). We will review the proposed crossing of Ferry Road

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153. Van Sicklin, at 36, *citing In Re: Okemo Mountain, Inc.* #2W5051-8-EB (Findings of Fact, Conclusions of Law and Order 12/18/86) at 9 ("Okemo Mountain").

154. Okemo Mountain at 9.

155. Halnon, NM-11, at 24–26.

156. Halnon, NM-11, at 25–26.

in a post-certification proceeding with due consideration of the Environmental Board's standard that it "cannot approve a project solely because it looks good by comparison to something worse. To do so would reduce the Board's role to one of finding the lowest common denominator and then deciding whether a project somehow rises above that level."[157]

In some locations, we are requiring additional screening. This is based on our conclusions that "installation of effective vegetative screening will be critical to the long-term mitigation of the adverse aesthetic effects" in more sensitive locations.[158]

In some locations, however, a portion of the project can be so greatly out of scale with its surroundings that no amount of screening can successfully mitigate its visual effects.[159] We conclude the existing location of the New Haven substation is such a location in terms of the proposed expansion, and therefore require its relocation if feasible. The proposed cumulative effects in Salisbury of the new 345 kV line and the existing 115 kV line are also so greatly out of scale that we order they both be moved to the west away from Route 7 travelers' views and closer to backgrounding vegetation; screening would not be effective, and would also interfere with enjoyment of the open agricultural and wetlands views.

In requiring the underground placement of the 115 kV line in the Bay Road area, we adhere to our precedent in approving an underground transmission line at another sensitive location on Lake Champlain.[160]

As previously noted, we have established a precedent that our assessment of whether a particular project will have an "undue" adverse effect on aesthetics and scenic or natural beauty will be "significantly informed by overall societal benefits of the project."[161] We build on that precedent in this case by our conclusion that our analysis of the relationship between undue adverse effects and societal benefits should be informed by the societal benefits of aesthetics and scenic or natural beauty as well as the other values protected under Section 248(b)(5). In clear statutory language the legislature has called for the Board to carefully consider and protect the

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157. Van Sicklin at 44.

158. Northern Loop at 28.

159. Town of Barre, #5W1167-EB (Findings of Fact, Conclusions of Law, and Order, 6/2/94) at 22.

160. PV20 Order at 19 (undergrounding the line will not have an undue adverse effect on aesthetics under Criterion 8).

161. Docket 6792, Order of 7/17/03 at 28.

valuable scenic resources of Vermont. Our conclusions in this regard do not depart from prior precedents established by the Environmental Board and this Board, but rather build on them. This is a "once in a generation" project. As such, it should follow precedent, but it may also set precedent within the applicable statutory provisions.

We conclude, after a careful review of the extensive evidence in this case and applicable law, that the modifications and mitigation required in this Order are necessary and appropriate to protect sensitive locations of noteworthy scenic or natural beauty, for current and future generations.

C. Other Act 250 and Environmental Criteria

404. The proposed Project will not have an undue adverse impact upon air and water purity, the natural environment and the public health and safety, with due consideration having been given to the Act 250 criteria discussed below. This finding is supported by Findings 405 through 504, below.

(1) Outstanding Resource Waters

405. The proposed Project will not affect any waters designated as "outstanding resource waters" by the Vermont Water Resources Board. Gilman/Briggs pf. at 4; Gilman/Briggs sup. pf. (5/20/04) at 4.

(2) Water and Air Pollution

406. The proposed Project will not result in undue air or water pollution. This finding is supported by Findings 407 through 463, below.

Water Pollution

407. The proposed Project will not result in undue water pollution. This finding is supported by Findings 418 through 463, below.

Air Pollution

408. The proposed Project will not result in undue air pollution. This finding is supported by Findings 409 through 417, below.

409. The proposed Project will produce limited air emissions. No brush will be burned during construction. Any brush that is cleared will be chipped and/or hauled away if necessary, and trees will be windrowed for the property owners' use or removal. Water and/or chloride will be applied during construction, as necessary, to control dust from vehicular traffic and construction activities. Johnson pf. at 2.

410. The proposed Project will involve the installation of new sulfur hexaflouride (SF6) "gas" breakers at several substations. The SF6 breakers allow for the reduction of mineral oil-filled substation equipment at the site. SF6 is a greenhouse gas, but it is not emitted into the air as part of the proper operation of the breakers. VELCO will monitor the circuit breakers for leakage prior to installation and during time of service. When maintenance is required on the SF6 breakers, the gas will be recycled with a gas cart to prevent emissions. Johnson pf. at 2–3.

Noise

411. The proposed Project will not produce undue noise levels. This finding is supported by Findings 412 through 417, below.

412. The U.S. Environmental Protection Agency ("EPA") has established Protective Noise Level Guidelines to protect the public health and welfare. These guidelines are not meant to be applied as standards. For most residential areas, the Protective Level is 55 dBA Ldn.[162] Kaliski DD pf. at 3–4; exh. KK-DD-2.

413. The World Health Organization "Guidelines for Community Noise" 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.

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162. The acronym dBA refers to decibels weighted accorded to the so-called "A" scale to account for human perceptions of noise frequencies. The acronym Ldn refers to a day-night sound level where nighttime sounds are weighted by + 10 decibels.

414. The Environmental Board has set standards, based on instantaneous maximum noise levels, of 55 dBA (daytime) and 45 dBA (nighttime) for residential areas behind a grocery store. Kaliski DD pf. at 4.

415. A reasonable mitigation measure at the Granite substation is to use transformers that have guaranteed noise emission levels more than 10 dBA lower than the National Electrical Manufacturers Association standard for noise. Kaliski DD pf. at 5.

416. VELCO has performed analyses at the Granite substation, which, assuming the use of low-decibel equipment and specific mitigation measures, are below the standards described in the findings above. Kaliski DD at 6–7.

417. Residents near the proposed Project will be subject to some noise impacts during the construction of the project. In addition, residents near the Project's right-of-way will experience noise impacts during right-of-way maintenance activity. Tr. 3/1/04 (Vol. II) at 71, 78–79, 100–103 (Johnson).

Discussion

We have some concern as to the appropriate noise standards to apply. VELCO has provided evidence on noise guidelines promulgated by the EPA, the World Health Organization, and the Environmental Board; however, as a landowner adjacent to the Granite substation stated: "Although the predicted noise levels are below WHO guidelines, this station is located in rural Vermont, not in downtown New York City."[163] In addition to the three standards developed above, the Board has established a noise standard for net-metered wind turbines of 50 dB at a 300-foot radius from the base of the tower.[164]

The models prepared by VELCO indicate that the noise levels at the substations studied will not exceed any of the guidelines discussed above. Based upon this evidence we can find that the noise levels from the proposed substation upgrades will not be unduly adverse. However, we agree with Mr. Dexter's comment regarding the appropriateness of such standards for rural Vermont. For this reason, we will require VELCO to perform post-construction noise measurements at the substations and provide nearby landowners with the resulting

163. Dexter sur. pf. at 1.
164. CPG NM-11, Order of 5/26/00 at 22.

measurements. Landowners will then have 21 days to respond to the post-construction noise measurements, as outlined in Section XII. If appropriate, we will require VELCO to provide further noise mitigation.

VELCO has performed noise analysis for the New Haven substation as well as the Granite substation. In this Order, we are requiring VELCO to move the New Haven substation (unless VELCO demonstrates that moving it is infeasible) and will address the impacts of the new substation on landowners in post-certification proceedings. As part of this analysis, we will require VELCO to analyze the noise levels at the new substation.

(3) Headwaters

418. The proposed 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 419 through 422, below.

419. No project facilities will be located above 1,500 feet. Gilman/Briggs pf. at 5.

420. The primary areas of steep slopes and shallow soils are between West Rutland and Leicester. This portion of the corridor is well vegetated and contains no major areas of erosion. The Granite to Barre corridor is generally characterized by steep slopes; however, the construction in this corridor is limited to reconductoring and will not adversely impact soils. Gilman/Briggs sup. pf. at 4.

421. The areas of concern will be adequately protected during construction and maintenance by the erosion control techniques. Findings 467 and 468, below.

422. Right-of-way clearing will have a minimal effect on water quality due to rapid revegetation, except for minor areas such as ledge exposures. This rapid revegetation will ensure that the land's capacity to hold water will not be significantly diminished. 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 between poles and the small footprints of the poles themselves. Gilman/Briggs pf. at 5–6; Gilman/Briggs sup. pf. at 4–5.

(4) Waste Disposal

423. The proposed Project will meet all applicable health and environmental regulations for waste disposal. This finding is supported by Findings 424 through 427, below.

424. The Queen City and Granite substations will house sink and toilet facilities connected to approved on-site septic systems.[165] VELCO will obtain Water Supply/Wastewater Disposal Permits from the Vermont Department of Environmental Conservation. Johnson pf. at 3.

425. All new transformer installations will include an oil containment system designed in accordance with ANSI/IEEE Standard 980, "IEEE Guide for Containment and Control of Oil Spills in Substations." Johnson pf. at 4.

426. The proposed Project will have little impact on stormwater discharges as the increase in impervious surface will be minimal. No paving is proposed for the Project and substation surfaces will be filled primarily with loose crushed stone. Gilman/Briggs pf. at 7.

427. VELCO will require a stormwater discharge permit for its Granite substation, which will have a newly designed stormwater collection and discharge system. Rowe/Disorda/Gilman/Briggs reb. pf. at 15.

(5) Water Conservation

428. All plumbing fixtures installed at the substation control buildings will employ low-flow water conserving devices. Water usage will be minimal, as none of the substations will be manned. Johnson pf. at 4.

(6) Floodways

429. The proposed Project will not restrict or divert the flow of headwaters, increase the peak discharge of the streams, or endanger the health, safety, and welfare of the public or of riparian owners during flooding. This finding is supported by Findings 430 through 431, below.

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165. VELCO had indicated that the New Haven substation expansion, as proposed, would include sink and toilet facilities connected to on-site septic systems. We are not approving the proposed upgrade for the New Haven substation and are instead requiring VELCO to investigate moving the New Haven substation. It is unclear whether VELCO would design a new substation with the same facilities.

430. No poles for the proposed Project will be located within the 100-year floodway boundary. However, there are several locations along the proposed Project route where the proposed pole structures will be located inside the 500-year floodway boundary. Gilman/Briggs pf. at 7–8.

431. The pole structures proposed by VELCO will have a small footprint and 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 will not noticeably restrict or divert flood flow patterns. Gilman/Briggs pf. at 8.

(7) Streams

432. The proposed Project will maintain the natural condition of affected streams and will not endanger the health, safety, or welfare of the public or adjoining owners. This finding is supported by Findings 433 through 439, below.

433. VELCO has identified 56 streams and rivers along the West Rutland to New Haven corridor and 48 along the New Haven to Queen City corridor. Sixteen streams or watercourses have been identified along the Barre to Granite line. Several streams or watercourses have been identified within 100 feet of the New Haven, Vergennes, Charlotte, Shelburne, and Williston substations. Gilman/Briggs pf. at 9; Gilman/Briggs sup. pf. at 6; exh. VELCO G&B-Supp(2)-3.

434. The majority of streams and their buffer zones will be spanned by the conductors, leaving stream morphology, bottom, banks, fish habitat, and other characteristics intact. Johnson pf. at 8; Gilman/Briggs pf. at 11.

435. There are some locations along the transmission corridors where existing pole structures are located within 50 to 100 feet of the water. 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 due to equipment during construction, and therefore temporary. Construction will be in accordance with ANR's erosion control requirements, as discussed in Findings 467 and 468. Rowe/Disorda/Gilman/Briggs reb. pf. at 13–14; Johnson pf. at 7–8; Gilman/Briggs pf. at 11; Gilman/Briggs sup. pf. at 6–7; exhs. VELCO RJ-4 and RJ-5.

436. VELCO will avoid stream crossings where possible during construction. Where crossings are necessary, VELCO will utilize temporary bridges during construction. Johnson pf. at 8; Rowe/Disorda/Gilman/Briggs reb. pf. at 14–16.

437. 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; exh. VELCO RJ-6.

438. Where trees are removed for stream crossings, revegetation should occur within two to three years for moderate or low gradient streambanks or shorelines. Most smaller streams and rivers will not experience undue warming as a result of tree removal, due to the rapid growth of vegetation in the area. VELCO will retain as much cover over the streams as possible; vegetation that is 12 feet or shorter in close proximity to the streams will be kept to preserve shade. Gilman/Briggs pf. at 12; Gilman/Briggs sup. pf. at 6–7.

439. There will be some loss of shade cover and consequent thermal impacts along some of the larger streams. These impacts will be minor and not unduly adverse. Many of the crossings are perpendicular to the waterway, limiting reduction in shade vegetation. Those crossings that are not perpendicular follow the existing transmission corridor. Gilman/Briggs pf. at 12–13.

Discussion

As specified in Findings 467 and 468, VELCO will develop erosion control plans for the proposed Project, for approval by ANR and the Board. The Board will require, in the post-certification proceedings, that VELCO develop erosion control plans specific to affected watercourses and revegetation plans to ensure that the banks of any watercourses return to a condition as close to their natural condition as possible.

(8) Shorelines

440. The proposed Project will not have an undue adverse impact on shorelines with the conditions placed upon the proposed Project described below. This finding is supported by Findings 441 through 449, below.

441. The proposed Project will impact shorelines of several water bodies, including Shelburne Bay, the LaPlatte River, the Slang, the Leicester River, the Middlebury River, the New Haven River, and Otter Creek. Exh. VELCO G&B Supp(2)-5.

442. The transmission corridor follows an existing corridor for the majority of its length. Exh. VELCO G&B Supp(2)-5; exh. VELCO TD-4.

443. There will be some loss of shade cover and consequent thermal impacts along the rivers. These impacts will be minor and not unduly adverse. The crossings over the rivers and the Slang are perpendicular to the waterway, limiting reduction in shade vegetation. Gilman/Briggs pf. at 12–13.

444. The proposed Project will, insofar as possible and reasonable, retain the shoreline and the waters in their natural condition. Johnson pf. at 7–8.

445. Adequate erosion control measures will be employed to ensure sufficient vegetative cover. Johnson pf. at 7–8; Gilman/Briggs pf. at 11.

446. The existing transmission poles along Bay Road average 35.6 feet in height. Exh. VELCO DJB-Supp(1)-21; Raphael pf. at 3.

447. VELCO's proposed above-ground route along Bay Road, with distribution lines buried, would utilize poles ranging in height from 56.5 to 70 feet in height. Exh. VELCO Dunn/Harr DD-15.

448. VELCO's proposed above-ground route in the Bay Road area would not require clearing on the western side of the proposed 115 kV line but would require clearing on the eastern side of the proposed line. Exh. VELCO TJB-DD-2 at 8-B1–8-B4.

449. The proposed 115 kV line will be located along the eastern side of the railroad tracks along Bay Road in Shelburne. Exh. VELCO TJB DD-2 at Section 8-B.

Discussion

Subsection 6086(a)(1)(F) provides:

> A permit will be granted whenever it is demonstrated by the applicant that, in addition to all other criteria, the development or subdivision of shorelines must of necessity be located on a shoreline in order to fulfill the purpose of the development or subdivision, and the development or subdivision will, insofar as possible and reasonable in light of its purpose:

> (I) retain the shoreline and the waters in their natural condition,
>
> (ii) allow continued access to the waters and the recreational opportunities provided by the waters,
>
> (iii) retain or provide vegetation which will screen the development or subdivision from the waters, and
>
> (iv) stabilize the bank from erosion, as necessary, with vegetation cover.

This subsection makes clear that the intent of the Vermont General Assembly in passing this statute was to provide substantial protection for the environmental, scenic, and recreational characteristics of the State's shorelines.

Shoreline has been defined by statute as "[t]he land adjacent to the waters of lakes, ponds, reservoirs, and rivers."[166] The Environmental Board has interpreted this geographic limitation broadly. In a recent decision, the Environmental Board developed a two part test for determining if a project must be reviewed under criterion 1(F). The first part examines whether a proposed project is located within a shoreline as defined by statute. The second part of the test examines the impact of the proposed Project:

> Does the project, or an element of it, have the potential to adversely affect the values which Criterion 1(F) seeks to protect? Projects on lands adjacent to the water's edge — even those which do not involve the physical development of the line between earth and water — may also trigger review under Criterion 1(F) if they may have adverse impacts on the criterion's four subcriteria: maintenance of the shoreline and the water in their natural condition, continuing access to the waters and their recreational opportunities; the retention of vegetation for aesthetic purposes, and bank stabilization to prevent erosion. Shorelines, and the extent to which they encompass lands at some distance from the water's edge may vary, but the key qualities to be protected do not.[167]

The proposed Project crosses and therefore directly impacts the shorelines of several water bodies. The shoreline of Shelburne Bay is not physically impacted by the proposed Project, but, under the Environmental Board's precedent on this issue, the proposed Project does impact the scenic component of this subsection.

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166. 10 V.S.A. § 6001(17).

167. *Re: EPE Realty Corporation and Fergessen Management, Ltd.*, No. 3W0865-EB at 23 (Environmental Board, November 24, 2004). *See also*, Brooks R., Toward Community Sustainability: Vermont's Act 250 (Vol. I) at § B.03[i](ii)(A).

No party has raised the issue of whether the proposed Project "must of necessity be located on a shoreline in order to fulfill the purpose" of the project. However, we determine that this standard has been met in this case. The transmission lines will follow an existing transmission corridor for the majority of its length. This route is therefore the most economic and environmentally feasible route. In addition, it would be impossible to construct a transmission system without crossing shoreline of any rivers in Vermont. We therefore conclude that the proposed Project meets the necessity portion of this subsection.

We now turn to the environmental portion of this subsection. The evidence indicates that the proposed Project can be constructed to ensure that it will not have an adverse environmental impact on shorelines. As specified in Findings 467 and 468, VELCO will develop erosion control plans for the proposed Project, for approval by ANR and the Board. In the post-certification proceedings, the Board will require erosion control plans specific to each affected shoreline, in addition to revegetation plans.

A second component of this subsection is the requirement that a project not unreasonably interfere with access to the recreational opportunities on the shorelines. There is no indication that access to any waters will be impaired by the proposed Project.

The final component of this subsection, addressing vegetative screening, presents the most difficulties for the proposed Project. The proposed Project crosses several water bodies. These crossings are within an existing transmission corridor, but the right-of-way for all of the crossings must be expanded to accommodate the larger lines. VELCO has indicated that it will minimize clearing in these areas and attempt to retain as much existing vegetation along the shoreline as possible. However, the proposed Project will still result in decreased vegetation along the shorelines. The statute does not prohibit such clearing, but requires the developer to, "insofar as possible and reasonable in light of its purpose . . . retain or provide vegetation which will screen the development or subdivision from the waters." The water bodies crossed by the proposed Project will be impacted by the presence of lines spanning the water, and it is not possible to screen this impact. VELCO has committed to placing transmission structures as far from the shoreline as possible at these crossings, and retain as much existing vegetation as possible. Based upon these factors, we conclude that the vegetative component of this subsection is satisfied for those areas where the proposed Project crosses water bodies.

The same cannot be said for the Bay Road area in Shelburne. The vegetation between the proposed Project and the shoreline will be retained. However, this vegetation is insufficient to screen the increased pole heights that would result from an overhead line in this area. The existing vegetation to the east of the proposed line would be cleared, amplifying the aesthetic impact of the proposed Project in this area. There have been no proposals to increase vegetative screening along this portion of the transmission line. These factors lead us to conclude that there is no proposal for an aboveground transmission line that reasonably retains or provides vegetation which will screen the development or subdivision from the waters.

The proposed Project will have an undue adverse impact on the Shelburne Bay shoreline as proposed by VELCO. For this reason, in conjunction with other considerations that we address in Section V.B, the appropriate mitigation is to place the 115 kV line underground in the vicinity of Bay Road in Shelburne.

(9) Wetlands

450. The proposed Project will not violate the rules of the Water Resources Board relating to significant wetlands. This finding is supported by Findings 451 through 463, below.

451. There are no Class One wetlands located in the area of the proposed Project. Rowe/Disorda/Gilman/Briggs reb. pf. at 4; Gilmans/Briggs pf. at 16.

452. There are approximately 137 Class Two and Three wetlands in the West Rutland to New Haven corridor, and approximately 168 Class Two and Class Three wetlands 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; exh. VELCO G&B Supp(2)-2.

453. Conditional Use Determinations ("CUD"s) from ANR will be required for any impacts to Class Two wetlands and their 50-foot buffer zones. Construction of new poles is considered a conditional use. The CUDs will likely contain conditions designed to protect wetlands from undue adverse impacts. Gilman/Briggs pf. at 20–21; Rowe/Disorda/Gilman/Briggs reb. pf. at 5.

454. The Vermont Wetlands Rules list, as an allowed use, "routine repair and maintenance of utility poles and lines in a manner which minimizes adverse impacts and is accordance with a plan approved by the Secretary [of ANR]" and "the emergency repair of utility poles and lines or the maintenance, reconstruction or routine repair of structures and facilities . . . in existence as of February 23, 1990 or additions to such structures or facilities which does not involved substantial expansion or modification." Vermont Wetland Rules, as adopted December 10, 2001, Section 6.2; Rowe/Disorda/Gilman/Briggs pf. at 5.

455. A U.S. Army Corps of Engineers permit (commonly known as a "404 permit") will be required for the discharge of dredged or fill materials into waters of the Unites States, including wetlands. The U.S. EPA and the U.S. Fish and Wildlife Service will have the opportunity to review wetland impacts during the Army Corps of Engineers review. The 404 permit will likely contain conditions designed to protect wetlands from undue adverse impacts. Gilman/Briggs pf. at 20–21.

456. Construction will be avoided in most wetlands by spanning the wetland. Johnson pf. at 9; Gilman/Briggs pf. at 18–19.

457. In some circumstances, there will be impacts from construction, primarily from creation of access roads, structures that must by necessity be located in wetlands or buffer zones, and filling of wetlands at substation sites. The footprint of each pole structure is small and will have relatively little impact on individual wetlands. Gilman/Briggs pf. at 18.

458. Construction of the proposed Project in wetland areas will occur during winter months or dry summer months, to reduce disturbance to wetlands. VELCO will use construction mats, if necessary. Johnson pf. at 9.

459. The proposed Project will affect four wetlands of particular sensitivity, described in detail below:

- Floodplain forests located at the crossings of Otter Creek, Leicester River, New Haven River, and LaPlatte River, located on the West Rutland to New Haven corridor. VELCO will span as much of these wetlands as possible to minimize impacts from construction and pole placement. Gilman/Briggs pf. at 19-20;
- A wetland in the vicinity of milepost 33.5 – 34.2 within the West Rutland to New Haven corridor, and within the New Haven to Queen City corridor at milepost 1.1.

- South Slang in North Ferrisburgh. The line will follow an existing corridor and will not require significant widening. The line will span the Slang, and VELCO will remove the existing poles and locate the new poles further back from the shoreline to reduce any potential impact. Conditions post-construction should not be significantly different from the existing conditions at this site.
- The LaPlatte River in Shelburne. The proposed line crossing will require placement of at least one pole in the wetlands on the south side of the LaPlatte River, and the corridor will not to be cleared. The proposed corridor is adjacent to an existing railroad corridor and a municipal sewer line corridor. Considering the line's placement alongside these existing corridors, and the large extent of the forested wetlands, the impacts upon the LaPlatte River wetlands will not be unduly adverse.

Gilman/Briggs sup. pf. (5/20/04) at 9; tr. 11/8/04 (Vol. II) at 88–89 (Harr).

460. Hand clearing of vegetation, rather than pesticide use, is appropriate in the following wetlands: the Slang, LaPlatte River complex, McCabe Brook, and the Short Brook wetland. Tr. 8/6/04 (Vol. I) at 92–93 (Gilman & Briggs).

461. Compensation may be required if there is a net undue adverse effect on any protected function of a wetland. Vermont Wetland Rules, as adopted December 10, 2001, Section 8.5(c); Rowe/Disorda/Gilman/Briggs pf. at 11.

462. Vermont's Pesticide Advisory Council does not allow VELCO to apply herbicides within 30 feet of surface waters, but VELCO is allowed to apply herbicides within wetlands without surface water. Rowe/Disorda/Gilamn/Briggs reb. pf. at 6–7.

463. Herbicides should not be applied within the buffer of any wetland that contains standing water. Tr. 6/16/04 (Vol. I) at 22 (Quackenbush); exh. Towns Cross 270.

464. The Vermont Wetlands Rules establish buffer zones around Class I and Class II wetlands. The purpose of the buffer zones is "to protect those function that make a wetland significant." For a Class II wetland, a fifty foot buffer zone is established contiguous to the boundaries of the wetland, unless a buffer zone specific to a particular wetland is established by the Water Resources Board. Vermont Wetlands Rule, as adopted December 10, 2001, Section 4.3.

Discussion

Shelburne and Charlotte argue in their briefs that VELCO should be prohibited from applying herbicides within the buffer zones of any wetlands that contain standing water. VELCO objects to this proposed requirement, relying on the Pesticide Advisory Council's determination that VELCO may apply herbicides within the buffer zones of such wetlands.

We conclude that prohibiting use of herbicides within the buffer zone of wetlands with surface water is justified. The proposed Project will impact hundreds of wetlands and the additional protection that will be afforded to a portion of these wetlands (those with standing water), will help in balancing the cumulative impact of the proposed Project. Requiring more stringent standards that the Pesticide Advisory Council will provide an environmental benefit without causing any meaningful (or perhaps even measurable) economic impact.

(10) Sufficiency of Water and Burden on Existing Water Supply

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

(11) Soil Erosion

466. The proposed Project will not cause unreasonable soil erosion or reduction of the land to hold water so that a dangerous condition may result. This finding is supported by Findings 467 through 468, below.

467. During construction of the proposed Project VELCO will 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 Erosion Prevention and Sediment Control Plans submitted to and approved by ANR for the proposed Project. Johnson pf. at 5–6.

468. VELCO must obtain a General Permit for Stormwater Runoff from Construction Sites from ANR prior to construction. This permit is required for discharge of stormwater runoff from qualifying construction sites in Vermont where the activities result in the disturbance of five or more acres of land. ANR has testified that VELCO should not have difficulty obtaining this permit. Rowe/Disorda/Gilman/Briggs reb. pf. at 13–14; tr. 6/11/04 (Vol. II) at 84 (Greenwood).

(12) Transportation Systems

469. The proposed Project will not cause unreasonable congestion or unsafe conditions with respect to transportation systems. This finding is supported by Findings 470 through 475, below.

470. Construction vehicles should be able to park at existing or newly created parking areas adjacent to the substation sites and in the construction areas. Once construction is completed, there will only be minimal traffic to the substations for maintenance. Johnson pf. at 14.

471. During line construction, traffic may need to be stopped for short periods of time to allow pulling of ropes, wires, or conductors. All required local and state road crossings and construction permits will be obtained. Johnson pf. at 14.

472. The majority of the proposed 115 kV line will run along an existing railroad corridor. Exh. VELCO G&B supp(2)-5.

473. Transmission structures will be located at a minimum of 25-feet from the edge of the outer rail. Tr. 11/8/04 (Vol. II) at 18–19 (Dunn).

474. There has been no indication that the proposed 115 kV transmission line will interfere with the operation of the railroad. Tr. 7/30/04 (Vol. I) at 64 (Dunn).

475. The Meach Cove property has an airstrip licensed by the Federal Aviation Authority. Tr. 11/9/04 at 34 (Davis).

Discussion

No party has contended that it would create unsafe conditions if the proposed 115 kV line were constructed alongside, and in some areas within, the right-of-way of the existing railroad corridor. VELCO has indicated that it has had discussions with the owner of the railroad, and VELCO currently believes that the proposed transmission structures will not interfere with the operation of the railroad. However, this Board has not seen an agreement with the railroad. VELCO must file such an agreement with the Board prior to the commencement of construction of the 115 kV line.

The Federal Aviation Authority regulates potential aviation hazards, including transmission structures.[168] It is possible that the Federal Aviation Authority will require VELCO to mitigate the impact of the transmission structures near the Meach Cove airstrip. VELCO will, of course, need to comply with all applicable federal regulations. If the Federal Aviation Authority requirements result in alterations to the transmission structures near the Meach Cove airstrip, VELCO must submit the revised plans to the Board for our approval.

(13) Educational and Municipal Services

476. The proposed Project will not place an unreasonable burden on the ability of municipalities to provide educational or municipal services. This finding is supported by Findings 479 through 481, below.

477. Construction of a new transmission line generally has a negative effect on property values. Wilson pf. at 9–13; tr. 2/26/04 (Vol. I) at 62 (Wilson); exhs. VELCO Cross Wilson 1, VELCO Cross Wilson 2.

478. Aesthetic mitigation, such as screening, can affect the impact of a transmission project on property values. Tr. 2/26/04 (Vol. I) at 62 (Wilson).

479. The proposed Project will not bring additional students into the area. Johnson pf. at 14.

480. The proposed Project will not create an additional burden on local fire departments or local law enforcement officers, nor will it generate significant solid waste. Johnson pf. at 14–15.

481. The proposed Project will result in increased taxable property in the affected municipalities. Johnson pf. at 14.

Discussion

The Towns argue that "VELCO has not made any showing that the development of the [proposed Project] will not, on a net basis, negatively impact the property values and tax revenues . . . and thereby affect the ability of the Town to provide municipal services."[169] We have heard testimony that *new* transmission lines can have a negative impact on property values. The studies that have reached this conclusion discuss the implications of a new transmission

168. 14 CFR Part 77.

169. Charlotte Brief at 38.

corridor and do not address the situation here — the upgrade of an existing transmission line. In addition, such studies do not account for the aesthetic mitigation that we are requiring VELCO to undertake. Thus, the studies have limited relevance.

It is important to note that the analysis pursuant to these sections are not limited to the economic impact on the municipalities in which the proposed project is located. Environmental Board precedent makes clear that the analyses under these criteria must examine the impacts of the proposed project on all governments affected, not only the town in which the proposed Project is located.[170] The proposed Project, by promoting reliability in the State, will enhance the economic environment within Vermont generally (see Section VII).

Even if we did find that the proposed Project would have a negative impact on property values and tax revenues, this would not prohibit the Board from making a positive finding under these criteria. The relevant section of Act 250 does not prohibit a project from having a negative impact on property values and tax revenues. Rather, we must find that the proposed Project does not place an unreasonable burden on local governments. Hosting an upgraded transmission line, in an existing corridor, built to ensure the reliability of the region's electrical infrastructure upon which businesses, residents, and schools rely (see Section VII), does not present an unreasonable burden.

(14) Rare and Irreplaceable Natural Areas

482. The proposed Project will not have an undue adverse impact on rare and irreplaceable natural areas. This finding is supported by Findings 483 through 485, below.

483. The proposed Project passes through several areas that may be considered to be rare and irreplaceable natural areas:

- A clay plain forest in Leicester, north of Bullock Road, at mileposts 16.8–17.1 on the 345 kV corridor;
- A wetland complex south of Town Hill Road in New Haven;
- A clay plain forest and wetland in Salisbury, in the vicinity of Halnon Brook, around mileposts 22–23.0 on the 345 kV corridor;

170. *Tafts Corner Associates*, #4C0696-11-EB at 10–11 (Environmental Board, March 31, 1992).

- A clay plain forest south of the Middlebury substation, around milepost 27.3 on the 345 kV corridor;
- A floodplain forest at Otter Creek contiguous with the extensive wetlands of Long Swamp;
- A clay plain forest in Ferrisburgh, north of East Slang, at mileposts 10.0 and 11.0 on the 115 kV corridor;
- The South Slang in North Ferrisburgh, containing freshwater marshes and aquatic habitat adjacent to Lake Champlain;
- The LaPlatte River area in Shelburne.

Gilman & Briggs pf. at 23; Gilman & Briggs supp. pf. (5/20/04) at 10; Popp pf. at 3–7.

484. Right-of-way clearing within the clay plain forests will hold the forest in an early successional state. Popp pf. at 5.

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

Discussion

A witness for the ANR recommended that right-of-way clearing within affected clay plain forests should be minimized by "placing higher poles or placing them closer to the existing line in order to minimize the amount of cutting."[171] VELCO recommends against such actions, stating that restrictions on cutting will reduce reliability and the placement of higher poles will result in a greater aesthetic impact.[172] VELCO has previously indicated that methods such as use of V-string insulators on the proposed 345 kV line[173] and use of a single pole delta configuration rather than H-frame structures (in conjunction with shorter spans to reduce pole height),[174] can be used to decrease the width of the right-of-way necessary for reliability. We will require VELCO to file a proposal, developed in conjunction with the ANR, to minimize the right-of-way clearings required through the rare and irreplaceable areas listed above.

171. Popp pf. at 6.
172. Rowe/Disorda/Gilman/Briggs reb. pf. at 22.
173. Tr. 2/18/04 (Vol. I) at 54 (Boers).
174. Smith pf. at 26.

(15) Necessary Wildlife Habitat and Endangered Species

Necessary Wildlife Habitat

486. The proposed Project will not destroy or significantly imperil necessary wildlife habitat or any endangered or threatened species. This finding is supported by Findings 487 through 499, below.

487. Necessary wildlife habitat within the project area consists of deer wintering habitat. The proposed Project will require the clearing of approximately 43 acres of deer wintering habitat at 22 sites. Gilman/Briggs pf. at 25, 27; Rowe/Disorda/Gilman/Briggs pf. at 16–17.

488. In order to compensate for the 43 acres of impacted deer habitat, VELCO will need to permanently conserve 86 acres of comparable habitat. Rowe/Disorda/Gilman/Briggs reb. pf. at 17–18.

489. VELCO will establish deer crossing lanes in some areas where the transmission corridor crosses deer habitat. The siting of these lanes will be determined by topography and the extent of habitat on both sides of the corridor. The lanes will consist of maintenance of coniferous shrubs and trees, up to a maximum size allowable consistent with safety, across the width of the corridor. 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.

490. VELCO will include wildlife travel lanes on the final construction plans that will be developed for each line. The plans and profiles will include schematic cross-sections and notes detailing deer crossing lane management. Rowe/Disorda/Gilman/Briggs reb. pf. at 18.

491. VELCO will minimize construction impacts upon waterfowl and wading bird habitat by designing pole placements to span wetlands where possible; placing nest boxes within the corridor in habitats associated with larger rivers and streams, where some trees potentially useful to wood ducks may need to be removed; and limiting construction in these areas to fall and winter, which are outside 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.

Discussion

In addition to the measures that VELCO will take to mitigate the impact of the proposed Project on deer wintering areas identified above, we will require VELCO to work in conjunction with the ANR to develop a proposal that would minimize the clearing necessary for the right-of-way through the affected deer wintering habitat.

Threatened and Endangered Species

492. Within the project area there are a number of plant species that are listed as endangered or threatened by the State of Vermont. Gilman/Briggs pf. at 30; Gilman/Briggs sup. pf. (5/20/04) at 12.

493. The ANR has identified seven rare species of particular concern: spring cress (*Cardamine bulbosa*); summer sedge (*Carex aestivalis*); mountain mint (*Pycnanthemum muticum*); small dropseed (*Sporobolus neglectus*); Massachusetts fern (*Thelypteris palustris*); black gum (*Nyssa sylvatica*); and glaucous bluegrass (*Poa glauca*). Popp pf. at 11–12.

494. Through careful placement of access roads and poles, along with fencing off areas containing plant populations during construction, most of the endangered, threatened, and rare plant populations along the corridor will be avoided. Where avoidance of a threatened or endangered plant species is not possible, VELCO will obtain an endangered species takings permit from the ANR. Gilman/Briggs pf. at 31; Rowe/Disorda/Gilman/Briggs reb. pf. at 21, 24.

495. An osprey, currently listed as an endangered species, has established a nest site on an existing transmission structure on the west side of South Slang in North Ferrisburgh. VELCO has proposed removing this structure during construction. VELCO intends to install a raised wooden nesting platform at the top of an H-frame structure on the west side of the Slang. The existing nest would be removed when the nest is unoccupied (November through February). VELCO would need to obtain an endangered species permit for removal of the existing nest. Gilman/Briggs sup. pf. (5/20/04) at 13; Dunn/Harr DD pf. at 5–6.

496. The proposed Project may have some impact on the habitat of the Indiana bat, a federally listed endangered species. VELCO will manage acreage adjacent to the transmission corridor in Salisbury to provide alternate roosting opportunities for Indiana bats. The ANR and/or the United States Fish and Wildlife Service may require VELCO to clear the line from

Pittsford to Vergennes only during the hibernating period for bats (November 1 through April 1). Gilman/Briggs sup. pf. (5/20/04) at 14; Rowe/Disorda/Gilman/Briggs reb. pf. at 20.

Discussion

VELCO is proposing, for environmental and aesthetic reasons, to remove the existing transmission structure containing the osprey platform from the shoreline of the Slang. The benefits that might arise from this action might not outweigh the effect that such a move would have on the osprey. Consequently, we will require VELCO to file an analysis of the impact of moving this transmission structure on the osprey.

The ANR has requested that "VELCO be required to monitor the populations of all listed species for a period of five years following construction so that no detrimental impacts go unnoticed and that management could be varied accordingly."[175] The ANR also requests that VELCO draft a management plan to address the protection of endangered species within the transmission line right-of-way. No party has provided comments on these issues. We find that, given the potential impact of the proposed Project, these requests are reasonable and will be included as conditions of VELCO's certificate of public good. Prior to the commencement of construction, Petitioners shall flag and fence the identified endangered and threatened populations as well as populations of the seven rare species identified by the ANR.

Motorized Vehicle Use in the Project Corridor

497. VELCO holds easements for most of its transmission rights-of-way in Vermont. These easements do not grant rights to restrict access. Rowe/Disorda/Gilman/Briggs reb. pf. at 19.

498. VELCO will unobtrusively place downed logs or trees around rare, threatened, and endangered plant species to provide some protection from motorized vehicles. Popp pf. at 10; Rowe/Disorda/Gilman/Briggs reb. pf. at 23–24; tr. 6/16/04 (Vol. I) at 112 (Popp).

499. If the ANR determines that a Project area is being adversely affected by ATV or snowmobile use, VELCO will participate in discussions among the ANR, landowners, the

175. Popp pf. at 10.

Vermont Association of Snow Travelers and the Vermont All Terrain Vehicle Sportsman's Association to address such impacts. Rowe/Disorda/Gilman/Briggs reb. pf. at 19.

(16) Development Affecting Public Investments

[10 V.S.A. § 6086(a)(9)(K)]

500. The proposed Project, as modified and conditioned by today's Order, 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 with the conditions included in this section. This finding is supported by Findings 501 through 505, below, and the findings in Section V.B.

501. The landscape near the Ferry Road crossing includes the Knowles Farm, which was conserved with public money to preserve "the scenic and aesthetic resources of a rural landscape" along Ferry Road along with the values of "open space" and "to maintain for the benefit of future generations the essential characteristics of the Vermont countryside." Knowles Farm includes a trail easement for public recreational uses. Exh. DPS-Cross-158 (reb.) at 1; Donovan pf. at 6; Bloch reb. pf. at 1–2.

502. The proposed Project passes near Shelburne Bay Park, a Fish and Wildlife boat launch, the Charlotte Park and Wildlife Refuge, and several parcels of land that are subject to scenic easements. Exh. JD-2; exh. Shelburne-3.

503. The proposed Project would be within the easterly views of people engaged in recreation activities on the Bay. Henderson-King/Lalley pf. at 32.

504. The proposed Project is adjacent to the Salisbury elementary school and adjacent to or located on nine parcels of land within Charlotte containing scenic easements. Exh. VELCO TD-4; exh. JD-2.

505. The proposed Project crosses several rivers and the Slang, and travels along Shelburne Bay. Exh. VELCO TD-4; exh. VELCO G&B-supp(2)-5.

Discussion

Criterion 9(K) addresses developments affecting public investments and states:

> A permit will be granted for the development or subdivision of lands adjacent to governmental and public utility facilities, services and lands, including, but not limited to, highways, airports, waste disposal facilities, office and maintenance buildings, fire and police stations, universities, schools, hospitals, prisons, jails, electric generating and transmission facilities, oil and gas pipe lines, parks, hiking trails and forest and game lands, when it is demonstrated that, in addition to all other applicable criteria, the development or subdivision will not unnecessarily or unreasonably endanger the public or quasi-public investment in the facility, service, or lands, or materially jeopardize or interfere with the function, efficiency, or safety of, the public's use or enjoyment of or access to the facility, service, or lands.

In addition to the public investments listed in the statute, the Environmental Board has determined that bodies of water such as Lake Champlain and the White River constitute public investments.[176] In addition, the Environmental Board has examined the meaning of the word "adjacent" in this statute and has concluded that it "is a relative term that must be considered in the context of the scale of a project."[177] The proposed Project involves the construction of substantial transmission facilities, and the scope of impact extends beyond the land through which it passes. We will not limit our review, under this criterion, to the lands immediately adjacent to the proposed Project. The analysis of this criterion includes an analysis of the visual impacts of the proposed Project.[178] We will therefore review the impact of the proposed Project on lands physically adjacent to the proposed Project and to lands where the proposed Project has an adverse aesthetic impact.

The Environmental Board offers the following analysis for developments affecting public investments:

> The Board interprets Criterion 9(K) to call for two separate inquiries with respect to public facilities. First, the Board is to examine whether a proposed project will unnecessarily or unreasonably endanger the public investment in such facilities. Second, the Board is to examine whether a proposed project

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176. *See*, *Northshore Development, Inc.*, No. 4C0626-5-EB at 12 (Environmental Board, December 29, 1988) and *Robert B. & Deborah J. McShinsky*, No. 3W0530-EB at 10 (Environmental Board, April 21, 1988).

177. *Re: L & S Associates*, No. 2W0434-8-EB at 37 (Environmental Board, September 22, 1993).

178. *See*, *Vermont Department of Forests, Parks, and Recreation (Phen Basin)*, No. 5W0905-7-EB at 10 (Environmental Board, July 15, 2004); "The purposes of Criterion 9(K) include promoting the Park's recreational values, while protecting its scenic and natural qualities."

> will materially jeopardize or interfere with (a) the function, efficiency or safety of such facilities, or (b) the public's use or enjoyment of or access to such facilities.[179]

Under the first prong of this test, we must determine whether the proposed Project will physically damage the public investment itself. The right-of-way clearing for the proposed Project might constitute physical damage. However, the proposed line is within or adjacent to an existing transmission corridor and existing cleared right-of-way. The increased clearing would not constitute an endangerment of any public investment along the proposed Project.

The second prong of this test examines whether the proposed Project will "materially jeopardize or interfere with (a) the function, efficiency or safety of such facilities, or (b) the public's use or enjoyment of or access to such facilities." The only potential impact that the proposed Project will have on conserved and protected lands is aesthetic. As we have found in Section V.B, the proposed Project will not have an undue adverse impact upon aesthetics or the scenic beauty, with the modifications and conditions set forth in today's Order. Consequently, the proposed Project, so modified and conditioned, will not materially interfere with the public's use or enjoyment of these public and conserved lands.

We have determined that the Project as *proposed* would have a substantial adverse impact on the aesthetics of the Ferry Road area in Charlotte and the Bay Road area in Shelburne and the significant public investments (such as Shelburne Bay, Shelburne Bay Park, and the Knowles Farm) located within these areas. The impact of the proposed Project on these significant public investments leads us to conclude that the proposed Project, if constructed in the manner proposed by VELCO, would materially interfere with the public's enjoyment of Shelburne Bay, the Shelburne Bay Park, and Knowles Farm. As we have stated in Section V.B, we are requiring VELCO to place the proposed 115 kV line underground in the vicinity of both the Bay Road and Ferry Road area unless an acceptable overhead proposal is filed with the Board. Placing these portions of the line underground will sufficiently mitigate the impact of the proposed Project on public investments.

The Department contends that properties that are subject to easements designed to protect the scenic enjoyment of the subject parcel, and purchased with public funds, are not subject to

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179. *Swain Development Corporation*, No. 3W0445-2-EB at 33 (Environmental Board, August 10, 1990).

this criterion. We are not persuaded by the Department's argument. We see no reason why a public investment that purchases a property in fee simple for purposes of conserving the land should be treated differently from a public investment that purchases an easement that accomplishes the same conservation purpose. Furthermore, the scenic easements at issue in the current proceeding are relevant to our review of the aesthetic impacts of the proposed Project, so considering the easements under criterion 9(K) would not materially affect our overall decision.

D. Historic Sites

506. The proposed Project will not have an undue adverse effect on historic resources. This finding is supported by Findings 507 through 524, below.

(1) Archaeological Resources

507. It is likely that the proposed Project will impact Native American and European American archaeological sites. Exhs. DSF-2, DSF-3, DSF-4.

508. Because the proposed upgrade involves a large geographic area, alternative siting of the proposed Project is unlikely to reduce impacts on potentially sensitive archaeological sites. Exh. VELCO Cross Dillon-1 at 29–31.

509. On June 29, 2004, the Vermont Division for Historic Preservation ("DHP") issued a letter determining 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. VELCO 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 out by a qualified consulting archeologist in all archaeologically sensitive and known site areas to be impacted by the proposed 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*. VELCO's 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.

Exh. VELCO DSF-Reb-1.

510. Placing any portion of the transmission lines underground has the potential to create additional impacts on archaeological resources. Frink reb. pf. at 2.

511. Further studies would be required to assess the potential impacts caused by undergrounding portions of the line. Frink reb. pf. at 2.

512. The Bay Road area in Shelburne has been identified as an area of potential archaeological significance. Exh. VELCO Cross Dillon-1 at 25–26.

Discussion

Our determination that VELCO has met its burden under this criterion is subject to VELCO's compliance with the conditions established by the Vermont Division for Historic

Preservation. VELCO will file with the Board any compliance filings required by the Division for Historic Preservation.

This Order requires VELCO to place approximately 1.3 miles of the 115 kV transmission line underground in the Bay Road area in Shelburne. This is one of the areas of potential archaeological significance that has been identified by VELCO. We do not wish to create an undue adverse impact on archaeological resources through mitigation of aesthetic impacts. We will therefore require VELCO to file a detailed report on the impact of an underground line on archaeological resources in the Bay Road area by November 1, 2005. Parties will then have 30 days to file comments upon the report.

(2) Above Ground Historic Resources

513. Historic properties are generally defined as "buildings or structures being at least fifty years of age and retaining original or historic architectural or structural integrity." Exh. VELCO Cross Ehrlich-2 at 2.

514. VELCO has identified one historic district and 53 individual historic properties within the viewshed of the proposed 345 kV line. Exh. VELCO Cross Ehrlich-1 at 3.

515. VELCO has identified two historic districts and 34 individual historic properties within the viewshed of the proposed 115 kV line. Exh. VELCO Cross Ehrlich-2 at 3.

516. Neither the 345 or the 115 kV line will have a direct physical impact on any individual historic property. Rather, the impact on the historic properties will be limited solely to visual impacts. Exhs. VELCO Cross Ehrlich-1 at 3, VELCO Cross Ehrlich-2 at 4.

517. The 345 kV line will have an adverse impact on the following historic properties:

- "The Home Farm" on Arnold District Road, in Brandon, which is not listed in the published State Register;
- A house on West Salisbury Road, in Salisbury, listed as #59 in the published State Register;
- The Marble Works of Quarry Road, in Middlebury, listed as #19 in the published State Register;
- A house on River Road, in New Haven, listed as #40 in the published State Register;
- A house on Hunt Road, in New Haven, listed as #65 in the published State Register.

Exh. VELCO Cross Ehrlich-1.

518. The 115 kV line will have an adverse impact on the following historic properties:

- The Tupper House on Botsford Road, in Ferrisburgh, listed as # 69 in the published State Register;
- A house on Botsford Road, in Ferrisburgh, labeled as # F-15 in the Hugh-Boyle Report, which is not listed in the published State Register;
- The Jones House at 400 Town Line Road, in Charlotte, which is not listed in the published State Register;
- Harbor Road Bridge over McCabe's Brook, in Shelburne, listed as # 0413-52 in the unpublished State Register;
- A House at 425 Bay Road, in Shelburne, listed as # 0413-66 in the unpublished State Register.

Exh. VELCO Cross Ehrlich-2.

519. The adverse impacts upon the properties listed above can be sufficiently mitigated through methods such as careful pole placement, lower poles in select areas, planting screening vegetation, and selective clearing. Exhs. VELCO Cross Ehrlich-1 and 2.

520. The proposed 345 kV and 115 kV transmission lines follow existing transmission corridors for almost their entire lengths. Exh. VELCO TD-4; exh. VELCO G&B Supp(2)-5.

521. The S.S. Ticonderoga, located on the grounds of the Shelburne Museum, and Shelburne Farms are listed as National Historic Landmarks. Pritchett sur. pf. at 16; Henry/Boyle reb. pf. at 3.

522. The 115 kV line as proposed would have no visual effect on any building or structure at Shelburne Farms. Henry and Boyle reb. pf. at 3. The view of the proposed 115 kV line will not be prominent from Shelburne Farms. Tr. 10/20/04 at 38 (Pritchett).

523. There will be only a distant, limited view of the 115 kV line from the S.S. Ticonderoga at the Shelburne Museum. The adverse aesthetic effects from the proposed 115 kV poles and conductors as viewed from the top deck of the Ticonderoga at the Shelburne Museum would not be significantly greater than the effects from the existing poles and conductors. Exh. VELCO-Cross-Ehrlich 2 at 56.

524. The proposed 115 kV line will impact two historic structures on the Meach Cove property: an aircraft hanger and a horse barn, both built in the mid-1930s. Exh. VELCO Cross Ehrlich-2 at 50.

Discussion

To evaluate a project's impact upon historic sites, a three part analysis is employed: "(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."[180]

The Environmental Board has set forth the following standards for determining whether a project has an adverse and undue impact:

> In evaluating adverse effect on a site, it is central to determine whether a proposed project is in harmony or fits with the historic context of the site. 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.[181]

VELCO has identified ten properties along the 345 and 115 kV lines that will be adversely impacted by the proposed Project. These identified properties did not include

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180. *Re: Manchester Commons Associates*, No. 8B0500-EB at 18 (Environmental Board, September 29, 1995).

181. *Re OMYA, Inc. and Foster Brothers Farm, Inc.*, No. 9A0107-2-EB at 30–31 (Environmental Board, May 25, 1999).

Shelburne Farms, Shelburne Museum, and the Meach Cove property. VCSE argues that these three properties are not only adversely impacted, but that the impact is undue. We disagree with VCSE's assessment. The 115 kV line in the area of two of these properties replaces an existing 34.5 kV transmission line within the existing transmission corridor. Although the transmission structures for the 115 kV line will be higher than the existing structures, they will be a significant distance from both Shelburne Farms and Shelburne Museum. We therefore conclude that the proposed Project will not have an adverse impact upon these properties.

There will be a direct and adverse impact on Meach Cove. However, the evidence in the record indicates that the proposed Project can be mitigated in such a manner as to avoid an undue adverse impact. The post-certification proceedings will ensure that proper aesthetic mitigation has been developed prior to construction of the proposed Project.

Although there will be an adverse impact upon the ten identified properties, we find that VELCO's aesthetic mitigation should prevent unduly adverse impacts. To ensure that there is sufficient mitigation for the adversely affected historic properties along the transmission corridors, we will require VELCO to mark all properties identified as adversely impacted by its consultants on the detailed construction and aesthetic mitigation plans required for the post-certification process.

On November 15, 2004, the Division of Historic Preservation filed a letter with the Board and parties stating its opinion of the impacts of the proposed Project on above-ground historic resources. No party requested that this letter be made part of the evidentiary record. The ANR has requested in its brief that the Board review the November 15 letter during post-certification review. The Department, in its reply brief, recommends that we grant ANR's request. Neither ANR or the Department propose a process for reviewing the November 15 letter or why review during the post-certification process would be appropriate.

ANR may file the November 15 letter as part of the post-certification review in this Docket. However, there is sufficient evidence in the record to determine that the proposed Project will not have an undue adverse impact on above-ground historic resources without reference to the November 15 letter.

VI. System Stability and Reliability

525. The proposed Project will not adversely affect system stability and reliability, and is proposed specifically to enhance system stability and reliability for northwest Vermont. This finding is primarily supported by many of the findings addressing 30 V.S.A. § 248(b)(2), above, and some additional findings below.

A. DPS Concerns re: Granite Substation Design, as filed by VELCO

526. Under VELCO's original proposal: (a) 225 MVARs of reactive support, comprised of 75 MVARs of fixed capacitors and 150 MVARs associated with the STATCOM installation, are all connected to a single 115 kV bus; and (b) 150 MVARs of STATCOM reactive support is connected to this bus with a single 115 kV breaker. Under stressed conditions, loss of 225 MVARs of reactive support due to a single contingency could have a severe adverse impact on voltages in the area. VELCO subsequently revised the above reactive support configuration to the satisfaction of the DPS. Smith pf. at 31; Smith and Litkovitz sur. pf. at 6, 7–8.

527. VELCO proposes to install the 150 MVAR dynamic reactive device as two 75 MVAR sections, with each section connected to separate ring bus positions through separate step-up transformers. Each 75 MVAR section is comprised of two modules, presumably 37.5 MVAR each. The DPS further recommends each 75 MVAR section be divided into three 25 MVAR modules (to reduce impact to reactive support in the event of a failure of a single module), and that VELCO procure a spare module for emergency on-site use. Exh. VELCO Dunn/Harr-DD-20; Smith DD pf. at 3–4.

528. VELCO is continuing to evaluate the technical aspects of a synchronous condenser installation at the Granite substation. As of the design detail filing, the synchronous condenser technology is VELCO's preferred technology for the 150 MVAR dynamic reactive support at the Granite substation. VELCO states that this installation will fit into the expansion area that VELCO requested in its original June 5, 2003, filing. Dunn/Harr DD pf. at 9; exh. VELCO Dunn/Harr-DD-20.

529. The DPS is concerned that installation of synchronous condensers at the Granite substation would be the first installation in New England of permanent (or dedicated) synchronous condensers at a transmission station at 115 kV and above. The DPS advises that

any available operational experience that could be obtained from other regions should be carefully considered. Smith DD pf. at 2.

530. While recognizing that synchronous condensers offer some potential advantages over the solid state electronic (FACTS) technologies VELCO originally considered, the DPS raises the issue that synchronous condensers may not offer the least-cost solution with regard to life-cycle costs. The DPS makes several recommendations. First, VELCO should perform a detailed analysis to determine the suitability of synchronous condensers for this transmission application — specifically to determine if there are any fatal flaws regarding technical performance. Second, VELCO should develop a functional specification for the various applicable dynamic reactive technologies, including synchronous condensers (if no fatal flaws are found) and FACTS devices including static var compensators (SVCs) and static compensators (STATCOMs). VELCO should request detailed quotes for a specified modular configuration. Third, VELCO should perform special studies to evaluate the impact (either positive or negative) of a device's dynamic response on nearby customers, and to evaluate the interaction of the device on nearby rotating machines, FACTS devices, and HVDC installations. Smith DD pf. at 1–3.

Discussion

Because VELCO has not finalized its plans for a dynamic reactive device at the Granite substation, the Board will require a compliance filing on this topic in the post-certification review phase of this docket. This compliance filing shall include all of the analyses recommended by the DPS[182] to determine which reactive support device is in fact appropriate for this critical location, from both a system stability/reliability standpoint and a least-cost standpoint.

The Board is not convinced that the proposed installation of dedicated synchronous condensers at the Granite substation would present reliability concerns simply because it would be the first in New England at 115 kV and above. First, there may presently be no dedicated synchronous condensers at 115 kV or above in the Northeast because, to date, there has not been

182. The specific studies that the DPS recommends are discussed in Mr. Smith's design detail testimony at pages 2–3.

a need for one. Second, all generators act as synchronous condensers when running to control voltage. Third, synchronous condensers are not a new technology, and are employed in other regions in the United States. However, as suggested by the DPS, any available operational experience that could be obtained from other regions should be carefully considered.

The Board concludes that it would result in greater reliability for the 150 MVAR dynamic reactive device to be separated into two 75 MVAR sections, with each section connected to a separate position on the ring bus. The Board also concludes that dividing each section into three (25 MVAR) modules, rather than two (37.5 MVAR) modules, would result in a greater ability to provide voltage support in the event of the failure of one of the modules. VELCO should procure a spare module for emergency on-site use in the event of a failure of one of the modules. As part of its compliance filing for the Granite substation, VELCO should also submit estimates of cost, equipment required, and space required for the alternatives of either two 37.5 MVAR modules or three 25 MVAR modules, including spare components.

B. Underground Cables - 115 kV

531. Faults on underground cables tend to be significantly less frequent than faults on overhead lines. Tr. 6/14/04 (Vol. II) at 16–17 (Smith & Litkovitz); exh. Board 10; tr. 7/30/04 (Vol. I) at 93–95 (Boers); Aabo sur. pf. at 2.

532. Underground cables tend to fail at the splices and terminations, and therefore a more reliable design would minimize the splices and terminations. The small chance of splice or termination failure must be weighed against the risk of failure of overhead components. Tr. 6/14/04 at 43–45 (Aabo).

11. Underground cable installations of 3000 feet (roughly 0.6 miles) or less can be constructed with only one reel of cable per phase, thereby eliminating the need for splices and manholes. Aabo DD pf. at 2.

533. A permanent fault on a 3-cable system can result in an extended circuit outage of up to two weeks, or even longer if sufficient spare parts are not immediately available. Smith & Litkovitz supp. pf. at 8.

534. In the event of a permanent outage, the circuit restoration times for a four-cable underground system would probably be comparable to that of an overhead line. Smith & Litkovitz supp. pf. at 9; tr. 6/14/04 (Vol. II) at 66 (Smith).

535. Most faults on overhead lines are temporary (i.e., due to a lightning strike) and an automatic reclosure attempt is made within seconds of the fault. Some utilities allow one automatic relcosure attempt on hybrid lines (lines containing both overhead line and underground cable in series), while many do not, for fear of high short circuit currents further damaging the cable, splices, and terminations in the event that the fault was in the cable section. Smith & Litkovitz supp. pf. at 9; Smith & Litkovitz reb. pf. at 13; Aabo sur. pf. at 1.

536. For the case of a hybrid line upon which automatic reclosing is not permitted, regardless of whether a temporary fault is on an underground or overhead section, the required switching procedures, which would employ remote control (SCADA) and motorized disconnect switches, would require a time period on the order of minutes. Smith & Litkovitz reb. pf. at 13.

537. For a situation involving more than one underground cable section between circuit breakers,[183] and with a substation located between the underground sections, outages to the substation could last for several hours, until the faulted cable section could be located and the required restoration switching performed, if automatic reclosing is not permitted. Smith & Litkovitz reb. pf. at 13–14.

538. DPS concerns with the reliability of a 115kV hybrid line would be resolved if a four-cable system were employed and if each of the transitions (between underground and overhead sections) contained relays to ensure that the fault is not on an underground section, reliable communications equipment, power supplies, current transformers, potential transformers, and an enclosed building for this equipment, all located in a fenced-in area. Under these conditions, the DPS believes that reclosing could be safely performed for temporary faults on the overhead sections of hybrid lines. Smith & Litkovitz sur. pf. at 9; Williams sur. pf. at 7–8.

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183. The reroute proposal places circuit breakers on the 115kV line at New Haven, Vergennes, and Queen City. Smith & Litkovitz reb. pf. at 13 (footnote 9).

539. A four-cable system used in portions of the proposed 115 kV line would result in adequate reliability, although such reliability would be somewhat less than that of an overhead line. Smith & Litkovitz supp. pf. at 10.

540. Underground cable has much lower impedance than overhead lines. Impedance mismatch at overhead/underground transition points causes unique transient phenomena when circuits are switched on and off. Underground cables have a relatively high value of shunt capacitance which can cause voltage issues for longer length applications. All of the above issues can be overcome by widely accepted engineering and operational measures. Hybrid transmission lines require careful modeling and study to ensure that there are no adverse impacts. Smith pf. at 24.

541. Electric system studies that should be performed when considering high voltage underground circuits are: continuous current studies; continuous voltage studies; and transient analysis. These studies are likely performed for purely overhead lines, but are very important for lines containing underground cable. Boers sur. pf. at 5–6; tr. 9/21/04 (Vol. I) at 66–67 (Boers).

542. Concerns regarding electromagnetic transients and voltage spikes associated with one automatic reclosure on a hybrid line should not be significantly greater than those same concerns for reclosing on an overhead line if the underground portion of the line comprised only a small percentage of the overall line length, and if the underground cable had an adequately-sized shield/sheath assembly and grounding connections. A system study, including electromagnetic transient analysis, should be performed as a matter of prudent utility planning. Aabo sur. pf. at 1–2; Williams sur. pf. at 6-8.

Discussion

The above findings demonstrate that underground cable used for short lengths of the proposed 115 kV line from New Haven to Queen City could be designed and installed in a manner that would not significantly or adversely affect system stability and reliability, if the 4-cable design is utilized, if system studies (including continuous current, continuous voltage, electromagnetic transient, and harmonic analyses) are performed, and if the cable section is designed and installed according to the specifications dictated by the system studies. Under the above circumstances, the outage time due to a permanent fault would probably not be materially

different between an overhead and a hybrid line. For the case of a temporary fault, the outage time of the hybrid line would be comparable to that of an overhead line, if one automatic reclosure attempt is allowed. Some utilities in the United States allow one reclosure attempt on a 115 kV hybrid line, and therefore have experience with this process. If one reclosure attempt is not allowed, the outage time for the hybrid line could be as low as a few minutes (rather than seconds if one reclosure is allowed).

C. Underground Cables - 345 kV

543. At 345 kV, one or both ends of the underground cable would require a transition station. For the lowest-cost underground cable system to meet VELCO's reliability standards, this type of 345 kV transition station would require a fenced and graded site approximately 155 feet x 230 feet, and would contain a transition structure, shield masts, disconnect switches, surge arrestors, current transformers, and a small control building to house a remote fault location and recording capability. An all-season access drive to the station would be required. Boers sur. pf. at 8–9.

544. ISO-NE has found, in examining the proposed use of underground cable in Connecticut, that extensive installation of underground cable for higher voltage (345 kV) transmission lines introduces new operating and reliability concerns, including issues related to capacitance and harmonics, that are difficult to resolve. Tr. 9/21/04 (Vol. II) at 86–89 (Whitley); exh. VELCO DL Surrebuttal-3.

545. For its new underground 345 kV reinforcement in Boston, NSTAR is currently performing the same electromagnetic transient and harmonic analyses as Southwestern Connecticut. NSTAR is still determining whether Boston has the same problems as Southwest Connecticut. Boston is a strong system with relatively high short circuit levels, and it can tolerate underground cable better than Vermont can. Southwestern Connecticut is a moderately strong part of the system. Portions of the rest of New England, such as Vermont, northern New Hampshire, and Maine, are described as weak parts of the system which could not tolerate underground cable as well. There are local details of system performance that dictate how well or not the system in question will deal with over-voltages due to interruption of underground cable. Tr. 9/22/04 (Vol. II) at 42–43 (LaForest).

546. An underground 345 kV system rated for 500 MVA would likely have sufficient thermal capability to provide transmission service to northwest Vermont under the most severe contingencies. 1500 MVA is a level that matches the thermal capability of the overhead 345 kV line thereby preventing an underground section from becoming the limiting element of the circuit. Smith and Litkovitz sur. pf. at 4–5.

547. A 1500 MVA 345 kV XLPE underground cable system would use two 1750 kcmil cables per phase to meet the power transfer requirement, installed in a two wide by three high concrete-encased ductbank.[184] A 500 MVA 345 kV XLPE underground cable system would use one 1500 kcmil cable per phase, with a fourth, spare cable, installed in a two wide by two high square ductbank. The fourth spare cable is installed because it is unlikely that a 345 kV system could tolerate the outage time – which could be a month or longer – to repair a failed cable if only three cables were installed. Williams sur. pf. at 3–4.

548. There is very little experience with 345 kV XLPE-insulated cables in this country; automatic reclosing on this voltage cable is not recommended at all until more experience is gained with operating XLPE-insulated cables at this voltage. No U.S. utility allows automatic reclosure on a 345 kV cable. Tr. 9/21/04 (Vol. I) at 43 (Williams); Williams sur. pf. at 7.

549. In the absence of reclosure on a 345 kV line containing both overhead and underground sections, the result would be a system that is not as reliable as an all-overhead construction. Where reclosing is not permitted, faults that otherwise would result in outages of just a few seconds would now result in the loss of a line for several hours so that VELCO operators could determine whether the fault originated in the overhead or underground sections of the line. Smith and Litkovitz sur. pf. at 5.

550. Installing underground cable at 345 kV and above introduces an entirely new set of technical and operational factors into the operation and maintenance of the power system. Tr. 9/21/04 (Vol. II) at 86 (Whitley).

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184. This configuration would not employ any spare cables. In the event of a fault on one of the two cables per phase, the failed cable would be removed from service, the unfailed cable re-energized, and the power flow would be reduced to about 750 MVA until the failed cable was repaired.

Discussion

The above findings demonstrate that the use of underground cable for portions of the proposed West Rutland to New Haven 345 kV line would have a significant potential to adversely affect system stability and reliability.[185] While similar to underground cable at 115 kV in some ways, underground cable at 345 kV differs in other significant ways. Similar to 115 kV line applications, the likelihood of damage to breakers and other equipment due to short-circuit fault currents is reduced for short sections of underground cable in series with long sections of overhead line. However, the combination of the facts that underground cables have a much higher capacitance than overhead lines, and the electromagnetic transients and voltage spikes due to switching are more pronounced at higher voltages (i.e., the effect is larger at 345 kV than at 115 kV), are cause for very careful analysis and planning when considering underground cable at 345 kV. It would be much more problematic to utilize 345 kV underground cable in Vermont than in either Boston or southwest Connecticut because Vermont has a much weaker transmission system in terms of the ability to tolerate electromagnetic transients and voltage spikes at 345 kV. In addition, the fact that one reclosure attempt should not be made in the case of a temporary fault anywhere on the line would further reduce the reliability of what would likely become the most critical line serving northwest Vermont.

D. Vergennes Radial Feed

551. Vergennes is presently served by a looped system of 46 kV from the south and 34.5 kV from the north. However, the Queen City to Vergennes 34.5 kV line cannot support the Vergennes load during high load periods. 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. Cecchini supp. pf. at 2.

552. The Petitioners' original proposal was to feed the Vergennes load via a looped 115 kV line, which would solve the City of Vergennes's reliability problems. Boers pf. at 8; exh. VELCO TD-5; exh. VELCO DJB-11; Smith and Litkovitz supp. pf. at 4.

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185. In fact, no party is currently requesting the use of underground cable for any portion of the proposed West Rutland to New Haven 345 kV line.

553. The Petitioners' current (re-route) proposal is to feed the proposed Vergennes substation with a looped 115 kV line, and to feed Vergennes's existing substation (and therefore Vergennes's load) with a 1.6-mile radial 34.5 kV line. Although reliability to Vergennes will be lower than under the original proposal, the proposed reroute will result in a higher level of reliability for Vergennes than Vergennes has today. GMP has made provisions to further enhance the reliability of the 1.6 mile 34.5 kV supply to the Vergennes substation. GMP alone currently serves 12 substations radially. Cecchini supp. pf. at 2–4.

554. The City of Vergennes is aware, and is not concerned, that the current radial proposal is more reliable than the situation today, but less reliable than the original, looped, proposal. Tr. 6/11/04 (Vol. I) at 34–35 (Perry).

555. Outages on the 1.6-mile radial supply to Vergennes would only impact Vergennes, would have no impact on the other substations supplied by the 115 kV path from New Haven to Queen City, and would have no impact on the overall operation of the bulk transmission system. Smith and Litkovitz, supp. pf. at 5–6.

Discussion

Although the current proposal to serve Vergennes via a radial 34.5 kV line would be less reliable than the Petitioners' original proposal to serve Vergennes via a looped 115 kV configuration, the current proposal would be more reliable than the existing conditions Vergennes experiences today. In addition, the radial line serving Vergennes should not adversely affect the reliability or operation of the bulk transmission system. Therefore, the Board concludes that the Petitioners' proposal to serve Vergennes radially would not adversely affect system stability and reliability.

VII. Economic Benefit

A. Introduction

Based on the record evidence, we conclude that the proposed Project results in an economic benefit to the state and its residents. The proposed Project will increase reliability and, thus, reduce the potential economic and safety risks associated with wide-spread loss of power in Northwest Vermont. The proposed Project is the most economic solution with the least number

of implementation hurdles that can be placed into service in a timely manner. Conversely, doing nothing to correct for observed signs of reliability deficiencies at current peak load levels is neither sound regulatory policy nor likely to result in anything but negative economic consequences.

Findings

556. The proposed Project will result in positive economic and social benefits to the state and its citizens. This finding is supported by Findings 557 through 566, below.

557. Improved reliability in the bulk power system in northwest Vermont increases public safety and convenience while simultaneously reducing Vermont's exposure to outages which could potentially have large economic impacts on Vermont. Dunn pf. at 13; Ventriss pf. at 2–3; exh. LV-1; Smith pf. at 8–10.

558. Improved reliability in the bulk power system is important to attracting and retaining businesses and supporting a healthy business climate in Vermont. Dunn pf. at 13; Ventriss pf. at 2–3.

559. A more reliable bulk power system enhances efforts to promote economic development and create jobs in Vermont. Exh. VELCO TD-20 (letter from Vermont Chamber of Commerce dated April 4, 2003).

560. The proposed Project will provide Vermont with increased access to wholesale electric markets when existing contracts for wholesale power begin to expire over the next several years. It will increase the number of market options to choose from, such as renewable generation located outside of northwest Vermont or new, efficient gas plants. Dunn pf. at 13–14; Smith pf. at 14; exh. VELCO TD-20 (letter from EMDC, LLC dated May 5, 2003, and letter from Renewable Energy Vermont dated May 13, 2003).

561. Reliable power supply and competitively-priced electricity are critical to manufacturing companies who compete for business in world markets. Exh. VELCO TD-20 (letter from IBM dated April 10, 2003).

562. The proposed Project will reduce the need to run more costly generation alternatives out-of-merit to support the transmission grid. Dunn pf. at 13–14; Mertens pf. at 7.

563. The proposed Project will improve Vermont's system peak capacity, which will provide greater certainty to electric delivery. Mertens pf. at 15.

564. The negative impact on property values, if any, caused by the proposed Project might range as high as 5% to 10% of the property's value. Exhs. VELCO Cross Wilson-1, VELCO Cross Wilson-2.

565. The effects, if any, of transmission lines on property values are narrowly confined to properties located adjacent to the rights of way and dissipate quickly with distance. Exh. VELCO Cross Wilson-2.

566. Pole height and voltage of the transmission lines do not have a significant impact on property values. Exh. VELCO Cross Wilson-2.

567. The proposed 345 kV line follows an existing 115 kV line corridor throughout the entire proposed route from West Rutland to New Haven. The proposed 115 kV line from New Haven to the Queen City substation in South Burlington follows existing 46 kV and 34.5 kV subtransmission lines in most areas. Exh. DPS-DR-1 at 3.

568. Approximately 4.4 miles of the proposed 115 kV line runs through locations that do not have any existing transmission or subtransmission lines. However, these new locations are mostly within an existing railroad corridor. Exh. DPS-DR-l at 3; Dunn pf. at 11; Boers pf. at 23.

Discussion

Pursuant to 30 V.S.A. § 248(b)(4), the Board must find that the proposed Project "will result in an economic benefit to the state and its residents" before issuing a certificate of public good.

We conclude that the proposed Project will result in an economic benefit to the state and its residents. Our reasons for reaching this conclusion are simple. It is clear that the status quo presents unacceptable risks of outages in northwest Vermont. While we may not have a detailed, quantified estimate of the economic costs of inaction, those costs would be significant, for the reasons that follow.

The evidence demonstrates that the proposed Project is needed to assure Vermont that electric power can be reliably provided now and in the near future, up to load levels of approximately 1,200 MW. The proposed Project would thus reduce the possibility of potentially

serious economic consequences caused by wide-spread loss of power in northwest Vermont (which could cascade to wider areas of the state, as well). Such economic consequences would include, but are not limited to, the cost of lost production at manufacturing facilities and other energy-dependent businesses. A more reliable bulk power system could enhance businesses' perceptions of Vermont as a place to locate or expand existing facilities. If businesses perceive Vermont's infrastructure to be more reliable than other states in the Northeast, Vermont will be at a competitive advantage in attracting new businesses to Vermont or convincing existing companies to expand here.[186] Conversely, if businesses perceive the infrastructure to be less reliable than other states as a result of doing nothing to address current signs of deficiencies, then Vermont could be at serious competitive disadvantage.

The proposed Project would increase the capacity of the bulk power system to transmit electricity into and out of the state and, as a result, would provide Vermont's utilities with greater access to wholesale markets. This access would provide economic benefits by affording Vermont's electric distribution utilities with access to a wider range of options for replacing existing power purchase contracts that will be expiring over the next several years. The Vermont distribution utilities would also benefit economically because VELCO would have more flexibility to transmit power into the northwest Vermont region at peak demand periods rather than run uneconomic generators. When Vermont's electric distribution utilities save money on their power purchases, whether long-term contracts or short-term peak purchases, their customers will benefit too, from lower electricity bills. Greater access to wholesale markets also presents additional opportunities for Vermont's renewable energy providers to sell electricity into the New England grid.

New Haven, CLF and other opposing parties argue that, for three basic reasons, the Board should not find that the proposed Project provides an economic benefit. They contend, first, that the Board cannot approve the proposed Project unless it compares the economic cost of the proposed Project to the economic cost of outages — i.e., a comparison to the "status quo."[187] The opposing parties contend that VELCO and the Department have not quantified the cost of

186. Ventriss pf. at 3.
187. New Haven Brief at 12.

the reliability problems (i.e. the cost of outages) that the proposed Project is designed to address.[188]

Second, the opposing parties contend that before making an affirmative finding, the Board must conclude that the economic benefits of the proposed Project have been assessed in a "head-to-head" comparison with the proposed alternatives.[189] Such an economic analysis, according to CLF, must identify the solution that is the best deal for Vermont and its citizens. CLF further argues that even in the absence of a head-to-head comparison, the record clearly identifies the demand-side management approach to reliability as the best deal for Vermonters.[190] According to CLF, such an approach would yield cumulative customer savings estimated at $503 million ($2003 NPV) and other additional benefits in the form of job creation.[191]

Third, Vermont Citizens for Safe Energy ("VCSE") argues that VELCO has relied on outdated methodologies to estimate the effects of the proposed Project (particularly the 345 kV and 115 kV lines) on property values. VCSE contends that as a result of this reliance, VELCO failed to demonstrate that the proposed Project results in an economic benefit for Vermont and its citizens.[192]

We do not agree with the claim that we must base our decision on a strict comparison of only the net present value costs of the alternatives to the net present value costs of the status quo.[193] Some considerations do not readily lend themselves to an easily quantifiable cost analysis. Furthermore, there is no requirement under the statute limiting our analysis strictly to those economic benefits that are readily quantifiable. Doing nothing to address reliability in a system that is already experiencing deficiencies is neither sound regulatory policy, nor likely to result in anything but negative economic consequences, especially in light of growing peak demand for power in northwest Vermont.

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188. New Haven Brief at 14; CLF Brief at 65.
189. CLF Brief at 67.
190. CLF Brief at 68.
191. CLF Brief at 66–67.
192. VCSE Brief at 5–6.
193. Although the record does indicate that ARC 5 has an estimated net present value which is $66 million less than the proposed Project, we have concluded that ARC 5 was not a viable solution due to the need to build 3 new electric generation facilities in northwest Vermont. *See* Section II.G of this Order.

As for whether the proposed Project is a more economic and achievable option than the alternatives, as we explained in Section II, above, we conclude that it is. CLF's assertion that demand-side management can yield greater net benefits than the proposed Project is unpersuasive for the same reasons that we stated in Section II.G, above. We agree with CLF that, from a conceptual point of view, the economic and other societal benefits of demand-side management programs are real and significant, because energy consumption is reduced and program dollars are recycled through the Vermont economy. However, to address the reliability needs of northwest Vermont, potential demand-side management savings alone would not obviate the need for three new power plants in the Burlington area. Given the significant uncertainties in siting and constructing generation facilities in this area, the demand-side management alternative would not meet the region's need for service.

With regard to VCSE's argument that VELCO relied on outdated estimation techniques to evaluate the possible effects of the 345 kV and 115 kV lines on property values, there is insufficient evidence to conclude that such effects, if any, will be material. Two academic reports submitted into the record discussed these potential negative effects. In these reports, properties that were located adjacent to transmission rights of way were found to be appraised at values that were 5 to 10% less than comparable properties located in areas removed from the transmission rights of way. The reports concluded that the negative effects, where they existed, were narrowly confined along a strip adjacent to the rights of way and dissipate quickly with distance. At least one of these studies also found that neither the height of the pole nor the voltage of the lines had a material impact on property values. As the proposed 345 kV and 115 kV lines are being located, for the most part, in existing transmission rights of way, we conclude that the *incremental* impact of the proposed 345 kV and 115 kV lines on property values, if any, will most likely be *de minimus*. While the conclusions of the report may not apply equally to all property owners along the proposed rights of way, we find that the proposed Project provides an economic benefit to Vermont as a whole.

VIII. ORDERLY DEVELOPMENT

A. Introduction

We conclude that the proposed Project will not unduly interfere with the orderly development of the region. We base this conclusion on our examination, pursuant to Section 248(b)(5), of the local and regional plans for the affected communities. It is important to note that under Section 248's statutory language, the proposed Project does not need to conform to the requirements of these plans, only that we give due consideration to the land conservation measures contained in such plans and the recommendations of the affected local and regional planning commissions and legislative bodies. Consequently, we have carefully and respectfully examined such plans and recommendations in reaching our conclusions.

B. Orderly Development Generally

569. The proposed 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, and the land conservation measures contained in the plan of any affected municipality. This finding is supported by Findings 570 through 623, below.

570. The proposed Project involves proposed improvements to transmission facilities in the following Vermont communities, using primarily existing electrical corridors:

- Within the area of the Rutland Regional Planning Commission ("RRPC") – West Rutland, Proctor, Pittsford, Brandon, and Poultney.
- Within the area of the ACRPC – Leicester, Salisbury, Middlebury, New Haven, Vergennes, and Ferrisburgh.
- Within the area of the Chittenden County Regional Planning Commission – Charlotte, Shelburne, South Burlington, and Williston.
- Within the area of the Central Vermont Regional Planning Commission – Barre Town, Barre City, and Williamstown.
- With the area of the Upper Valley/Lake Sunapee Regional Planning Commission – Hartford.

Dunn/Rowe pf. at 3.

571. On March 13, 2003, VELCO provided detailed notice to each of the foregoing regional planning commissions and the selectboards and planning commissions of each of the foregoing

towns, describing the project plans for each of the towns and regions. Dunn/Rowe pf. at 6, 7, 8, 9, 12, 14, 15, 17, 18, 20, 21, 23, 25, 27, 28, 29, 30, 32, 37, 40, 42; exh. VELCO DR-5.

572. The planning commissions of the foregoing towns and regions did not submit any recommendations to VELCO and the Board pursuant to 30 V.S.A. § 248(f), with the possible exception of the ACRPC. Exhs. ACRPC AL-2, AL-3.

C. West Rutland through Salisbury

573. Within West Rutland, all proposed Project improvements will be within an existing VELCO transmission corridor or the existing West Rutland substation. Dunn/Rowe pf. at 4–5.

574. The West Rutland plan provides that statements therein are not to be interpreted as a standard with which "an applicant for any state or local land use permit or approval must comply in order to obtain that permit or approval." Exh. VELCO DR-4.

575. Within Proctor, all project improvements will be located within an existing VELCO corridor. The project will not contravene any land conservation measures contained in Proctor's town plan. Dunn/Rowe pf. at 6; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-6, RDGB-Reb-8.

576. Within Pittsford, all project improvements will be located within an existing VELCO corridor. The project will not contravene any land conservation measures contained in Pittsford's plan. Dunn/Rowe pf. at 6–7; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-7, RDGB-Reb-8.

577. Within Brandon, all project improvements will be located within an existing VELCO corridor. The project will not contravene any land conservation measures contained in Brandon's plan. Dunn/Rowe pf. at 7–8; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-8, RDGB-Reb-8.

578. Within Leicester, all project improvements will be located within an existing VELCO corridor. The project will not contravene any land conservation measures contained in Leicester's plan. Specifically, Leicester's town plan encourages "the siting of new construction to prevent adverse impacts on environmentally sensitive areas or primary agricultural soils." The proposed Project will not have undue adverse impacts on environmentally sensitive areas or prime agricultural soils. Dunn/Rowe pf. at 7–9; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-9, RDGB-Reb-8; *see also* Section V.C of this Order.

579. Leicester's town plan also encourages "the burying of utility lines whenever feasible." Dunn/Rowe pf. at 8; exh. VELCO DR-9 at 18.

580. Within Salisbury, all project improvements will be located within the existing VELCO corridor. The project will not contravene any land conservation measures contained in Salisbury's plan. Dunn/Rowe pf. at 9; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-10, RDGB-Reb-8.

D. Middlebury

581. Within Middlebury, all project improvements will be located within the existing VELCO corridor. Middlebury's plan favors use of existing corridors and consolidation, where possible to avoid the need for additional transmission corridors, and states: "There should not be any new major transmission corridors planned throughout the Town." The project will not contravene any land conservation measures contained in Middlebury's plan. Dunn/Rowe pf. at 10–11; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-11, RDGB-Reb-8.

582. Middlebury's plan also contains the following provision:

> In order for this project to conform with Middlebury's Town Plan, the following standards must be met:
>
> a. The project shall clearly benefit and be necessary for Vermonters.
>
> b. The project must include adequate mitigation, including modified design, tree planting, and where necessary, compensation for the effects upon the property values of adjacent owners.
>
> c. VELCO and the PSB must assure that any electromagnetic effects, right-of-way maintenance by herbicides or other health and environmental hazards, present or future, are adequately minimized and corrected.
>
> d. Proposed aesthetic recommendations at public highway crossings must be developed through site visits and local public hearings.

Dunn/Rowe pf. at 10.

E. New Haven

583. Within New Haven, as modified by the Reroute Filing, project improvements include:

- Construction of approximately 5.1 miles of 345 kV transmission line, located east of and parallel to the existing VELCO 115 kV line, within the existing utility

corridor, extending from the Middlebury town line north to VELCO's New Haven substation.

- Expansion of the New Haven substation to accommodate a new 345 kV yard, an expanded 115 kV yard, and modifications to the 46 kV yard.
- Replacement of CVPS' existing 1.3 mile long 46 kV subtransmission line, that runs northwest from VELCO's New Haven substation to the former White Pigment Plant, with a new VELCO 115 kV single pole transmission line.
- Replacement of a portion of GMP's existing 46 kV subtransmission line, that runs northwest, mostly along the railroad, from the former White Pigment Plant to the point where GMP's existing line turns toward Waltham, with a new VELCO 115 kV single pole transmission line.
- Removal of the existing GMP 46 kV line from New Haven to Vergennes, except where 12.5 kV distribution underbuild must remain.
- Construction of new 115 kV single-pole transmission along the railroad tracks from the point where GMP's existing line turns towards Waltham to the New Haven border.

Dunn/Rowe pf. at 12–13; Dunn sup. pf. at 3; Boers sup. pf. at 9; exhs. VELCO TD-5 and TD Supp(1)-1.

584. The project will not contravene any land conservation measures contained in New Haven's plan. Dunn/Rowe pf. at 12–14; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-12, RDGB-Reb-8.

585. New Haven's plan, adopted in 2000, states that the zoning bylaws need to be updated to include, among other things, the following:

> A system to discourage new public utility expansion, including, but not limited to, expanded/upgraded electric transmission facilities, that may have an adverse impact on viable agricultural operations and environmentally sensitive areas, which poses health risks to citizens, which poses threats to property or property values, or which degrades scenic corridors and existing aesthetics.

Exh. VELCO DR-12. New Haven's planning commission voted in December 2003 to "reaffirm" this "implementation clause." New Haven has provided no evidence that this clause has in fact been implemented. *See*, e.g., Hall pf. and Hall exhs. 1–3.

F. Ferrisburg

586. Within Ferrisburg, as modified by the Reroute Filing, project improvements include:

- Construction of new 115 kV single-pole transmission line along the railroad tracks from the New Haven border to the eastern boundary of the City of Vergennes.
- Construction of new 115 kV single-pole transmission line coming across the northern boundary of the City of Vergennes to the railroad tracks, then along the railroad tracks to the point where the Ferrisburgh Reroute begins.
- Construction of new 115 kV single-pole transmission along the route of the Ferrisburgh Reroute.
- Along the railroad tracks from the end of the so-called Ferrisburgh Reroute to the Charlotte border, replacement of GMP's existing 34.5 kV line with single pole 115 kV transmission line.
- Expansion of the existing GMP substation located on the north side of Long Point Road in the Village of North Ferrisburgh, to upgrade the 34.5 kV services to 115 kV.

Dunn/Rowe pf. at 17; Dunn sup. pf. at 3–4, 6; Boers sup. pf. at 9–10; exhs. VELCO TD-5 and TD Supp(1)-1.

587. The project will not contravene any land conservation measures contained in Ferrisburgh's plan. Dunn/Rowe pf. at 18; Gilman/Briggs sup. pf. at 3–4; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-15, RDGB-Reb-8.

588. Ferrisburgh's plan contains the following provision: "[The] Zoning By-Laws will be amended to limit development and establish setback requirements around important natural resources. The Town will also include regulations and requirements pertaining to transmission and telecommunications towers to protect the Town's character and resources — natural, historical and scenic." There is no evidence in the record that Ferrisburgh has implemented this provision by enacting the called-for zoning bylaws. Dunn/Rowe pf. at 18; exh. VELCO DR-15.

G. Vergennes

589. Within Vergennes, as modified by the Reroute Filing, project improvements will include:

- New single pole 115 kV transmission corridor running along the railroad tracks from the eastern border with Ferrisburgh to a point where the new corridor diverges from the railroad tracks to run overland to the new substation proposed

in the vicinity of Kayhart Crossing, then from the new substation to the northern border with Ferrisburgh.

- A new 115/34.5 kV substation in the vicinity of Kayhart Crossing.
- A new 34.5 kV line from the new substation into the City of Vergennes.

Dunn sup. pf. at 3–4, 9–10; Boers sup. pf. at 9; exh. VELCO TD-Supp(1)-1.

590. The project will not contravene any land conservation measures contained with the Vergennes municipal plan. Dunn/Rowe pf. at 16–17; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-14, RDGB-Reb-8.

591. The City of Vergennes supports the project as amended by the Reroute Filing. The City seeks that the Board will impose appropriate conditions in any certificate of public good that it may issue to Petitioners to ensure that the aesthetic value of the Kayhart Crossing area is protected. Perry sup. pf. at 3-5; exh. Vergennes RP-5.

H. Charlotte

592. Within Charlotte, project improvements will include:

- Replacement of approximately 6.3 miles of GMP's existing 34.5 kV subtransmission line with a single-pole 115 kV transmission line.
- Under the Reroute Proposal, construction of a new substation.

Dunn/Rowe pf. At 18-19; Boers sup. pf. at 4.

593. The proposed Project will not cause additional development in Charlotte that would not conform to the zoning bylaws. Tr. 3/3/04 (Vol. I) at 26 (Bloch).

594. The only area identified in Charlotte where the proposed Project may prevent development in accordance with the zoning bylaws is in the area of Ferry Road crossing, which may become a growth center, with village expansion in this area in a pedestrian-oriented manner as well as for retail uses. The proposed transmission line could have a negative effect on the desirability of the area for the potential village expansion. Tr. 3/3/04 (Vol. I) at 27–8 (Bloch).

595. The project will not contravene any land conservation measures in the Charlotte plan. Dunn/Rowe pf. at 18–20; Rowe, et al., reb. pf. at 26; exhs. VELCO DR-16, RDGB-Reb-8.

596. The Charlotte plan contains the following:

a. In Section 1.1, a vision to maintain and enhance "the scenic beauty and open land of the Town through protection of working farmland and the

creation of conservation areas" and to preserve the Town's "unique environmental and cultural resources through both regulatory and non-regulatory actions."

b. In Section 2 (Goals for the Future of the Town), the following goals and objectives:

Goal 1. To maintain and protect Charlotte's Rural Character and Heritage.

Objective 1.2. Preserve the quality of the landscape through the protection of open land, panoramic views of the Green Mountains, Lake Champlain and Adirondack Mountains, the rural night sky, and valuable natural resources.

Objective 1.3. Preserve the small town character in the villages and rural areas.

Goal 2. To direct and manage growth in the Town.

Objective 2.6. Manage growth and development to be in harmony and scale with the rural character, historic pattern, and quality of settlement in the Town.

Goal 4. To encourage sound conservation practices in land and water uses and provide a healthy environment for people, plants and animals.

Objective 4.3. Protect valuable wildlife habitat, wetlands, productive or unique forestlands, and natural areas.

Objective 4.6. Limit development in areas of the Town where significant environmental and natural resources are located and promote development away from those areas.

c. In Section 4.4.4, the Charlotte plan identifies as "significant resources" in the Rural District around Ferry Road "open space and scenic vistas, especially in the center and western parts of the Town," and "the conservation and aesthetic value of roadside environments."

d. Charlotte has inventoried significant environments; these inventories are incomplete. Map 12 of the Charlotte Plan shows significant views to the east. Map 13 of the Charlotte Plan shows roads with high scenic or conservation values.

- Map 13 shows Greenbush Road to be a "most scenic road."
- Map 13 shows only one "wildlife value area" in the vicinity of the proposed Project route near Greenbush Road.

Bloch pf. at 3–4; exhs. Charlotte DB-3 and DB-4.

597. The Charlotte plan also contains the following:

a. In Chapter 4 of the Charlotte Town Plan, Section 4.4.6 - Special Features:

> Ubiquitous overhead utility lines for power, telephone and cable television have the impact of diminishing the Town's scenic vistas, views and general landscape quality. These are important services, but the vision for an aesthetically beautiful Charlotte includes the replacement of overhead lines with underground lines and requires the installation of new lines underground. It is the objective of the Town that all utilities will be underground.

b. In Chapter 5, Section 5.8, Community Facilities and Services, paragraph 5.8.12, Utility Distribution Policies:

> **Policy 1.** New or replacement electrical, telephone, cable and other utility lines, are encouraged to be located underground. In particular, the Town seeks to protect public roads with high scenic value by placing utility transmission lines underground. Placing transmission lines underground reduces their negative impacts to the landscape and potentially reduces long term maintenance costs.
>
> **Policy 2.** The Town supports co-location of utility lines in existing rights of way in order to reduce impacts to scenery. New utility transmission line infrastructure should be located within existing rights of way unless the greater public good is better served by placing them elsewhere.
>
> **Policy 3.** The Town will continue to require underground utility lines within subdivisions as a condition of approval.

c. In Chapter 5, Section 5.8, Community Facilities and Services, paragraph 5.8.12, Utility Distribution Strategies: "The Town will explore ways to encourage underground placement of utility transmission lines, including, installation of empty conduit during road construction and re-construction projects."

Exh. VELCO DR-16; Bloch pf. at 5–6; exh. Charlotte DB-2.

598. On page 77, the Charlotte plan, at the beginning of section 5, states:

> This section of the Plan lays out the policies and strategies which the Town hopes will accomplish the vision, goals and objectives described earlier. As was stated in the Introduction to the Plan, "policies" are meant to be used to review and guide development proposals, while "strategies" are meant to guide discussion, and will need further action to be enacted, for example by amending the Zoning Bylaws or through the work of a Town committee.

Exh. Charlotte DB-2 at 77.

599. Charlotte's plan allows, in determining whether to bury utility lines, consideration of the costs of such burial and the impacts of such burial on the provision of reliable electric service. Exh. DPS-Cross-93; tr. 3/3/04 (Vol. I) at 26 (Bloch).

I. Shelburne

600. Within Shelburne, project improvements include:

- Under the Original Proposal, replacement of approximately 2.4 miles of GMP's existing 34.5 kV subtransmission line, running from the Charlotte town line in an existing corridor north to the substation, with a new single-pole 115 kV transmission line. Under the Shelburne Reroute or Meach Cove Reroute proposals, approximately half a mile of this stretch of line would be moved to a new corridor west of the existing corridor.
- Expansion of the existing GMP substation located on Harbor Road to upgrade the 34.5 kV service feed to 115 kV.
- Replacement of 3.2 miles of GMP's existing 34.5 kV subtransmission line north of the substation, with a new single-pole 115 kV transmission line. An alternate route is proposed for this section of new corridor to avoid impacts to the Nature Conservancy area and to residential development along the Shelburne Harbor and Bay Road. The new line will exit the expanded substation from the north, and proceed east to join the railroad ROW at the southern boundary of the Nature Conservancy property. The new 115 kV line will then follow the railroad for approximately 1.1 miles, to a point on Bay Road where the railroad meets the existing 34.5 kV line.

Dunn/Rowe pf. at 20–21; Dunn sup. pf. at 7–8; exh. VELCO TD-Supp(1)-3.

601. There is no evidence in the record that the proposed Project will cause additional development in Shelburne that will not be in conformance with the town's zoning bylaws. Tr. 3/3/04 (Vol. I) at 80 (Pierce).

602. The only specifically identified manner in which the proposed Project may prevent development in Shelburne in accordance with the zoning bylaws is the prevention of rural residential development, that might otherwise occur, due to the presence of taller poles.

Appropriate aesthetic mitigation measures would reduce that concern. Tr. 3/3/04 at 81–2 (Pierce). (Vol. I)[194]

603. The project will not contravene any land conservation measures in the Shelburne plan. Dunn/Rowe pf. at 20–21; Rowe, et al., reb. pf. at 17; VELCO exhs. DR-17, RDGB-Reb-8.

604. The Shelburne plan states that it contains "Goal, Objective, and Proposal & Strategy Statements which will guide the future of the community." It states that "goals" are "broadly based statements intended to set forth the general principles which will govern all future land use decisions." It states that "objectives set more specific directions that guide actions." It also states that "proposals and strategies are some of the possible courses of action available to the Town to implement the goals and objectives." Exh. Shelburne DLP-3 at 3.

605. The Shelburne plan contains the following statements:

> a. "There shall be no development which would cause alterations to the Town's open lands, shorelines, ridgelines or roadside views in such a way that would intrude upon or diminish the scenic beauty of Shelburne." This statement is an objective of the Shelburne plan.
>
> b. "To preserve and enhance the role of the village as the center for the town of Shelburne, and preserve those qualities which make it unique." This is a goal of the plan.
>
> c. "In order to reinforce and enhance the visual and functional cohesiveness of the Village as the central element of Shelburne, the Town should strive to implement the overall recommendations of the Shelburne Village Plan, 1988, Research & Evaluation Specialists of Vermont, Alexander/Truex/de Groot." This is an objective of the Shelburne plan.
>
> d. "Distinct and recognizable entrances to the Village shall be maintained which differentiate the Village from areas surrounding it."
>
> e. "Structure the Town's Zoning Bylaws to insure that any subdivision or development of property identified as part of a visually significant area is designed to minimize disruption of the view to the greatest extent possible. This might be achieved through selective designation of building locations, roads, utility lines, and the overall pattern of the subdivision. Conditions may be established with regard to the addition, protection, elimination, or

194. When asked if his concerns about the proposed Project's impact on the western gateway to the village involved the prevention of development at the western edge of the village, Mr. Pierce did not affirm that the prevention of development was related to his concerns, instead stating that his concerns were with the specific impact of the substation upgrade on the western gateway. Tr. 3/3/04 (Vol. I) at 80–81 (Pierce).

management of vegetation as a means of maintaining views and aesthetic features and the specific designing of structures."

f. "Views in areas which are gateways into Shelburne and into the Village shall be preserved through techniques cited above."

g. "To preserve and protect sites, structures, areas, and objects of historical, cultural, architectural or archeological significance to the Town of Shelburne." This is a goal of the Shelburne plan.

h. "Conserve historic and cultural resources included, but not limited to, the resources identified on the Historic Resources Map and Archeological Sensitivity Map [195] through the adoption of measures for the protection of historic sites, structures, objects and areas." This is an objective of the Shelburne plan. .

I. "To provide necessary public utilities, facilities and services to meet the needs of the community and ensure the orderly, safe and environmentally acceptable conversion of developable lands." This is a goal of the Shelburne plan.

Exhs. Shelburne DLP-3 at 6-7, 13, 16-17, 21.

J. South Burlington

606. Within South Burlington, project improvements include:

- Replacement of approximately 1.2 miles of GMP's existing 34.5 kV line located in the railroad right-of-way from the Shelburne town line to the existing GMP Queen City substation, with a single pole 115 kV transmission line. Just north of the Shelburne town line, VELCO's 115 kV Queen City to Williston line is currently co-located on tubular steel poles with GMP's 34.5 kV line for approximately 0.6 miles. For this portion of the route, the 34.5 kV line will be replaced with a 115 kV line, utilizing the existing structures.
- Expansion of VELCO's Queen City substation (as proposed under the Reroute Filing).

Dunn/Rowe pf. at 22; Dunn; sup. pf. at 13–15; Boers sup. pf. at 7.

607. The project will not contravene any land conservation measures in the South Burlington plan. Dunn/Rowe pf. at 21–3; Rowe, et al., reb. pf. at 17; exhs. VELCO DR-18, RDGB-Reb-8.

608. The South Burlington plan contains the following provision:

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195. Neither Shelburne nor any other party has placed the referenced maps in evidence. *See generally* prefiled testimony of Pierce, Henderson-King and Lalley, and Dunn and Rowe, rebuttal testimony of Henry and Boyle, and "rebuttal" testimony of Pritchett; exhs. VELCO DR-17 and Cross-Ehrlich-2; and exh. Shelburne DLP-3.

> Future utility lines, including power as well as phone and cable TV, are encouraged to be underground. Only if there is appropriate screening and unusually severe conditions that make undergrounding prohibitively expensive, should waivers for the above-ground utilities be considered. Future transmission lines should be confined to existing utility corridors, and placed underground if possible.

Exh. VELCO DR-18.

K. Williston

609. Within Williston, project improvements include the proposed substation expansion. No new transmission lines will be installed. Dunn/Rowe pf. at 23–25.

610. The project will not contravene any land conservation measures in the Williston plan. Dunn/Rowe pf. at 25; Rowe, *et al*., reb. pf. at 17; exhs. VELCO DR-19, RDGB-Reb-8.

611. The Williston town plan states:

> New electric and gas service lines that are installed by developers should be located underground. Additionally, the Town should encourage replacement of existing overhead lines with underground service. Particular priority should be given to areas of visual or historic importance, such as Williston Village and the commercial center surrounding Taft Corners. The Town should establish, as part of its Capital Budget and Program, a fund to pay a portion of the cost of converting overhead lines to underground.

Exh. VELCO DR-19 at 90.

L. Barre City and Town, Williamstown

612. Within the City of Barre, VELCO will reconductor approximately 0.2 miles of existing 115 kV transmission line, located in the western section of the city. The proposed Project does not include changes at the VELCO Barre City substation. The proposed Project is not inconsistent with the Barre city plan. Dunn/Rowe pf. at 26; Rowe, *et al.*, reb. pf. at 17; exhs. VELCO DR-20, RDGB-Reb-8.

613. Within the Town of Barre, VELCO will reconductor approximately 2.8 miles of existing 115 kV transmission line, running from the Barre City line to the Williamstown line. The proposed Project is not inconsistent with the Barre town plan. Dunn/Rowe pf. at 26–27; Rowe, et al., reb. pf. at 17; exhs. VELCO DR-21, RDGB-Reb-8.

614. Within Williamstown, project improvements include:

- Reconductoring approximately 2.7 miles of VELCO's existing 5.6 mile, 115 kV Barre-Granite transmission line, running from the Barre town line to the Granite substation.
- Expansion of the Granite substation.

Boers pf. at 34–35.

615. The proposed Project is not inconsistent with the Williamstown Town Plan. Dunn/Rowe pf. at 27; Rowe, et al., reb. pf. at 17; exhs. VELCO DR-22, RDGB-Reb-8.

M. Hartford

616. Within Hartford, the proposed Project's improvements include the addition of three 115 kV breakers, a capacitor bank, and associated equipment at VELCO's Hartford substation to improve system reliability. No line upgrades are planned. Dunn/Rowe pf. at 28.

617. The project will not contravene any land conservation measures in the Hartford plan. Dunn/Rowe pf. at 28–29; Rowe, *et al.*, reb. pf. at 17; exhs. VELCO DR-22, RDGB-Reb-8.

618. The Hartford plan contains the following: "When designing new utility corridors, utilize existing utility corridors, where possible, and avoid undue adverse effect on the aesthetics or habitat of an area (using the "*Quechee Test*"), particularly as viewed from Routes 5, 14, 4, I-91, and I-89." Exh. VELCO DR-23.

619. The changes associated with the proposed Project are located at an existing, remote substation, not visible from Route 5 or I-91. The substation is not visible from any of the surrounding roads or from any residences, which limits any potential adverse aesthetic impact. Dunn/Rowe pf. at 29.

N. Poultney

620. Within Poultney, improvements associated with the proposed Project are located at the Blissville substation, and include a 115 kV/ 350 MVA PAR device with breaker and two line breakers to improve reliability by controlling power flow between the VELCO and Niagara Mohawk transmission systems. Dunn/Rowe pf. at 29.

621. The project will not contravene any land conservation measures in Poultney's plan. Dunn/Rowe pf. at 29–30; Rowe, *et al.*, reb. pf. at 17; exhs. VELCO DR-24, RDGB-Reb-8.

O. ACRPC Resolutions

622. On March 12, 2003, the ACRPC passed a resolution which "requests that, as part of considering the request for a Certificate of Public Good for any electric transmission lines in Vermont, that the Public Service Board consider the impact of electric and magnetic fields on human health both in the design and in the siting of power lines." This resolution does not name the proposed Project specifically, but states that it was made in the context of "increases in population and demand for electricity in northwest Vermont [that] may increase the likelihood of expansion of existing electric facilities within the Addison Region." Exh. ACRPC-AL-2.

623. On December 10, 2003, the ACRPC passed a resolution in which it requested that the Board "consider" the following:

a. Pursuant to 30 V.S.A. § 248(b)(1), investigate whether the proposed project is reasonably sized to provide the necessary reliability without overburdening the area. Specifically, is the proposed addition of the 345 kV corridor from Rutland to New Haven necessary or could reliability be achieved in a more cost effective or aesthetic manner by improving the existing 115 kV corridor with a second 115 kV line?

b. Pursuant to 30 V.S.A. § 248(b)(2), investigate whether locally-based generation, efficiency-based options or other alternatives exist that could provide moderately priced power and provide jobs improving the region's economy.

c. Pursuant to 30 V.S.A. § 248(b)(4), ensure that the analysis of impacts uses an economic model that includes societal costs, including losses in property value resulting from proximity to the corridor and property tax consequences to municipalities stemming from that lost value; and also the negative economic impacts from degradation of the scenic corridor.

e. Pursuant to 30 V.S.A. § 248(b)(5), investigate and impose mitigation options on a town-by-town basis, applying similar solutions to similar population densities, viewsheds or other circumstances.

    I. Corridor modification. Provide for special mitigation in specified historic districts or areas of specific aesthetic significance, including consideration of under grounding lines, or moving the corridor or substation location to other areas exhibiting less impact.

    ii. Stipulated Local Mitigation Plan. Requiring the applicant to commit to a localized aesthetic mitigation process for each municipality that requires stipulations to mutually agreed upon measures including:

- Plantings at road crossings within transmission right-of-way, town road right-of-way and, with consent, upon land of private individuals bordering the transmission corridor;
- Reducing cutting of existing vegetation wherever feasible;
- Locating construction staging areas and committing to mitigating measures surrounding construction prior to actual construction;
- Consolidating lines, modifying pole designs, configurations or the type of poles used;
- Providing compensation to towns and individuals for economic losses caused by the transmission route;
- Providing for other special mitigation measures, including under grounding in specified historic districts or areas of specific aesthetic significance.

Exh. ACRPC-AL-3.

Discussion

Section 248(b)(1) provides that, before the Board may issue a certificate of public good for an in-state facility, the Board shall find that the facility:

> 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 the municipal legislative bodies, and the land conservation measures contained in the plan of any affected municipality.[196]

The Vermont Supreme Court has previously construed the effect that the Board is to give to municipal enactments under this statutory provision. In *City of South Burlington v. VELCO,* 133 Vt. 438 (1975), the Court held that the legislature's use of the phrase "due consideration" "at least impliedly postulates that municipal enactments, in the specific area, are advisory rather than controlling." 133 Vt. at 447.[197] The Court further stated that, without a "clear and explicit legislative pronouncement" it would not construe Vermont's statutes "in any manner giving

196. Section 248(b)(1) contains additional provisions that only apply to natural gas transmission lines.

197. At the time of the Supreme Court's *City of South Burlington* decision, Section 248(b)(1) required the Board to give due consideration to the recommendations of the municipal and regional planning commissions and the municipal legislative bodies. The requirement to give due consideration to the land conservation measures of municipal plans was added later. P.A. No. 273 § 1 (1988 Adj. Sess.).

single municipalities the power to subvert utility projects statewide in scope and broadly entrusted to a single planning and supervisory agency." 133 Vt. at 448.

To apply the statutory language, we must also address the contention of the Department that the "recommendations" to which Section 248(b)(1) refers are recommendations provided pursuant to 30 V.S.A. § 248 (f).[198] Section 248(f) requires, first, that the petitioner provide plans to the municipal and regional planning commissions at least 45 days prior to submitting its petition to the Board (unless the planning commissions waive the requirement), and, second, that "[s]uch commissions shall make recommendations, if any, to the public service board and to the petitioner at least 7 days prior to filing of the petition with the public service board." According to the Department, the phrase "the recommendations of the municipal and regional planning commissions" as used in Section 248(b)(1) should be interpreted to refer only to recommendations presented pursuant to Section 248(f).[199]

We agree only in part with the Department's statutory interpretation. As the Department contends, it is clear that we are required to consider any Section 248(f) recommendations in our determination of a project's conformance with Section 248(b)(1). However, we do not read the term "recommendations" in Section 248(b)(1) as narrowly as does the Department, for one simple reason: in Section 248(b)(1), the recommendations that we are to consider include recommendations not only those of the municipal and regional planning commissions, but also "the recommendations of the municipal legislative bodies." Because Section 248(f) only provides for the submission of recommendations from the municipal and regional planning commissions, and not from the municipal legislative bodies, we conclude that the legislature's use of the term "recommendations" in Section 248(b)(1) is not strictly limited to those recommendations submitted pursuant to Section 248(f). Instead, when a municipal legislative body, municipal planning commission, or regional planning commission intervenes as a party and elects to present relevant evidence and argument relating to Section 248(b)(1), that evidence and argument is entitled to due consideration.

We also must determine what constitutes "land conservation measures" in the municipal plans. Applying the plain language of the statute, such measures are those that are specifically

198. Department Brief at 56–57.
199. Department Brief at 56.

directed toward land conservation, and not general policy statements that apply indiscriminately throughout the municipality. Thus, a general statement in a municipal plan calling for all transmission lines to be buried, regardless of whether they would be located in a developed or undeveloped portion of the municipality, would not by itself constitute a "land conservation measure."

Consistent with the Vermont Supreme Court's precedent in applying the Act 250 requirement of conformance with local plans, we further conclude that for a provision in a municipal plan to constitute a "measure" that is cognizable under Section 248(b)(1), that provision must "evince a sufficiently 'specific policy'" promoting land conservation. *In re John A. Russell Corp.,* 2003 VT 93, ¶ 19, 838 A.2d 906, 913 (Vt. 2003). The Court concluded that without that specificity, it would be "thus left with precisely the sort of broad goals lacking in specific policies or standards that we have consistently disallowed as the basis for the denial of a permit under Criterion 10." *Id.* Non-specific provisions of municipal plans should not carry more weight in applying Section 248(b)(1) than in applying Criterion 10 of Act 250 (10 V.S.A. § 6086(a)(10), given that Section 248(b)(1) requires "due consideration" of the land conservation measures of the municipal plans, rather than a finding of conformance as required by Criterion 10.

In its brief, the Department has carefully analyzed each of the municipal plan provisions that are set forth in the findings above. The Department contends that, with the possible exception of the Hartford plan provision described in Finding 618, above, none of these provisions constitutes a land conservation measure, in that each provision is not directed toward land conservation, is not sufficiently specific, or both.

Based on our own review of the municipal plan provisions set forth in the findings above, we concur with the Department's analysis. Thus, the only provision in the plans of affected municipalities that could be construed as a land conservation measure is the following statement in the Hartford municipal plan:

> When designing new utility corridors, utilize existing utility corridors, where possible, and avoid undue adverse effect on the aesthetics or habitat of an area (using the "Quechee Test"), particularly as viewed from Routes 5, 14, 4, I-91, and I-89.

The proposed Project is consistent with this provision.[200]

Turning now to apply the provisions of Section 248(b)(1) to the evidence before us, we conclude that the proposed Project will not unduly interfere with the orderly development of the region. We reach this conclusion having carefully considered the recommendations of the municipal and regional planning commissions, the recommendations of the municipal legislative bodies, and the land conservation measures of the plans of affected municipalities, while bearing in mind that the preferences of individual municipalities should not be allowed "to subvert utility projects statewide in scope." *City of South Burlington*, 133 Vt. at 448.

The effects of the proposed Project on the orderly development of the region are limited by the use of existing transmission corridors and existing substation locations for the vast majority of the Project.[201] Thus, VELCO and GMP avoid, for the most part, the development of previously undeveloped lands. Even that segment of the proposed Project that involves the greatest extent of new transmission right-of-way — the Vergennes Reroute — closely follows the existing railroad right-of-way. The only two new substation sites that will be developed — in Vergennes and Charlotte — reflect the preference of the involved municipalities not to expand at the existing substation locations.

It is also important to recognize that the proposed Project will enhance the reliability of electric service in northwest Vermont, as discussed in Sections II.E and VI of this Order. In this way the Project may enhance the orderly development of the region.[202]

As for the recommendations of the municipal legislative bodies, municipal planning commissions, and regional planning commissions, most of the recommendations that are in the record are in the form of evidence and argument of those local governmental bodies that chose to

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200. Although the remaining municipal plan provisions set forth in the findings do not constitute land conservation measures, the issues raised by those provisions are almost all addressed in our analysis of the various criteria of Section 248.

201. Board and Supreme Court precedent support this conclusion. *See*, *Petition of VELCO*, Docket No. 4381, Order of 3/6/80 at 4–5 ("By paralleling the existing corridor . . . a proposed [transmission line] routing has been chosen that has already been considered in the developmental aspects of communities by both public and private endeavors."); *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.")

202. The Shelburne Town Plan recognizes the importance of providing necessary utility service. E.g., exh. DLP-3 at 21.

intervene. Such evidence and argument are addressed throughout today's Order. The only other recommendations in the record are the two resolutions issued by the ACRPC on March 12, 2003, and December 10, 2003.

The ACRPC's March 2003 resolution requests that the Board consider, as part of its review of the proposed Project, the impact of EMF on human health both in the design and siting of the proposed transmission lines. We have carefully considered these issues and address them in Section IV of this Order.

The resolution that the ACRPC issued on December 10, 2003, asks that the Board consider the impacts of the proposed Project under Sections 248(b)(1), (2), (4), and (5). We have considered these impacts in the sections of this Order that address those statutory provisions.

IX. TWENTY-YEAR PLAN

Introduction

We find that the proposed Project is in compliance with the Department's 1994 Twenty Year Electric Plan. Pursuant to 30 V.S.A. § 202(b), the Department is required to "prepare an electrical energy plan for the state. The plan shall be for a twenty-year period and shall serve as a basis for state electrical energy policy." Under Section 248(b)(7), the Board is required to find that the proposed Project is in compliance with the twenty-year electric plan "or that there exists good cause to permit" the construction of the proposed Project. After review of the Department's twenty-year plan and the findings in the record, we conclude that the proposed Project is in compliance with the twenty-year plan.

Findings

624. The proposed Project is in compliance with the electric energy plan approved by the Department under section 202 of title 30. This finding is supported by Findings 626 through 642, below.

625. Even if it were not in compliance with the Department's electric energy plan, there would exist good cause to permit the proposed Project. This finding is supported by the totality of the findings set forth in this Order.

626. The Department's current Twenty-Year Electric Plan was adopted in December 1994 (the "1994 Plan").[203] 1994 Plan.

627. "The overriding goals of [the 1994] 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." 1994 Plan at 1-1 (emphasis in original).

628. One of the principle goals of the 1994 Plan is the provision of efficient electric service. Specifically, the 1994 Plan describes strategies for reducing line losses in transmission and distribution systems. 1994 Plan at 1-1, 5-19 to 5-23.

629. The proposed Project would implement this strategy in two existing transmission corridors. First, the existing 115 kV corridor between West Rutland and New Haven would be upgraded with the addition of a 345 kV transmission line. Second, the 46 kV and 34.5 kV lines between New Haven and Queen City would be replaced by a 115 kV transmission line. Both of the proposed transmission lines would result in lower line losses on the VELCO system. Exh. DPS-GES&WSL-2 at 1.

630. The 1994 Plan provides that planning of Vermont's bulk transmission system should address current and future constraints for the import and export of power. The proposed Project would promote this objective because it would lessen transmission congestion in northwest Vermont, thereby allowing the importation of lower-cost generation and lowering congestion costs. 1994 Plan at 5-5; exh. DPS-GES&WSL-2 at 1–2.

631. The 1994 Plan provides that Vermont's electric service should be reliable, such that customers experience interruptions of minimal frequency and duration. The proposed Project would enhance the reliability of the bulk transmission system in Vermont, especially in the northwest portion of the state, reduce the likelihood of outages to customers, and lessen the probability of voltage collapse which could result in outages over a relatively wide area. 1994 Plan at 1-1, 1-7 to 1-8, 5-6 to 5-8; exh. DPS-GES&WSL-2 at 2; Findings in Sections II.E and VI.

632. The 1994 Plan provides that Vermont's electric consumers should experience minimal impairments in power quality. Power quality encompasses more than frequency and duration of

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203. In this Docket, the Board has taken official notice of the 1994 Plan. *See* Order of 8/9/04 at 5.

outages; it also includes voltage variations such as sags, undervoltage and overvoltage conditions, surges, and harmonic distortion. The proposed Project would improve power quality on the Vermont grid. 1994 Plan at 1-1, 5-8 to 5-12; exh. DPS-GES&WSL-2 at 2–3.

633. The 1994 Plan provides that the public health and safety should be protected in the distribution of electric energy (page 1–3). VELCO would construct the electric facilities of the proposed Project in a manner consistent with the construction safety standards of the National Electrical Safety Code. This meets the safety standard set in Board Rule 3.500. 1994 Plan at 1-3; exh. DPS-GES&WSL-2 at 2.

634. The 1994 Plan establishes a policy of prudent avoidance of electromagnetic fields from transmission lines. The proposed Project is consistent with this policy. 1994 Plan at 1-7, 5-12 to 5-13, 8-3; exh. DPS-GES&WSL-2 at 3; *see* findings in Section IV.

635. The 1994 Plan provides that overall visual aesthetics should be carefully considered in the construction and location of electric lines. The proposed Project, with the conditions set forth in this Order, would be consistent with this provision of the 1994 Plan. 1994 Plan at 5-7; exh. DPS-GES&WSL-2 at 2; *see* findings in Section V.B.

636. The 1994 Plan provides that transmission planning should employ Geographic Information Systems ("GIS") formats. GIS is an electronic system that allows users to collect, manage, and analyze large volumes of geographical data and associated descriptive information. VELCO employed GIS in its planning of the proposed Project. 1994 Plan at 5-13 to 5-14, 8-3 to 8-4; exh. DPS-GES&WSL-2 at 3.

637. The 1994 Plan provides that improvements to the bulk transmission system should utilize existing transmission corridors to the fullest extent possible. The majority of transmission lines in the proposed Project would be constructed within existing corridors. The only significant portion of transmission line that would not be placed within an existing corridor is the Vergennes Reroute, which VELCO proposed to avoid substantial aesthetic impacts in the Vergennes downtown and river basin areas.[204] 1994 Plan at 5-19, 8-13; exh. DPS-GES&WSL-2 at 3.

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204. As noted in Finding 635, above, the 1994 Plan calls for consideration of aesthetic impacts in the siting of electric lines.

638. The 1994 Plan provides that the preferred method to increase transmission capacity is to upgrade existing transmission facilities to allow higher power transfer levels, in order to avoid the adverse environmental impacts associated with acquiring additional land or construction of additional miles of lines. The proposed Project adopts this strategy where feasible, namely in the New Haven to Queen City corridor where existing 46 kV and 34.5 kV subtransmission lines would be removed and replaced with a new 115 kV transmission line. 1994 Plan at 5-19, 8-13; exh. DPS-GES&WSL-2 at 3.

639. The 1994 Plan provides that transmission equipment (such as conductors and transformers) should be acquired in a least-cost manner, taking into consideration life-cycle energy loss costs. In the proposed Project, VELCO proposes to use 1272 ACSR conductor for the proposed transmission lines. These large conductors are sized to meet system and contingency conditions that might arise over the next 30 to 40 years. It is highly unlikely that the cost of acquiring and mechanically supporting a larger size conductor would be cost-effective on the basis of incremental loss savings. As for transformers, VELCO has traditionally selected transformers using a methodology that accounts for the cost of transformer losses. If VELCO continues this practice in selection of transformers for the proposed Project, VELCO would be complying with the 1994 Plan's recommendation for least-cost equipment acquisition. 1994 Plan at 8-11 to 8-12; exh. DPS-GES&WSL-2 at 4.

640. The 1994 Plan recommends consideration of high-power electronic control devices, often referred to as FACTS devices, for controlling transmission system voltage and stability following contingencies. VELCO has considered the use of such devices for the proposed Project, specifically, a static compensator or STATCOM, as part of the proposed Granite substation upgrade. VELCO will evaluate whether to install a STATCOM, or a more traditional device known as a synchronous condenser, at this substation. 1994 Plan at 5-20; exh. DPS-GES&WSL-2 at 4; Dunn/Harr DD pf. at 9.

641. The 1994 Plan provides that every utility resource-acquisition proposal "needs to be evaluated on the basis of the net present value of its total costs and benefits over the lifetime of the project, with environmental externalities taken into consideration." To determine whether the proposed Project complies with the least-cost provisions of the 1994 Plan requires a

determination of whether the proposed Project complies with least-cost planning principles. 1994 Plan at 2-13; tr. 8/4/04 (Vol. I) at 59–60 (Parker).

642. The proposed Project complies with least-cost planning principles. *See* findings in Section II.

Discussion and Conclusions

Section 248(b)(7) of Title 30 provides that, in order for the Board to issue a certificate of public good for the proposed Project, we must find that it "is in compliance with the electric energy plan approved by the department under section 202 of [title 30], or that there exists good cause to permit the proposed action." A separate statutory provision, Section 202(f) of Title 30, requires that:

> any company seeking board authority . . . to site or construct a generation or transmission facility . . . shall notify the department of the proposed action and request a determination by the department whether the proposed action is consistent with the [department's electric energy] plan. In its determination whether to permit the proposed action, the board shall consider the department's determination of its consistency with the plan along with all other factors required by law or relevant to the board's decision on the proposed action. If the proposed action is inconsistent with the plan, the board may nevertheless authorize the proposed action if it finds that there is good cause to do so.

On July 2, 2004, the Department issued a "DPS Determination under 30 V.S.A. § 202(f)" ("July 2 Determination"), and filed a copy of the Determination with the Board. The July 2 Determination addresses the consistency of the proposed Project with the Department's 1994 Vermont Electric Plan. In response to a request by VELCO that we take administrative notice of the Department's July 2 Determination, and in light of objections to that request by New Haven and VCSE, on October 6, 2004, we issued an Order taking notice of the July 2 Determination but restricted its use as follows:

> *However*, the use of this evidence will be strictly limited; it can only be used to show that the Department made the determination and cannot be used to prove truth of the matter asserted (i.e., whether the proposed [Project] is in fact consistent with the 1994 Vermont Electric Plan). The [proposed Project's] consistency with the Plan is neither an indisputable fact nor a generally recognized fact within our expertise. To allow use of the July 2

> Determination as evidence of such consistency would go beyond the permissible limits of administrative notice.[205]

In its brief, New Haven argues that because of this limitation on our use of the July 2 Determination, it is not possible for this Board to carry out the intent of the legislature.[206] According to New Haven, the statutory scheme requires that the Department, not the Board, be the entity that determines consistency with the Department's Plan, with the Board then required to "consider" that determination. New Haven contends that:

> Now there is no reasoning for the Board to consider. The Board instead is being asked to take on the Department's role as state energy planner, and decide *ab initio* whether the [proposed Project] and its component parts are consistent with the Department's 20-year electric plan. This is unlawful.[207]

The evidentiary record before us includes the Department's determination of consistency with the 1994 Plan, although the determination does not constitute evidence of the truth of the matter asserted (i.e., that the proposed Project is in fact consistent with the 1994 Plan). The record also includes much of the analysis upon which the Department based its determination. However, we do not have in the record the entirety of the Department's supporting analysis. The question presented by New Haven's argument is whether we are precluded from issuing a certificate of public good for a project when the evidentiary record does not include the entirety of the analysis upon which the Department bases its Section 202(f) determination.

For two independent reasons, we conclude that we are not so precluded. First, we are guided by the use of the same term, "consider," in Section 248 itself. Section 248(b)(1) requires that we "consider" the recommendations of municipal and regional planning commissions and municipal legislative bodies in determining whether a proposed project will unduly interfere with the orderly development of the region. Section 248(f) allows the local governmental entities to provide their recommendations 7 days prior to the date that an application is filed (with the local authorities having received the plans at least 45 days prior to the application being filed). Given that the legislature has provided that those recommendations are to be

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205. Order of 10/6/04 at 5 (emphasis in original; footnote omitted).

206. New Haven also asserts that the Department's July 2 Determination was unlawful. New Haven Brief at 17–18. We have already addressed this argument in our Order of August 9, 2004, (at page 4) and need not revisit it here.

207. New Haven Brief at 19.

submitted before the application is even filed, has required the Board to "consider" those recommendations, and has included no requirement that the recommendations be incorporated into the evidentiary record,[208] it is clear that we can "consider" such recommendations of a governmental body without those recommendations being included in the evidentiary record.

Second, to adopt New Haven's statutory construction would produce nonsensical results. Both Section 248(b)(7) and Section 202(f) provide that we may approve a proposal, notwithstanding its noncompliance with the Department's Electric Plan, if we find good cause to do so. Given this clear legislative allowance for us to approve a project for good cause even where the Department determines that the project does not comply with its plan, it would lead to an irrational result if we were stalemated and unable to approve a project where good cause exists when we have *no* Department determination before us. Statutes are to be construed to avoid such irrational or absurd results.[209]

While New Haven argues that we cannot determine whether the requisite good cause exists without having before us the reasoning behind the Department's determination,[210] the statutory language reads otherwise. The "good cause" provisions in both Section 202(f) and Section 248(b)(7) relate to good cause to permit the proposed action regardless of consistency with the Department's Electric Plan, *not* good cause to reject the Department's determination or reasoning.

We conclude that the proposed Project is in compliance with the 1994 Plan. This conclusion is based on the foregoing findings of fact, including those incorporated from other relevant sections of this Order.[211] We further conclude that, because the proposed Project is required to meet Vermont's present and future need for reliable electric service, and is the least-cost option for so doing that is reasonably capable of being implemented in the timeframe

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208. Nor is there any statutory requirement that the local governmental bodies become parties in order to present recommendations under Section 248(f).

209. *Wesco, Inc. v. Sorrell,* 2004 VT 102 ¶ 14, ___ A.2d ___; *Will v. Mill Condominium Owners' Assoc.*, 2004 VT 22, ¶ 15, 848 A.2d 336, 342 (Vt. 2004).

210. New Haven Brief at 16.

211. The overriding goals of the 1994 Plan "to meet Vermont's electric energy needs in a manner that is efficient, adequate, reliable, secure, sustainable, affordable, safe and environmentally sound," reflect the very factors that we evaluate under the various provisions of Section 248(b).

needed for the same reasons, even if the proposed Project were determined to be not in compliance with the 1994 Plan, there would be ample good cause to approve it.

X. EXISTING AND PLANNED TRANSMISSION FACILITIES

643. The proposed Project can be served economically by existing or planned transmission facilities without undue adverse effect on Vermont utilities or customers. This Finding is supported by the findings in Sections II, VI, and VII, and the three findings below.

644. VELCO's existing transmission system is not capable of reliably meeting Vermont's existing and future and electrical needs. The four existing 115 kV transmission lines which serve northwest Vermont were built during the period between the late 1950s and mid 1980s. VELCO has not built any significant transmission lines since the 1980s, and no significant generating resources to serve northwest Vermont have been added since the 1980s. Planning Panel pf. generally; exh. VELCO Planning-6; G. Parker pf. at 2–4.

645. The proposed Project is a coordinated series of transmission upgrades which work together to supply a projected Vermont summer peak load of 1,200 MW. Dunn pf. at 5; Planning Panel pf. at 22.

646. The primary purpose of the planned transmission facilities of the proposed Project is to improve the reliability of the existing transmission facilities serving northwest Vermont. Dunn pf. at 5; Planning Panel pf. at 2.

XI. OTHER ISSUES

In the briefs the parties raised issues too numerous to specifically respond to in this Order. We believe that this Order adequately addresses the legal and factual issues that are necessary to make our determination as to the proposed Project's consistency with the general good of the state. While we have considered the arguments of all parties, we have only explicitly addressed those that would materially affect our findings under any of the criteria under Section 248.

On December 23, 2004, New Haven filed a motion to strike portions of the briefs filed by the Department, VELCO, and ISO. New Haven contends that the identified portions of the briefs "contain unfounded factual assertions and/or hearsay that are not part of the admitted

evidence in this case." On December 30, 2004, the Department filed a response to the motion stating that New Haven's motion is improper, as it does not cite to any authority for filing such a motion, and that the record supports the Department's contentions in the challenged portions of its brief.

Even if we were to assume that New Haven is correct that certain briefs contain assertions not based upon the record evidence, the proper disposition of this issue would not be to strike the offending sections but to not rely upon such assertions in the final Order. This is the course of action that we have taken in this Order. Consequently, we deny New Haven's motion to strike.

New Haven's reply brief makes several assertions related to matters outside the scope of this Order. These include the eligibility of the proposed Project for a required wetlands permit, the ability of VELCO to obtain the easements necessary to construct the proposed Project, and the alleged necessity for municipal and State Transportation Board review. We have not addressed these issues as this Docket concerns our review of the proposed Project for compliance with the requirements of Section 248. As we state in this Order, VELCO is responsible for obtaining any approval, outside of the Board, that is necessary for construction of the proposed Project.

New Haven, in its brief, argues that the Board must dismiss VELCO's petition because ANR has failed to provide evidence on all criteria of Section 248(b)(5). Section 248(a)(4)(E) states:

> [t]he agency of natural resources shall appear as a party in any proceedings held under this subsection, shall provide evidence and recommendations concerning any findings to be made under subdivision (b)(5) of this section, and may provide evidence and recommendations concerning any other matters to be determined by the board in such a proceeding.

During the course of these proceedings, the Department coordinated with the Vermont Department of Health to provide evidence on the issue of electromagnetic fields and with a consultant to provide evidence on the issue of aesthetics. Both EMF and aesthetics fall within the Act 250 criteria incorporated under Section 248(b)(5).

New Haven's argument is unpersuasive. The plain language of the statute creates a duty upon ANR. But it does not provide a specific remedy for ANR's failure to provide evidence. In

the absence of a statutory remedy, we find that it would be unreasonable to interpret the statute to create as a remedy harm to Petitioners for ANR's failure. Rather, the proper recourse to New Haven and similarly situated parties when ANR fails to act is to seek a writ of mandamus from state court compelling ANR to file evidence. New Haven has provided no rationale as to why the consequences of an alleged procedural failure of *ANR* should be borne by the *Petitioners*.

XII. POST-CERTIFICATION PROCESS

A. The Rationale for a Post-Certification Process

In this Order, as in past Section 248 orders, we are approving the proposed Project conditional upon Petitioners filing certain information subsequent to their receipt of a CPG and prior to construction. This bifurcated process is a pragmatic recognition that some post-certification review by the Board is necessary. The Vermont Supreme Court addressed the Board's authority to employ such a process in a 1973 challenge to the Board's certification of a general route while allowing petitioners to provide additional information during a post-certification review process. In its decision, the Court pointed out the practical reasons for such an approach:

> 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 of the alternatives with variations in advance to their approval would be unreasonably excessive.[212]

The Court further stated:

> 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 the 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.[213]

It is clear, therefore, that post-certification proceedings are an accepted and useful component of Section 248 review. The more demanding issue for us is determining what components of the

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212. *In re Vermont Elec. Power Co., Inc.,* 131 Vt. 427, 434 (1973).

213. 131 Vt. at 435 (citations omitted).

proposed Project must be reviewed after the issuance of a certificate of public good and the proper process that should be followed.

The Board must weigh three competing interests in determining the timing and the detail of the information required from the petitioner. The first consideration is the Board's "duty under Vermont law to make affirmative findings, based upon the evidentiary record, on each of the statutory criteria."[214] The second is the cost to Vermont ratepayers of requiring construction-level design detail early in the regulatory process. The third consideration is ensuring that the public and parties are provided with adequate notice.

Pursuant to Section 248, the Board is required to make positive findings on a wide range of criteria. Certain criteria, such as Section 248(b)(2), can be analyzed without reference to the site-specific aspects of the project, while the analysis of others, such as the Act 250 criteria incorporated under Section 248(b)(5), requires the introduction of site-specific evidence. There is sufficient evidence to conclude that the Petitioners will be able to construct the proposed Project in a manner that will not create an undue adverse impact under any of the relevant criteria. The post-certification process ensures that construction of the project will occur in a manner consistent with this conclusion.

In this Docket, the Petitioners have repeatedly provided evidence, particularly for the Act 250 criteria, that it would obtain permits from ANR and other agencies, thus satisfying the necessary criterion. We have allowed this process in the past but as we stated recently:

> to the extent the applicant relies upon permits issued by other agencies or outside studies to form the evidentiary basis for its petition (in effect relying upon them as a rebuttable presumption), the Board cannot issue a certificate until those documents are submitted and other parties have had an opportunity to rebut them. In some cases, this may require further evidentiary hearings, which could have the effect of delaying a project. An applicant that chooses to rely upon such permits (rather than presenting direct evidence) must bear this risk.[215]

The process for filing and review of such permits will be addressed below.

In this Docket the Board has required the Petitioners to provide detailed construction and aesthetic mitigation plans for selected areas along the proposed Project to ensure that, for certain

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214. Docket 6792, Order of 7/17/03 at 36.
215. *Id.* at 37.

perceived problem areas, they could provide detailed plans sufficient to meet this requirement.[216] In requiring this information we stated:

> We emphasize as strongly as possible that the designation of these sites is not an indication that these are the only sites that the Board considers to be sensitive, or that will require detailed design plans. In fact, if the project is approved on an overall basis, the entire proposed route will require such detail for submission and review in post certification proceedings. However, these sites seem particularly significant in terms of potential 'show-stopper' or 'ripple effects' on other parts of the proposal. In addition, these specific examples will inform the Board's judgment regarding other sensitive sites. Thus, the process we require should both improve and expedite an ultimate resolution of this case.[217]

We did not require the Petitioners to provide detailed construction plans for the entire project at that time. It is sufficient to determine that a route is possible without requiring the petitioner (and the ratepayer) to incur the substantial costs of creating detailed plans without any certainty that the proposed Project would receive a certificate of public good. It is during the post-certification process that Petitioners will be required to provide detailed construction plans for the entire proposed Project.

The last consideration is ensuring that parties and the public have adequate notice of the proposed Project to be able to comment upon it. VELCO has made a good-faith effort to provide individual notice of the proposed Project to all landowners adjacent to the proposed route. In addition it has produced several exhibits detailing the proposed route for the 345 kV and 115 kV lines and the location of the expanded substations.

VELCO contends in its reply brief that only parties should be allowed to participate in the post-certification process. Specifically, VELCO states that towns and regional planning commissions who failed to participate in the Docket should not now be allowed to provide comments on compliance filings. VELCO contends that this is a matter of fairness and that a "very disciplined review process" is needed to meet its construction schedule.

We agree that entities that have not been participants in this Docket should not be allowed to re-examine issues that have already been litigated by several parties. However, although parties have had a general knowledge of the potential impacts of the proposed Project,

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216. *See* Docket 6860, Order of 7/2/04.
217. Docket 6860, Order of 7/2/04 at 4 (citations omitted).

until the post-certification process, certain site specific impacts have not been fully ascertainable. The towns and regional planning organizations can provide valuable information as to the required aesthetic mitigation, and they will be allowed to participate on this issue. Potentially affected landowners, towns, and regional planning commissions will have the opportunity to provide comments on the Petitioners' final construction and aesthetic mitigation plans.[218]

B. Requirements of the Post-Certification Process

Throughout this Order we have identified the plans, permits, and reports that Petitioners are required to file for post-certification review. We do not reiterate the required filings here. Rather, we will provide guidelines for the process.

The post-certification process will be conducted by the Board's hearing officers. The hearing officers will be responsible for conducting the necessary site visits and file reports and recommendations with the Board. The final determinations on all substantive issues will be made by the Board.

No later than two months after the issuance of this Order, the Petitioners must submit a proposed schedule for filing the plans, permits, and reports required by this Order pursuant to the procedures outlined in this section. The schedule for the plans should be divided according to the affected towns, although more than one town may be scheduled for filing at one time. The schedule shall also list all necessary permits and reports. After the Petitioners file their proposed schedule, parties will have fourteen days to comment on the schedule. Upon completion of this comment period, the Board will issue a schedule.

(1) Process for permits and reports

As stated above, we are requiring Petitioners to file a proposed schedule for filing permits and reports. As part of this proposed schedule, Petitioners shall file a list of all required permits and the agencies from which these permits must be obtained.

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218. We are not requiring VELCO to file post-certification filings with individual landowners who are not parties to this Docket. The municipalities have the ability to communicate with their residents regarding VELCO's filings, and while we cannot and do not require such action by the municipalities, we strongly encourage it.

Petitioners shall file all permits and reports with parties, affected municipal governments, and municipal and regional planning commissions two weeks prior to the Petitioners filing with the Board. A good-faith effort, on the part of all involved, to resolve any differences must be made during this two-week period. After this two-week period has run, the Petitioners may file the permits and reports with the Board. The Board will then provide a two-week period to receive comments on the filings. Any party, municipal and regional organization, or landowner who believes that the filings raise a significant issue that should be addressed through evidentiary hearings may request a hearing on that issue.

For some of the required permits, the responsible agency issues draft permits for public comment prior to the issuance of a final permit. This comment period could provide parties an opportunity to raise issues regarding necessary permits and, in the interests of efficiency, we encourage parties to utilize the agency's process to address any concerns with a permit. We recognize that the permit process of ANR and other relevant agencies is unlikely to be structured to accommodate notice to parties in this Docket. We encourage the Petitioners to work with these agencies to develop a mechanism for providing relevant parties in this Docket notice of the issuance of any draft permits.

(2) Process for plans

Petitioners shall file detailed construction plans for the 345 kV line, the 115 kV line, and the substation upgrades, with parties, affected municipal governments, and municipal and regional planning commissions two weeks prior to the Petitioners filing with the Board. During this time, parties and affected municipal and regional entities should work with the Petitioners to determine at which areas site visits will be required. A good faith effort, on the part of all involved, to resolve any differences must be made during this two-week period. After this two-week period has run, the Petitioners may file the plans with the Board. Any party, municipal and regional organization, or landowner who believes that the filings raise a significant issue that should be addressed through evidentiary hearings may request a hearing on that issue.

The Plans filed shall include:

- the location, height, and design (e.g., H-frame, delta configuration) of each transmission structure, and the span length between structures;

- the amount of clearing required for the right-of-way;
- aesthetic mitigation measures, including proposed plantings, height, species, number, growth rate, and whether berms will be used;
- areas where the Board has determined that the proposed Project will result in an adverse aesthetic impact;
- historic properties that have been identified by the Board as adversely affected;
- environmental mitigation measures, including erosion control;
- the location of underbuild; and
- the height and footprint of all structures within substations.

We have determined that photo-simulations will not be required for all areas, as some parties have requested. Parties, municipal and regional organizations, and landowners may request that the Petitioners perform photo-simulations for certain areas and if the Petitioners do not agree to perform such simulations, these entities may ask the Board to order the requested photo-simulations.

When the Board determines that a site visit is necessary, a hearing officer will schedule a site visit to review the plans. The Petitioners will not be required to automatically stake out all pole locations and aesthetic mitigation measures in advance of the site visit. However, parties, towns, and landowners may request that such action be taken.[219] The default standard for filing comments by parties, towns, and landowners will be fourteen days after the site visit. It is possible that the Petitioners will be required to file additional information, in which case the comment period will be extended.

The Petitioners have argued that they should be required to file landscaping plans only after construction is complete. We reject this argument and will require the Petitioners to file landscaping plans concurrent with the filing of final construction plans. This process has been used in prior Section 248 dockets, and VELCO contends that the continuation of this practice is necessary to ensure that its construction schedule is met. The location of structures will play a key role in determining the aesthetic impact of the proposed Project. Filing detailed construction plans concurrent with the plans for aesthetic mitigation will improve post-certification review.

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219. We note that in some of the more difficult areas (i.e., those where there is an adverse impact), such practices should expedite the review process.

Mitigating the aesthetic impacts of the proposed Project will be significantly improved by ensuring proper placement of structures.

ACRPC recommends that the Petitioners be required to fund expert aesthetic witnesses for towns' review of the post-certification process. ACRPC cites to "precedent allowed by 24 V.S.A. § 4440(d)" for Board authority, but does not discuss the Board's own precedent on this issue. The Board has never granted intervenor funding.[220] The costs of regulatory actions are an allowable expense for utilities that may be passed on to ratepayers. Essentially, if the Board were to allow intervenor funding in this Docket, as ACRPC requests, ratepayers would be paying for the affected towns to hire experts to review the final plans. For these reasons, the Board declines to grant ACRPC's request that the Petitioners be required to fund experts for towns' review of post-certification filings.

(3) Process for the New Haven substation, Ferry Road, and Bay Road

In this Order the Board has required VELCO to move the New Haven substation, if possible, and to place the proposed 115 kV line in the vicinity of Bay Road in Shelburne underground unless VELCO could provide an alternate configuration that addresses the Board's concerns for this area. The post-certification process for these two areas will need to be more extensive than for other sites along the post-certification process.

VELCO shall file a schedule for its actions with respect to the possibility of relocating the New Haven substation. This schedule should include a deadline for filing a preliminary report to address the feasibility of relocating the substation. In addition, the schedule should include deadlines for filing supplemental testimony regarding the impact of a substation at the new site on subsections 248(b)(1) and (5).

This Order does not determine an acceptable overhead design for the proposed 115 kV line near the Ferry Road crossing. We are providing VELCO more time to negotiate with the interested parties and to determine an overhead configuration for this area. In its March 1, 2005, schedule VELCO will address the deadline for concluding its negotiations and developing an acceptable proposal at this location.

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220. The Board has ordered a petitioner to pay intervenors' costs as a sanction. *See* Docket 6300, Order of 12/15/00 at 9–10.

VELCO must file either a schedule for addressing the archaeological and environmental impacts of an underground 115 kV line in the Bay Road area or an alternate proposal for an overhead configuration that will address the Board's concerns. If the latter course of action is taken, VELCO shall file a proposed schedule for filing supplemental information addressing the site specific criteria of Section 248.

XIII. CONCERNS OF THE PUBLIC

The Board has received hundreds of comments upon the proposed Project in the form of oral comments at public hearings, written comments, and e-mails. Under Vermont law, our decision must be based upon the evidence presented by formal parties during the evidentiary hearings. However, public comments play an important role by raising new issues or offering perspectives that we should consider. Although it is not possible to address each individual concern, the comments generally fall into the six categories which we will address below.

- Aesthetics: Commenters were concerned with the aesthetic impact of the proposed Project, and the potential that these impacts could result in decreased tourism and property values.
- Electromagnetic fields: Many comments express concern that EMF levels from the proposed Project will result in a health risk.
- Alternatives to the proposed Project: Many people suggested that increased energy efficiency or renewable generation would obviate the need for the proposed Project.
- Beneficiaries of the proposed Project: The Board received a number of comments stating that the only beneficiaries of the proposed Project would be, alternatively, VELCO, Chittenden County, or southern New England.
- VELCO's process: Some commenters expressed concern with VELCO's methods in this Docket. Some comments stated that VELCO's practices were not consistent with the "Vermont way" of doing business.
- Support for the proposed Project: Commenters recommended that the Board approve the proposed Project for the increased electric reliability and attendant economic benefit.

A. Aesthetics

We acknowledge that the line will have an aesthetic impact. However, this is no basis for denying the project or requiring that the transmission lines be placed underground in most areas. The applicable standard for judging the aesthetic impacts of a project is whether it will have an undue adverse effect.

A standard of no aesthetic impact is untenable. It would prohibit all development in the state. Instead the Environmental Board has developed, and this Board has adopted, the so-called Quechee test for determining whether a proposed project will have an undue adverse impact on aesthetics. Under this standard, the Board must first determine whether the impact of the project will be adverse. The project will 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 the project were found to have an adverse impact, it would then be necessary to determine whether such an impact would be undue. Such a determination would be required if the project violated a clear written community standard intended to preserve the aesthetics or scenic beauty of the area, if it would offend the sensibilities of the average person, or if generally available mitigating steps were not taken to improve the harmony of the project with its surroundings. In determining whether a project will have an undue adverse effect the Board takes into consideration the overall societal benefits of the project.

In those areas where the proposed Project will have an adverse impact, careful pole placement and plantings of screening trees will ensure that the impact from the project will not be undue. There are two locations where the Board is requiring VELCO to take action beyond pole placement and plantings. We are requiring VELCO to move the New Haven substation and to place the 115 kV line underground in the vicinity of Bay Road in Shelburne.

B. Electromagnetic Fields

The comments that we received on this issue ranged widely. Several people commented that, due to the uncertainty of the health effects from EMF, we are obliged to underground the entire project. The rationale underlying these comments was generally either (1) a moral obligation to prevent any harm, or (2) that the policy of prudent avoidance requires preventing

any exposure. We also received some comments from some members of the public that stated, without any sense of uncertainty, that EMF caused leukemia.

We have carefully reviewed this issue in Section IV, but we will reiterate the main points here.

Our understanding of the health issues surrounding EMF is based upon the numerous studies from health authorities including the National Institute of Environmental Health Sciences, the World Health Organization, the International Agency for Research on Cancer, and the Vermont Department of Health. These agencies, without exception, state that the evidence that EMF is a risk factor in childhood leukemia is weak and the evidence that EMF is a risk factor for any disease other than leukemia is either absent or practically so. The World Health Organization and other agencies conclude that EMF presents the same cancer risk as coffee. The NIEHS concludes that the evidence for EMF as a health risk is insufficient to take strong regulatory action.

Based upon such evidence, this Board cannot find that EMF poses an unreasonable health risk such to deny the proposed Project or require significant cost expenditures such as requiring that the line be placed underground. However, based upon the fact there is some level of uncertainty surrounding the health effects of EMF, we require the Petitioners to examine options to reduce EMF levels along the line.

Finally, we express our concern with the misinformation that has been disseminated by groups opposed to this project. We have received letters from the public that begin with the words "I am scared" and continue on to state certain "facts" concerning the health risks of EMF, "facts" that are contradicted by the findings of international, national, and state health organizations. Engagement in these proceedings, rather than simply spreading fear, would be a far more responsible method of addressing the issue of EMF.

C. Alternatives

Commenters have stated that the proposed Project is not needed, that energy efficiency or generation could displace the need for the proposed Project. As we stated in Section II – *Need*, the electric grid in Vermont is not sufficient to meet the reliability criteria established by ISO New England, and determined to be appropriate by this Board. In order to meet these reliability

criteria, either the project must be built or an aggressive energy efficiency program, in conjunction with three 40 MW of bulk generation fossil fuel power plants must be developed.[221] *If* an aggressive energy efficiency program were begun sooner and *if* additional utility-scale generation were built in northwest Vermont, there would be a viable alternative to the proposed Project. However, these two measures have not been, nor can they be, implemented in sufficient time to ensure reliability in northwest Vermont.

We emphasize the need for fossil fueled bulk generation power plants because many of the public comments focused on the possibility of renewable energy displacing the need for the proposed Project. In a recent docket we compared the benefits and drawbacks of renewable power to baseload power plants such as the Vermont Yankee nuclear station.[222] Searsburg has the capacity to produce 6 MW of power. To meet the necessary reliability criteria, construction of 20 Searsburg- sized wind projects would need to be constructed in northwest Vermont. In addition, since wind projects typically run for only one-third of the hours in a year, each wind project would require the capability of storing power. Finally, transmission lines would need to be constructed to connect these 20 wind projects to the electric grid.

D. Motives for the proposed Project

A number of comments have stated that the project is merely for the benefit of VELCO, southern New England, or northwest Vermont. The evidence before us demonstrates that the primary beneficiaries will be the citizens of Vermont, who will benefit from the improved reliability, economic development, and enhanced safety that results from a more robust electric grid.

It is true that VELCO will benefit from the project through an increase in its equity, dividends from which have traditionally been used to reduce the bills charged to Vermont's ratepayers by VELCO's utility owners. However, other utilities benefit in the same manner through provision of electrical service to new residences. Simply because a utility benefits from a project does not discount the need or benefit of the project to the public as a whole.

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221. A bulk generation plant is one that is of utility scale and connected at transmission-level voltage. Exh. VELCO MDM-2 at 47, 51. A 40 MW bulk generation plant would be larger than any existing generation facility in Vermont other than the Vermont Yankee nuclear power station and the McNeil thermal plant.

222. Docket 6812, Order of 3/15/04 at 115–116.

Several commenters have asserted that the proposed Project is merely a "superhighway" to provide electricity from New York or Canada to southern New England. Under this theory, Vermont would bear the burdens of the project but would receive no benefit. The evidence in the record disputes this contention. As we have stated in Section II, the proposed Project is needed to ensure reliability for northwest Vermont.

Finally, there is a concern by some residents that this project only benefits northwest Vermont. The primary purpose of the project is to increase reliability in that region. However, the benefits of the project extend to all Vermonters, as described in Section VII.

E. Vermont Way

The last set of comments which we address are those that state that VELCO's practices, in pursuing the construction of this project, have not been consistent with the Vermont way of doing business. We share similar concerns about VELCO's actions.

VELCO has made several missteps throughout this Docket that have cost ratepayers money and extended the schedule for this Docket. For example, the initial design of the project had the 115 kV transmission line passing within 20 feet of a residence in Vergennes,[223] a design that was clearly problematic. The failure to perform leg-work up front has cost time and money. Six weeks were added to the schedule in this Docket due to the Petitioners' February 6, 2004, reroute filing. The costs of redesigning the line have not been addressed, and are not subject to this Board's jurisdiction, but these costs will be borne by Vermont ratepayers.

VELCO's actions with respect to its proposed routes near Ferry Road in Charlotte have also concerned this Board. At one point in these proceedings VELCO altered its preferred route near the Waldorf School and proposed placing the transmission line on the opposite side of the railroad track from the school. VELCO failed to inform the affected landowners of this change, necessitating yet another delay in the schedule to allow the Board to hear the concerns of the newly affected landowners.

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223. Tr. 2/19/04 (Vol. I) at 26 (Markowski).

F. Support for the proposed Project

The Board has received letters of support for the proposed Project. These commenters expressed concern with the level of electrical reliability. In particular, these comments stated that a reliable electrical grid is essential for attracting and retaining businesses. In addition, some representatives of medical centers stated that a high level of electric reliability is required for the safe and efficient functioning of medical centers.

G. Conclusion

The number of comments that we received on this Docket is an indication of both the importance and the scope of the proposed Project. In addition, the volume of comments speaks to the willingness of Vermonters to become involved in issues that are crucial to this state. Although the comments cannot directly form the basis of our decision, they have helped us in identifying and focusing on the issues that directly impact the lives of Vermont citizens.

XIV. CONCLUSION

After a rigorous examination of the evidentiary record and analysis of the legal arguments put forth by the parties in this Docket, we find that the proposed transmission upgrades will promote the general good of the state with the conditions that we have included in this Order. The evidence presented in this Docket has convinced us that the proposed Project can be constructed, with the alterations required by this Order, without undue adverse impacts on Vermont's natural and built environment and without presenting a risk to Vermonters' health and safety. In making this determination, we are troubled that apparent past inaction by VELCO in pursuing non-transmission alternatives may have required us to now approve the proposed Project in order to ensure the electrical reliability of northwest Vermont. For this reason, we are opening a separate investigation to examine methods of ensuring that non-transmission alternatives are presented in a timely manner.

To the extent the findings in this Order are inconsistent with any proposed findings, such proposed findings are denied.

XV. ORDER

IT IS HEREBY ORDERED, ADJUDGED AND DECREED by the Public Service Board of the State of Vermont that:

1. The proposed Project, in accordance with the evidence and plans submitted in this proceeding, and as modified and conditioned by this Order, will promote the general good of the State of Vermont in accordance with 30 V.S.A. § 248, and a certificate of public good to that effect shall be issued with the conditions set forth in paragraphs 2 through 20 below.

2. Petitioners shall file, for the Board's approval, final construction plans for the 345 kV line, 115 kV line, and the substation upgrades, concurrent with plans for aesthetic and environmental mitigation, as required by the post-certification process described in this Order. Petitioners may commence construction only after receiving approval for such plans, and receipt of all necessary permits.

3. For the post-certification review process, Petitioners shall take the following actions:

- Petitioners shall identify areas of high EMF levels close to existing residences and propose measures likely to mitigate EMF exposure at these locations.
- Petitioners must file all design detail construction plans, with associated environmental mitigation measures, as identified Section XII of this Order, with the Board, affected parties, affected municipal governments, and affected local and regional planning commissions.
- Petitioners must file a list of all required permits with the Board and the parties.
- Petitioners must file all required permits with the Board and the parties.
- Petitioners shall conduct pre- and post-construction noise measurements at all substations and file the results with the Board and affected parties.
- Petitioners must file with the Board, the Department, ANR, the Town of Ferrisburg, and any other party that requests a copy, an analysis of the impact of moving the transmission structure alongside the Slang in Ferrisburgh, on the osprey nest atop that structure.
- In its filings, Petitioners shall demonstrate that it has given careful consideration to all measures, as identified in Section V.B of this Order, for mitigation of adverse aesthetic impacts.

4. Petitioners shall file a schedule within two months of this Order identifying the permits, plans, and reports required for post-certification review and identifying the date upon

which each permit, plan, or report shall be filed. The schedule shall include dates by which the Petitioners would file the information set forth in paragraph 3 for each section of transmission.

5. Petitioners may commence construction of the reconductoring of its 115 kV line from Barre to Williamstown line.

6. Construction, operation, and maintenance of the proposed Project shall be in accordance with the findings and requirements set forth in this Order.

7. Petitioners shall coordinate with the local electric distribution utilities, telephone, and cable companies, to place the electric distribution, telephone, and cable lines underground in those areas where the Board has identified that such action is necessary for aesthetic mitigation.

8. Petitioners shall relocate the New Haven substation, consistent with the findings and conclusions of Section V.B, unless they can demonstrate that such action is not feasible.

9. Petitioners shall identify an acceptable configuration for the Ferry Road area consistent with the findings and conclusions of Section V.B.

10. Petitioners shall place the 115 kV line in the Bay Road area underground from approximately mile marker 23.8 to mile marker 25.1, consistent with the findings and conclusions of Section V.B.

11. Petitioners shall file a detailed archaeological report on the impact of placing the 115 kV line underground in the areas of Ferry Road and Bay Road by November 1, 2005.

12. Petitioners must file any agreement with Vermont Railways to locate the transmission structures within the railroad right-of-way with the Board.

13. Petitioners shall notify the Board as to any determinations made by United States Fish and Wildlife Service and/or ANR regarding the mitigation required for any possible adverse impacts on Indiana Bat populations.

14. Petitioners are required to monitor the populations of certain endangered, threatened, and rare species listed in Section V.C, for a period of five years following construction and draft a management plan to address the protection of endangered species within the transmission line right-of-way.

15. VELCO shall continue to monitor the state of scientific knowledge regarding health effects of EMF and report to the Board on an annual basis for the next five years, the results of such monitoring.

16. Petitioners shall 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 Erosion Prevention and Sediment Control Plans submitted to and approved by ANR for the proposed Project.

17. Petitioners shall file system studies that address the impact of placing portions of the 115 kV line underground on system stability and reliability, and include harmonic, continuous current, continuous voltage and electromagnetic transient analyses.

18. Petitioners shall file an analysis designed to identify the appropriate reactive support device necessary, examining both cost and system stability/reliability, for the Granite substation.

19. In selecting transformers for the proposed Project, the Petitioners must employ a methodology that accounts for the cost of transformer loss.

20. To ensure protection of archaeological resources, Petitioners must comply with the requirements of the Vermont Division of Historic Preservation, as set out in the Division's letter of June 29, 2004.

21. The Board will open an investigation into the responsibility of VELCO to explore and implement cost-effective, non-transmission alternatives to transmission upgrades. This investigation will revisit the Board's previous determination not to require VELCO to prepare an integrated resource plan and will assess whether deficiencies in VELCO's load forecasting has contributed to a lack of timely consideration of non-transmission resources. The investigation will also address, among other issues, the extent to which Vermont's electric distribution utilities should coordinate their planning and associated activities with VELCO's planning.

Dated at Montpelier, Vermont, this 28th day of January, 2005.

s/Michael H. Dworkin	
(With separate statement below)	PUBLIC SERVICE
s/David C. Coen	BOARD
	OF VERMONT
s/John D. Burke	

OFFICE OF THE CLERK

FILED: January 28, 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.

XVI. Separate Statement of Board Chairman Michael Dworkin

While I join the Board's opinion in this matter, I write separately on one point. We all agree that VELCO's proposal requires substantial mitigation in the area west of New Haven village, and today's Order requires relocation of the nearby substation as part of that mitigation. I believe that we could both save money and achieve greater mitigation benefits if we, instead, required VELCO to bury four-tenths of one mile of 115 kV line at the point where VELCO's proposed new route crosses Vermont Route 17 to the west of New Haven village.

There is no doubt that VELCO's proposed routing in this area would have undue adverse effects without significant mitigation. Our site visit showed (and the expert testimony confirmed) two important things. The view eastwards is sustained and includes farms and villages, backed by the broad sweep of our Green Mountains, including the Bristol Cliffs Wilderness Area and the cliffs themselves. The view westwards shows the farmland of the Champlain Valley, backed by open lake and 5,000 feet of rise to the Great Peaks of the Adirondacks. These views are not just beautiful; they also epitomize the Champlain Valley's motto of 'a land of milk and honey' – a working landscape surrounded by natural beauties that refresh us as we work and live. Here we see the balance that Vermonters have inherited, preserved and created.

An obvious question is why we should bury the wire here and not in many other lovely places? In many places, the impact of the new lines can be mitigated by better design, materials, and plantings. That is not the case in New Haven. Three factors drive my thoughts. First, while we can glimpse a balanced landscape in many places throughout Vermont, the New Haven views, even more than others, shows that balance to us all. The second is that, given the folds of land, the long straight highway, and the broad sweep of views, neither plantings nor differing pole designs are likely to adequately reduce the impact of the new line. The third is that the cost of an underground 115 kV crossing of Route 17 would actually be lower (perhaps as much as a million dollars lower) and the option would be easier for VELCO to implement than the relocation

alternative.[224] I am also aware that the weight of the expert testimony was that the burial of the wires at the crossing was of even greater aesthetic importance than the relocation of the substation. Thus, I can only conclude that — in this spot — the balance between adverse impacts and necessary mitigation does require a short length of burial, from the substation one-tenth of a mile south of Route 17 to the place where the view shifts, three-tenths of a mile north of the highway.

However, if the wires are not to be buried, I conclude that the substation should be moved in order to (at least partially) mitigate the adverse aesthetic impacts of the new wires.[225] Thus, I join with my colleagues in the Order above.

Dated at Montpelier, Vermont, this 28th day of January, 2005.

s/Michael H. Dworkin
Michael H. Dworkin, Chairman

224. Moving the substation is estimated to cost more than $2 million, with attendant design delays and a number of local siting concerns that have not yet been addressed. For line burial, the cost would probably be about half as much. The evidence in this case established a general rule-of-thumb that line burial would have an incremental cost of about $2.3 million per mile; i.e., $920,000 for four-tenths of a mile (assuming routine circumstances, a reliable four-cable design and transition structures at each end). In this case the cost should be even less, since: (1) the area is open, providing ease of installation; (2) one end of the buried wire would connect to a substation where considerable construction work will be necessary for other reasons; and (3) no splices would be required within this short length of buried cable.

225. I add that, if the New Haven substation cannot be relocated (a possibility that the Order above recognizes, but does not encourage), we will need to reconsider the value of burying the relevant wires at this location, and the necessity of doing so in order to avoid what would otherwise be an unduly adverse aesthetic impact.

Appendix A — Schedule of Hearings

Technical Hearings were held on the following dates:

February 11, 12, 13, 17, 18, 19, 20, 23, 24, 26, 27, 2004
March 1, 3, 4, 2004
April 29, 2004
June 10, 11, 15, 16, 17, 18, 2004
July 26, 27, 29, 30, 2004
August 4, 5, 6, 2004
September 21, 22, 2004
October 20, 2004
November 8, 9, 2004
December 2, 3, 6, 2004

Appendix B — Appearances

James Volz, Esq.
Aaron Adler, Esq.
Dixie Henry, Esq.
for Vermont Department of Public Service

Kimberly K. Hayden, Esq.
Elijah D. Emerson, Esq.
Primmer & Piper, P.C.
for Vermont Electric Power Co., Inc.

Thomas N. Wies, Esq.
for Vermont Electric Power Company, Inc.

John B. Kassel, Esq.
Shems Dunkel & Kassel, PLLC
for Vermont Electric Power Company, Inc.

Donald J. Rendall, Jr., Esq.
for Green Mountain Power Corporation

Peter H. Zamore, Esq.
Sheehey Furlong & Behm, P.C.
for Green Mountain Power Corporation

Warren Coleman, Esq.
David Englander, Esq.
for Vermont Agency of Natural Resources

Matthew Goldberg, Esq.
for ISO New England, Inc.

Bernard D. Lambek, Esq.
Zalinger Cameron & Lambek, P.C.
for ISO New England, Inc.

Anthony M. Macleod, Esq.
Whitman Breed Abbott & Morgan
for ISO New England, Inc.

Robert E. Fletcher, Esq.
Joseph S. McLean, Esq.
Stitzel, Page & Fletcher, P.C.
for Towns of Charlotte, Ferrisburgh and Shelburne and the City of Vergennes

Larry Simino, Chairman, Selectboard
for Town of Ferrisburgh

Fred S. Dunnington, Town Planner
for Town of Middlebury

James A. Dumont, Esq.
for Town of New Haven

Renny Perry, City Manager
James Ouimette, Esq.
for City of Vergennes

Elizabeth Fitzsimmons, Executive Director
for Vergennes Partnership

Adam G. Lougee, Executive Director
for Addison County Regional Planning Commission

Sandra Dragon, President
for Associated Industries of Vermont

John H. Marshall, Esq.
Downs Rachlin Martin, PLLC
for Central Vermont Chamber of Commerce, Franklin County Industrial Corporation, Greater Burlington Industrial Corporation, Vermont Home Builders & Remodelers Association, Vermont Society of Professional Engineers, Vermont Ski Areas Association, Vermont Chamber of Commerce and Vermont Business Roundtable, Lake Champlain Regional Chamber of Commerce

Fred Kosnitsky, Vice President
for The Voice for the Potash Brook Watershed

Mark Sinclair, Esq.
for Conservation Law Foundation

Vermont Public Interest Research Group

Cheryl L. Conner, Esq.
for Frederick M. Peyser, Jr.

Elaine Bodurtha, Esq.
for Frederick M. Peyser, Jr.

Mark & Kathy Gagnon
Pro Se

Donnel & Jo-Ann Dexter
Pro Se

Lorraine Gilians
Pro Se

Robert Bick
for Shelburne Park Homeowners

Harvey D. Carter, Jr., Esq.
for Vermont Citizens for Safe Energy, Inc.

Michael Hurlburt, President
for Vermont Citizens for Safe Energy, Inc.

Eben Markowski & Heidi Mahoney
Pro Se

Todd & Elizabeth Rheault
Pro Se

Edward V. Schwiebert, Esq.
Reiber, Kenlan, Schwiebert & Facey, P.C.
for Edward V. & Lauren G. Schwiebert

David J. Shlansky, President
for Burchfield Resources, LLC

Ray A. & Alison C. Simmons
Pro Se

Jeremy & Jennifer Towne
Pro Se

Gary W. Lange, Esq.
Swanson & Lange
for Gary W. Lange & Martha L. Redpath

David L. Grayck, Esq.
Cheney Brock & Saudek, P.C.
for Meach Cove Real Estate Trust

Robert H. Booher
Pro Se

Eric Durett
Pro Se

Catherine E.C. Hughes
Pro Se

Richard Poulin
Pro Se

Appendix C — Procedural History

On June 5 and June 9, 2003, Vermont Electric Power Company, Inc. ("VELCO") and Green Mountain Power Corporation ("GMP"), respectively, filed petitions with the Vermont Public Service Board ("Board") seeking a certificate of public good, pursuant to 30 V.S.A. § 248, for the construction of a new 345 kV transmission line from West Rutland to New Haven, the upgrade of a portion of a 34.5 kV and 46 kV transmission line from New Haven to South Burlington to a 115 kV transmission line, upgrades at a number of existing VELCO and GMP substations, and the reconductoring of an existing 115 kV transmission line from Williamstown to Barre, Vermont (collectively, the "proposed Project").[226]

The Board convened a prehearing conference on July 16, 2003, to establish a schedule for this Docket, identify potential parties, and explore any preliminary issues. During the prehearing conference several potential parties raised the issue of whether the Petitioners should be required to provide individual notice to all potentially affected landowners. The Board invited parties to provide comments on this issue.

Permissive intervention was granted to ISO New England, Inc., the Vermont Public Interest Research Group, the Conservation Law Foundation, Voice for Potash Brook Watershed, Vermont Citizens for Safe Energy, Inc. ("VCSE"), Shelburne Park Homeowners, Associated Industries of Vermont, Eben Markowski and Heidi Mahoney, Donnel and Jo-Ann Dexter, Mark and Kathy Gagon, Lorraine Gelians, Ray and Allison Simmons, Edward and Lauren Schwiebert, Burchfield Resources, LLC, Todd and Elizabeth Rheault, Jeremy and Jennifer Towne, Frederick M. Peyser, Central Vermont Chamber of Commerce, Franklin County Industrial Corporation, Greater Burlington Industrial Corporation, Lake Champlain Regional Chamber of Commerce, Vermont Business Roundtable, Vermont Chamber of Commerce, Vermont Home Builders and Remodelers Association, Vermont Society of Professional Engineers, Vermont Ski Areas Association, Town of Ferrisburgh, Town of New Haven, City of Vergennes, Vergennes Partnership, Town of Charlotte, Town of Shelburne, Town of Middlebury, and the Addison County Planning Commission.

226. *See* Appendix D for a comprehensive description of the proposed Project.

Public hearings were held on September 5, 2003, in Barre, Vermont, on September 29, 2003, in Brandon, Vermont, and on September 30, 2003, in Charlotte, Vermont.

On October 17, 2003, the Board issued an Order establishing preliminary groupings of intervenors for purposes of consolidating their participation in this Docket. Parties were grouped into categories such as public interests groups, landowners, business organizations, municipal governments, and local and regional planning commissions. In an Order dated November 24, 2003, the Board suspended the grouping requirements on the condition that parties voluntarily coordinate their efforts to the extent feasible.

On October 24, 2003, VCSE and Frederick M. Peyser, Jr. requested that the Board "order or otherwise secure a certification from Petitioner's counsel that it has given individual notice by mail to all landowners as of a date certain." The motion asserted that a significant number of potentially impacted landowners had not received individual notice from petitioner VELCO. On December 5, the Board issued an Order addressing this issue and examining the steps that VELCO had taken to notify individual landowners. VELCO contended that it had sent letters to individual landowners on July 26, 2003, and explained the process it used to determine affected landowners. On December 12, 2003, VCSE filed additional comments on this issue. On February 19, 2004, the Board ruled that VELCO had made a reasonable good faith effort to notify individual landowners, thus denying VSCE's request for an order of notice for individual landowners.

On February 6, 2004, VELCO filed proposed modifications to its petition. The proposed modifications included several changes to the route of the proposed 115 kV transmission line from New Haven to South Burlington, changes to substations located in Vergennes, Shelburne, Charlotte and South Burlington, and changes in pole heights for both the proposed 115 kV line and the proposed 345 kV line.

On February 25, 2004, the Board granted permissive intervention to Gary W. Lange and Martha L. Redpath and Meach Cove Real Estate Trust, landowners newly impacted by VELCO's February 6, 2004, reroute proposal.

In an Order dated March 5, 2004, the Board denied an objection to VELCO's February 6 reroute proposal and scheduled supplemental evidentiary and public hearings, required that the reroute proposal be noticed pursuant to 30 V.S.A. § 248(a)(4), established an appropriate

intervention deadline for newly affected persons, and allowed parties additional time to prepare for and address the issues presented by the original and amended petitions. The Board further required VELCO to take all reasonable efforts to make its original and amended petitions, its prefiled testimony and exhibits, and its previous discovery responses available to new and potential intervenors upon request.

Public Hearings regarding VELCO's proposed reroute were held on March 18, 2004, in Charlotte, Vermont, and on April 13, 2004, in Brandon, Vermont.

On February 6, 2004, New Haven filed a motion requesting that the Board compel VELCO, GMP and ISO-NE to seek regional cost support for conservation and other non-transmission alternatives to the proposed Project. On April 21, 2004, the Board denied New Haven's motion on the determination that the Board does not have the authority to take the action requested by New Haven.

On February 6, 2004, New Haven filed a motion requesting that the Board appoint an independent counsel and experts pursuant to 30 V.S.A. § 220 and 217. In an Order dated April 8, 2004, the Board denied New Haven's motion, stating that a broad range of views was being presented by the many parties to the Docket, leading to a full exploration of the issues. Consequently, the appointment of independent counsel or experts was not warranted.

On March 9, 2004, New Haven filed a "Motion for Partial Judgment (and pursuant to Vermont Rules of Civil Procedure 56 Summary Judgment) as to the 345 kV Line and Substation, or if Judgment is Denied, for an Order Conditioning Re-Opening of Petitioner's Evidence Upon Finding of Experts and Counsel to Respond to Re-Opened Evidence." New Haven contended that VELCO had not made a prima facie case for the Board to determine that the 345 kV line and New Haven Substation met the economic and least-cost criteria of 30 V.S.A. § 248. On May 28, 2004, the Board issued an Order denying New Haven's motion, stating that VELCO has not had a chance to be fully heard regarding the issue of the proposed 345 kV line and the New Haven substation. In addition, the Board concluded that New Haven was not entitled to summary judgment as there had been testimony on the need and least-cost criteria for the 345 kV line and the New Haven substation, and VELCO, under the Rules of Civil Procedure, was entitled to benefit of all reasonable doubts and inferences concerning the question of whether it had made a prima facie case.

On July 2, 2004, the Board issued an Order requiring VELCO to produce additional evidence regarding the aesthetic and environmental impacts of portions of its proposed Project. In particular, the Board required VELCO to provide detailed design information for eight sites in order to inform the Board's judgment regarding aesthetically and environmentally sensitive sites.

On July 2, 2004, the Department filed with the Board a "DPS Determination under 30 V.S.A. § 202(f)". The July 2 determination addressed the consistency of the proposed Project with the Department's 1994 Vermont Electric Plan. On July 20, 2004, New Haven and VCSE jointly filed motions requesting that the July 2 Determination be excluded from the evidentary record. On August 9, 2004, the Board issued an Order denying the New Haven and VCSE requests because the July 2 Determination had not been offered into evidence. However, pursuant to New Haven and VCSE's requests, the Board did take judicial notice of the Department's existing Twenty-Year Electric Plan.

On August 24, 2004, VELCO requested that the Board take administrative notice of the Department's July 2 Section 202(f) determination. On October 6, 2004, the Board granted VELCO's request. The Board noted that the use of the evidence was to be strictly limited, used only to show that the Department made the determination and could not be used to prove the truth of the matter asserted (i.e., whether the proposed Project is consistent with the 1994 Vermont Electric Plan). The Board further noted that the proposed Project's consistency with the Plan is neither an indisputable fact nor a generally recognized fact within the Board's expertise.

As a result of a design change in VELCO's proposed 115 kV line, on October 6, 2004, the Board granted permissive intervention to Robert H. Booher, Eric Durett, Catherine E.C. Hughes, and Richard Poulin who were newly affected by the change.

Appendix D — Detailed Project Description

This appendix provides a general description of the proposed Project. This represents the Project as proposed by the Petitioners, and includes all changes the Petitioners have proposed over the course of this proceeding. The Project as approved is subject to the modifications and conditions set forth in today's Order.

I. West Rutland to New Haven 345 kV Line

A. Construct a new, approximately 35.5-mile, 345 kV line within the existing VELCO West Rutland to New Haven 115 kV transmission corridor.
[Dunn pf. at 8; Boers pf. at 6-7; Dunn sup. pf. at 8-9; exhs. TD-3, TD-4, and DJB-8; Boers supp. pf. at 7; exhs. DJB-Supp(1)-1 through 3; exhs. Dunn/Harr-DD-1 through 7, 18.]

B. Work within existing VELCO West Rutland Substation.
[Boers pf. at 2-3; exhs. DJB-2, 3, and 4; exh. TD-4.]

1. Install two 345 kV breakers on existing 4-breaker ring bus.
2. No expansion to the fenced area is proposed.

C. Expansion of existing VELCO New Haven Substation.
[Boers pf. at 4-6; exhs. DJB-5, 6, and 7; exhs. TD-4 and TD-8.]

1. Install 4-position 345 kV ring bus (install 2 breakers initially).
2. Install 6-position 115 kV ring bus (presently contains two 115 kV line breakers).
3. Install 60 MVAR shunt reactor and breaker at New Haven 345 kV station (taps the 345 kV line via a breaker).
4. Install two 345/115 kV, 336 MVA autotransformers.
5. Install a 115/46 kV, 12.5 MVA transformer.
6. Existing 0.88-acre substation expanded to 6.80 acres.

II. New Haven to Queen City (South Burlington) 115 kV Line

A. Construct approximately 27 miles of new 115 kV line mostly along GMP's existing New Haven to Queen City 46 kV/ 34.5 kV transmission corridor.
[Dunn pf. at 9; Boers pf. at 18-30; exh. TD-5; exh. DJB-24; Dunn sup. pf. at 3-8; Boers supp. pf. at 8-11; exhs. TD-Supp(1)-1 through 3; exhs. DJB-Supp(1)-4 through 30; exhs. Dunn/Harr-DD-7 through 15.]

B. Remove the 46 kV line from New Haven to Vergennes (although most of the poles would remain because of the underbuilt distribution).
[Cecchini sup. pf. at 3, 5.]

C. Construct new VELCO Vergennes 34.5 kV Substation (approx. 1.5 acres fenced area).

[Dunn supp. pf. at 9-11; exh. TD-4; Boers pf. at 2-4; exhs. DJB-Supp(1)-31 through 34b.]

1. Install a 115/34.5 kV, 30 MVA transformer.
2. Install 4-position 115 kV ring bus (install 3 breakers initially).
3. Construct 0.5 miles of new 34.5 kV line between proposed substation and existing GMP 34.5 kV line to form a 1.6-mile radial connection between the proposed and existing Vergennes substations.
4. Existing Vergennes substation to remain in service.

D. Expansion of existing North Ferrisburgh Substation.

[Boers pf. at 10-12; exh. DJB-14.]

1. Install a 115/13.2 kV 20 MVA transformer and disconnect switches.
2. Construct a new 24 by 24 foot control building.
3. Existing 0.09-acre substation expanded to 0.33 acres.

E. Construct new VELCO Charlotte Substation (1.7 acres).

[Dunn supp. pf. at 11; exhs. TD-Supp(1)-2 & 5; Boers sup. pf. at 4-5; exhs. DJB-Supp(1)-35 through 38.]

1. Install a 115/12.47 kV 20 MVA transformer.
2. Install metalclad switchgear.
3. Install a 115 kV circuit switcher.
4. Existing Charlotte substation to be removed.

F. Complete reconstruction of existing Shelburne Substation.

[Dunn supp. pf. at 12; exhs. TD-Supp(1)-3 & 6; Boers supp. pf. at 5-6; exhs. DJB-Supp(1)-39 through 42.]

1. Install 115/12.47 kV 20 MVA Transformer.
2. Install metalclad switchgear.
3. Install a 115 kV circuit switcher.
4. Existing 0.10-acre substation expanded to 0.25 acres fenced area.

G. Expansion of existing VELCO Queen City (South Burlington) Substation.

[Dunn sup. pf. at 12-13; exh. TD-Supp(1)-7; Boers supp. pf. at 6-7; exhs. DJB-Supp(1)-43 through 46.]

1. Install 6-position 115 kV ring bus (install 4 breakers initially).
2. Existing 0.79-acre substation expanded to approximately 1.6 acres fenced area.

III. Expand existing VELCO Blissville (Poultney) Substation.
[Boers pf. at 38-40; exhs. DJB-37, 38, and 39.]

A. Install a 115 kV PAR, 200 MVA, 40 degree range.
B. Install two 115 kV breakers.
C. Existing 0.76-acre substation expanded to 0.93 acres.

IV. Work within existing VELCO Essex (Williston) Substation.
[Boers pf. at 31-32; exhs. DJB-25, 26, and 27.]

A. Install a 115 kV breaker on line K-24 (Essex to Berlin).
B. No expansion of the fenced area is proposed.

V. Expansion of existing Williston Substation.
[Boers pf. at 32-33; exhs. DJB-28, 29, and 30.]

A. Install a 3-breaker 115 kV ring bus.
B. Install a 115 kV breaker.
C. Expand existing 0.52-acre substation to 1.06 acres.

VI. Expansion of existing Hartford Substation.
[Boers pf. at 37-38; exhs. DJB-34, 35, and 36.]

A. Install a 24.75 MVAR capacitor and 115 kV breaker.
B. Install two 115 kV line breakers.
C. Expand existing 0.71-acre substation to 0.84 acres.

VII. Expansion of existing VELCO Granite (Williamstown) Substation.
[Boers pf. at 34-36; exhs. DJB-31, 32, and 33; Dunn reb. pf. at 14-15; exh. TD Reb-6; exh. Dunn/Harr-DD-16.]

A. 115 kV yard:
1. Install 2nd 230/115 kV, 300 MVA transformer.
2. Install +/- 150 MVAR [Dynamic reactive device/SVC (1st stage is +/- 75 MVAR)].
3. 1st and 2nd stages connected at separate bus positions on 115 kV ring bus.
4. Install three 115 kV breakers, completing a 6-position ring bus.
5. Install six 25 MVAR capacitor banks (1st stage is 4 capacitor banks, 2nd stage is 2 capacitor banks).

B. 230 kV yard:
1. Install a 4-position 230 kV ring bus (install 2 breakers initially).
2. Install 230 kV, 550 MVA PAR, 60-degree range.
3. Install one 230 kV breaker for the PAR.

C. Expand existing 4.72-acre substation to 6.66 acres.

VIII. Reconductor Granite (Williamstown) to Barre 115 kV line.
[Dunn pf. at 9; Boers pf. at 36; exh TD-3.]

A. Reconductor 115 kV line to 1272 ACSR (5.6 miles).