Comparison of Energy Efficiency to Supply-Side Resources – Case Study

(Excerpts from Public Service Board Final Order re VELCO Northwest Reliability Project, Docket No. 6860, January 28, 2005)

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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.

A. Overview of Today's Order

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

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.[1]

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

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

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.[1]

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 that Vermont's bulk transmission system will suffer two significant, concurrent failures at a period of high demand, the

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

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."[1] 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.[1]

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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.

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 plants[1] 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.[1] 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[1] 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.[1] Yet, if VELCO maintains, as it has before us in this proceeding, that it does not pursue demand-side or generation alternatives,[1] 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.[1] In the investigation we will also revisit the Board's previous determination not to require VELCO to prepare an integrated resource plan,[1] 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.[1] 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 planning. Finally, it appears likely that this investigation should also consider, or at least

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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

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.[1]

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A. Alternative Resource Configurations

1. 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.

2. 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.

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

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

Charge.

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.

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.

4. 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).

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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.

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

15. 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.

16. The present value of the expected total societal costs, without regard to Pooled Transmission Facility ("PTF") treatment,[1] of ARC 5 is approximately 5.19% less ($66 Million)

15. 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

than the present value of the expected total societal costs of the proposed Project. Montalvo pf. at 10–11 (Present Value cost Table).

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

22. 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

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total MW demand. Vermont's share of the proposed Project costs is estimated to be 4.1%. (Dunn pf. at 16).

> 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.

23. 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).

24. 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.

25. 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).

26. 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).

27. 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.

28. 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).

29. 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.

30. 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.[1] As the power deficit continues to increase, Vermonters would be exposed to more outage-related risks than we find to be acceptable.

16. Exh. VELCO MDM-2 at 26.

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.[1] 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.[1] 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 stations — could be implemented within the necessary timeframe.

CLF and other opposing parties also contend that VELCO was predisposed to a transmission-only solution.[1] 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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17. As noted in Finding 108, 475 MW of generation or load reduction would be needed to replace or defer the 115 kV line.

18. 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.

19. 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[1] 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."[1] 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.[1]

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.[1] 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.[1]

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20. 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.

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

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

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

24. Montalvo reb. pf. at 13.

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.[1] 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 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.[1] 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.[1]

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.[1] 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."[1] CLF asserts that VELCO was also obligated to determine which incentives would be necessary to "induce sufficient curtailment."

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25. CLF Brief at 58.
26. Chernick pf. at 15, fn. 8.
27. Montalvo reb. pf. at 14.
28. CLF Brief at 71.

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).

Demand-response programs are not instantaneous and thus cannot be called upon in emergencies.[1] Demand-response programs, while helpful to the system, cannot provide for contingencies in the same manner as transmission or generation.[1] 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.[1]

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29. CLF Brief at 72.
30. Mallory reb. pf. at 8.
31. Mallory reb. pf. at 8.
32. Mallory reb. pf. at 12.

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.[1] 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.[1] 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. [1] 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.

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

34. 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).

35. Exh. SHP-3 at 12.

It appears that in analyzing the alternatives, neither VELCO nor the DPS included a ten percent risk adjustment factor for demand-side measures.[1] CLF contends that, as a result, the 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.[1] Had VELCO and the DPS complied with Board precedent[1] 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"[1] 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.[1] 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.[1] 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

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36. 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 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.

37. CLF Reply Brief at 17.

38. *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).

39. CLF Reply Brief at 15.

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

41. *See* exh. OEI-1.

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 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.[1] 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).

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