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.

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

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.

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:

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.

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.

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

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).

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.