COMMONWEALTH OF MASSACHUSETTS

Energy Facilities Siting Board

)

In the Matter of the Petition of Boston Edison)

Company for Approval of its Occasional)

Supplement and Plan to Construct a New)

115/14kV Substation andTransmission Line in)

Milford and Hopkinton, Massachusetts)

)

)

The Petition of Boston Edison Company for)

Exemption of Proposed Transmission Lines,) EFSB 96-1

Transmission Station, Substation and Distribution)

Facilities from the Zoning By-Laws of the)

Towns of Milford and Hopkinton, Massachusetts)

and for a Determination that Proposed Transmission)

Lines, Transmission Station, Substation and)

Distribution Facilities are Necessary and Will Serve)

the Public Convenience and be Consistent With the)

Public Interest)

_____)

FINAL DECISION

Robert P. Rasmussen

Hearing Officer

December 22, 1997

On the Decision:

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The Energy Facilities Siting Board hereby APPROVES the petition of Boston Edison Company to construct two 1.3-mile long, 115-kilovolt underground electric transmission lines; a transmission station; a 115/14-kilovolt substation; and distribution facilities in the towns of Hopkinton and Milford, Massachusetts using the Company's preferred sites and routes.

I. INTRODUCTION

A. Summary of the Proposed Project

Boston Edison Company ("BECo" or "Company") is an investor-owned electric utility corporation engaged in the generation, transmission, distribution, purchase, and bulk and retail sale of electricity in forty communities in the Commonwealth of Massachusetts, including the Town of Hopkinton (Exh. BE-1, at 1-1).

BECo has proposed to construct two 1.3-mile long, 115-kilovolt ("kV") underground electric transmission lines which would be located beneath Purchase Street in Milford and South Street in Hopkinton (id. at 1-5). These two new transmission lines would connect the Company's proposed substation on South Street in Hopkinton ("South Street substation" or "Station #126") with a proposed transmission station, to be located off Purchase Street in Milford (id.). The proposed transmission station would provide an interconnection point with two existing, overhead 115-kV New England Electric System ("NEES") transmission lines, which run from Medway to Milbury and pass through Milford to the south of Hopkinton (id.).

For its preferred route, BECo has proposed two overhead taps to connect the two existing NEES transmission lines with the Company's proposed transmission station (id. at 1-5, fig. 1-1). The proposed Company transmission lines would then exit underground, from within the enclosed area of the transmission station, and proceed to Purchase Street and run north under Purchase Street into Hopkinton (id. at 1-5, 1-7). The transmission lines would then continue north under South Street in Hopkinton to the proposed site of the South Street substation (id.) (see Figure 1).

BECo also identified a comparable set of facilities using alternative sites and routes (id. at 1-7, fig. 1-2). The alternative facilities would tap the same NEES transmission lines at a point approximately two miles to the west of the preferred route tap site and connect with an alternative transmission station, which would be located off East Street in the Town of Upton (id. at 1-7). The two new transmission lines would then exit underground, from within the enclosed area of the alternative transmission station, and proceed to East Street and run north under East Street and School Street approximately 1.1 miles to an alternative substation which would be located near the intersection of School Street and West Main Street in Hopkinton (id.) (see Figure 2).

BECo indicated that the transmission station at either site would be located on an approximately 140-foot square area surrounded by a seven-foot high barbed-wire fence, and would consist of four manually operated disconnect switches, two single pressure sulfur hexafloride circuit breakers, two sets of measuring transformers, surge protection equipment and cable terminators (Exh. BE-AJ-1, at 4). A 25-foot square control house would house the control equipment and a storage battery for control power, and two 40-foot tall shielding masts(1) would be located within the enclosed area (id.; Exhs. BE-AJ-4; Hopkinton-RR-1). In addition, to effect the tap of the NEES transmission lines, BECo would locate two sets of three steel poles on the NEES right-of-way ("ROW") and three short sections of wire would connect the existing transmission lines to an incoming bridge structure, within the transmission station, by way of the new set of three steel poles (Exhs. BE-1(att. A); HO-E-14). The existing NEES steel structures which support the existing transmission lines will either be raised by approximately ten feet or replaced (id.).

The proposed substation at either site would consist of two 24/32/40 mega-volt ampere ("MVA"), 115/14-kV low-noise transformers and two sections of 14-kV switchgear equipped with a total of 12, 14-kV feeder positions (Exh. BE-1, at 1-5). The transformers

would be enclosed on three sides by sound barriers to attenuate noise, and the entire substation would be enclosed by a seven-foot high barbed-wire fence (id.).

In addition to the proposed new transmission lines, transmission station and substation, BECo would install new distribution circuits and equipment connecting the proposed substation at either site to the existing distribution system, using routes which vary depending on the substation site chosen (id. at 1-7, 1-9).

B. Procedural History

BECo filed its "Occasional Supplement to the Long Range Forecast" ("petition") with the Energy Facilities Siting Board ("Siting Board") on March 11, 1996. In its petition, the Company sought approval of its plans to construct the South Street substation, two new 115-kV transmission lines, and the associated transmission station and distribution facilities. The Siting Board docketed the petition as EFSB 96-1. The Company requested a postponement of the public hearings on its petition and memorialized the Siting Board's approval of the postponement in a May 10, 1996 letter. On November 1, 1996, BECo filed an Addendum to its Occasional Supplement ("Addendum") and requested the Siting Board to proceed with the adjudication in this docket. On December 4 and 5, 1996, the Siting Board conducted public hearings on the petition and addendum in the Town of Milford and the Town of Hopkinton, respectively. In accordance with the direction of the Hearing Officer, BECo provided notice of the public hearings and adjudication.

Timely petitions to intervene were submitted by: the Town of Upton Board of Selectmen ("Town of Upton"); the Town of Milford; the Town of Hopkinton Board of Selectmen ("Town of Hopkinton"); State Senator Richard T. Moore; State Senator David P. Magnani; State Representative Barbara Gardner; State Representative Marie J. Parente; the Office of the Attorney General for the Commonwealth ("Attorney General"); Andrej Thomas Starkis, Esq.; Mr. Douglas Vrooman; Ms. Mary M. Plummer; and Brendan J. Perry and Joseph F. Oliveri d/b/a/ Interface Realty Partnership ("IRP"), Sovereign Development, Ltd. ("Sovereign") and Interface Electronics Corp. ("IEC"). In addition, timely petitions to participate as an interested person were received from Richard A. Amato and Ms. Stephanie Atanian. BECo also submitted a letter indicating that it had no objection to the granting of interested person status to Mrs. Eleanor Broderick, who made an oral request for such status following the conclusion of the public hearing in Hopkinton. On December 19, 1996, the Conservation Law Foundation, Inc. ("CLF") filed a late-filed petition to intervene on a limited basis.

The Hearing Officer allowed the petitions to intervene of: the Towns of Upton, Milford(2) and Hopkinton; Senators Moore and Magnani; Representatives Gardner and Parente; the Attorney General; Attorney Starkis; Mr. Vrooman; Ms. Plummer; and IEC.(3) See Hearing Officer Procedural Order, January 17, 1997, at 6-7. The Hearing Officer also allowed the petitions to participate as an interested person of: Mr. Amato;

Ms. Atanian; Mrs. Broderick; and CLF. Id. at 7.

The Siting Board conducted seven days of evidentiary hearings commencing June 11, 1997 and ending June 26, 1997. BECo presented four witnesses: Amin R. Jessa, a senior supervisor engineer for the Company, who testified regarding the need for the project, the project approach comparison, the site/route selection process, and costs and reliability of the proposed and alternative facilities; Pamela M. Chan, senior program director in the Air Quality Consulting and Engineering Group for Earth Tech, an environmental engineering and consulting firm, who testified regarding alternative approaches including alternative sites and routes; Daniel J. Stuart, senior environmental scientist for Earth Tech, who testified regarding environmental issues and permitting; and Dr. Peter A. Valberg, principal at Gradient Corporation and adjunct associate professor of environmental health at the Harvard School of Public Health, who testified regarding electric and magnetic fields ("EMF") and their potential health effects.

The Town of Hopkinton presented three witnesses: William Teuber, vice president and chief financial officer for EMC Corporation ("EMC2"), who testified regarding the financial impact of power outages experienced at EMC2; Daniel Fitzgerald, director of corporate facilities for EMC2, who testified regarding the future energy requirements for EMC2; and Maureen Dwinnell, the treasurer-tax collector for the Town of Hopkinton, who testified regarding the need for reliable electric service in the Town of Hopkinton.

The Town of Upton presented written testimony of one witness, Richard A. Amato, the owner of the Amato Farm which is located near the site of the alternative substation site and abuts the route of the alternative transmission lines, who testified regarding the impacts of construction of the alternative facilities on his home and business.

Senator Magnani, the State Senator for the Town of Hopkinton, provided testimony regarding the need for increased electrical reliability and capacity for the industrial parks in the Town of Hopkinton.

The Hearing Officer entered 119 exhibits into the record, consisting largely of responses to information and record requests. The Company entered 32 exhibits into the record. The Attorney General entered 45 exhibits into the record. Representative Parente entered 38 exhibits into the record. Senator Magnani entered 3 exhibits into the record. The Town of Milford entered 65 exhibits into the record. The Town of Upton entered 95 exhibits into the record. The Town of Hopkinton entered 18 exhibits into the record. Attorney Starkis entered 53 exhibits into the record. Mr. Vrooman entered 116 exhibits into the record.

Initial briefs were filed by BECo ("BECo Initial Brief"), the AG ("AG Brief"), the Town of Hopkinton ("Hopkinton Brief"), Attorney Starkis ("Starkis Initial Brief"), and CLF ("CLF Brief") on August 4, 1997. Reply Briefs were filed by BECo ("BECo Reply Brief") and Attorney Starkis ("Starkis Reply Brief") on August 11, 1997.

C. Jurisdiction

The Company's petition is filed in accordance with G.L. c. 164, § 69H, which requires the Siting Board "to implement the energy policies . . . to provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost," and pursuant to G.L. c. 164 § 69J, which requires electric companies to obtain Siting Board approval for construction of proposed facilities at a proposed site before a construction permit may be issued by another state agency.(4)

The Company's proposal to construct two 1.3-mile long, 115-kV electric transmission lines falls squarely within the second definition of "facility" set forth in G.L. c. 164, § 69G. That section states, in part, that a facility is:

(2) any new electric transmission line having a design rating of sixty-nine kilovolts or more and which is one mile or more in length except reconductoring or rebuilding of existing transmission lines at the same voltage.

The Company also proposes to construct a new transmission station and new substation in Milford and Hopkinton, respectively. The third definition of facility set forth in G.L. c. 164, § 69G is pertinent in determining whether the transmission station and substation are jurisdictional facilities. In that third definition a facility is defined as:

(3) any ancillary structure including fuel storage facilities which is an integrated part of the operation of any electric generating unit or transmission line which is a facility.

The Siting Board has interpreted the term "ancillary structure" in its prior decisions, and has stated that such a structure is a "facility" within the meaning of G.L. c. 164, § 69G if (1) the structure is subordinate or supplementary to a jurisdictional facility, and (2) the structure provides no benefit outside of its relationship to the jurisdictional facility. See Commonwealth Electric Company, EFSB 96-6, at 4 (1997) ("1997 ComElec Decision"); New England Power Company, EFSB 95-2, at 5 (1996) ("1996 NEPCO Decision"); Commonwealth Electric Company, 17 DOMSC 249, 263 (1988) ("1988 ComElec Decision").

The Company has stated, and the Siting Board agrees, that the proposed transmission station, substation and associated distribution facilities will be supplemental to the jurisdictional transmission facilities and would provide no benefit in the absence of the jurisdictional transmission lines (See Company Initial Brief at 4). Accordingly, the Siting Board finds that the proposed transmission station, substation and associated distribution facilities are facilities within the meaning of the third definition of facility in G.L. c. 164, § 69G.

BECo also filed with the Department of Public Utilities ("Department") petitions pursuant to G.L. c. 164, § 72 and G.L. c. 40A, § 3 that relate to the need for, construction of, and siting of the proposed facilities. These petitions were docketed by the Department

as D.P.U. 96-35 and D.P.U. 96-36, respectively. Although the Department has initial jurisdiction over such petitions, G.L. c. 164, § 69H(2) provides that the Siting Board may accept such matters for review and approval or rejection that are referred by the Chairman of the Department pursuant to G.L. c. 25, § 4, provided that it shall apply Department and Siting Board standards in a consistent manner. The Chairman referred these two petitions to the Siting Board on April 25, 1996 in an Order in which these matters were consolidated with the Siting Board docket in EFSB 96-1. The Siting Board hereby accepts for review these two petitions.

D. Scope of Review

In accordance with G.L. c. 164, § 69H, before approving an application to construct facilities, the Siting Board requires applicants to justify transmission line facility proposals in three phases. First, the Siting Board requires the applicant to show that additional energy resources are needed (see Section II.A, below). Next, the Siting Board requires the applicant to establish that its project is superior to alternative approaches in terms of cost, environmental impact, reliability, and ability to address the previously identified need (see Section II.B, below). Finally, the Siting Board requires the applicant to show that its site selection process has not overlooked or eliminated clearly superior sites, and that the proposed site for the facility is superior to a noticed alternative site in terms of cost, environmental impact, and reliability of supply (see Section III, below).(5) Additionally, in the case of an electric company which is required by G.L. c. 164, § 69I to file a long-range forecast with the Department, the applicant must show that the facility is consistent with the electric company's most recently approved long-range forecast. G.L. c. 164, § 69J. BECo is an electric company required to make such a filing and to make such a showing.(6)

II. ANALYSIS OF THE PROPOSED PROJECT

A. Need Analysis

1. Standard of Review

In accordance with G.L. c. 164, § 69H, the Siting Board is charged with the responsibility for implementing energy policies to provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. In carrying out this statutory mandate with respect to proposals to construct energy facilities in the Commonwealth, the Siting Board evaluates whether there is a need for

additional energy resources(7) to meet reliability, economic efficiency, or environmental objectives. The Siting Board must find that additional energy resources are needed as a prerequisite to approving proposed energy facilities.

2. Description of the Existing System

The Company indicated that the Town of Hopkinton is supplied by seven 14-kV distribution lines, three of which are tapped off BECo Distribution System Supply ("DSS") lines, and four of which are supplied directly from 115/14-kV Company-owned distribution substations (Exh. BE-1, at 2-2). The Company explained that two 14-kV distribution lines, 65-1325H3 and 65-1325H4, are tapped off DSS line 65-1325H, which extends from BECo Substation 65 in Medway to BECo Substation 274 in Sherborn, and that line 519-75H1 is tapped off DSS line 519-75H, which supplies BECo Substation 519 in Framingham from BECo Substation 274 in Sherborn (Exhs. BE-1, at 2-4; DV 1.1(att.)). Of the remaining four lines, the Company indicated that the 65-H2 and 65-H6 lines originate at Substation 65 in Medway and extend into Hopkinton from Holliston,(8) while the 274-H2 line is supplied from Substation 274 in Sherborn, and the 455-H3 line is supplied from Substation 455 in West Framingham (Exh. BE-1, at 2-2). The Company stated that the 14-kV distribution circuits supplying Hopkinton extend nine to eighteen miles from their 14-kV supply source, averaging 10.7 miles in exposed length (id.; Exh. BE-AJ-1, at 6).(9) The Company also stated that the present distribution system serving Hopkinton has a firm capacity of approximately 41 MW (Exhs. BE-3; BE-AJ-1, at 6; Tr. 2, at 73).

The Company indicated that the NEES 115-kV transmission line facilities that pass through Upton and Milford near Hopkinton's southern border, do not supply power directly to Hopkinton (Exh. BE-1, at 4-6).(10)

3. Reliability of Supply

BECo asserted that the proposed project is needed both to improve the reliability of electric service to its customers in Hopkinton and to serve forecasted load growth (id. at 1-1). BECo stated that Hopkinton historically has experienced poor reliability of electric service due to its rapid growth, location on the western edge of BECo's service territory, and lack of a local source of electric supply (id. at 1-3 to 1-4, 2-6 to 2-8).(11) BECo identified two problems with the existing 14-kV distribution supply configuration that result in reduced system reliability (id.). First, the Company stated that Hopkinton is supplied by long overhead distribution supply lines from sources located in Framingham, Medway, and Sherborn (id.). The length of these lines renders them susceptible to a high frequency of service interruptions (id.). Second, the Company stated that Hopkinton has

experienced voltage stability problems as a result of excessive voltage drops and associated failures on the system (id.). The Company asserted that the large number of voltage regulators which have been added in the Hopkinton area to help control these problems will, over time, increase reliability problems, since voltage regulators are mechanical devices subject to external stresses and eventual internal degradation (Tr. 2, at 21). BECo also stated that peak summer load on this system is projected to increase during 1997 and 1998, and noted that this projected load growth would potentially increase service interruptions and voltage stability problems (Exh. BE-AJ-1, at 8).(12)

BECo stated that it previously installed two major rounds of distribution system reinforcements to address the reliability and capacity problems first experienced in Hopkinton during the 1980's (Exhs. HO-N-1b; BE-1, at 1-3, 2-4). BECo indicated that the first round of reinforcements was completed in 1988 and included the installation of 14-kV spacer cable, power transfers from nearby circuits, establishment of new distribution circuits, conversion of 4-kV service areas to 14-kV, and the installation of radio controlled devices and reclosing equipment to provide quick load transfer capability to reduce outage durations (Exh. BE-1, at 1-3, 2-4). BECo stated that the second round of reinforcements, which were installed beginning in the summer of 1995, included an expanded preventative maintenance program, replacement of existing 175-kilovolt-ampere ("kVA") voltage regulators with 250-kVA models, installation of new technology fuses to prevent voltage sags under certain fault conditions, load transfer from unregulated to regulated circuits, one distribution circuit extension, and the establishment of two new distribution circuits (id.). BECo asserted that these reinforcements, while providing the best reliability under the existing supply configuration and expected short-term loads, do not solve the fundamental problems in Hopkinton associated with circuit length (id. at 2-5). Beyond the two distribution system reinforcements described above, the Company added there would be one additional reinforcement option available if conditions warrant (Exhs. HO-N-3b; ATS-8).(13)

The Company stated that, at present, in the event of the failure of any of the distribution feeders supplying Hopkinton load, it would transfer loads from unaffected parts of the circuits to adjacent circuit(s) while attempting to keep circuit loads within their respective ratings and maintain proper voltage levels (Exh. HO-N-3c).

In this Section, the Siting Board first examines the reasonableness of the Company's system reliability criteria. The Siting Board then evaluates: (1) whether the Company uses reviewable, appropriate and reliable methods for assessing system reliability based on load flow analyses; (2) whether existing and projected loads, either normally or under certain contingencies, exceed the Company's reliability criteria, thereby requiring additional energy resources; and (3) whether acceleration of C&LM programs could eliminate the need for such additional energy resources.

a. Reliability Criteria

i. Positions of the Parties

The Company cited four distribution system reliability criteria which are applicable to the reliability problems experienced in the Hopkinton Supply Area ("HSA").(14) These four criteria are: (1) to maintain single contingency firm service on an emergency basis until a fault is repaired or defective equipment is replaced; (2) to maintain equipment loadings within their respective emergency capacity ratings during a single contingency, and within their normal capacity ratings during normal operating conditions; (3) to maintain acceptable voltage levels at each customer;(15) and (4) to maintain on a qualitative basis acceptable levels of reliability with respect to distribution system performance in supply areas, including frequency of interruptions and voltage level deviation (Exh. BE-1, at 2-5, 2-6). The Company's witness, Mr. Jessa, testified that BECo does not use strict reliability criteria for indicators such as voltage deviation and frequency of interruptions, but qualitatively compares performance in supply areas such as the HSA with norms for overall system operation (Tr. 3, at 121-122).

The Company stated that the distribution circuits that supply electric power to Hopkinton range in length from nine to 18 miles, and are over twice the typical length for overhead distribution circuits system-wide (Exh. BE-1, at 2-7). The Company also stated that the frequency of interruptions experienced by Hopkinton customers is approximately 1.5 times greater than the average for the entire BECo overhead distribution system (Exh. Milford 1-5; Tr. 3, at 123). The Company explained that this high frequency of interruptions is due primarily to the high average length of the distribution circuits supplying Hopkinton (Exh. BE-1, at 2-7). BECo presented records of specific interruptions on the distribution circuits that supply Hopkinton (id.).

On the issue of voltage, Mr. Jessa testified that the HSA has more distribution voltage regulators than in other cities and towns throughout BECo's service territory -- 18 sets(16) of voltage regulators overall and up to four sets on individual circuits (Exh. BE-3, at 3; Tr. 2, at 20-21). Mr. Jessa added that the HSA is the only area within BECo's service territory that uses any 250-kVA voltage regulators, or that has more than two sets of 175-kVA voltage regulators on a single circuit (Tr. 2, at 21; Tr. 3, at 105). The Company indicated that voltage regulators, like other mechanical equipment, can fail, and that the high number of voltage regulators in the HSA increases the exposure of the HSA to reliability problems associated with equipment failures (Tr. 3, at 118). The Company further indicated that subjecting voltage regulators to loads above their rating increases their failure rate (id. at 88). The Company's outage records indicate that voltage regulator failures have accounted for 20 percent of interruptions on one of its distribution circuits, and less than ten percent of interruptions on each of the other distribution circuits (Exh. DV 1.4; Tr. 3, at 162).

ii. Analysis

The Siting Board consistently has found that if the loss of any single major component of a supply system would cause significant customer outages, unacceptable voltage levels, or thermal overloads on system components, then there is justification for additional energy resources to maintain system reliability. Norwood Municipal Light Department, EFSB 96-2, at 11-12 (1997) ("Norwood Decision"); 1996 NEPCo Decision, EFSB 95-2, at 10; New England Power Company, 21 DOMSC 325, 339 (1991) ("1991 NEPCo Decision").

With respect to BECo's reliability criteria relative to the maintenance of firm service, equipment loadings and, voltage levels, the Siting Board agrees that operation of BECo's distribution system within the parameters BECo has identified, helps avoid overloads, voltage instability, and outages, and is therefore essential for providing a reliable, least-cost energy supply.

Accordingly, the Siting Board finds that BECo's reliability criteria relative to the maintenance of firm service, equipment loadings, and voltage levels are reasonable for purposes of this review.

With respect to BECo's qualitative comparison of the HSA with system-wide operational statistics concerning frequency of interruptions and voltage level regulation, the Siting Board agrees that both indicators identified by the Company are potentially important measures of a distribution area's performance. The Siting Board notes, however, that it has not previously reviewed the need for a new transmission line based on qualitative comparisons for the performance indicators that BECo identifies.

In some past reviews, the Siting Board has considered on a case-by-case basis reliability criteria which were based on indicators that were new or of special relevance in those cases. See, Norwood Decision, EFSB 96-2, at 9-12; 1991 NEPCo Decision, 21 DOMSC at 325. In those cases, applicants sought to justify new or case-specific reliability criteria based on comparisons to industry practices and experience within the applicant's own system, rather than on comparison to the applicant's system alone. Id.

In the Norwood Decision, EFSB 96-2, at 12, the Siting Board reviewed criteria premised on the expectation that voltage concerns and line losses arise from use of long feeder lines. In that decision, the Siting Board noted that direct indicators of voltage concerns such as high average feeder line length, coupled with outage and complaint records showing reduced reliability, might well be an appropriate reliability-based system design criterion. Id. Here, BECo has cited the HSA's longer-than-average distribution supply lines as an underlying factor accounting for both the high incidence of outages and abnormal voltage deviations on the system.

While the Company has related feeder line length to performance indicators, i.e., outage frequency and voltage regulation problems, the Siting Board notes that the record does not indicate how the Company selects and justifies thresholds for identifying the presence of unacceptable performance. The Siting Board notes that BECo's comparison approach

might have been more appropriate for use in establishing need if it relied on a fixed standard or comparison to industry practice, rather than relying solely on a comparison to BECo's own system-wide norm.(17) However, the Siting Board recognizes that a comparison approach may reasonably demonstrate need if, for example, such comparisons demonstrate a very significant deviation from a company's system-wide norm. Therefore, the Siting Board finds reasonable the approach of identifying particular performance indicators, e.g., incidence of outage or voltage regulation problems, to serve as a basis for the determination of an unacceptable level of reliability.

The Siting Board concludes that, consistent with our requirement as set forth in the Norwood Decision, BECo has presented evidence of high average feeder line length in conjunction with a high frequency of outages or other service interruptions in Hopkinton. Further, to support its position that such indicators demonstrate a need for additional energy resources, BECo has presented evidence as to the extent of deviation of such indicators from the Company's system-wide norms.(18) Therefore, BECo has established that outage frequency comparisons constitute a potentially reasonable basis for establishing need as part of the Siting Board's system configuration analysis in this review (see Section II.A.3.c, below).

Accordingly, the Siting Board finds that BECo's reliability criteria relative to the maintenance on a qualitative basis of acceptable levels of reliability with respect to distribution system performance in supply areas, including frequency of interruptions and voltage level deviation, are reasonable for purposes of this review.(19)

The Siting Board notes that the Company's qualitative comparison-based criteria may also be appropriate for use in conjunction with other need analyses that are based on fixed reliability limits or thresholds, rather than for use as stand-alone indicators of need.(20) The Siting Board further notes that for purposes other than establishing need, e.g., for comparing alternative project approaches or facility-level alternatives, a comparison to system-wide norms may also be appropriate.

b. Load Forecasts

The Siting Board statute requires that forecasts be based on substantially accurate historical information and reasonable statistical projection methods. See G.L. c. 164, §§ 69J and 69I. To ensure that this standard has been met, the Siting Board and the Department have consistently required forecasts to be reviewable, appropriate and reliable. Norwood Decision, EFSB 96-2, at 14-15; Colonial Gas Company, D.P.U. 96-18, at 5 (1996); Northeast Utilities, 17 DOMSC 1, 6 (1988). A forecast is reviewable if it contains enough information to allow full understanding of the forecasting method. A forecast is appropriate if the method used to produce the forecast is technically suitable to the size and nature of the utility that produced it. A forecast is reliable if the method provides a measure of confidence that its data, assumptions, and judgments produce a

forecast of what is most likely to occur. Boston Edison Company, 24 DOMSC 125, 146 (1992); Commonwealth Electric Company/Cambridge Electric Company; 22 DOMSC 116, 124-125 (1991); Commonwealth Electric Company/Cambridge Electric Company; 12 DOMSC 39, 42 (1985).

i. Positions of the Parties

The Company argued that Hopkinton has experienced significant load growth over the past five years and is one of the fastest growing portions of BECo's service territory (Company Initial Brief at 12).(21) In support of its argument, the Company provided historical and projected loads for Hopkinton and the HSA, and also provided projected loads from its system-wide forecast for the portion of its system, identified as Region 12, which encompasses Hopkinton and the HSA (Exhs. HO-N-7b; HO-N-1(att.); HO-RR-5(att.); ATS-1; Tr. 4, at 11).(22)

With respect to its Hopkinton forecast, the Company indicated that it develops town-specific forecasts based on projections of growth in existing load and additions of new load, developed for both residential and commercial/industrial components of load (Exh. HO-N-7a).(23) The Company indicated that Hopkinton peak load was 25 MW in 1995, and projected peak load will increase to 40 MW in 1998 and 44 MW in 2000 (Exh. ATS-1b). The Company indicated that the forecasted peak load of 44 MW in the year 2000 represents a nearly three-fold increase from 1990 levels (Exh. ATS-1; Tr. 4, at 11). The Company attributed approximately 83 percent of the projected 1995-1998 increase in peak load to the planned operation of five new or expanded facilities at EMC2 on South Street in Hopkinton (Exh. BE-1, at 1-3 to 1-4).(24)

With respect to its forecast for Region 12, the Company indicated that it uses system-wide forecast methods for residential, commercial and industrial components of load (Exh. HO-N-7).(25) Mr. Jessa stated that the system-wide model then forecasts loads for each region of BECo's service territory by analyzing the performance of substations located within each region (Tr. 4, at 131). In addition, BECo also relied on information provided by the Massachusetts Department of Communities and Development ("MDCD") and local planning boards in developing its Region 12 forecast (Exh. HO-RR-5). The Region 12 forecast shows a peak load of 265 MW in 1995, and a projected peak load of 300 MW in 1999

(Exh. HO-RR-5).

Mr. Jessa stated that, based on consultation with the preparer of the system-wide forecast, he concluded that there was a high degree of consistency in the approaches used and the results of the Region 12 forecast and the Hopkinton forecast (id.; Exh. HO-N-7a). Prior to finalizing the forecast data for the Town of Hopkinton, Mr. Jessa stated that he and the preparer of the system-wide forecast met to ensure that their respective forecasts, as they

applied to Hopkinton, were consistent (Tr. 4, at 131). Mr. Jessa confirmed that he treated the system-wide forecast as a given, and added that any corrections to inconsistencies were made to the Hopkinton forecast, but that any differences that the Company believed reflected more accurate information for the Hopkinton forecast were retained (id. at 136-138).

Mr. Starkis argued that BECo's forecast of load growth in Hopkinton is almost entirely dependent on growing demand from EMC2, and that EMC2 has stated that it now has sufficient power to meet its projected needs (Exhs. BE-1, at 1-3 to 1-4; DJF-1, at 3; Starkis Initial Brief at 7; Starkis Reply Brief at 2).(26) Further, Mr. Starkis argued that during testimony, in contravention to the Town of Hopkinton's assertion of growth at EMC2's Hopkinton facilities, Daniel Fitzgerald and William Teuber, both of EMC2, discussed only a company-wide revenue-growth projection of 25 percent which they did not specifically relate to growth at the Hopkinton facilities (Starkis Reply Brief at 3, citing, Tr. 7, at 89-92).

ii. Analysis

The record indicates that BECo has submitted load growth projections based on expected loads in Hopkinton's residential and commercial/industrial sectors. In addition, BECo analyzed its Hopkinton forecast to establish its consistency with the system-wide forecast for BECo's Region 12, the larger service area in which the Town of Hopkinton is situated.

In previous transmission line reviews, the Siting Board has stated that, in facility reviews where a company projects load growth for a portion of its service territory, the Siting Board will require the company to use quantitative techniques where sufficient data is available, or other systematic techniques, and to document all pertinent assumptions to support the allocation of system-wide growth to service areas and to individual substations within the service areas. 1997 ComElec Decision, EFSB 96-6, at 14; 1991 NEPCo Decision, 21 DOMSC at 344.

Here, BECo has indicated that it uses end-use models and other quantitative techniques to develop a system-wide forecast. With respect to the allocation of system-wide growth to Region 12, however, BECo indicated only that it developed projected loads based on the performance of substations within regions, and also used information from MDCD and local planning boards. As for BECo's Hopkinton forecast, the record indicates that it is based on projections of growth in existing load and additions of new load.

The Siting Board notes that the Company did assess the consistency of its Hopkinton forecast with its Region 12 forecast. Mr. Jessa testified that the Company made some adjustments to its Hopkinton forecast to address inconsistencies with the Region 12 forecast, but also retained differences where the Company believed that the Hopkinton

forecast reflected more accurate information. The record indicates that, with these adjustments for consistency, the Hopkinton forecast still incorporates growth rates that are well in excess of those reflected in the Region 12 forecast. The Siting Board further notes that, consistent with previous Siting Board reviews, the Company has relied on a combination of quantitative and judgmental factors to assess consistency between the two forecasts. See, 1996 NEPCo Decision, EFSB 95-2 at 12-13; 1995 NEPCo Decision, 4 DOMSB at 126-127.

Here, the Company has used a step-down approach to develop its region-level forecast, and compared that forecast's consistency with the Hopkinton forecast. However, the record does not indicate whether, and if so how, BECo used quantitative or other systematic techniques to allocate system-wide growth to service areas, e.g., Region 12, or individual substations within the service area, as required by the Siting Board's standard of review.

Further, the record does not include sufficient documentation of the Company's methods for the Siting Board to conclude that the Hopkinton forecast is reviewable or appropriate as those terms are defined above. Thus, BECo has not demonstrated that the Hopkinton forecast, considered on a stand-alone basis, meets our statutory requirement.

With regard to the Hopkinton forecast, the record indicates that EMC2 accounts for approximately 83 percent of the short-term growth in the Hopkinton forecast. Thus, in this case, the reliability of BECo's forecast depends to a significant degree on the accuracy of projected requirements for EMC2.

Mr. Starkis argued that BECo has failed to establish need because the record does not contain EMC2's commitment to expand at its Hopkinton facilities as opposed to elsewhere. However, although EMC2 accounts for approximately 83 percent of the Company's short-term peak load growth in Hopkinton, BECo has pursued the proposed project to meet overall needs in the community, not specifically to provide a dedicated supply to EMC2. Further, we note that simply because EMC2 accounts for a large share of projected growth, it does not follow that little or none of the growth attributable to EMC2 would materialize in the absence of EMC2's continued or expanded operations in Hopkinton. Rather, the record supports an expectation that the projected growth may well reflect a variety of demographic and economic opportunity factors present in Hopkinton -- notably the accessibility from Route 495 -- that transcend the decision of any one industrial customer to expand or not expand in the community.

The Siting Board is concerned that BECo has failed to adequately demonstrate either (1) that it used quantitative or other systematic techniques to derive its Region 12 forecast and/or its Hopkinton forecast from its system-wide forecast, or in the alternative (2) that it used reviewable and appropriate methods to develop its Hopkinton forecast.(27) The Siting Board also notes that the large share of growth attributable to EMC2, although unusual, does not justify a lack of attention to documentation of forecast allocation methods in the review. In the present case, the Siting Board has recognized that some of the 83 percent of forecasted short-term growth attributed to EMC2 likely also reflects

demographic and economic opportunity factors attributable to the service area, as distinct from reflecting only EMC2's presence as a customer. Generally, a company's forecast provides the means to document any such factors that affect load growth. In addition, the record indicates that an approximately 17 percent share of BECo's forecasted short-term growth is not attributable to EMC2.

The Siting Board notes that when a single customer accounts for a large share of projected growth in a service area for which facility improvements are proposed, it is prudent to closely monitor that customer's planned growth as it relates to its future energy and load requirements. Specifically, the Siting Board expects that, as part of a continuing monitoring of the load growth in a community in which a facility has been approved, a company should obtain at frequent intervals prior to the commencement of construction of such approved facilities, updates from all major customers concerning their expectations with respect to future energy and load requirements and alter their construction activities appropriately.

The Siting Board finds that a general step-down forecast approach is a reasonable and acceptable method for forecasting subareas within a company's service territory provided it (1) fully identifies the geographic and any other components of that company's forecast framework at the regional forecast level, and the relationship of such components to the system-wide forecast, and (2) fully describes the methods for deriving region level forecasts from the system-wide forecast, and the application of those methods to derive the specific forecast for the region in which the proposed project is located. However, here the Siting Board finds that, although the extent of growth forecasted for Hopkinton is substantial, BECo has not established that its forecast is reviewable, appropriate, or reliable.

c. Equipment Loading and Configuration Analysis

In this Section, the Siting Board considers whether there is a need for additional energy resources based on BECo's reliability and design criteria.

i. Positions of the Parties

BECo asserted that electrical facilities serving Hopkinton would be operating near or in excess of their maximum capacity ratings in the 1998-2000 time-frame (Exh. BE-1, at 2-10; Tr. 3, at 96). In addition, the Company indicated that its existing exposure to outages and voltage instabilities on the long HSA distribution feeders was inconsistent with its system reliability planning and design criteria (Exh. BE-1, at 2-5, 2-6).

BECo indicated that the maintenance of firm service under a single contingency, without overloading equipment, was its primary reliability criteria (id.) (see Section II.A.3.a, above). The Company stated that implementation of the third set of distribution reinforcements, potentially necessary during 1997-1998, would be the last reasonable short-term alternative to the proposed project (Exh. HO-N-3b; Tr. 3, at 96). The Company indicated that these reinforcements, and the two sets of reinforcements that preceded them, were never intended as long-term solutions to Hopkinton's reliability problems (Tr. 3, at 43). The Company provided system diagrams and tables showing equipment loadings on the distribution system serving the HSA under normal operations and worst-case contingencies for 1997 and 1999 (Exhs. HO-N-3(att. 2); BE-AJ-10; BE-3, at 1 and revised tables N-3a-3, N-3a-4). The Company indicated that it developed projected loadings for 1997 based on the existing system and projected loadings for 1999 assuming implementation of the third stage of distribution reinforcements (Exhs. HO-N-3(att. 2); BE-AJ-10; Tr. 3, at 96-97). The Company also provided estimates of voltage drop and compensation requirements for selected circuits, based on results of its loading calculations and information on circuit length and size (Exh. AG-1(att.), table 1; Exh. DV-1.1; Tr. 4, at 139-158).(28)

BECo stated that for the Summer of 1997, it analyzed the worst-case contingency on the existing HSA system of a 14-kV bus section failure at Substation 65 in Medway, which resulted in the unscheduled loss of both the 587-1365H DSS line and the 65-H2 distribution circuit (Exhs. BE-3, at 1, 3; AG 1-9). BECo indicated that, under this contingency, the emergency rating of the 455-H3 distribution circuit would be exceeded (Exhs. BE-3, at 1; HO-N-3, table N-3a-2). BECo further indicated that, under the same contingency, unstable voltage conditions would occur on portions of the 65-1365H4 line for a "good amount of time," in contravention of its reliability standards, until switching operations were performed (Tr. 3, at 146-153).

BECo stated that for the Summer of 1999, it analyzed the same worst-case contingency on the existing HSA system which resulted in the unscheduled loss of the same distribution circuit and DSS line as under the Summer 1997 scenario (Exhs. BE-3, at 2, 3, Table N-3a-3; HO-RR-1, table N-3a-3). BECo indicated that, under such contingency, the emergency rating of the 65-H5 distribution circuit would be substantially exceeded (Exh. HO-RR-1, table N-3a-3). BECo further indicated that under Summer 1999 normal load without any contingency, the normal rating of the 65-H2 distribution circuit would be exceeded (id.).

The Company also provided comparative data as to the length of supply circuits on the 14-kV distribution system, and associated reliability concerns, including a high incidence of outages and problems with voltage regulation (Exhs. BE-1, at 2-7; HO-N-6). The Company stated that Hopkinton's supply circuits range in length from nine to 18 miles, and are over twice the typical length for overhead distribution circuits system-wide (Exh. BE-1, at 2-7).

With respect to outages, BECo presented records of specific interruptions on the distribution circuits supplying Hopkinton (Exh. DV-1.4A; HO-N-6).(29) Senator

Magnani provided a survey and other information concerning commercial/industrial and residential electrical failures and complaints in Hopkinton (Exhs. HO-N-14(att.); DPM-1(atts.); ATS-DPM-1; ATS-DPM-1(supp.); ATS-TOH-4; ATS-TOH-4(supp.)). The Company stated that the frequency of interruptions experienced by Hopkinton customers is approximately 1.5 times greater than the average for the entire BECo overhead distribution system (Exh. Milford 1-5; Tr. 3, at 123). The Company explained that the high frequency of interruptions experienced is due primarily to the high average length of the distribution circuits supplying Hopkinton (Exh. BE-1, at 2-7). With respect to voltage, the Company stated that Hopkinton's residential and business customers frequently experience unacceptable voltage level deviations (id. at 2-8).

Andrej T. Starkis argued that the Company has failed to demonstrate either the need under G.L. c. 164, §§ 69I and 69J, or the reasonable necessity under G.L. c. 40A, § 3, for the proposed project. Mr. Starkis argued that the proponents of the proposed project have, in aggregate, produced no credible evidence to support the alleged electrical reliability problems associated with the existing distribution supply system in Hopkinton (Starkis Initial Brief at 7-8; Starkis Reply Brief at 4). Further, Mr. Starkis noted that in contravention of the Company's position regarding the mere presence of voltage regulators on a circuit, and a corresponding potential increase in both exposure and internal regulator failure, record evidence indicated that only about 10 percent of aggregate interruptions appeared to be attributable to voltage regulator presence (exposure) or failure (Tr. 4, 106-107; Starkis Reply Brief at 5).

With regard to Senator David P. Magnani's testimony, Mr. Starkis noted that it was accompanied by a compilation of business survey results prepared by EMC2's Corporate Community Involvement Manager, and later supplemented (Exhs. DPM-1; ATS-DPM-1 (supp.); Starkis Initial Brief at 7). Mr. Starkis stated that of those businesses, less than half reported any problems (Starkis Initial Brief at 7). Of those businesses that did report problems, Mr. Starkis added that few provided sufficient specifics to evaluate the relevancy of those problems to the Company's petition (id.). Mr. Starkis noted that some of the problems cited were problems dating back to the late 1980s, while other problems that were cited corresponded to massive weather-related outages throughout eastern Massachusetts (id.). Mr. Starkis argued that yet other problems cited reflected significant exaggeration of the scope of the problems encountered (id.).

Mr. Starkis also claimed that the Town of Hopkinton's records submitted as evidence were sparse and similarly ambiguous (Exh. MLD-1(exhs. a, b, c); Tr. 7, at 153; Starkis Initial Brief at 7-8; Starkis Reply Brief at 4). Further, he noted that in response to an intervenor information request, the Town of Hopkinton supplied only two July, 1987 letters from EMC2's General Counsel, indicating the "veritable plague of outages" it was experiencing at that time (Exh. ATS-TOH-4(supp.)(atts. 2, 3); Starkis Initial Brief at 8).

Mr. Starkis also argued that the record does not support the Company's argument that BECo's circuits will experience overloading absent the proposed project, particularly in light of BECo's anticipated system reinforcements (Starkis Reply Brief at 2). Mr. Starkis argued that the Company's analysis projects overloads only in Medway near Substation

65, and that the assumptions of load growth and system operation associated with that overload are only as accurate as Mr. Jessa's projections (Starkis Reply Brief at 2).

The Town of Hopkinton noted that even with BECo's short-term distribution improvements in place, EMC2 still experienced two outages in April, 1997 and two outages and one low-voltage condition in June, 1997 (Exh. DJF-1, at 4; Tr. 7, at 40, 72-84). The Town of Hopkinton argued that this provides evidence that reliability problems in the Town persist and "invariably will increase" (Hopkinton Brief at 7).

The Town of Hopkinton also noted that the record indicates that power-reliability problems have been a concern since as early as 1989 (id., citing, Exhs. ATS-TOH-4(sup.) (att. 2); MLD-1, at 5-6). The Town of Hopkinton stated that the Company has attempted to resolve its reliability problems within the confines of the present configuration of BECo's facilities serving Hopkinton (Hopkinton Brief at 10). The Town of Hopkinton argued that the Siting Board should not penalize a company for instituting short-term remedies by requiring the company to then wait for additional data as to the effectiveness of those short-term remedies before instituting more long-range solutions as to do so would be a disincentive to companies to attempt to address problems in the short-term (id.).

ii. Analysis

The Company has developed analyses of equipment loadings and voltage levels on the distribution system serving the HSA under normal operations and worst-case contingencies

for 1997 and 1999. The Company described its methods for calculating load flow by system component and identifying equipment loading excedances, and provided full HSA results on a set of system load flow diagrams. With respect to voltage levels, the Company described its calculation methods and provided analyses that showed exceedances of its voltage criteria.(30)

The Company also provided detailed documentation of outages in the HSA for the years 1993 through 1995. The Company then presented comparative statistics for the HSA and the overall BECo service area with respect to (1) the incidence of outages, and (2) system characteristics that potentially relate to outage rates and other performance indicators, including average distribution line length and extent of reliance on voltage regulation.

The Siting Board finds that the Company used reviewable and appropriate methods for assessing the reliability of its supply based on appropriate system reliability planning and design criteria.

The Company and other parties have provided outage and complaint records, cited above,

that indicate that the extended feeder lines that serve Hopkinton, ranging from 9 to 18 miles and averaging 10.7 miles in length, result in a frequency of interruptions that is 1.5 times the system average. The record demonstrates that extended feeder lines also result in higher impedance and voltage drops along these lines.

In addition, the Company has projected that equipment loadings would exceed capacity ratings under peak load as early as 1997. As indicated in Section II.A.3.b, above, the Siting Board was unable to find that the Company's forecast met the Siting Board's standard of review. However, the record indicates EMC2's load increased 2 MW between 1995 and 1996, and that BECo expected EMC2's ongoing expansion in Hopkinton to result in 7 MW of additional load between 1996 and 1997 and further increments of additional load beyond 1997. Although the Company's overall forecast of as much as 44.5 MW of load in Hopkinton by 2000 cannot be accepted as reliable, the Company's 1997 contingency analysis is based on a Hopkinton load of 35.0 MW -- 9.5 MW less than the projected level for 2000.

Based on recent load levels in Hopkinton and the expectations for expansion and associated load requirements at EMC2 through 1997, the Siting Board concludes that the peak load in Hopkinton is likely to reach the level underlying the Company's 1997 contingency analysis within the 1997-2000 time frame. Thus, based on the record, the Siting Board finds that the 1997 contingency analysis provides a reasonable basis for establishing need in this review.

The Siting Board finds that the Company's analysis demonstrates that (1) under the worst-case single contingency with the present configuration, emergency ratings on one or more existing distribution lines would be exceeded beginning in 1997, and (2) under the worst-case single contingency with the present configuration, the voltage level on an existing distribution line would be inconsistent with system reliability criteria beginning in 1997. In addition, the Siting Board finds that the frequency of interruptions in the HSA is higher than system norms, and considered together with other existing and expected violations of system reliability criteria (noted in (1) and (2), above) in the HSA, such frequency of interruptions is inconsistent with the operation of a reliable system.

The Siting Board is not persuaded that it is appropriate to analyze the record in a manner that ignores the fact that short-term solutions are not equivalent to long-term solutions, as urged by Mr. Starkis.(31) Rather, we agree with the arguments of the Town of Hopkinton that penalizing a company for instituting short-term remedies by requiring the companies to then wait for additional data as to the effectiveness of those short-term remedies would be a disincentive to companies to attempt to address problems in the short-term.

The record demonstrates that, even with the first two sets of short-term remedies in place, as recently as June, 1997, outage and voltage deviation conditions are still occurring in Hopkinton. The fact that BECo may be able to rectify such conditions were it to complete the third set of short-term distribution system reinforcements does not negate the evidence as to unacceptable reliability with the existing configuration.(32) Nor does the availability of a short-term solution detract from an analysis suggesting that only a long-

term solution would meet all identified needs (see also Section II.B, below).

As noted above, the Siting Board has previously held that if the loss of any single major component of a supply system would cause significant customer outages, unacceptable voltage levels, or thermal overloads on system components, then there is justification for additional energy resources to maintain system reliability. Accordingly, consistent with this precedent, the Siting Board here finds that BECo has established that there presently is a need for additional energy resources in Hopkinton based on the Company's reliability criteria.

d. Accelerated Conservation and Load Management

G.L. c. 164, § 69J requires a petitioner to include a description of actions planned to be taken to meet future needs and requirements, including the possibility of reducing requirements through load management.

i. Positions of the Parties

The Company argued that although C&LM programs may marginally reduce loads at certain points on the HSA system, the acceleration of such programs would not rectify the underlying problems in the HSA associated with distribution supply circuit length and exposure, or the consequent equipment failures, frequency of service interruptions, and unacceptable customer voltage levels (BECo Initial Brief at 13).

BECo asserted that, given the nature of the electrical supply problems in the HSA, accelerated C&LM efforts would not address the identified reliability need (Exhs. BE-1, at 2-10, 2-11; AG 1-14; HO-N-8b). BECo further asserted that the reliability problems faced in Hopkinton require a comprehensive solution that will result in a dramatic reduction in the length of overhead distribution circuits, and indicated that measures such as C&LM and distributed generation were, therefore, accordingly weighted (Exh. AG 1-16).(33)

BECo stated that it offers a full range of C&LM programs to its residential and commercial/industrial customers throughout its service territory (Exhs. BE-1, at 2-10 to 2-11; MJP 1-13; HO-N-8a). BECo indicated that penetration of these programs in Hopkinton is consistent with the rate of penetration of C&LM programs throughout BECo's service territory (Exh. BE-1, at 2-10 to 2-11). BECo provided documents detailing its C&LM and energy conservation measure programs at EMC2 (Exh. AG 1-17(supp.)(atts.)).(34) BECo provided annual potential load reductions in Hopkinton as a result of C&LM efforts (Exh. HO-N-8a). BECo projects that C&LM will provide annual

load reductions of 1.82 MW to 2.02 MW from 1997 through 1999 (id.). BECo indicated that the commercial/industrial component of those savings would exceed 1 MW annually in the same timeframe (id.; Exh. MJP 1-13).

The Attorney General argued that the Company failed to consider Demand Side Management ("DSM")(35) and distributed generation technologies as need options in their analysis and recommendations in this proceeding(36) (Attorney General Brief at 1, citing, Exhs. AG 1-16; AG 2-5; BE-1; BE-2). The Attorney General stated that two separate reports, conducted on behalf of BECo during 1995, identified Hopkinton as an area with high potential savings from targeted DSM and distributed generation technologies, which could help BECo avoid higher-than-average transmission and distribution ("T&D") costs(37) for the Hopkinton area (Exhs. AG-3, at 8; AG-4A).(38) The Attorney General argued that, based on these reports alone, the Company should have at least included a detailed analysis of investments in such alternatives located proximate to the load, instead of the more costly T&D investments in the Hopkinton area (Attorney General Brief at 2). Finally, the Attorney General encouraged the Siting Board to direct the petitioner to investigate the impact that DSM and distributed generation technologies, collectively referred to by the Attorney General as distributed utility planning, would have in the Hopkinton area, and to commence a pilot project to introduce said technologies into this area during 1998 (id.).

CLF noted that the two reports, cited above and provided by the Attorney General, were prepared for the BECo DSM Settlement Board in 1995 (CLF Brief at 3). CLF stated that both reports specifically identify the Hopkinton area as prime for the use of distributed generation and C&LM as alternatives to conventional T&D system investments (id.). CLF stated that in responding to Exhibit AG 2-12, BECo stated that Hopkinton area reliability problems and the ability to maintain customer choice created the need for a more comprehensive solution (id. at 4). CLF asserted that, by not conducting a rigorous analysis, BECo has not demonstrated that Hopkinton's electrical problems could not be addressed by a sophisticated distributed generation and C&LM solution (id.). Finally, CLF requested that the Siting Board require BECo to conduct an extensive analysis of the feasibility and cost-effectiveness of an alternative utilizing distributed generation and C&LM (id. at 5).

ii. Analysis

The record demonstrates that while C&LM efforts, either accelerated or at expected annual incremental levels, could theoretically alleviate some of the equipment overloads, thereby increasing the reliability of some portions of the HSA, it would not appreciably eliminate the aggregate length and corresponding exposure of the Hopkinton distribution supply system, or provide a long-term solution to the potential load growth on that system in the Hopkinton area during the next several years. The record demonstrates that a reasonable acceleration of planned DSM programs would not be sufficient to meet the

identified need. Therefore, an extensive analysis of the feasibility and cost-effectiveness of a C&LM alternative is not warranted. See, 1996 NEPCo Decision, EFSB 95-2, at n.2, 17. Here, the Siting Board has acknowledged that the present configuration of the HSA distribution supply system is unique enough, in terms of its high average length and corresponding exposure, that system improvements beyond C&LM are needed. In addition, although the Siting Board has not found BECo's load forecast to be reliable, the Siting Board agrees with the Company that, if Hopkinton load does increase by the projected 19.5 MW over the 1995-2000 period, it is unlikely that even accelerated C&LM efforts in Hopkinton would provide any significant long-term relief from the identified reliability problems.(39),(40)

Therefore, based on the above, the Siting Board sees no need to direct the Company to further investigate accelerated C&LM as an alternative to the proposed project.(41) However, the Siting Board expects that BECo will encourage the implementation of C&LM measures whenever and wherever possible throughout its service territory. Further, in future proceedings where the identified need relates primarily to the need for additional capacity in a targeted area, the Siting Board may require a more extensive analysis of the feasibility and cost-effectiveness of a C&LM alternative.

Accordingly, the Siting Board finds that acceleration of C&LM programs could not eliminate the identified need for additional energy resources based on BECo's reliability criteria.

e. Conclusions on Reliability of Supply

The Siting Board has found that BECo's reliability criteria relative to the maintenance of firm service, equipment loadings, and voltage levels are reasonable for purposes of this review. The Siting Board also has found reasonable the approach of identifying particular performance indicators, e.g., incidence of outage or voltage regulation problems, to serve as a basis for the determination of an unacceptable level of reliability, and has found that BECo's reliability criteria relative to the maintenance on a qualitative basis of acceptable levels of reliability with respect to distribution system performance in supply areas, including frequency of interruptions and voltage level deviation, are reasonable for purposes of this review.

The Siting Board has further found that BECo has not demonstrated that the Hopkinton forecast, considered on a stand-alone basis, represents a forecast that meets our statutory requirement. In addition, the Sting Board has found that, although the extent of growth forecasted for Hopkinton is substantial, BECo has not established that its forecast is reviewable, appropriate, or reliable.

The Siting Board has also found that the Company used reviewable and appropriate methods for assessing the reliability of its supply based on appropriate system reliability planning and design criteria, and that the Company's analysis demonstrates that (1) under the worst-case single contingency with the present configuration, emergency ratings on

one or more existing distribution lines would be exceeded beginning in 1997, and (2) under the worst-case single contingency with the present configuration, the voltage level on an existing distribution line would be inconsistent with system reliability criteria beginning in 1997. In addition, the Siting Board has found that the frequency of interruptions in the HSA is higher than system norms, and considered together with other existing and expected violations of system reliability criteria (noted in (1) and (2), above) in the HSA, such frequency of interruptions is inconsistent with the operation of a reliable system. The Siting Board has therefore found that BECo has established that there presently is a need for additional energy resources in Hopkinton based on the Company's reliability criteria.

Finally, the Siting Board has found that acceleration of C&LM programs could not eliminate the identified need for additional energy resources based on BECo's reliability criteria.

Accordingly, the Siting Board finds that additional energy resources currently are needed for reliability purposes in Hopkinton.

In making this finding, the Siting Board notes that it has not relied on the future forecasted load projected by BECo beyond 1997 and reviewed in Section II.A.3.b, above. As set forth in that section, the Siting Board rejected that forecast, based on the failure of BECo to fully explain the methods it used in its step-down forecast approach. Nevertheless, the Siting Board notes that if BECo's projections of load growth beyond 1997 do in fact occur, reliability problems in the Hopkinton area likely will be either more pronounced than indicated by the analysis above, or will occur sooner than expected.

B. Comparison of the Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69H requires the Siting Board to evaluate proposed projects in terms of their consistency with providing a necessary energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. In addition, G.L. c. 164, § 69J requires a project proponent to present "alternatives to planned action" which may include: (a) other methods of generating, manufacturing, or storing; (b) other sources of electrical power or natural gas; and (c) no additional electric power or natural gas.(42)

In implementing its statutory mandate, the Siting Board requires a petitioner to show that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. 1997 ComElec Decision, EFSB 96-6, at 22; Norwood Decision, EFSB 96-2, at 20; Boston Edison Company, 13 DOMSC at 63, 67-68, 73-74 (1985). In addition, the Siting Board requires a petitioner to

consider reliability of supply as part of its showing that the proposed project is superior to alternative project approaches. 1997 ComElec Decision, EFSB 96-6, at 23, Norwood Decision, EFSB 96-2, at 21; Massachusetts Electric Company, 18 DOMSC at 383, 404-405 (1989).

2. Development of Project Approaches

The Company presented four alternative approaches for meeting the identified need in the Hopkinton area: (1) the proposed project;(43) (2) the installation of a new single-transformer 115/14-kV substation in Hopkinton, similar to the proposed project in location and layout, supplied by a single 1.3-mile long underground transmission line ("one transformer alternative"); (3) a low voltage alternative to supply Hopkinton center via approximately eight miles of new underground 14-kV distribution circuits in ductbanks from an existing BECo substation in Sherborn to Hopkinton center ("low voltage alternative"); and (4) local generation to provide 30 MW of firm capacity at a single site or at multiple locations in Hopkinton ("local generation alternative") which included an analysis of both a combustion turbine option and a fuel cell option (Exh. BE-1, at 1-5, 3-1 to 3-3).(44),(45)

The Company stated that the proposed project would have the capability to add 80 MW of capacity to the HSA, with a firm capacity of 40 MW (Exh. BE-2, at 3-3; Tr. 4, at 71, 92). The Company indicated that the configuration of the HSA distribution system would be changed such that the proposed project would serve 80 percent of the Hopkinton load and that the remaining areas, located close to the Hopkinton-Holliston or Hopkinton-Ashland border, would be served by circuits from substations located in Framingham, Medway and Sherborn (Tr. 3, at 29).(46) BECo noted that there were several possible routing options for the proposed project (Exh. BE-1, at 4-13 to 4-24). For purposes of comparing the different alternatives, the Company assumed that the proposed project would tap the existing NEES 115-kV transmission line via a new BECo transmission station, and that the 115-kV transmission lines would extend underground from the transmission station northerly under Purchase Street across the Hopkinton town line to the site of the proposed South Street substation (id.).

The Company stated that the one transformer alternative would follow the same route and have essentially the same environmental impacts as the proposed project, but would provide only 40 MW of capacity to the HSA (Exh. BE-1, at 3-4; Tr. 4, at 92). The Company stated that the one transformer alternative would cost approximately $3 million less than the proposed project (id. at 3-6; Tr. 4, at 76).

The Company stated that the low voltage alternative would consist of the construction of

an eight-mile underground ductbank with four new distribution circuits located entirely in local streets and Route 135, with no overland portions (Exh. BE-1, at 3-2; Tr. 4, at 126). The low voltage alternative would begin at Station 274 in Sherborn, travel on local streets to Route 135 in Framingham, continue through downtown Framingham, through Ashland and end at the center of Hopkinton, in the vicinity of town hall (Tr. 4, at 125). The Company stated that the cost of the low voltage alternative would be approximately $13.27 million

(Tr. 4, at 81; Exh. DV-1.29, att. 2).

The Company initially analyzed a local generation alternative consisting of three 15 MW gas-fired combustion turbines ("CTG alternative") at a single location near the South Street industrial area, providing 30 MW of firm capacity (Exh. BE-1, at 3-2). As in the case of the proposed project, the configuration of the HSA distribution system would be changed such that the generation alternative would serve approximately 80 percent of Hopkinton load (Tr. 2, at 14; Tr. 3, at 29).

In response to questions concerning the use of a distributed generation alternative using renewable energy sources rather than combustion turbines, the Company asserted that fuel cells were the only distributed resource technology that could possibly provide capacity to meet the 30 MW need (Exh. AG-2-12; Tr. 4, at 44).(47) Further, the Company asserted that any type of distributed generation would have to be located in the South Street area, proximate to the load, in order to meet the identified need (Exh. AG-2-12). For purposes of addressing the questions raised about the option of distributed generation, the Company outlined a fuel cell scenario consisting of an unspecified number of units assumed to occupy a space of 2.5 square feet per kW, or 75,000 square feet for 30 MW ("fuel cell alternative") (id.).

However, the Company argued that local generation of any kind within Hopkinton would not fully remove the reliance on extended feeder lines, and therefore could only partially correct the fundamental problems associated with the present supply configuration (Exh. HO-A-2). The Company stated that because either local or distributed generation could only partially address the reliability problems in Hopkinton, could involve significantly greater environmental impacts, and would result in greater costs than the proposed approach, generation of any kind within the Town of Hopkinton was not further considered as a project approach (id.) (See Section II.B.5, below).

Both CLF and the AG expressed concerns regarding BECo's early dismissal of distributed generation as a project approach. CLF asserted that the opportunity to explore distributed generation and C&LM in Hopkinton was identified and presented to BECo at least two years ago through two reports prepared for the Boston Edison DSM Settlement Board (id. at 3, citing, Exh. AG-3; AG-4A). CLF asserted that BECo did not thoroughly investigate distributed generation and C&LM alternatives before proposing the project (id. at 4). CLF argued that, to ensure that BECo is providing a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, the Siting Board should require BECo to conduct an analysis of the feasibility and

cost-effectiveness of using clean distributed generation and C&LM (id. at 5).

The Attorney General, while not questioning the need for the proposed project or BECo's cost analysis, asserted that BECo improperly overlooked distributed utility planning when developing the proposed project (AG Brief at 1). The Attorney General argued that, given that two separate reports which identified the potential for high savings from distributed generation versus traditional high-cost T&D projects, BECo should have prepared a detailed analysis comparing distributed generation and targeted DSM as alternatives to the proposed project (id. at 2). The Attorney General urged the Siting Board to require the Company to investigate the impacts that distributed utility planning would have in the Hopkinton area, and to implement a pilot project in the area in the next year in conjunction with the construction of the proposed facilities (id.).

3. Ability to Meet the Identified Need

In Section II.A.3.c, above, the Siting Board found that there is a need for additional energy resources based on the Company's reliability criteria relative to (1) the maintenance of firm service, equipment loadings, and voltage levels under worst case contingencies, and (2) frequency of outages. In this section the Siting Board evaluates whether each approach would provide a reliable supply to the HSA consistent with the Company's reliability criteria for equipment loadings and voltage levels.

a. Proposed Project

The Company asserted that the proposed project would meet the identified need by providing for sufficient firm capacity at the Hopkinton load center to meet future load growth, maintain acceptable voltage levels, and improve reliability (Exh. BE-1, at 3-3). The Company indicated that the proposed project would: provide approximately 80 MW of firm system capacity to meet expected load growth; reduce the average length of overhead circuits from 10.7 miles to 4 to 5 miles, thereby reducing the frequency of outage and voltage problems;(48) and reduce the number of voltage regulators from 18 sets to two operating sets and two backup sets, thereby reducing the number of incidences of voltage regulator failure (id. at 2-4; Tr. 3, at 32; Tr. 4, at 71). The Company presented a load flow diagram indicating that with the implementation of the proposed project, as of the summer of 1999, all circuits would function within normal ratings under normal load and within emergency ratings under a single contingency (Exh. BE-AJ-8).

The record demonstrates that the proposed project would meet projected load under a single contingency without exceeding equipment capabilities; and remove the current dependence on extended feeder lines that has resulted in a high frequency of outages, exceedence of BECO's voltage criteria, and problems with voltage and regulation.

Accordingly, the Siting Board finds that the proposed project would meet the identified need.

b. One Transformer Alternative

The Company stated that the one transformer alternative would provide increases in near-term capacity, reduction in lengthy exposed circuits, and a reduction in voltage regulators similar to those provided by the proposed project (Exh. BE-1, 3-3). However, the Company stated that the use of a single transformer substation would leave the HSA vulnerable to a station transformer fault or transmission cable fault (id.). The Company therefore asserted that its reliability standard of firm service under any single contingency event would not be met (Exh. HO-A-3). The Company explained that the only back-up supply under the one transformer alternative would be the existing distribution system, which cannot reliably serve the entire Hopkinton load (id.; Exh. Milford-1-9). Further, the Company noted that the single transformer would provide approximately 40 MW of capacity at the Hopkinton load center, as opposed to the 80 MW of capacity provided by the proposed project (Tr. 4, at 93).

The record demonstrates that the one transformer alternative would not maintain firm service in the contingency of a station transformer fault or transmission cable fault and therefore would not meet the Company's reliability criteria to provide a firm supply for the HSA. Accordingly, the Siting Board finds that the one transformer alternative would not meet the identified need.

c. Low Voltage Alternative

The Company stated that the low voltage alternative would provide 30 MW of firm capacity to the HSA via new underground circuits, and would reduce the length of some of the exposed overhead circuits (BECo Initial Brief at 18; Exh. BE-1, at 3-4). However, the Company asserted that not all of the circuits supplying Hopkinton would be connected to new underground lines and that the system, therefore, would still be exposed to reliability problems posed by lengthy overhead circuits (Exhs. BE-1, at 3-4; HO-A-3).

The Company also stated that the low voltage alternative would not significantly reduce the system's need for voltage compensation, due to the size of the load and the distance from the load to the supply source (Exhs. BE-1, at 3-4; HO-A-5). The Company referred to its need analysis of the existing system, showing unacceptable voltage levels on one circuit beginning in 1997 under a worst case contingency, and indicated a similar contingency likely would cause unacceptable voltage levels under the low voltage

alternative (Tr. 4, at 104-105, 107-109).(49)

In addition, the Company stated that although the low voltage alternative would consist of a nine conduit ductbank, only four new circuits of 10 MW(50) each would be installed at this time (Tr. 4, at 23-24, 70). The Company stated that if in the future it was necessary to add capacity over 40 MW, it would be costly to upgrade the low voltage alternative, while the proposed project would be able to provide 80 MW of capacity without later upgrades (id. at 109-110). The Company indicated that the construction cost for running the circuits is $50 a linear foot, and each circuit would need to run underground for a distance of approximately eight miles (id. at 25-26, 109).

The record indicates that the low voltage alternative would provide additional distribution line capacity to serve Hopkinton, enabling the Company to meet a worst-case single contingency without equipment overloads. In addition, the low voltage alternative would relieve portions of the extended overhead distribution system via the new underground feeder lines, thereby shortening overhead circuit length and reducing associated exposure to frequent outages. However, because the combined underground-overhead length of circuits supplying Hopkinton would remain lengthy, the low voltage alternative would not significantly reduce the existing need for voltage compensation. Mr. Jessa's testimony indicated that, under a worst case contingency with the low voltage alternative, the Company's basic voltage criteria likely would be violated on one or more circuits.(51),(52)

Accordingly, the Siting Board finds that the low voltage alternative would not meet the identified need.

d. Local Generation Alternative

The Company stated that adding generation within the Town of Hopkinton would alleviate the heavy load flows over existing long distribution lines (Exh. HO-A-2). However, the Company asserted that, to maintain stability under the local generation alternative, the Company would need to maintain an interconnection to the regional grid (id.; Exh. HO-A-9; Tr. 3, at 25-26). Specifically, the Company stated that local generation, sited either in the South Street industrial area or throughout Hopkinton, would have to be operated in parallel with the overall BECo system to minimize the frequency deviations and voltage fluctuations associated with load changes (Exh. HO-A-9). The Company therefore determined that the long existing overhead circuits have to be retained as part of the overall area supply system under the local generation alternative (Exh. HO-A-2). The Company therefore argued that the addition of local generation would not reduce system exposure to short circuits and the interruptions or voltage level drops that occur during those short circuits (id.). The Company concluded that the local generation alternative could eliminate that portion of outages attributable to regulator failures, which could be up to 20 percent on respective circuits (Tr. 4, at 14).

The Company acknowledged that the fuel cell alternative would not need to be connected to the regional grid in order to maintain stability (Tr. 1, at 188). BECo explained that the small-scale nature of fuel cells would most likely avoid potential stability problems, but noted the likelihood of a problem would be dependent on the size and the associated generating capacity of each fuel cell (id.; Tr. 2, at 134).(53)

The record indicates that the CTG alternative would provide 45 MW of new capacity, including 15 MW of backup generation capacity, to ensure a firm supply of 30 MW. This level of capacity at the Hopkinton load center should be sufficient to ensure that equipment loadings would be maintained within appropriate levels under normal and single-contingency conditions. However, BECo argues that for stability purposes, it would be necessary to connect the CTG alternative to the existing grid by retaining the existing distribution system links, and that those links would continue to subject the HSA to the existing high incidence of outages. The record is not clear as to whether it would be necessary to retain the entire existing system of multiple circuits, as opposed to one circuit or a small number of circuits, in order to maintain steady state stability. Further, the record indicates that the existing distribution circuits differ as to exposure characteristics and the actual extent and mix of outages. Therefore, it is not clear that the maintenance of a distribution link to provide stability for the CTG alternative would create an unacceptable level of exposure such as exists under the present system.

The record indicates that the fuel cell alternative theoretically could provide sufficient new capacity to the Hopkinton load center to ensure that equipment loadings would be maintained within appropriate levels under normal and single-contingency conditions. It also indicates that, depending on the configuration of the fuel cell array, it may be unnecessary to connect the fuel cells to the regional grid. In addition, as with the CTG alternative, it is not clear that maintenance of a distribution link for the fuel cell alternative would create an unacceptable level of exposure.

Accordingly, for purposes of this review, the Siting Board finds that the local generation alternatives potentially could meet the identified need. The Siting Board considers BECo's argument concerning possible continued exposure to distribution lines outages at greater length as part of its comparison of reliability.

e. Conclusion on the Ability to Meet the Identified Need

The Siting Board has found that BECo has demonstrated that the proposed project would meet the identified need, and that the local generation alternatives potentially could meet the identified need, but that the one transformer alternative and the low voltage alternative would not meet the identified need.

Accordingly, the Siting Board next evaluates the reliability, environmental impacts, and

the cost of the proposed project and the local generation alternatives.

4. Reliability

In this section, the Siting Board compares the proposed project with local generation relative to providing a reliable supply of electricity to the HSA (see Section II.A.3.a, above).

The Company asserted that local generation would not address the reliability problems caused by exposure to lengthy overhead circuits which would be addressed by the proposed project (BECo Initial Brief at 19). BECo stated that in order for local generation to maintain steady state stability and to respond quickly to changes in load, the source of local generation must be connected to the existing distribution circuits; therefore the existing overhead circuit would need to be kept in place (Exhs. HO-A-2; HO-A-9; Tr. 4, at 14). The Company noted that construction of the proposed project may make future installation of distributed generation for capacity purposes a more viable alternative, since the system would be more stable than it is at present and could operate in a reliable manner (Tr. 4, at 18-19).

The record demonstrates that Hopkinton experiences a high incidence of service interruptions, voltage deviations, and other reliability problems that are associated with the existing long distribution lines. The record indicates that the CTG alternative would require a closed 14-kV link to the regional transmission system for stability purposes, but appears to indicate that such a link would not be required for the fuel cell alternative. Either alternative would require delivery of natural gas or other fuel to support operations in Hopkinton.

With respect to the CTG alternative, the record does not clearly establish the extent of the 14-kV interconnection that would be required. Moreover, the record shows that the existing distribution lines differ as to their exposure characteristics, and the extent and the mix of past outages. However, retention of any closed 14-kV link based on one or more overhead lines of nearly 10 miles or more in length would expose the Hopkinton supply to a greater likelihood of outages than the proposed project, which would provide firm transmission supply near the Hopkinton load center without the need for any closed 14-kV links.(54) In addition, if natural gas provides the sole fuel supply to operate the CTG alternative, such supply would be subject to potential interruption.

With respect to the fuel cell alternative, the record does not indicate the extent or likely means for providing gas or other fuel to support such operations in Hopkinton. Assuming use of natural gas, the Siting Board notes that, as in the case of the CTG alternative, such fuel supply would be subject to potential interruption. In addition, the Siting Board notes that the record does not address industry experience with reliance on fuel cell generating technology to meet a load of the size and characteristics present in Hopkinton, including

the concentration of load in the South Street area.

Accordingly, the Siting Board finds that the proposed project would be preferable to the CTG alternative and slightly preferable to the fuel cell alternative with respect to reliability.

5. Environmental Impacts

In this Section, the Siting Board compares the proposed project to the local generation alternatives including both the CTG alternative and the fuel cell alternative, with respect to environmental impacts resulting from: (1) facility construction; (2) permanent land use; and (3) magnetic field levels.

a. Facility Construction Impacts

BECo asserted that environmental impacts of the proposed project would be limited to the temporary impacts associated with the construction of the underground transmission and distribution lines in and along roadways (Exh. BE-1, at 3-4). The Company indicated that temporary traffic interruptions would occur during construction along Purchase Street, a fully developed residential roadway (id.). BECo stated that construction activities along Purchase Street would be confined to one side of the street in order to maintain one lane of traffic (id. at 5-13). Although the underground transmission line would traverse a wetland between the proposed transmission station and Purchase Street, the Company indicated that directional drilling would be used to minimize impacts to the surface wetlands (Exh. BE-DS-1, at 2; Tr. 6, at 30-36). In addition, BECo stated that construction noise would be temporary and would be confined to the daytime (Exh. BE-1, at 5-13).

With respect to the CTG alternative, the Company indicated that, if the CTG site were not proximate to an existing gas pipeline, construction of a natural gas pipeline to serve the CTG alternative would have impacts at least comparable to the construction impacts associated with the proposed underground transmission facilities (id. at 3-5). The Company noted that the Tenneco pipeline that travels through Hopkinton is located approximately two miles from the South Street industrial area (Tr. 4, at 84).

The Siting Board notes that the proposed project consists of the construction of a transmission station and a substation at two separate sites, and construction in roadways for the underground transmission and distribution lines. The impacts from the construction of the transmission line along Purchase Street, while temporary, would be more disruptive than the construction impacts of the transmission station and substation.

With regard to construction of the CTG alternative at one location in an industrial area, construction of a 45-MW facility would likely involve more extensive construction and take a longer time than the proposed project. Further, since the CTG alternative is gas-fired, there is the potential for disruption of roadways or other parcels of land in order to construct an interconnect to an existing gas pipeline. Accordingly, the Siting Board finds that the proposed project would be preferable to the CTG alternative with respect to facility construction impacts.

With respect to the fuel cell alternative, the record does not indicate that installation of fuel cells would require greater or lesser construction impacts than those associated with the construction of the substation and transmission station. While the proposed project would involve additional construction impacts associated with the proposed transmission line, the Siting Board also notes that the fuel cell alternative would require delivery of fuel which could involve construction impacts. Given the concentration of load in the South Street area, we further note that most but not necessarily all of the fuel cells likely would be located at the proposed substation site or at industrial facilities nearby. Therefore, assuming use of natural gas as fuel, the Siting Board notes that the fuel cell alternative, like the CTG alternative, would potentially require disruption of roadways or other parcels of land in order to construct new or expanded facilities to deliver gas. Accordingly, the Siting Board finds that the fuel cell alternative would be comparable to the proposed project with respect to facility construction impacts.

b. Permanent Land Use and Community Impacts

BECo asserted that the permanent land use impacts of the proposed facilities would be limited to the proposed transmission station and substation, and would be minimal (Exh. BE-1, at 3-4). With respect to tree clearing, the Company stated that approximately two acres of trees would be cleared for the proposed project (Exh. HO-RR-11(att.)). With respect to community impacts, the Company stated that the sites of the proposed transmission station and the proposed substation would be located approximately 800 feet, and 700 feet, respectively, from the nearest sensitive receptor (Exh. BE-1, at 5-9; Tr. 2, at 43-49). The Company further indicated that the proposed transmission station would have a minimal visual impact based on its size, an approximately 200 square feet area, its location on a 25.6-acre site in a forested area that is lower in elevation than the nearby residences, and the additional landscaping that will be installed by BECo (Exh. BE-1, at 1-5, 5-9). Further, BECo stated that the proposed substation would have minimal visual impacts based on its location in commercial/industrial area, surrounded by commercial uses on three sides of the parcel (id.). The Company indicated that the substation site is 65,000 square feet, and the fenced-in area that would contain the proposed substation facilities would be 25,000 square feet (Tr. 4, at 23, 84).

BECo asserted that when operational, the CTG alternative would have significantly greater noise and visual impacts than the proposed project, would produce air emissions,

and would require significant amounts of water (Exh. BE-1, at 3-5).(55) Specifically, the Company asserted that noise impacts from the CTG alternative would be six to nine decibels greater than the operational noise levels of the proposed project (id.). The Company asserted that the CTG alternative would require approximately 80-105 gallons per hour of water for NOx control, which would create a strain on the Hopkinton water supply (Exh. Milford 1-10, (att. TM 1-10)). The Company indicated that the fuel cell alternative would produce water, heat and carbon dioxide as by-products (Exh. AG-2-12).

The Company stated that either the CTG alternative or the fuel cell alternative would require significant amounts of land, and estimated that 75,000 square feet would be necessary for installing fuel cells based on 2.5 square feet per kW (Exh. AG-2-12; Tr. 4, at 87).(56) By comparison, BECo indicated that the proposed project would require 44,200 square feet of land at two sites for the proposed transmission station and substation (Exh. AG-2-12). The Company indicated that its property on South Street -- the substation site under the proposed project -- is too small for either the CTG alternative or the fuel cell alternative (Tr. 4, at 85). The record indicates that the permanent land use impacts of the proposed project would be minimal due to the location of the transmission station in a wooded area away from residents, and the location of the substation in a commercial/industrial area. In addition, as discussed above, the transmission line will be located underground. However, the record indicates that the transmission station, substation and transmission line would require the clearing of approximately two acres of trees.

In comparison, the CTG alternative would have greater noise and visual impacts, and greater local air emissions, and would have water requirements that could strain the local water supply. In addition, the record indicates the Company's substation site likely would not accommodate the CTG alternative. Thus, the record indicates that overall the CTG alternative would have greater permanent land use impacts than the proposed project.

In order to accommodate 30 MW of firm capacity, the fuel cell alternative would require more space that the proposed project, and a larger site than is available at the Company's substation site in the South Street industrial area. The South Street site likely could accommodate approximately two-thirds of the fuel cells required, with the remaining one-third located at another smaller site or at existing industrial facilities in the area. The proposed project would also require use of two sites and the clearing of two acres of trees. Thus, on balance, the permanent land use impacts of the fuel cell alternative and the proposed project are comparable.

Accordingly, the Siting Board finds that the proposed project would be preferable to the CTG alternative, and comparable to the fuel cell alternative, with respect to permanent land use and community impacts.

c. Magnetic Field Levels

The Company stated that the proposed project would minimize exposure to electric and magnetic fields (Exh. BE-PV-1, at 3). The Company explained that the underground, steel-pipe-encased 115-kV transmission lines would produce minimal magnetic fields and that the ancillary distribution line would traverse a commercial/industrial area (id.). The Company stated that the current power supply in Hopkinton is supplied by lengthy overhead 14-kV distribution lines, including significant lengths of on-street line, and that with the proposed project, power would be provided in close proximity to most major users, reducing overall exposure in the Town of Hopkinton to magnetic fields (Tr. 6, at 131).

The record indicates that the proposed 115-kV transmission line will generate minimal magnetic fields. Although the ancillary distribution line would have significantly higher field levels, it is of limited length and would extend through a commercial/industrial area along an alignment located 20 to 25 feet from property frontages (see Section III.C.3.v, below). Both local generation alternatives, if sited at the Hopkinton load center, would not require transmission lines, but would involve distribution lines in essentially the same configuration as the distribution lines for the proposed project.

Accordingly, the Siting Board finds that the proposed project is comparable to both local generation alternatives with respect to magnetic fields.

d. Conclusions on Environmental Impacts

In Sections II.B.5.a, b, and c, above, the Siting Board has found that: (1) the proposed project would be preferable to the CTG alternative, and comparable to the fuel cell alternative, with respect to facility construction impacts; (2) the proposed project would be preferable to the CTG alternative, and comparable to the fuel cell alternative, with respect to permanent land use and community impacts; and (3) the proposed project would be comparable to both local generation alternatives with respect to magnetic field impacts.

Based on the above analyses, the proposed project is preferable to the CTG alternative and comparable to the fuel cell alternative with respect to environmental impacts. However, the record indicates that the assumed firm capacity of both the CTG alternative and the fuel cell alternative would be 30 MW -- sufficient to meet projected load requirements in the 1997-to-2000 time frame -- while the firm capacity of the proposed project would be 40 MW. The Siting Board notes that the space requirements and possibly other identified impacts of the CTG alternative and the fuel cell alternative would be greater, if based on an initial firm capacity of 40 MW, or if impacts of possible future capacity additions to meet longer term load growth are considered.

The record also does not include documented analysis of the relative impacts of alternative project approaches on air quality, including consideration of displacement of emissions at existing generating plants elsewhere in the region. With respect to the fuel cell alternative, the Siting Board notes that displacement of air emissions from plants using combustion technologies is a potential benefit of fuel cell and other distributed generation technologies. The record indicates that the fuel cell alternative would result in emissions of carbon dioxide but not other air pollutants.

The Siting Board concludes that the record demonstrates a clear environmental advantage for the proposed project, relative to the CTG alternative, but does not indicate a clear environmental advantage, on balance, between the proposed project and the fuel cell alternative.

Accordingly, the Siting Board finds that the proposed project would be preferable to the CTG alternative, and comparable to the fuel cell alternative with respect to environmental impacts.

6. Cost

The Company asserted that the proposed project would be preferable to both local generation alternatives with respect to cost (Exh. BE-1, at 3-6). The Company stated that the capital costs of installing the CTG alternative would be approximately twice those of the proposed project (id.; Exh. HO-RR-7). BECo stated that it estimated that construction costs for the proposed project would be $12.547 million, and that total costs, including construction, engineering, consultant fees, study fees and permitting costs would be $13.42 million (Exhs. DV-1.1-3; DV-1.2-9(att. 2); Tr. 4, at 72-74). The Company stated that the installed cost of the CTG alternative would be approximately $26 million, not including the cost of the gas pipeline, and estimated the cost for fuel cells to be $600 per kW, or $18 million for 30 MW (Exh. Milford 1-10; AG-2-12).

The Company asserted that wheeling charges, transmission line losses, distribution losses, and fuel costs would be comparable for the proposed project and the CTG alternative (Exh. HO-RR-7). The Company explained that fuel costs would be comparable, even though the proposed facilities do not use fuel, because the CTG would displace existing generation facilities (id.). BECo calculated that the annual O&M costs of the CTG alternative would be $4.19 million, including costs for staffing the station and maintaining the turbines and fuel system, while the projected first year O&M costs for the proposed project would be $32,300 to $35,600, including costs of substation and transmission station operation and transformer losses (id.; Exh. HO-RR-6(att. 2)).(57)

The record demonstrates that, based on the Company's estimates of capital costs and operating and maintenance costs, the overall cost of either the CTG alternative or the fuel cell alternative would be significantly higher than the cost of the proposed project.(58)

Accordingly, the Siting Board finds that the proposed project would be preferable to the CTG alternative and the fuel cell alternative with respect to cost.

7. Conclusions: Weighing Need, Reliability, Environmental Impacts, and Cost

In comparing the proposed project to the one transformer alternative, the low voltage alternative, and the local generation alternatives, the Siting Board has found that the proposed project would meet the identified need, that the local generation alternatives potentially would meet the identified need, and that the one transformer alternative and the low voltage alternative would not meet the identified need.

With respect to the reliability, environmental impacts, and costs of the proposed project and the local generation alternatives, the Siting Board has found that: (1) the proposed project would be preferable to the CTG alternative and slightly preferable to the fuel cell alternative with respect to reliability; (2) the proposed project would be preferable to the CTG alternative and comparable to the fuel cell alternative with respect to environmental impacts; and (3) the proposed project would be preferable to both local generation alternatives with respect to cost. Accordingly, the Siting Board finds that the proposed project is preferable to the local generation alternatives.

The Siting Board notes that the capital costs for the fuel cell alternative are 50 percent higher than the cost of the proposed project, and that the fuel cell alternative apparently provides no compensating reliability or environmental advantages. For this reason, in addition to the reasons set forth in Section II.A.3.d, above, the Siting Board can find no basis, in this case, on which to require the Company to investigate the impacts that distributed utility planning would have in the Hopkinton area, or to implement a pilot project in the area in the next year in conjunction with the construction of the proposed facilities as urged by the Attorney General. We note that such a pilot program in Hopkinton would clearly raise the costs of the proposed project to BECo ratepayers, without providing any documented benefits. Similarly, we find no basis for requiring BECo to conduct an analysis of the feasibility and cost-effectiveness of using clean distributed generation in the Hopkinton area, as CLF has requested. Such a requirement, except in the context of another facility proposal, is beyond our authority. However, we put BECo and other utilities on notice that we will continue to require all project proponents to evaluate all reasonable project alternatives, including distributed generation, where appropriate, as part of our project review. As the Siting Board noted in the 1996 NEPCo Decision, EFSB 95-2 at 19, "in future transmission line cases, the Siting Board expects applicants to provide a more complete analysis of the ability of distributed generation to meet the identified need, or to provide an explanation of why distributed generation is not appropriate."

III. ANALYSIS OF THE PROPOSED AND ALTERNATIVE FACILITIES

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69H-69Q to provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, §§ 69H and J. Further, G.L. c. 164, § 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In its review of other site locations, the Siting Board requires a petitioner to show that its proposed facilities' siting plans are superior to alternatives and that its proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. 1997 ComElec Decision, EFSB 96-6, at 47; Norwood Decision, EFSB 96-2, at 33; 1991 NEPCo Decision, 21 DOMSC at 376.

A. Description of the Proposed and Alternative Facilities

1. Proposed Facilities

BECo proposes to construct two new, 1.3-mile long, underground 115-kV transmission lines in Milford and Hopkinton that will connect the proposed South Street substation with a proposed transmission station in Milford (Exh. BE-1, at 1-5, fig. 1-1). The new transmission station would be located adjacent to the existing NEES 115-kV Medway to Millbury overhead transmission lines, at a point to the west of Purchase Street in Milford, and would be connected to these lines by two new overhead tap lines (id.). The new transmission lines would exit underground from within the enclosed area of the transmission station, proceed along a new ROW to Purchase Street, run north under Purchase Street into Hopkinton and continue north under South Street in Hopkinton to the site of the proposed South Street substation (id. at 1-5, 1-7, Fig. 1-1).

BECo indicated that the transmission station would be located on an approximately 140-foot square area; structures would include a 25-foot square control house and two 40-foot tall shielding masts (Exhs. BE-AJ-1, at 4; Hopkinton-RR-1). In addition, two sets of three steel poles would be located on the NEES ROW and three short sections of wire would connect the existing transmission lines to an incoming bridge structure, within the transmission station, by way of the new sets of three steel poles (Exhs. BE-1(app. A); HO-E-14). The proposed South Street substation would consist of two 24/32/40 MVA, 115/14-kV transformers and related equipment (Exh. BE-1, at 1-5). In addition, new distribution facilities would be installed to connect the new substation to the existing distribution system (id. at 1-7). Distribution facilities would include (1) three new distribution circuit feeders that would run underground from 300 to 7,000 feet and rise up to connect with existing overhead circuits in South Street, and (2) two DSS line feeders that would run underground to supply and backup a proposed new customer-built substation on South Street (id.).

2. Alternative Facilities

BECo also identified a comparable set of facilities using alternative transmission line routes and alternative substation and transmission station sites (id. at 1-7, fig. 1-2). For the alternative route, two overhead taps would connect the NEES Medway-to-Millbury lines, at a point approximately two miles to the west of the primary route tap site, to a transmission station which would be located off East Street in the Town of Upton (id. at 1-7). The two new transmission lines would then exit the alternative transmission station underground, proceed to East Street and run north under East Street and School Street approximately 1.1 miles to an substation which would be located near the intersection of School Street and West Main Street in Hopkinton (id. at 1-7, Fig. 1-2). The new distribution facilities would include four distribution circuits and two DSS lines (id. at 1-9). Three of the distribution circuits would connect with overhead lines on School Street and the fourth distribution circuit and two DSS lines would travel underground for approximately two miles along West Main Street and South Street to Hayward Street where the distribution circuit would connect with overhead lines (id.). The DSS lines would continue underground to a proposed new customer-built substation on South Street (id.).

B. Site Selection Process

1. Standard of Review

In order to determine whether a facility proponent has shown that its proposed

facilities' siting plans are superior to alternatives, the Siting Board requires a facility proponent to demonstrate that it examined a reasonable range of practical facility siting alternatives. 1997 ComElec Decision, EFSB 96-6, at 50; Norwood Decision, EFSB 96-2, at 36; Northeast Energy Associates, 16 DOMSC 335, 381, 409 (1987) ("NEA Decision"). In order to determine that a facility proponent has considered a reasonable range of practical siting alternatives, the Siting Board requires the proponent to meet a two-pronged test. First, the facility proponent must establish that it developed and applied a reasonable set of criteria for identifying and evaluating alternatives in a manner which ensures that it has not overlooked or eliminated any alternatives which are clearly superior to the proposal. 1997 ComElec Decision, EFSB 96-6, at 50; Norwood Decision, EFSB 96-2, at 38; Berkshire Gas Company (Phase II), 20 DOMSC 109, 148-149, 151-156 (1990). Second, the facility proponent must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. ComElec Decision, EFSB 96-6, at 50; Norwood Decision, EFSB 96-2, at 36; NEA Decision, 16 DOMSC at

381- 409.

In the sections below, the Siting Board reviews BECo's site selection process, including BECo's development and application of its siting criteria as part of that process.

2. Development and Application of Siting Criteria

a. Description

The Company indicated that it conducted a two-stage site selection process (Exh. BE-1, at 4-2). The Company stated that in the first stage it developed a set of threshold criteria to narrow the geographic area under consideration and to identify all viable facility configurations within the defined geographic area (id.). BECo stated that in the second stage it developed a set of detailed screening criteria to rank the identified options (id.).

BECo asserted that its threshold criteria were consistent with satisfying reliability considerations at the least cost with minimum environmental impact (id.). The Company indicated that distinct threshold criteria were developed for the siting of each component of the new facilities -- the substation, the transmission line and the transmission station (id. at 1-2, 4-2 to 4-3).(59) Specifically, the Company stated that: (1) the substation had to be located within the Town of Hopkinton, within a five-mile radius of the extreme edge of the Company's service territory;(60) (2) the maximum length of the transmission line from a 115-kV supply source with adequate power and capacity was two miles for an underground route and nine miles for an overhead route; (3) an underground transmission line had to be located beneath existing roadways; (4) an overhead transmission line had to be located on an existing overland ROW with sufficient width for construction and maintenance of the lines; and (5) both the substation and transmission station required buildable, upland sites with direct access to a public street (id.). In addition, the Company stated that the substation had to abut the transmission line route and provide access to the existing distribution system, while the transmission station had to abut the supply source and the transmission line route (id. at 4-3). The Company explained that the two mile and nine mile maximum for underground and overhead transmission line construction, respectively, were cost-based (Exh. Milford 1-18). The Company stated that, in order to reasonably limit overall project costs, it determined that the cost of the transmission line component of the project should be comparable to the cost of the substation component (id.).

The Company identified potential overhead and underground transmission line corridors connecting potential supply sources to the identified substation siting area (Exh. BE-1, at 4-3). The Company then identified potential transmission station sites at the intersections of the potential transmission corridors and supply sources and potential substation sites along the transmission corridors within the substation siting area (id.). The Company stated that when one of the threshold criteria was not met, the facility configuration was

eliminated from consideration (BECo Initial Brief at 28). The Company stated that one identified underground transmission line route as well as three identified overhead transmission line routes, including the Interstate 495 corridor, were eliminated from further consideration due to inadequate width and significant construction difficulties (Exh. BE-1, at 4-7 to 4-8).

Based on the application of the threshold criteria, the Company identified seven transmission line routes with related facilities ("facility alternatives") (Exh. BE-1, at 4-13 to 4-24). The Company stated that four of the facility alternatives would tap the existing NEES Medway to Millbury 115-kV transmission lines and include underground transmission lines --the proposed and alternative facilities along South Street and School Street, respectively, and the West Main Street and Hayden Rowe alternatives (id. at 4-13 to 4-24). The Company further stated that three of the facility alternatives would tap BECo's existing Substation 365 and associated 115-kV transmission line in Medway and include overhead transmission lines -- the Ash Street, Chestnut Street, and South Mill Street alternatives (id.).

The Company stated that the Interstate 495 corridor intersects the existing NEES Medway to Millbury 115-kV transmission line in Milford and travels north to the substation siting area (id.). The Company explained that overhead construction within the Interstate 495 highway median was initially considered but was determined to be infeasible due to the terrain and problems of access for construction (Exh. BE-2, at 4-1; Tr. 5, at 27-28, 30). However, in response to concerns of the Town of Milford, the Company later reassessed the Interstate 495 highway median as a potential overhead transmission line route and developed preliminary design plans for constructing the transmission line within the highway median, and identified two potential tap sites and two potential substation sites using this route (Exh. BE-2, at 4-2).(61) The Company stated that the length of the transmission line along this route would range from 2.3 miles to three miles and that construction would entail clearing the majority of the vegetation within the highway median, blasting, disturbance of wetland areas, crossing of streams that are tributary to the Town of Milford water supply, and spanning the southbound highway lane to connect to a substation site (id.; Tr. 6, at 13-15).

The Company stated that the preliminary design plans were presented to the Massachusetts Highway Department ("MHD") and that the MHD determined that the above ground placement of transmission lines in the median area was not an acceptable alternative (Exh. BE-2, at 4-4).(62) The Company stated that in light of the response from the MHD, it rejected further consideration of the Interstate 495 corridor transmission line route (id.). The Company added that it did not discuss an underground route along the Interstate 495 corridor with the MHD because such a route did not meet its criteria that an underground transmission line be located beneath existing developed roadway corridors (Exh. AG-2-1). The Company asserted that underground construction outside of the developed Interstate 495 roadway would not be reasonable or feasible due to significant construction difficulties and access constraints (Tr. 5, at 42-45, 54, 79).(63)

The Company stated that it developed screening criteria for the categories of

environmental impacts, reliability and cost and a rating system of raw scores and weighting factors to evaluate each of the seven facility alternatives (Exh. BE-1, at 4-25). BECo stated that its environmental screening criteria included thirteen criteria that could be affected by the proposed project within three general groupings -- water resources, land resources and community resources (id. at 4-27). The Company indicated that: (1) water resources included wetlands and floodplains, surface waters, ground waters, and protected waters; (2) land resources included significant habitat, tree clearing, protected lands, geology, and soil; and (3) community resources included cultural resources, traffic, noise and visual impacts (id. at 4-27 to 4-37).

BECo next calculated raw scores and weights for each facility alternative for each environmental screening criterion (id. at 4-27 to 4-37, App. B). To calculate the raw score for each of the thirteen criteria, the Company assigned a ranking of low, medium or high based on specified indicators that classified the severity of impact for each criterion, with low designating the most severe impacts (id.). The Company assigned raw numerical scores of one for a low ranking, two for a medium ranking and three for a high ranking (id.).

To calculate weighting factors, the Company assigned a level of importance -- very important, moderate importance, or minor importance -- to each of the thirteen criteria based on the overall importance of each criterion and the ability to minimize or mitigate impacts (id. at 4-17 to 4-38; Tr. 5 at 20).(64) The Company then assigned values of one, two and three to the levels of minor importance, moderate importance and very important, respectively and multiplied the value for each criterion by the number of environmental criteria assigned that level of importance (i.e., three criteria of minor importance, five criteria of moderate importance, five criteria that were very important) (Exh. BE-1, at 4-38). The results of this multiplication were then added together. The total, 28, was divided into 100 to determine a percentage equivalent for each unit of value (id.). The result, 3.6 percent, was then multiplied by the assigned value of one, two or three for the levels of importance -- minor, moderate and very important (id.). Therefore, the resultant weighting factors were: (1) minor importance criteria, 3.6 percent; (2) moderate importance criteria, 7.2 percent; and (3) very important criteria, 10.8 percent (Exh. BE-1, at 4-38).

The Company then multiplied the raw score by the weighting factor to determine the weighted environmental score for each environmental criterion for each facility alternative (Exh. BE-1, at App. B).(65) BECo then summed the weighted scores for each facility alternative to determine its overall environmental score (id. at App. B). The Company indicated that the resultant environmental scores for the facility alternatives ranged from 1.21 to 2.15 (Exh. DV 1.1-8)

The Company stated that it developed a reliability criterion to compare alternatives with respect to (1) improvement of power quality, i.e., maintenance of required voltage, and (2) reduction in the frequency of interruptions (Exh. BE-1, at 4-25).(66) The Company explained that power quality would be improved and the frequency of interruptions reduced by reducing the exposure of the distribution circuits in Hopkinton (id.).(67) For

each facility alternative, the Company calculated a reliability index which was based on the expected number of interruption incidents each year (Exh. BE-1, at 4-25).(68) The Company stated that the reliability score for each facility alternative was a comparison of that facility alternative's reliability index to the reliability index of the facility alternative with the highest reliability, converted to a scale of one to three, with a score of one assigned to the least reliable facility configuration (id.).(69) The Company stated that the category of reliability was considered to be very important (id. at 4-37). The Company indicated that the resultant reliability scores for all of the facility alternatives ranged from one to three (Exh. DV 1.1-8).

To determine the cost of each facility alternative, the Company summed the separate costs of distribution, stations, transmission and land acquisition (Exh. BE-1, App. B). The Company further stated that, like the reliability score, the cost score was based on a comparison of the total cost of each facility alternative to the total cost of the least-cost facility alternative, converted to a scale of one to three, with a score of one designating the highest cost (id., at 4-26, App. B).(70) BECo stated that the category of cost also was considered to be very important (id. at 4-37). The Company indicated that the resultant cost scores for all of the facility alternatives ranged from one to three (Exh. DV 1.1-8).

BECo assigned the same weight of .333 to each of the categories of environmental impact, cost and reliability (Exh. BE-1, at 4-40). For each facility alternative, BECo multiplied each of its total environmental, cost and reliability scores by a factor of .333 to calculate weighted scores and then summed the three weighted scores to determine an overall score (id. at 4-38 to 4-40). BECo asserted that the three categories of environment, cost and reliability were equally important, but acknowledged that environmental impacts had a smaller influence on the total score than did the cost and reliability because its scoring system resulted in a narrower range for environmental scores (1.21 to 2.15) compared to the range of cost and reliability scores (1 to 3) (id. at 4-38; Tr. 5, at 130). However, the Company stated that the range of environmental scores adequately reflected the range of impact and that it would not have been appropriate to expand the environmental scores to a one to three range because the differences in environmental impacts would have been further emphasized (Tr. 5, at 124, 130).

BECo then compared the seven identified facility alternatives (Exh. BE-1, at 4-38 to 4-40). The Company indicated that the facility alternatives that included underground transmission lines had the highest environmental scores while the facility alternatives that included overhead transmission lines had the lowest scores (Exh. DV 1.1-8). The Company stated that, overall, the South Street alternative (the proposed facilities) had the best environmental score of 2.15 with the fewest criteria rated as having high impacts (Tr. 5, at 24). The Company explained that the proposed facilities received low scores for three environmental criteria -- wetlands and floodplain, protected waters and traffic (id. at 23). BECo stated that the low scores resulted from: (1) the need to fill wetlands in order to construct the access road to the transmission station; (2) the classification of wetlands within the access road area as an outstanding resource-water-related wetlands system; and (3) the need to construct beneath heavily travelled streets (id. at 23-24).(71)

The Company indicated that the School Street alternative received the next best environmental score of 1.90 (Exh. DV 1.1-8). The Company indicated that the School Street alternative received low scores for the criteria of surface waters, protected lands, cultural and traffic and overall, received fewer high scores than the proposed facilities (Exh. DV 1.1-2). The Company stated that the environmental scores for the two remaining facility alternatives with underground transmission lines were 1.87 and 1.72, while the environmental scores for the facility alternatives with overhead transmission lines were lower, ranging from 1.54 to 1.21 (Exh. DV 1.1-8).

The Company stated that the reliability scores ranged from 3.00 for greatest reliability to 1.00 for least reliability (id.). BECo stated that the proposed facilities received the highest score of 3.00 because they had the least number of expected interruptions -- 5.21 incidents per circuit per year (id.). The Company stated that the School Street and West Main Street alternatives had reliability scores of 2.10 based on 6.15 expected incidents per circuit per year (id.). The Company added that the reliability scores for the other facility alternative with underground transmission, the Hayden Rowe alternative, was 1.00, the lowest of all alternatives, based on expected interruptions of 7.28 incidents per circuit per year (id.). The Company further stated that the reliability scores for facility alternatives with overhead transmission lines ranged from 2.56 to 1.53 based on expected interruptions ranging from 5.67 to 6.74 incidents per circuit per year (id.).

The Company stated that the cost scores ranged from 3.00 for the least cost alternative to 1.00 for the highest cost alternative (id.). BECo stated that the proposed facilities received the highest score of 3.00 because they were least cost with a total cost of $12.547 million (id.). The Company indicated that the lower cost of the proposed facilities was due, in large part, to its comparatively lower distribution component cost (Exhs. DV 1.1-1 to 1.1-7). The Company stated that the School Street alternative had the next lowest cost, $13.894 million, with a score of 2.55 (Exh. DV 1.1-8) The Company also stated that the Hayden Rowe alternative had the highest cost at $18.564 million, with a score of 1.00, and that the remaining facility alternatives had costs ranging from $14.388 million to $15.232 million, with corresponding scores ranging from 2.39 to 2.11 (id.).

In summing the environmental, reliability and cost scores for each of the seven routes, the Company indicated that summed scores ranged from 2.72 to 1.24 (id.). The proposed facilities received the highest score of 2.72 and the School Street facilities received the next highest score of 2.18 (id,).

b. Arguments of the Intervenors

Mr. Starkis argued that the Company's site selection process was inadequate in that the Company did not evaluate an Interstate 495 underground transmission line route (Starkis Brief at 10). He stated that the Company should have balanced the potential additional costs of an Interstate 495 route against the benefit of avoiding residential areas (id. at 11). In addition, Mr. Starkis criticized the Company's weighting and scoring system (id.). He

argued that the Company should have employed standard reliability criteria rather than criteria unique to the electrical supply system in Hopkinton (id.). In addition, he argued that the environmental impacts scoring system does not realistically balance competing environmental concerns and that the overall scoring system does not adequately balance environmental concerns in the aggregate with concerns of reliability and cost (id.). He noted that because reliability and cost are scored from one to three and environmental impacts are scored within a one-point range, environmental impacts have less of an influence on the final outcome than cost and reliability (id.).

c. Analysis

BECo has developed a set of criteria for identifying and evaluating alternative facilities that includes natural resource factors, land use factors, human environmental factors, cost and reliability -- types of criteria that the Siting Board has found to be appropriate for the siting of transmission lines and related facilities. See 1997 ComElec Decision, EFSB 96-6, at 53; Norwood Decision, EFSB 96-2, at 38; New England Power Company, 4 DOMSB 109, 167 (1995) ("1995 NEPCo Decision"). The Company first developed a set of threshold criteria to identify the geographic boundaries of the proposed substation location, transmission line length and ROW requirements, and location of the transmission station and substation in relation to the other facilities. The Company used these threshold criteria to identify seven potential facility configurations. In order to evaluate the identified routes, BECo prepared a comprehensive list of environmental criteria that could be affected by the construction and operation of the proposed facilities, assigned scores to each of the criteria which considered the severity of impacts, and assigned weights to each of the criteria which considered the level of importance of the criterion and the ability to minimize or mitigate impacts. BECo also assigned scores to the cost and reliability categories based on specific factors in each category. In addition, the Company determined category weights to conduct a balancing of the environmental, reliability and cost categories and to calculate an overall score for each of the identified alternatives.

Thus, the Company has provided a comprehensive, quantitative method to compare identified alternatives on the basis of environmental impacts, cost and reliability. However, the Company's criteria and scoring system leads, in two respects, to potential under-emphasis on environmental factors compared to cost and reliability factors. First, the Company's threshold criteria requiring that underground and overhead transmission lines be no longer than two and nine miles in length, respectively, were based exclusively on cost, specifically the cost of the substation. The Siting Board recognizes that it is reasonable to consider the clear cost advantages of overhead lines when determining maximum reasonable line lengths; however, by the same logic, these maximum line lengths should also reflect the environmental advantages of typical underground lines.

Second, the Company's scoring methodology, while theoretically giving equal weight to

the three categories of environmental impacts, reliability and cost, in practice places greater weight on cost and reliability. Specifically, because the range of reliability and cost scores is greater than the range of summed environmental scores, reliability and cost actually have a greater influence on the total score than does environmental impacts. The Company defended its scoring system indicating that it adequately reflected the range of environmental impacts but acknowledged that it had the effect of narrowing the potential magnitude of impact of the environmental score on the overall score. The Siting Board is concerned that the structure of the Company's scoring system is unequal in important aspects among the three overall categories, leading to an inherent potential to underweight environmental impacts relative to cost and reliability.

First, scores for both cost and reliability range from one to three, without regard for the significance of the actual range of costs and reliability indicators. In contrast, the score for each environmental criterion ranges from one to three only if the worst and best alternatives actually show the characteristics for high and low environmental impact.

Second, unless the same alternatives are scored one and three for every environmental criterion, the summing of scores for respective criteria to derive total environmental scores incorporates a netting offset that reduces the range of the summed scores to a multiple of less than one to three. The scoring for cost and reliability indicators is done on a total score basis, and incorporates no netting effects among component categories.

The Company has both defended its methods and concluded that the outcome of its site selection scoring appropriately reflected environmental, cost and reliability considerations. However, the record shows that structural elements of the Company's scoring system led to a smaller range of environmental scores, relative to cost and reliability scores. This discrepancy, which results from the relative lack of sophistication in scoring cost and reliability criteria, is essentially inherent to the scoring approach. The Company did not provide convincing reasons, separate from its scoring, as to why overall environmental differences among its alternatives were less significant than the cost and reliability differences.(72)

Nevertheless the Company's site selection process enabled it to identify a number of potential underground and overhead transmission line routes. Although the underground route along Interstate 495 exceeded two miles, it was not eliminated from further consideration based on the two-mile criteria. Instead, it was not identified as a viable route because it could not be implemented in the roadway and was therefore inconsistent with the Company's criterion limiting underground line location to an existing roadbed.

In addition, the Company used a method for comparing the identified routes which included a quantitative balancing of environmental impacts, reliability and cost impacts. Further, although the categories of environmental impacts, reliability and cost may not have been appropriately balanced, the proposed facilities received the highest scores in all three categories.

Based on the foregoing, the Siting Board finds that the Company has developed a

reasonable set of criteria for identifying and evaluating facility alternatives. The Siting Board also finds that the Company has applied its site selection criteria consistently and appropriately, and in a manner which ensures that it has not overlooked or eliminated any siting options which are clearly superior to the proposed project.

Accordingly, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternatives to the proposed project in a manner which ensures that is has not overlooked or eliminated any siting options which are clearly superior to the proposed project.

3. Geographic Diversity

BECo presented two different underground routes for the proposed transmission line -- one route that travels within streets within the Towns of Milford and Hopkinton and one route that travels within roadways within the Towns of Upton and Hopkinton. They each start at a different point along the existing NEES Medway to Millbury 115-kV transmission line ROW where a transmission station will be constructed and each terminate at the site of a new substation. The Siting Board finds that the Company has identified a practical range of transmission line routes and facility sites with some measure of geographic diversity.

4. Conclusions on the Site Selection Process

The Siting Board has found that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternatives to the proposed project in a manner which ensures that is has not overlooked or eliminated any siting options which are clearly superior to the proposed project. In addition, the Siting Board has found that BECo has identified a practical range of transmission line routes and facility sites with some measure of geographic diversity.

Accordingly, the Siting Board finds that the Company has considered a reasonable range of practical siting alternatives.

C. Environmental Impacts, Cost and Reliability of the Proposed and Alternative Facilities

1. Standard of Review

In implementing its statutory mandate to ensure a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, the Siting Board requires project proponents to show that proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring a reliable energy supply. To determine whether such a showing is made, the Siting Board requires project proponents to demonstrate that the proposed project site for the facility is superior to the noticed alternatives on the basis of balancing cost, environmental impact, and reliability of supply. 1997 ComElec Decision, EFSB 96-6, at 60; Norwood Decision, EFSB 96-2, at 43; Berkshire Gas Company, 23 DOMSC 294, 324 (1991).

An assessment of all impacts of a facility is necessary to determine whether an appropriate balance is achieved both among conflicting environmental concerns as well as among environmental impacts, cost, and reliability. 1997 ComElec Decision, EFSB 96-6, at 60; Norwood Decision, EFSB 96-2, at 43; Eastern Energy Corporation, 22 DOMSC at 188, 334, 336 (1991) ("EEC Decision"). A facility which achieves that appropriate balance thereby meets the Siting Board's statutory requirement to minimize environmental impacts at the lowest possible cost. 1997 ComElec Decision, EFSB 96-6, at 60; Norwood Decision, EFSB 96-2, at 43; EEC Decision, 22 DOMSC at 334, 336.

An overall assessment of the impacts of a facility on the environment, rather than a mere checklist of a facility's compliance with regulatory standards of other government agencies, is consistent with the statutory mandate to ensure a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. 1997 ComElec Decision, EFSB 96-6, at 60; Norwood Decision, EFSB 96-2, at 43-44; EEC Decision, 22 DOMSC at 334, 336. The Siting Board previously has found that compliance with other agencies' standards clearly does not establish that a proposed facility's environmental impacts have been minimized. Id. Furthermore, the levels of environmental control that the project proponent must achieve cannot be set forth in advance in terms of quantitative or other specific criteria, but instead, must depend on the particular environmental, cost and reliability trade-offs that arise in respective facility proposals. 1997 ComElec Decision, EFSB 96-6, at 60-61; Norwood Decision, EFSB 96-2, at 44; EEC Decision, 22 DOMSC at 334-335.

The Siting Board recognizes that an evaluation of the environmental, cost and reliability trade-offs associated with a particular review must be clearly described and consistently applied from one case to the next. Therefore, in order to determine if a project proponent has achieved the appropriate balance among environmental impacts and among environmental impacts, cost, and reliability, the Siting Board must first determine if the petitioner has provided sufficient information regarding environmental impacts and potential mitigation measures in order to make such a determination. 1997 ComElec Decision, EFSB 96-6, at 61; Norwood Decision, EFSB 96-2, at 44; Boston Edison Company (Phase II), 1 DOMSB 1, 39-40 (1993). The Siting Board can then determine whether environmental impacts would be minimized. Similarly, the Siting Board must find that the project proponent has provided sufficient cost information in order to determine if the appropriate balance among environmental impacts, costs, and reliability would be achieved. 1997 ComElec Decision, EFSB 96-6, at 61; Norwood Decision,

EFSB 96-2, at 44; Boston Edison Company (Phase II), 1 DOMSB at 40.

Accordingly, in the sections below, the Siting Board examines the environmental impacts, cost and reliability of the proposed facilities along BECo's primary and alternative routes to determine: (1) whether the environmental impacts of the proposed facilities would be minimized; and (2) whether the proposed facilities would achieve an appropriate balance among conflicting environmental concerns as well as among environmental impacts, cost and reliability. In this examination, the Siting Board conducts a comparison of the primary and alternative routes to determine which is preferable with respect to providing a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

2. Analysis of the Proposed Facilities Under the Primary Configuration

a. Environmental Impacts of the Proposed Facilities Under the Primary Configuration

In this section, the Siting Board evaluates the environmental impacts of the proposed facilities along the primary route and the proposed mitigation for such impacts, and any options for additional mitigation. As part of its evaluation, the Siting Board first addresses whether the petitioner has provided sufficient information for the Siting Board to determine: (1) whether environmental impacts of the proposed facilities would be minimized; and (2) whether the proposed facilities achieve the appropriate balance among environmental impacts and among environmental impacts, cost and reliability. The Siting Board then addresses whether the environmental impacts of the proposed facilities along the primary route would be minimized.

i. Water Resources

(a) Wetlands and Surface Water

BECo stated that the proposed facilities under the Primary Configuration would traverse a wetland and other areas in proximity to water resources (Exhs. BE-DS-1, at 2; BE-DS-3; BE-AJ-1, at 5). However, the Company indicated that no wetland would be altered by construction of the proposed facilities or access road (Exh. BE-DS-4(att. D) at D-1; HO-RR-11(sup.)).

The Company stated that approximately 300 feet of transmission line conduit would be installed beneath wetlands by directional drilling(73) between Purchase Street and the transmission station, in order to avoid alteration of the surface wetlands (Exh. BE-DS-1, at 2; Tr. 6, at 17). The Company's witness, Daniel Stuart, testified that directional drilling

would leave the wetland's surface undisturbed and minimize the potential of sediment flow into the wetland area during facility construction (Tr. 6, at 17).(74)

With respect to indirect impacts to water resources, the Company stated that approximately 1,850 square feet of buffer zone would be disturbed due to grading in the northeastern corner of the transmission station (Exh. BE-DS-4(att. D) at D-4). In addition, BECo stated that the transmission line route for the proposed facilities would pass within 100 feet of wetlands at one location near the town line of Milford and Hopkinton, along Purchase and South Streets (id. at D-5; Exh. BE-1, at 5-2). The Company stated that approximately 4,000 square feet of buffer zone would be impacted by construction work in the roadway (Exh. BE-DS-4(att. D) at D-5). The Company stated that construction of the substation would occur in proximity to a small, 240 square foot wetland area, but added that it would be unaffected by the construction activity (id. at D-6; Exh. BE-1, at 5-4). The Company indicated that construction at the substation site would disturb approximately 9,400 square feet of buffer zone (Exh. BE-DS-4(att. D) at D-6).

The Company stated that new concrete-encased duct bank containing new distribution lines would be constructed underground and extend from the substation to South Street, travelling north beneath the paved surface for approximately 2,000 feet to where it would interconnect with the existing distribution system in Hopkinton (id.; Exh. BE-1, at 1-7). The Company indicated that these underground facilities would be placed within 100 feet of nine forested wetlands that border the east and west sides of South Street in Hopkinton, but added that construction would not directly impact these wetlands (Exhs. BE-1, at 5-4; BE-DS-4(att. D) at D-6 to D-7). The Company stated that approximately 9,100 square feet of buffer zone would be impacted in this area (Exh. BE-DS-4(att. D) at D-7).

The Company further stated that it would use standard erosion control measures at all proposed facilities in or within 100 feet of wetlands in order to minimize potential impacts to wetland resources areas (Exh. BE-1, at 5-4). The Company indicated that where work would occur in close proximity to a wetland, silt fencing and staked haybales would be installed between the wetland edge and the work area to minimize silt migration into wetland areas down gradient of construction activity (id.). The Company added that where excavation is necessary in close proximity to wetland boundaries, any water that flows into a trench would be pumped out into either a closed corral of staked haybales or a wetland filter bag (id.).

BECo stated that surface waters are located near the proposed facilities in the vicinity of the Milford/Hopkinton town line (id. at 5-5). The Company indicated that the underground transmission lines would pass beneath two culverts in this area, one of which conveys an unnamed intermittent stream (id.). The Company stated that while no direct impact is anticipated, groundwater could be encountered during construction that would require the dewatering of the trench in order to facilitate installation of the two transmission line pipes (id.). The Company added that the distribution line facilities would cross at least four culverts in this area (id.).(75)

The Company stated that outstanding resource waters ("ORW"s) have been identified on the transmission station site, and in the vicinity of the underground transmission and distribution routes for the proposed facilities under the Primary Configuration (id. at 5-6; Exh. MJP 1-9). The Company stated that construction of the proposed facilities under the Primary Configuration could introduce sediments into ORWs, but added that it would use construction measures which avoid or minimize such impacts (Exhs. BE-DS-4, at 5, 5A; BE-1, at 5-4 to 5-6).

The Company stated that the ORW on the transmission station site is a wetland that borders a tributary to Louisa Lake, a public water supply located approximately 1.5 miles southeast of the proposed transmission station site in Milford (Exh. BE-1, at 5-6).(76) The Company stated that ORWs also occur on either side of Purchase and South Streets in Milford and Hopkinton, respectively, along the underground transmission and distribution line routes (id.). The Company stated that these ORWs include wetlands associated with Craddock Crewes Pond, and the headwaters of Huckleberry Brook, a tributary to Louisa Lake (id.). The Company indicated that while no direct impact is anticipated to these ORWs, groundwater could be encountered during construction of the underground lines (id.). The Company added that any trench dewatering necessary to eliminate unwanted groundwater encountered during construction would be done in a way to minimize the potential impact to the ORW (id.).

The record demonstrates that construction of the proposed facilities under the Primary Configuration would require construction both within and in proximity to wetlands. Specifically, the record indicates that the most sensitive areas along the Primary Configuration would be at the transmission station site and immediately beyond it where the Company plans to use directional drilling to avoid impacts to the surface of a wetland, and near the Milford/Hopkinton Town line where culverts interconnect wetlands separated by a roadway. However, the Company has proposed the use of appropriate mitigation techniques during construction to avoid or minimize adverse water-related impacts. Accordingly, the Siting Board finds that, with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to wetlands and surface water.

(b) Groundwater and Wells

The Company asserted that construction of the proposed facilities under the Primary Configuration likely would not affect groundwater resources (Exh. BE-1, at 5-5 to 5-6). Specifically, the Company noted that the Primary Configuration is not located over protected water supply resources or in close proximity to public supply wells for the Towns of Hopkinton or Milford (id. at 5-5). The Company stated that an area delineated as Zone II, approved by the Department of Environmental Protection for public groundwater supplies in Milford, is located approximately one-half mile southwest of the

proposed transmission station site (id.). The Company further stated that appropriate mitigation measures would be used to minimize any indirect impacts to groundwater associated with construction (id. at 5-6).

The record demonstrates that construction of the proposed transmission and distribution facilities, which would primarily be within existing paved roadways, would avoid direct, or minimize indirect, impacts to groundwater along the primary route.

Accordingly, the Siting Board finds that, with implementation of proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to groundwater and wells.

(c) Conclusions

The Siting Board has found that with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to wetlands and surface water. In addition, the Siting Board has found that with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to groundwater and wells. Therefore, the Siting Board finds that with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to water resources.

ii. Land Resources

In this Section, the Siting Board reviews the impact of the proposed facilities under the Primary Configuration with respect to tree clearing and upland vegetation, potential soil erosion and wildlife habitat.

BECo indicated that construction of the facilities under the Primary Configuration would require the clearing of approximately two acres of trees in aggregate (Exh. BE-1, at 5-7).(77) BECo stated that a maximum of one-half acre of tree clearing would be required at the substation site, a portion of which was previously cleared, and that a maximum of 1.5 acres of clearing would be required at the transmission station site (id.). The Company stated that the transmission station and substation sites are relatively level and well vegetated, and exhibit no significant potential for erosion during construction or operation of the proposed facilities (id.). The Company further stated that both sites would be covered with crushed stone to maintain soil stability following construction (id.).

The Company stated that construction impacts to soil resources will be further minimized through the location of underground T&D lines within existing roadways, thereby avoiding additional impacts to developed or open spaces (id. at 5-7, 5-9). The Company stated that it would enable the repavement of the full width of all affected road surfaces via payments to the Towns of Milford and Hopkinton upon completion of construction of the underground T&D facilities, but added that both town's Public Works Departments would be responsible for scheduling the repaving projects (id. at 5-9; Exh. HO-E-9).

BECo stated that, based on its review of the 1995-1996 Edition of the Massachusetts Natural Heritage Atlas,(78) neither protected species nor unique ecological habitats are known to occur either on, or in close proximity to, the site of the proposed facilities (Exh. BE-1, at 5-7).(79)

The record demonstrates that a significant portion of the proposed facilities would be located in areas which are already paved, and that BECo plans to implement measures to limit erosion impacts, to stabilize areas disturbed by construction, and to return such areas as much as possible to their original condition. Such measures include laying crushed stone at the transmission station and substation sites, and enabling the repavement of the full widths of roadways affected by the installation of the proposed transmission and distribution facilities.

In addition, the record demonstrates that there are no known rare or endangered species in the vicinity of the proposed facilities that would be adversely affected by the proposed construction.

Accordingly, the Siting Board finds that, with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to land resources.

iii. Land Use

In this Section, the Siting Board reviews the impact of the construction and maintenance of the proposed facilities under the Primary Configuration with respect to land use, zoning, traffic, safety and noise.

BECo stated that the proposed facilities in Milford would be located in a residentially zoned district (Exh. BE-1, at 5-10). The Company stated that the transmission station would be located on an undeveloped forested parcel adjacent to the existing NEES ROW, and approximately 1,000 feet from Purchase Street, a fully developed residential street (id.). The Company noted that construction of the proposed transmission station is a permitted use under Milford zoning by special permit, and that placement of the transmission lines underground from the station out to Purchase Street is a permitted use

(id.). The Company added that the transmission station would be fenced to inhibit unauthorized access (id.).

The Company stated that all proposed facilities within the Town of Hopkinton would be located in an industrially zoned district (id.). The Company added that the project area in Hopkinton is developed with commercial uses along the entire length of South Street (id.). The Company stated that the proposed substation would be sited on an industrial parcel with an abutting commercial use to the rear of the site and an abandoned gravel pit to the north (id.). In order to inhibit unauthorized access, the Company indicated that the substation would be fenced around its perimeter (Exh. HO-E-7(att. 1), at 3). The Company noted that Hopkinton's zoning by-law does not specifically address public utility facilities (Exh. BE-1, at 5-10).

With respect to impacts on historical or archaeological resources, BECo stated that it reviewed files at the Massachusetts Historical Commission ("MHC") including base map files, State Register of Historical Places and archeological site maps (Exh. BE-1, at 5-14). BECo stated that the only resources identified in the project area include historic properties along the proposed transmission line route in Milford (id.). The Company further stated that construction activity could potentially affect these resources if rock removal is required for trench excavation (id.). The Company added that rock removal is not expected based on its review of soil maps of the area which indicate no surface bedrock (id.).

BECo stated that if bedrock is encountered in these areas, it would be removed with backhoes or jack hammers if possible (Exh. BE-1, at 5-14). BECo further stated that if a significant amount of blasting is required near historic properties, it would contact the MHC and property owners to determine if there is a potential for any adverse impact to the structures (id.). BECo added that any required blasting would be conducted in accordance with applicable state and federal regulations to ensure the safety of construction personnel and properties in the immediate vicinity (id.).

With respect to traffic impacts, the Company stated that temporary traffic disruptions due to construction of the underground facilities would occur along Purchase and South Streets in Milford and Hopkinton, respectively, between the transmission station and the substation (id. at 5-10). The Company stated that trench excavation would be limited to one side of the street in order to maintain one lane of traffic (id. at 5-13 to 5-14). The Company stated that it would implement several measures to mitigate potential construction impacts on local traffic, in coordination with Milford's and Hopkinton's Departments of Public Works and other permitting authorities having jurisdiction (id.). The Company indicated that such measures would include construction restrictions during morning and afternoon hours of peak travel, use of steel plates to ensure access to driveways and intersections, identification of construction worker parking areas, police details to direct traffic during construction, periodic street sweeping to minimize the migration of sediments off-site, and an on-site community liaison to address local concerns (id.). The Company added that operation of the proposed facilities would not noticeably affect traffic in Milford or Hopkinton (id. at 5-10). However, the Company

acknowledged that on average, typical maintenance of a transmission line includes approximately twice a year inspection of the transmission line and manholes, a process that takes about twenty minutes (Tr. 5, at 93-94, 105).

With respect to noise impacts of the proposed project, BECo asserted that sound levels emanating from the proposed substation on South Street would be inaudible at the nearest residence (id., Appendix E at 3, n.2). The Company explained that noise from operation of the proposed substation would be attenuated through the selection of low-noise transformers, and the installation of a sound barrier on three of each transformer's four sides (id., at 5-11 to 5-12; Tr. 6, at 79-80). The Company provided the results of a noise analysis conducted to determine the potential impact of the two new transformers at the substation, the only permanent noise sources from the project (Exh. BE-1, at 5-11 to 5-12). The Company stated that it measured the nighttime ambient sound levels at the proposed substation site, and indicated that the lowest nighttime(80) ambient L90 noise level was 40 dBA (id., Appendix E, Table 2; Tr. 6, at 77-78). The Company indicated that operation of the two low-noise transformers at the substation would generate 39 dBA of noise, and that the combined effect of the ambient noise level and the facility noise level at the nearest residence would be 43 dBA, an increase of 3 dBA in the nighttime ambient noise levels (id., Appendix E at 2, 3; Exh. HO-RR-8; Tr. 6, at 78). In order to mitigate the noise impacts of construction, the Company stated that it would use standard construction equipment sound muffling devices, cease construction activity during the nighttime hours, and adhere to federal truck-noise regulations (Exh. BE-1, at 5-13).

Finally, BECo noted that under the terms of a settlement agreement between BECo and several intervenors(81) in the instant proceeding dated June 19, 1997 ("Terms of Settlement" or "Settlement Agreement"), the Company would be required to consult with the Town of Milford and restrict the construction hours for the project in order to avoid adverse impacts on rush hour traffic and provide funds for re-paving of the full width of Purchase Street where disturbed by the construction and installation of the proposed facilities (Exh. HO-RR-11(att.)). The Company also indicated that the Terms of Settlement require that it restrict noise levels to levels no higher than those listed in Appendix E of Exhibit BE-1 concerning the proposed project under the Primary Configuration (id.).

The record demonstrates that traffic, safety, and noise impacts associated with construction of the proposed facilities under the Primary Configuration would be temporary and acceptable, with implementation of mitigation measures proposed by the Company. Specifically, according to the record, BECo would contribute funding to re-pave streets disturbed by construction, take steps during construction to minimize impacts to traffic as well as to local residences and businesses, and maintain a community liaison during construction to address concerns of the public. The record also indicates that although bedrock formations are unexpected, there is a small possibility that historic properties in Milford could be adversely impacted if blasting is required to remove bedrock formations encountered along that portion of the route. BECo has committed to consult both with the MHC and affected property owners, and to follow applicable state and federal regulations to ensure safe conditions for all affected persons and properties in

the vicinity.

With regard to traffic, safety, and noise impacts associated with the operation of the proposed facilities under the Primary Configuration the record indicates that there would be no discernable traffic impacts during typical daily operation of the proposed facilities, although some minor traffic impacts may be encountered on those days that semi-annual inspections of the transmission line and manholes occur. In addition, the record demonstrates that both the transmission station and substation would be fenced to restrict access to Company personnel thereby minimizing any safety impacts associated with the operation of the proposed facilities. Further, the record demonstrates that operational noise from the proposed substation's low-noise transformers would be further reduced by the placement of a sound barrier around three sides of each transformer.

Accordingly, the Siting Board finds that with implementation of all proposed mitigation, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to land use. Zoning issues will be further addressed in Section IV, below.

iv. Visual Impacts

BECo stated that the potential for visual impacts to nearby residences and businesses would be limited to aboveground facilities -- the transmission station and the substation (Exh. BE-1, at 5-9). BECo explained that because the T&D lines would be located underground, related visual impacts would occur only during construction (id.).

The Company stated that the transmission station would be located on a residentially-zoned, 25.6-acre undeveloped parcel with access to Purchase Street (id.; Exhs. BE-4e, 4g, 4h, 4j). The Company asserted that the size of the parcel would provide sufficient separation of the transmission station from residences (Exh. BE-1, at 5-9). The Company stated that the transmission station would be placed adjacent to the north side of the NEES ROW in an area chosen to maximize the distance between the station and nearby residences (id.). The Company indicated that the closest home, located on Rose Road in Milford, would be situated 720 feet from the transmission station site while other homes on Purchase and Camp Streets would be at least 800 feet from the site (id.; Exh. HO-E-10a, Table E-10a-1). The Company stated that most of the area surrounding the transmission station would remain forested, and added that landscaping would be used to screen any openings providing views of the transmission station site from residences (Exh. BE-1, at 5-9).(82)

The Company stated that the proposed substation site is located in an industrial area (id.). The Company indicated that businesses abut the north, south, and west sides of the parcel, and that the east side faces South Street (id.; Exhs. BE-4a, 4b, 4c). The Company indicated that the nearest residence to the substation site on South Street in Hopkinton

would be located on Purchase Street in Milford, almost 1,100 feet away (Exh. HO-E-10a, Table E-10a-1). The Company further indicated that all other non-residential sensitive receptors(83) would be located no closer than 700 feet from the substation site, thus minimizing potential adverse visual effects from the substation facilities (Exh. BE-1, at 5-9).

The Company presented four architectural designs compatible with surrounding facilities and has committed to design the substation facade of brick to be similar in type with other buildings in the surrounding area (Exh. BE-1, at 5-9; Tr. 2, at 86; Tr. 6, at 23). In addition, under the Terms of Settlement, the Company is required to plant shrubs and trees of a sufficient height and density to screen the proposed substation facilities in Hopkinton from view from South Street and residential properties in Milford (id.).

The record demonstrates that, with the implementation of the proposed landscaping at the transmission station, the construction of the substation with a brick facade to resemble nearby buildings, and the screening requirements contained in the Terms of Settlement, the visual impacts of the proposed facilities under the Primary Configuration would be negligible. Accordingly, the Siting Board finds that, with the proposed mitigation relative to the design and screening of the proposed facilities, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to visual impacts.

v. Magnetic Field Levels(84)

The Company asserted that the proposed facilities have been designed to minimize exposure to magnetic fields (BECo Initial Brief at 45). The Company indicated that, presently, the magnetic field levels along Purchase Street in Milford, which are due to the distribution lines and circuit drops along the street, vary from three to five milligauss ("mG"), according to location on the east or west side of the street (Exh. BE-DS-1(att. E)). BECo indicated that there are two residences, 327 and 339 Purchase Street, which are located 20 feet from the proposed transmission line and that these residences will be the closest residences to the proposed transmission line (Exh. HO-10, Table 10a-1). The Company indicated that existing magnetic field levels at the edge of the roadway closest to the residences are approximately 1.4 mG at 327 Purchase Street and 0.5 mG at 339 Purchase Street (Exh. HO-E-11).(85)

The Company stated that peak magnetic fields directly over the centerline of the proposed transmission line would be: (1) 1.0 mG under anticipated turn-on conditions where power transmission would equal 30 MVA; (2) 1.3 mG under anticipated near-term peak load conditions where power transmission would equal 40 MVA; and (3) 2.0 mG under anticipated long-term (i.e., 20-year) peak load conditions where power transmission would increase to 60 MVA (Exh. HO-RR-12).(86) BECo further stated that the magnetic field levels would decrease with increasing distance from the centerline of

the proposed transmission line, decreasing to one-half of the maximum values at a lateral distance of eight feet from the centerline and would continue to decrease rapidly with distance away from the centerline (Exh. BE-DS-1(att. E)). The Company indicated that there are 23 residences within 100 feet of the proposed transmission line route (Exh. HO-E-10, Table 10b-1).

The Company stated that the underground construction and design of the transmission line would minimize the magnetic field impacts of the proposed facilities (id.).(87),(88) The Company stated that each of the two transmission lines connecting the transmission station to the substation will consist of three underground cables contained within a six-inch steel pipe (Exh. BE-1, at 5-11). The Company stated that use of one steel pipe for each transmission line would minimize the peak magnetic fields and the distance over which magnetic fields are elevated (Exh. BE-DS-1(att. E); Tr. 6, at 123-125). Dr. Valberg explained that the one-pipe design would bring the cables as close together as possible, and therefore the magnetic fields of the adjacent cables would be cancelled to the greatest extent possible (Tr. 6, at 123-124). Dr. Valberg further explained that steel is a conductive material and would therefore deflect the amount of magnetic fields reaching the environment by a factor of approximately ten (id.).

The Company stated that the distribution lines would be constructed primarily underground and that the highest magnetic field levels associated with the proposed project would occur at a point directly above the new distribution lines as they leave the substation (Exh. BE-1, at 1-7, 5-11). The Company indicated that magnetic field levels would begin to decrease within 300 feet of the substation as the loading on the lines begins to decrease (id.). The Company also stated that the distribution lines would produce higher magnetic fields than the transmission line because (1) their voltage is lower, and (2) they would not be constructed within a steel pipe (Tr. 6, at 127-129). Assuming the distribution lines are dedicated lines that carry the same load as the transmission line as they exit the substation, the Company estimated that, directly above the distribution lines, the magnetic field strength would be approximately 100 times the field strength of the transmission line (id. at 130). Based on this assertion, the Siting Board calculates the magnetic field strength directly over the distribution lines to range from approximately 100 mG to 200 mG under differing peak load conditions. Further, based on the Company's assertion that magnetic field levels would decrease with increasing distance from the centerline of the proposed transmission line, decreasing to one-half of the maximum values at a lateral distance of eight feet from the centerline, the Siting Board calculates that the magnetic field levels would decease to approximately 50 mG to 100 mG at a distance of eight feet from the centerline of the distribution line.

However, the Company stated that the distribution line route would traverse a commercial/industrial area where current in the lines would continue to be reduced as it is drawn off by industrial users and that there are no residences, schools or other sensitive receptors located within 100 feet of the distribution line route (id. at 126; Exh. HO-E-10, Table E-10b-2).(89) The Company indicated that the commercial and industrial property frontages along South Street are located approximately 20 to 25 feet from the proposed distribution line (Exh. HO-E-3(att. 6), Distribution Duct Banks, sheets 1-5).(90) In

addition, the Company asserted that because power presently is supplied to Hopkinton via distribution lines, installation of the proposed project which would provide power in close proximity to major users, would reduce the loading on the distribution lines servicing Hopkinton and would therefore result in an overall decrease in existing magnetic field levels in Hopkinton (Exh. BE-1, at 5-11; Tr. 6, at 131).

As a condition of the Settlement Agreement, BECo has agreed to: (1) conduct a baseline survey of EMF levels along Purchase Street, and at the transmission tap station and substation sites prior to installation of the proposed project; (2) conduct follow-up surveys of EMF levels after project installation on an annual basis for the first three years of facility operation and then on a bi-annual basis for the next six years; and (3) report results of all of the aforementioned EMF surveys to the parties to the Settlement Agreement (Exh. HO-RR-11). In addition, if EMF levels from the proposed project are determined to exceed applicable health or safety standards in place as of the date of the Settlement Agreement, BECo agreed to take reasonable corrective action as required by law to reduce such levels (id.).

In a previous review of proposed transmission line facilities, the Siting Board accepted edge-of-ROW levels of 85 MG for the magnetic field. Massachusetts Electric Company/New England Power Company, 13 DOMSC 119, 228-242 (1985) ("1985 MECo/NEPCo Decision"). The Siting Board has also applied these edge-of-ROW levels in subsequent reviews of facilities which included 115-kV transmission lines. See, 1997 ComElec Decision, EFSB 96-6 at 73; Norwood Decision, EFSB 96-2, at 33; MASSPOWER, Inc, 20 DOMSC 301, 401-403 (1990). Here, the magnetic field levels along the transmission line route would remain far below the levels found acceptable in the 1985 MECo/NEPCo Decision, with operation of the proposed transmission line. The record demonstrates that the Company has incorporated features into the design of the proposed transmission line that would minimize its magnetic fields. In addition, in accordance with its Settlement Agreement with the Milford Parties, the Company will monitor magnetic field levels along the transmission line route and will take corrective action if so required.

However, the maximum magnetic field levels near the underground distribution line in South Street likely would exceed the edge-of-the-ROW levels found acceptable in the 1985 MECo/NEPCo Decision. The record demonstrates that magnetic field levels will be highest as the distribution lines leave the substation and then decrease as current is drawn off by industrial users along the route. The record also demonstrates that, depending on peak load conditions, magnetic field levels would range from approximately 100 mG to 200 mG directly over the lines, decreasing to approximately 50 mG to 100 mG at a distance of eight feet from the lines and further decreasing with increasing distance from the lines.

The record further demonstrates that there are no residences within 100 feet of the proposed distribution lines, and that the property frontages of the commercial and industrial properties along South Street are located approximately 20 to 25 feet from the proposed distribution line. Thus, magnetic field levels due to the operation of the

proposed distribution line would not exceed 85 mG at the property frontages of the commercial and industrial properties along South Street. In addition, the record demonstrates that magnetic field levels of other distribution lines in Hopkinton would decrease as a result of the operation of the proposed facilities.

Accordingly, the Siting Board finds that, with implementation of the proposed facility design configuration, and the monitoring and mitigation plan set forth in the Settlement Agreement, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to magnetic field impacts.

vi. Conclusions on Environmental Impacts

In Section III.C.2.a, above, the Siting Board has reviewed the information in the record regarding environmental impacts of the proposed facilities under the Primary Configuration and the potential mitigation measures. The Siting Board finds that the Company has provided sufficient information regarding environmental impacts of the proposed facilities under the Primary Configuration and potential mitigation measures for the Siting Board to determine whether environmental impacts would be minimized and whether the appropriate balance among environmental impacts would be achieved.

In Section III.C.2.a, above, the Siting Board has found that: (1) with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to water resources; (2) with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to land resources; (3) with the implementation of all proposed mitigation, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to land use; (4) with the proposed mitigation relative to the design and screening of the proposed facilities, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to visual impacts; and (5) with implementation of the proposed facility design configuration, and the monitoring and mitigation plan set forth in the Settlement Agreement, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized with respect to magnetic field impacts.

Accordingly, the Siting Board finds that, with the implementation of proposed mitigation and compliance with all applicable local, state, and federal requirements, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized. In Section III.C.3.c, below, the Siting Board addresses whether an appropriate balance among environmental impacts and among cost, reliability, and environmental impacts would be achieved.

b. Cost of the Proposed Facilities Under the Primary Configuration

The Company submitted estimates of both the installation costs and the annual costs for the proposed facilities, and estimates of the installation costs of the alternative facilities (Exhs. DV 1.1-2; DV 1.1-3; HO-RR-6(atts. 1 & 2)). BECo stated that it estimated the installation costs of the proposed project at $12,547,000, and the first year O&M costs, including costs of substation and transmission station operation and transformer losses, at $35,600 (Exhs. DV 1.1-3; HO-RR-6(atts. 1& 2)). The Company indicated that annual distribution line losses in the area supplied by the proposed facilities would be $85,000, as compared with approximately $1,000,000 in losses to serve that area under the existing system (Exh. HO-RR-6).(91)

The Siting Board finds that BECo has provided sufficient cost information for the Siting Board to determine whether an appropriate balance would be achieved between environmental impacts and cost.

c. Conclusions

The Siting Board has found that BECo has provided sufficient information regarding the environmental impacts of the proposed facilities under the Primary Configuration and potential mitigation measures for the Siting Board to determine whether environmental impacts would be minimized and whether the appropriate balance among environmental impacts and between costs and environmental impacts would be achieved. The Siting Board has also found that BECo has provided sufficient cost information for the Siting Board to determine whether the appropriate balance would be achieved between environmental impacts and cost.

In Section III.C.2.a., above, the Siting Board reviewed the environmental impacts of the proposed facilities and proposed mitigation under the Primary Configuration with respect to water resources, land resources, land use, visual impacts, and magnetic field levels. For each category of environmental impacts, BECo demonstrated that, with the mitigation discussed above, the impacts would be minimized.

Accordingly, the Siting Board finds that the proposed facilities under the Primary Configuration would achieve an appropriate balance among conflicting environmental concerns as well as between environmental impacts and cost.

3. Analysis of the Proposed Facilities along the Alternative Route and Comparison

a. Environmental Impacts of the Proposed Facilities along the Alternative Route and

Comparison

In this Section, the Siting Board evaluates the environmental impacts of the proposed facilities under the alternative route. First, as part of its evaluation, the Siting Board addresses whether the petitioner has provided sufficient information regarding the alternative route for the Siting Board to determine whether the environmental impacts of the proposed facilities would be minimized, and whether the proposed facilities would achieve the appropriate balance among environmental impacts and between cost and environmental impacts. If necessary for its review, the Siting Board separately addresses whether the environmental impacts of the proposed facilities along the alternative route would be minimized, with potential mitigation. Finally, in order to determine a best route, the Siting Board compares the environmental impacts of the Primary Configuration to the environmental impacts of the alternative route.

i. Water Resources

BECo stated that wetlands occur on and in the vicinity of the alternative route for the proposed facilities (Exh. BE-1, at 5-15). The Company indicated that the underground T&D line routes would be located within existing roadways, thus avoiding direct disturbance of wetland resources adjacent to the roadway layout (id. at 5-16 to 5-18). The Company stated that the T&D facilities along the alternative route would cross a total of three culverts, one which enables a hydrological link between wetlands on both sides of East Street in Upton, and two others which convey water flow between the north and south portions of North Pond along a 1,500 foot section of West Main Street in Hopkinton (id.).(92) The Company stated that the West Main Street causeway is elevated in the vicinity of North Pond, but added that groundwater could be encountered during excavation (id.; Exh. Upton 4). BECo stated that because there are no uplands in the immediate vicinity of where dewatering the trench might be necessary, the proper discharge of trench water would be difficult and likely require the use of a settling tank or a wetland filter bag to ensure effective sediment removal prior to discharge into North Pond (Exhs. BE-1, at 5-16 to 5-18; Upton 5). The Company stated that the proposed facilities along the alternative route would not cross or otherwise impact the 100-year floodplain (Exh. BE-1, at 5-18).

BECo stated that a habitat of rare wetlands wildlife is estimated to occur in two areas along the alternative route, but added that construction activities would not directly impact these areas (id. at 5-20; Exh. Upton 2; Tr. 6, at 81-83).(93)

The Company stated that the alternative transmission station and substation sites are located in upland areas, and would not require dewatering activities (Exh. BE-1, at 5-19). The Company further stated that the proposed facilities along the alternative route would not traverse, or be placed in proximity to any water resource designated as an ORW (id.). The Company stated that the public water supply system in Hopkinton extends along the

portion of the alternative route on West Main Street (Exh. HO-RR-9). The Company noted that the Hopkinton water supply ends on School Street at the Pine Crest Village Condominiums, and that there is no known town water supply in Upton along the alternative route (id.; Exh. Upton 42). The Company indicated that residences/businesses along East Street in Upton obtain water from private wells (Exh. Upton 42). The Company added that it did not conduct detailed engineering to determine the exact locations of private wells on East Street that could be affected by construction of the alternative facilities (id.).(94)

The record demonstrates that impacts to existing and future water resources from the construction of the proposed facilities could be minimized along the alternative route. The record indicates that the Primary Configuration would involve construction proximate to ORWs, while the alternative route would not. However, the record also demonstrates that the alternative route's construction would be proximate to an estimated habitat of rare wetlands wildlife, and could potentially affect private wells along East Street. On balance, the alternative route could have greater impacts to water resources than the Primary Configuration. Accordingly, the Siting Board finds that the Primary Configuration would be slightly preferable to the alternative route with respect to water resources.

ii. Land Resources

The Company asserted that the land resource impacts from construction of the proposed facilities along the alternative route would be greater than those under the Primary Configuration due to the location of the alternative route substation near protected open space on School Street in Hopkinton (Tr. 6, at 85-86). Specifically, the Company indicated that a portion of the transmission line route and the substation site would abut the protected land (Exh. BE-1, Appendix C).

BECo indicated that approximately 2.5 acres in aggregate would need to be cleared of trees for the alternative facilities, including 1.5 acres for the transmission station and access road, and one acre for the substation and its access road (id. at 5-20; Exh. HO-E-16). The Company indicated that, as with the Primary Configuration, the construction of the alternative route transmission and distribution lines would occur chiefly in existing roadways, thereby minimizing tree clearing impacts (Exh. BE-1, at 5-20). The Company stated that the transmission station and substation sites for the alternative route would be level and well vegetated, thus minimizing the potential for erosion (id.). The Company further stated that bedrock is likely to be encountered only at the existing NEES ROW, where poles would need to be set to tap into the existing transmission lines (id.).

The record demonstrates that impacts of the construction of the proposed facilities along the alternative route with respect to tree clearing, upland vegetation and potential soil erosion would be minimized. However, the record also demonstrates that overall tree

clearing impacts for construction of the transmission station, substation, and associated access roads using the alternative route would be 2.5 acres, as compared to 2.0 acres for the Primary Configuration.

Accordingly, the Siting Board finds that the Primary Configuration would be slightly preferable to the alternative route with respect to land resource impacts.

iii. Land Use

BECo asserted that land use impacts from construction of the proposed facilities along the alternative route would be greater than those under the Primary Configuration due to the longer length of underground distribution lines in Hopkinton (Exh. BE-1, at 5-28). The Company stated that the length of the new distribution circuits would be over two miles using the alternative route, compared to approximately 2,000 feet under the Primary Configuration (id. at 5-23).

The Company stated that the proposed facilities along the portion of the alternative route in Upton would be located within an Agricultural-Residential zoning district (id. at 5-22). The Company further stated that, in Hopkinton, the remaining portion of the transmission line route and the substation site would be located in an Agricultural zoning district, while the distribution line route would be located within Agricultural, Residential, and Industrial zoning districts (id. at 5-23). The Company indicated that the same structures, buildings, and equipment as proposed under the Primary Configuration would be used at the alternative transmission station and substation sites (Exhs. Upton 12; Upton 23).

The Company indicated that approximately 18 residences along East and School Streets would be affected by construction of the underground transmission line, compared to approximately 19 residences under the Primary Configuration's transmission route (Exhs. HO-E-10b, Table E-10b-3; Upton 33).(95) The Company indicated that approximately 68 residences would be affected by construction of the underground distribution lines, compared to no residences or other sensitive receptors under the Primary Configuration's distribution line route (Exh. HO-E-10b, Table E-10b-4). The Company further indicated that the distance from the nearest residence to the substation would be 300 feet, and the distance from the nearest residence to the distribution line route would be eight feet (Exh. HO-E-10a). With respect to traffic impacts, the Company stated that police details and plastic barrels would be used during construction along East Street to maintain one lane of traffic, and added that steel plates would be used to maintain traffic at intersections and driveways (Exhs. Upton 51; Upton 2-13; Upton 2-15).(96) With respect to the longer underground distribution facilities necessary along the alternative route, the Company stated that underground distribution construction proceeds more slowly than that required for underground transmission (Exh. BE-1, at 5-23). The Company further stated that the portion of distribution line route along West Main and South Streets is heavily travelled (id. at 5-24). The Company added that upon completion of construction it would provide

funds for re-paving the full width of those roadways affected by excavation and placement of the proposed facilities (Exhs. Upton 58; Upton 59; HO-E-9).

The Company stated that it did not perform an analysis of the potential noise impacts of the alternative facilities (Exhs. BE-1, at 5-23; Upton 45). However, the Company indicated that the proposed low-noise transformers, large parcel size for the alternative substation site, and use of a three-sided sound barrier, if necessary, would ensure facility operation within the Massachusetts Department of Environmental Policy and local noise regulation guidelines (Exhs. BE-1, at 5-23; Upton 45; Upton 46).

Regarding potential cultural resource impacts, the Company stated that it reviewed files at the MHC to determine if any historical or archaeological resources were present in the vicinity of the alternative route (Exh. BE-1, at 5-24). The Company determined that one building along East Street in Upton was identified in the historic inventory (Exhs. Upton 39; HO-E-22, (att.)).(97) The Company stated that the MHC has determined that the proposed project along the alternative route would not have any adverse impact on historic resources (Exh. Upton 2-11).(98)

With respect to potential archeological impacts, the Company stated that two archeological sites were identified along the route for the alternative distribution facilities (Exh. HO-RR-10). The Company stated that one site includes the shoreline and areas of North Pond, including portions of West Main Street, while the other site includes a 1,000 foot length of West Main Street in the vicinity of the causeway at North Pond, extending to the north and south sides of the roadway (id.).

Richard A. Amato, representing the Amato Farm Partnership ("AFP"), stated that his colonial-era home is located six feet(99) from the edge of East Street, thus increasing the likelihood of adverse construction impacts to the home's fieldstone foundation (Exh. RAA-1, at 1, 4).(100) Mr. Amato stated that construction of the underground transmission line along both East and School Streets would adversely impact adjacent properties in Upton and Hopkinton, respectively, owned and operated by the AFP (Exh. RAA-1). Mr. Amato further stated that during the spring and summer, the public is invited to harvest strawberries on the premises, and that convenience and country atmosphere are the principle attractions for AFP's customers (id. at 3).

The record demonstrates that the proposed transmission facilities along the alternative route would traverse agricultural/residential and agricultural zoning districts while the associated substation and distribution facilities would traverse agricultural, residential, and industrial zoning districts. The record also demonstrates that construction of the alternative facilities would occur in more residentially populated areas than would the Primary Configuration. Construction would also affect active agricultural property, open to the public, along the transmission line route.

In addition, the record indicates that although the alternative transmission lines are marginally shorter than those under the Primary Configuration, the new underground distribution facilities would be considerable longer. These longer distribution facilities

would require a significantly longer construction period, thus greatly increasing the potential for local traffic impacts and related impacts to residences and businesses along that portion of the alternative route. With respect to potential noise impacts, the record demonstrates that the nearest residence to the substation site is closer at the alternative site than under the Primary Configuration. Potential impacts to archeological resources would be greater along the alternative route, although potential impacts to historic properties would be greater under the Primary Configuration.

Accordingly, on balance, the Siting Board finds that the Primary Configuration would be preferable to the proposed facilities along the alternative route with respect to land use impacts.

iv. Visual Impacts

BECo indicated that, as with the Primary Configuration, visual impacts of the proposed facilities along the alternative route would be limited to views of the aboveground facilities, including the transmission station and the substation (Exh. BE-1, at 5-20).

The Company stated that the alternative transmission station site in Upton is a 31.6-acre undeveloped parcel in an agricultural/residential zone with access to East Street in Upton and to the NEES ROW (id. at 5-22). The Company stated that the access road to the transmission station would be located between an existing private driveway on East Street and the existing NEES ROW (Exh. Upton 18). The Company stated that the transmission station would be located adjacent to the north side of the NEES ROW, as far as possible from the nearest residence (Exh. BE-1, at 5-22). The Company indicated that the nearest residence, located on East Street in Upton, would be situated 565 feet from the transmission station site (Exh. HO-E-10a, Table E-10a-2). The Company's witness, Mr. Stuart, testified that there are approximately three to four residences within 1,000 feet of the alternative transmission station site (Tr. 6, at 72-73). Mr. Stuart also testified that the proposed transmission station would have greater visual impacts at the alternative site than at the primary site, due chiefly to a rise in topography from East Street, where the existing NEES 115-kV transmission lines cross (id. at 73-74). The Company stated that most of the area surrounding the transmission station would remain forested, and that landscaping would be used to screen any openings providing views of the transmission station site from residences (Exhs. BE-1, at 5-22; Upton 16).

The Company stated that the alternative substation site in Hopkinton is an 18.3-acre undeveloped wooded parcel in an Agricultural zone, the east side of which is adjacent to School Street (Exhs. BE-1, at 5-22 to 5-23; Upton 21). The Company stated that the access road into the substation would be from School Street (Exhs. Upton 29; Upton 30). The Company also stated that sensitive receptors are located beyond the north and northwest sides of the substation site adjacent to West Main Street (Exh. BE-1, at 5-22). The Company indicated that an undeveloped wooded area is located to the west of the

substation site, and a farm field is to the south (id.; Exh. Upton 22). The Company also indicated that the nearest residence to the alternative substation site would be located on School Street in Hopkinton, 300 feet away (Exh. HO-E-10a, Table E-10a-2). The Company further stated that the surrounding woodland will provide significant natural screening of the substation facilities, and added that it would landscape the site to screen any openings providing views of the facilities to nearby residences (Exh. BE-1, at 5-22).

The record demonstrates that the visual impacts of the proposed facilities along the alternative route would be greater than those under the Primary Configuration due to the higher elevation of the alternative transmission station site. Accordingly, the Siting Board finds that the Primary Configuration would be preferable to the proposed facilities along the alternative route with respect to visual impacts.

v. Magnetic Field Levels

The Company indicated that the design of the alternative facilities would be identical to that of the proposed facilities, and that the alternative facilities would operate at the same power level as the proposed facilities (Exh. BE-1, at 5-23). Therefore, the Company stated that magnetic field increases along the new transmission line would be the same for the proposed and alternative facilities (id.). The Company indicated that there are 18 residences within 100 feet of the alternative transmission line route (Exh. HO-E-10, Table E-10b-3).

However, the Company stated that although the distribution lines would be constructed underground along South Street for a portion of the route, the overall route of the underground distribution facilities would traverse a mixed land use area (Exh. BE-1, at 5-23; Tr. 6, at 127, 130). The Company indicated that there are approximately 68 residences located within 100 feet of the alternative distribution line route (Exh. HO-E-10, Table E-10b-4).

The record indicates that the magnetic field impacts of the proposed facilities along the alternative route would be greater than under the Primary Configuration. The record demonstrates that the underground transmission lines along the alternative route would emit the same magnetic field levels, with the transmission line segment marginally shorter than under the Primary Configuration. However, the record also demonstrates that the alternative route's underground distribution facilities extending from the substation would traverse more heavily populated residential areas before terminating into the existing distribution network on South Street in Hopkinton. Therefore, the longer underground distribution facilities along the alternative route would result in a greater overall magnetic field impact due to the presence of 68 residences in proximity to the roadways where these distribution facilities would be located, and the presence of distribution-level currents and correspondingly high magnetic fields.

Accordingly, the Siting Board finds that the Primary Configuration would be preferable to the alternative route with respect to magnetic field levels.

vi. Conclusions on Environmental Impacts

In Sections III.C.3.a(i) to (v), above, the Siting Board has found that the Primary Configuration would be slightly preferable to the proposed facilities along the alternative route with respect to water resources and land resource impacts and preferable to the proposed facilities along the alternative route with respect to land use, visual and magnetic field impacts. Accordingly, the Siting Board finds that the Primary Configuration would be preferable to the proposed facilities along the alternative route with respect to environmental impacts.

b. Cost of the Proposed Facility along the Alternative Route and Comparison

BECo indicated that construction of the Primary Configuration is the least-cost alternative based on its analysis of construction, materials and equipment, and land acquisition, as compared to the alternative facilities (Exhs. BE-1, at 5-14 to 5-15, 5-24; DV 1.1-2; DV 1.1-3; DV 1.1-8). BECo submitted estimates of installation costs for the alternative configuration (Exhs. DV 1.1-2; DV 1.1-8). BECo explained that its estimates of installation costs for the alternative configuration included costs of 115-kV transmission, 14-kV distribution, a new transmission station and 115/14-kV substation, and land acquisition costs (Exh. DV 1.1-2).

BECo stated that it estimated installation costs at $13,893,750 for the alternative facilities, as compared to $12,547,000 for the Primary Configuration (id.; Exh. DV 1.1-3).

Proposed Facilities	Alternative Facilities
Distribution	$502,000	$ 2,168,750
Transmission Station/Substation	8,250,000	8,325,000
Transmission Line	3,400,000	2,900,000
Land Acquisition	395,000	500,000
Total Cost	$12,547,000	$13,893,750

Source of Table: Summary of Exhs. DV 1.1-2; DV 1.1-3

BECo indicated that costs of the Primary Configuration would be lower than those of the alternative facilities due primarily to significantly lower distribution costs and lower transmission costs (Exhs. DV 1.1-2; DV 1.1-3). BECo further indicated that the significant increase in 14-kV distribution costs associated with the alternative facilities is due to the alternative route's longer distribution facility length compared to that under the Primary Configuration (Exh. BE-1, at 5-23, 5-28).

The record demonstrates that the installation costs of the alternative facilities would be nearly 11 percent higher than corresponding costs for the Primary Configuration. Accordingly, the Siting Board finds that the Primary Configuration would be preferable to the alternative facilities with respect to cost.

c. Conclusions

In comparing the Primary Configuration to the alternative facilities, the Siting Board has found that the proposed facilities under the Primary Configuration would be preferable to the alternative facilities and route with respect to (1) environmental impacts, and (2) costs.

Accordingly, the Siting Board finds that the proposed facilities under the Primary Configuration would be preferable to the alternative facilities and route with respect to providing a necessary energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

IV. ZONING EXEMPTIONS/PUBLIC CONVENIENCE AND INTEREST

As noted in Section I.C, above, the Company filed two petitions with the Department, which are related to the proposed project under consideration by the Siting Board in the present proceeding and which have been consolidated for review in the Company's Siting Board proceeding. In one petition, the Company, pursuant to G.L. c. 164, § 72, sought a determination by the Department that BECo's proposed electric transmission line, transmission station, substation and distribution facilities are necessary and will serve the public convenience and be consistent with the public interest. In its other petition, the Company, pursuant to G.L. c. 40A, § 3, sought exemptions from the zoning by-laws of (1) the Town of Milford for the proposed transmission line and transmission station, and (2) the Town of Hopkinton for the proposed transmission line, substation and distribution facilities. Pursuant to G.L. c. 164, § 69H(2), the Siting Board applies the Department's

standards of review for such petitions to the subject matter of the Company's petitions in a manner consistent with the above findings of the Siting Board.(101)

A. Standard of Review

In its petition for a zoning exemption, the Company seeks approval under

G.L. c. 40A, § 3, which, in pertinent part, provides:

Land or structures used, or to be used by a public service corporation may be exempted in particular respects from the operation of a zoning ordinance or by-law if, upon petition of the corporation, the [D]epartment of [P]ublic [U]tilities shall, after notice given pursuant to section eleven and public hearing in the town or city, determine the exemptions required and find that the present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public....

Under this section, the Company first must qualify as a public service corporation (see Save the Bay, Inc. v. Department of Public Utilities, 366 Mass. 667 (1975)), and establish that it requires an exemption from the local zoning by-laws. The Company then must demonstrate that the present or proposed use of the land or structure is reasonably necessary for the public convenience or welfare.

In determining whether a company qualifies as a "public service corporation" for purposes of G.L. c. 40A, § 3, the Supreme Judicial Court has stated:

among the pertinent considerations are whether the corporation is organized pursuant to an appropriate franchise from the State to provide for a necessity or convenience to the general public which could not be furnished through the ordinary channels of private business; whether the corporation is subject to the requisite degree of governmental control and regulation; and the nature of the public benefit to be derived from the service provided.

Save the Bay, 366 Mass. at 680.

In determining whether the present or proposed use is reasonably necessary for the public convenience or welfare, the Department must balance the interests of the general public against the local interest. Id. at 685-686; Town of Truro v. Department of Public Utilities, 365 Mass. 407 (1974). Specifically, the Department is empowered and required to undertake "a broad and balanced consideration of all aspects of the general public interest and welfare and not merely [make an] examination of the local and individual interests which might be affected." New York Central Railroad v. Department of Public Utilities, 347 Mass. 586, 592 (1964). When reviewing a petition for a zoning exemption under G.L. c. 40A, § 3, the Department is empowered and required to consider the public

effects of the requested exemption in the State as a whole and upon the territory served by the applicant. Save the Bay, supra, at 685; New York Central Railroad, supra, at 592.

With respect to the particular site chosen by a petitioner, G.L. c. 40A, § 3 does not require the petitioner to demonstrate that its preferred site is the best possible alternative, nor does the statute require the Department to consider and reject every possible alternative site presented. Martarano v. Department of Public Utilities, 401 Mass. 257, 265 (1987); New York Central Railroad, supra, at 591; Wenham v. Department of Public Utilities, 333 Mass. 15, 17 (1955). Rather, the availability of alternative sites, the efforts necessary to secure them, and the relative advantages and disadvantages of those sites are matters of fact bearing solely upon the main issue of whether the preferred site is reasonably necessary for the convenience or welfare of the public. Id.

Therefore, when making a determination as to whether a petitioner's present or proposed use is reasonably necessary for the public convenience or welfare, the Department examines: (1) the present or proposed use and any alternatives or alternative sites identified (see Massachusetts Electric Company, D.P.U. 93-29/30, at 10-14, 22-23 (1995) ("1995 MECo Decision"); New England Power Company, D.P.U. 92-278/279/280, at 19 (1994) ("1994 NEPCo Decision"); Tennessee Gas Pipeline Company, D.P.U. 85-207, at 18-20 (1986)) ("1986 Tennessee Decision"); (2) the need for, or public benefits of, the present or proposed use (see 1995 MECo Decision, supra, at 10-14; 1994 NEPCo Decision, supra, at 19-22; 1986 Tennessee Decision, supra, at 17); and (3) the environmental impacts or any other impacts of the present or proposed use (see 1995 MECo Decision, supra, at 14-21; 1994 NEPCo Decision, supra, at 20-23; 1986 Tennessee Decision, supra, at 20-25). The Department then balances the interests of the general public against the local interest, and determines whether the present or proposed use of the land or structures is reasonably necessary for the convenience or welfare of the public.(102)

With respect to the Company's petition filed pursuant to G.L. c. 164 § 72, the statute requires, in relevant part, that an electric company seeking approval to construct a transmission line must file with the Department a petition for:

authority to construct and use . . . a line for the transmission of electricity for distribution in some definite area or for supplying electricity to itself or to another electric company or to a municipal lighting plant for distribution and sale . . . and shall represent that such line will or does serve the public convenience and is consistent with the public interest. . . . The [D]epartment, after notice and a public hearing in one or more of the towns affected, may determine that said line is necessary for the purpose alleged, and will serve the public convenience and is consistent with the public interest.(103)

The Department, in making a determination under G.L. c. 164, § 72, is to consider all aspects of the public interest. Boston Edison Company v. Town of Sudbury, 356 Mass. 406, 419 (1969). Section 72, for example, permits the Department to prescribe reasonable conditions for the protection of the public safety. Id. at 419-420. All factors affecting any phase of the public interest and public convenience must be weighed fairly by the Department in a determination under G.L. c. 164, § 72. Town of Sudbury v. Department of Public Utilities, 343 Mass. 428, 430 (1962).

As the Department has noted in previous cases, the public interest analysis required by G.L. c. 164, §72 is analogous to the Department's analysis of the "reasonably necessary for the convenience or welfare of the public" standard under G.L. c. 40A, § 3. See, New England Power Company, D.P.U. 89-163, at 6 (1993); New England Power Company, D.P.U. 91-117/118, at 4 (1991); Massachusetts Electric Company, D.P.U. 89-135/136/137, at 8 (1990). Accordingly, in evaluating petitions filed under G.L. c. 164, § 72, the Department relies on the standard of review for determining whether the proposed project is reasonably necessary for the convenience or welfare of the public under G.L. c. 40A, § 3. Id.

B. Analysis and Findings

BECo is an electric company as defined by G.L. c. 164, § 1, authorized to generate, distribute and sell electricity. Boston Edison Company, D.P.U. 87-74 (1987). Accordingly, BECo is authorized to petition the Department as public service corporations for the determinations sought under G.L. c. 40A, § 3, in this proceeding.

G.L. c. 40A, § 3, authorizes the Department to grant to public service corporations exemptions from local zoning ordinances or by-laws if the Department determines that the exemption is required and finds that the present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public. With respect to the Company's petition filed pursuant to G.L. c. 40A, § 3, the Company seeks exemptions from the operation of: (1) Article 1, § 1.4 (Building Permits), § 1.5 (Certificate of Zoning Compliance), and § 1.15 (Site Plan Review); and Article II, §2.2 (Use Regulation) and § 2.3 (Use Regulation Schedule) of the Town of Milford Zoning By-laws; and (2) Article Two, § F.19 (Uses Permitted by Right), § 23 (Earth Removal), § 25 (Off Street Parking), and Article Three, § 29(3) Administration and Procedure -- Special Permit) of the Town of Hopkinton Zoning By-laws. Based on its review of the zoning by-laws of the Town of Milford and the zoning by-laws of the Town of Hopkinton, the Siting Board concludes that some or all of these sections could impede the construction, operation and maintenance of the Company's proposed transmission line, transmission station, substation and distribution facilities. Therefore, the Siting Board finds that the Company requires exemptions from the operation of the above-listed sections of the Town of Milford Zoning By-laws and the Town of Hopkinton Zoning By-

laws for the construction, operation and maintenance of the proposed project.

Pursuant to G.L. c. 40A, § 3, the Siting Board next examines whether the company's proposed use of the land and structures as set forth in its petitions is reasonably necessary for the convenience or welfare of the public. In making its findings, the Siting Board relies on the analyses in Sections II and III, above. In those sections, the Siting Board found that the Company' reliability criteria are reasonable for purposes of this review, and that the Company's 1997 contingency analysis provides a reasonable basis for establishing need in this review (see Sections II.A.3.a. and c, above). The Siting Board also found that the Company's contingency analysis demonstrates that under the worst-case single contingency with the present configuration, (1) emergency ratings on one or more existing distribution lines in Hopkinton would be exceeded beginning in 1997, and (2) the voltage level on an existing distribution line in Hopkinton would be inconsistent with system reliability criteria beginning in 1997 in contravention of the Company's reliability criteria. The Siting Board also concluded that the peak load in Hopkinton is likely to reach the level underlying the Company's 1997 contingency analysis within the 1997-2000 time frame. In addition, the Siting Board also found that the frequency of interruptions in the HSA is higher than system norms, and considered together with the other existing and expected violations of system reliability criteria in the HSA, such frequency of interruptions is inconsistent with the operation of a reliable system. Therefore, the Siting Board found that there is a need for additional energy resources in Hopkinton based on BECo's reliability criteria.

In addition, the Siting Board found that the Company has demonstrated that acceleration of C&LM programs could not eliminate the identified need in Hopkinton for additional energy resources (see Sections II.A.3.d. and e, above). Consequently, the Siting Board found that additional energy resources currently are needed for reliability purposes in Hopkinton, and therefore, are reasonably necessary for the convenience or welfare of the public in the Hopkinton area.

The Siting Board notes that the Company evaluated a reasonable range of alternatives to the proposed project, including three project alternatives and one alternative facility configuration, in developing its strategy to supply Hopkinton with a reliable supply of electrical power. The record further indicates that the Company considered possible environmental impacts of the proposed transmission line, transmission station, substation and distribution facilities that may be of concern to the surrounding community, including water resources, land resources, land use, visual impacts, and magnetic field level impacts. The record indicates that the Company would implement measures to mitigate these impacts.

Thus, with the implementation of the mitigation measures identified by the Company, the Siting Board finds that the general public interest in the construction, operation and maintenance of the proposed transmission line, transmission station, substation and distribution facilities outweighs the minimal impacts of the Company' proposed project on the local community. Accordingly, the Siting Board finds that the proposed transmission line, transmission station, substation and distribution facilities are

reasonably necessary for the convenience or welfare of the public and exempts BECo from the operation of the above-listed sections of the Zoning By-laws of the Town of Milford and the Zoning By-laws of the Town of Hopkinton.

With regard to the Company's petition filed pursuant to G.L. c. 164, § 72, the Siting Board notes that the Company has complied with the requirements that it describe the proposed transmission line, provide a map or plan showing its general location, and estimate its cost in reasonable detail. Consistent with Department precedent and the public interest analysis above, the Siting Board here finds that BECo's proposed transmission line is necessary for the purpose alleged, and will serve the public convenience and is consistent with the public interest.

V. DECISION

The Siting Board has found that the Company has established that additional energy resources currently are needed for reliability purposes in Hopkinton.

The Siting Board also has found that both the proposed project and the local generation alternative would meet the identified need but that the proposed project is preferable to the local generation alternative.

The Siting Board further has found that the Company has considered a reasonable range of practical siting alternatives.

The Siting Board further has found that, with the implementation of proposed mitigation and planned compliance with all applicable local, state, and federal requirements, the environmental impacts of the proposed facilities under the Primary Configuration would be minimized.

The Siting Board further has found that the proposed facilities under the Primary Configuration would achieve an appropriate balance among conflicting environmental concerns as well as between environmental impacts and cost.

Finally, the Siting Board has found that the proposed facilities under the Primary Configuration would be preferable to the alternative facilities and route with respect to providing a necessary energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

In addition, the Siting Board finds that the proposed project is consistent with the most recently approved long-range forecast of BECo.

Accordingly, the Siting Board APPROVES the Company's petition to construct two 1.3-mile long, 115-kilovolt underground electric transmission lines; a transmission station; a 115/14-kilovolt substation; and distribution facilities in the towns of Hopkinton and Milford, Massachusetts using the Company's preferred sites and routes.

In addition, the Siting Board finds that BECo's proposed transmission line is necessary for the purpose alleged, and will serve the public convenience and is consistent with the public interest; and

The Siting Board GRANTS the Company's petition for an exemption from the operation of: Article 1, § 1.4, § 1.5, and § 1.15; and Article II, § 2.2 and § 2.3 of the Town of Milford Zoning By-laws; and from Article Two, § F.19, § 23, and § 25, and Article Three, § 29(3) of the Town of Hopkinton Zoning By-laws for the purposes of constructing and operating the proposed transmission line, transmission station and substation.

The Siting Board notes that the findings in this decision are based on the record in this case. A project proponent has an absolute obligation to construct and operate its facility in conformance with all aspects of its proposal as presented to the Siting Board. Therefore, the Siting Board requires the Company to notify the Siting Board of any changes other than minor variations to the proposal so that the Siting Board may decide whether to inquire further into a particular issue. The Company is obligated to provide the Siting Board with sufficient information on changes to the proposed project to enable the Siting Board to make these determinations.

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Robert P. Rasmussen

Hearing Officer

Dated this 22nd day of December, 1997

APPROVED by a majority vote of the Energy Facilities Siting Board at its meeting of December 19, 1997 by the members and designees present and voting. Voting for approval of the Tentative Decision as amended: Sonia Hamel, Acting Chair (for Trudy Coxe, Secretary, Executive Office of Environmental Affairs); John D. Patrone (Commissioner, DTE); James Connelly (Commissioner, DTE); David L. O'Connor (for

David A. Tibbetts, Director, Department of Economic Development); and Joseph Faherty (Public Member).

Nancy Brockway (Public Member) abstained from voting.

Sonia Hamel

Acting Chair

Dated this 22nd day of December, 1997

Appeal as to matters of law from any final decision, order or ruling of the Siting Board may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the order of the Siting Board be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Siting Board within twenty days after the date of service of the decision, order or ruling of the Siting Board, or within such further time as the Siting Board may allow upon request filed prior to the expiration of the twenty days after the date of service of said decision, order or ruling. Within ten days

after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the clerk of said court. (Massachusetts General Laws, Chapter 25, Sec. 5; Chapter 164, Sec. 69P).

1. 1 BECo originally indicated that the shielding mast would be "a maximum height of 75 feet" (Exh. BE-1 at 1-5).

2. 2 The Town of Milford withdrew as an intervenor on June 20, 1997.

3. 3 IEC withdrew as an intervenor on March 24, 1997.

4. 4 The Siting Board notes that St. 1997, c. 164, which was enacted on November 24, 1997, does not alter the Siting Board's jurisdiction or standards of review as it relates to the Company's proposed project.

5. 5 When a transmission line facility proposal is submitted to the Siting Board, the petitioner is required to present: (1) its preferred facility site and/or route; and (2) at least one alternative facility site and/or route. These sites and routes often are described as the "noticed" alternatives because these are the only sites and routes described in the notice of adjudication published at the commencement of the Siting Board's review. In reaching a decision in such a facility case, the Siting Board can approve a petitioner's preferred site or route, approve an alternative site or route, or reject all sites and routes. The Siting Board, however, may not approve any site, route, or portion of a route which was not included in the notice of adjudication published for purposes of the proceeding.

6. 6 The Department's most recent review of a long-range forecast for BECo was in D.P.U. 94-49, in which, consistent with 220 C.M.R. §§ 10.00 et seq., the Department accepted the Company's forecast. Boston Edison Company, D.P.U. 94-49 (1995).

7. 7 In this discussion, "additional energy resources" is used generically to encompass both energy and capacity additions, including, but not limited to, electric generating facilities, electric transmission lines, energy or capacity associated with power sales agreements, and energy or capacity associated with conservation and load management ("C&LM").

8. 8 BECo stated that distribution circuits 65-H2 and 65-H6 (65-H6 has been redesignated as DSS line 587-1365H) were brought into Hopkinton during the Fall of 1995 to relieve loading on DSS line 65-1325H and distribution line 455-H3 (Exhs. BE-1, at 2-2; BE-AJ-1, at 6). Line 587-1365H now serves as a dedicated supply to the EMC2 facility on South Street in Hopkinton (Exhs. BE-1, at 2-2; BE-AJ-1, at 6).

9. 9 The Company stated that the distribution circuits which presently supply Hopkinton leave the three substations (#65, #274, & #455) in underground ductbanks (Exh. BE-3, at 4). These distribution circuits proceed to where they rise up and then are supported by wooden poles along road sides and ROW's (id.). The Company added that an exception is 4,200 feet of circuit 65-1325H4 which lies underground along South Street in Hopkinton

between Hayward Street and EMC2's customer Substation No. 587 (id.; Tr. 2, at 109-110).

10. 10 BECo and NEES both own portions of the 115-kV transmission facilities extending from Millbury to Medway (Exhs. BE-1, Figure 4-2; HO-N-15). BECo indicated that its portion is designated 274-509 and extends southerly from Sherborn into Medway, then northwesterly to the Milford town line where it enters NEES service territory and becomes the property of NEES (Exhs. HO-N-10; HO-N-15).

11. 11 The Company indicated that the Town of Hopkinton's first written request for BECo to address electric service problems which would be addressed by the proposed project, was issued by the Town of Hopkinton Board of Selectmen on February 8, 1986 (Exh. HO-N-14(att.)).

12. 12 The Company's witness, Mr. Jessa, testified that there is a linear relationship concerning line length, electrical impedance, and voltage drop; the longer the line, the higher the electrical impedance and the larger the voltage drop along the line (Tr. 4, at 7-8). Mr. Jessa added that any increase in load along such a line only adds to the voltage drop (power loss) thereon (id.).

13. 13 The Company stated that this third and final reinforcement option would involve the extension of distribution circuit 65-1325H3 to South Street, providing relief to two existing circuits: 455-H3 and 587-1365H (Exh. HO-N-3b(att. 2)). The Company further stated that circuit 274-H2 could also be relieved via circuit 65-H5 if necessary, but added that no reasonable options would exist beyond these measures to reinforce the existing Hopkinton circuits (id.).

14. 14 Company diagrams indicate that the HSA consists of six towns: Framingham, Sherborn, Medway, Holliston, Hopkinton, and Ashland. See, e.g., Exh. HO-N-3(att. 1).

15. 15 The Company stated that line voltage levels of 114 Volts ("V") to 126 V under normal conditions, and between 110 V to 127 V under short-term emergency conditions, are considered acceptable (Exh. BE-1, at 2-6, n.4).

16. 16 Mr. Jessa indicated that each set contains three regulators, one for each electrical phase (Tr. 3, at 32-33).

17. 17 In future cases, the Siting Board may require that a reliability criterion reflect comparison to the reliability levels of other utilities serving areas of similar density.

18. 18 The Siting Board notes that its standard requires a showing of "high average feeder line length" in conjunction with "outage and complaint records." Here, the Company has provided detailed documentation of outages between the years 1993 and 1995 and explained why outage records beyond 1995 were not yet available, and why outage records from prior to 1993 could not be compiled.

19. 19 In making this finding, the Siting Board notes that evidence in the record concerning voltage regulation indicates that a small portion of outages are attributed to voltage regulator failures. Evidence which merely identifies significant variations in the number or size of voltage regulators, either alone or in comparison with system-wide norms, does not establish that voltage regulation concerns constitute a reasonable basis for establishing need.

20. 20 For example, if it were established that a company's existing energy resources and facilities would be inadequate to meet that company's service requirements in a future year, based on a fixed standard of reliability, it would be established that there is a need for additional energy resources or facilities beginning no later than that future year. To the extent that there is an unresolved question as to when the additional energy resources or facilities should be added, as opposed to whether they should be added, the comparison approach might be used to demonstrate that there is a reasonable need for the additional energy resources or facilities in an earlier year.

21. 21 Maureen Dwinnell, who testified on behalf of the Town of Hopkinton, indicated that Hopkinton has experienced a greater than 16 percent increase in population between 1990 and 1996; an almost 12 percent increase in residential housing units between 1993 and 1996; and an approximately 42 percent increase in business growth between 1986 and 1995 with a corresponding increase of approximately 70 percent in persons employed by those businesses (Exh. MLD-1, at 2-3). Further, Hopkinton's population is projected to increase an additional 35 percent over the next twenty years and the number of businesses is projected to increase an additional 11 percent over the next four years and an additional 61 percent over the next 20 years (id. at 7-8). Ms. Dwinnell attributes this growth to the location of Hopkinton near the confluence of Interstate Routes 495 and 90, ready access by auto or rail to many points in New England within a short period of time, and Hopkinton's ability to retain a "characteristic small town, rural ambience, while attracting many new residents who seek a rural life-style within easy access of the major commercial areas" (id. at 3).

22. 22 Mr. Jessa, testified that he and a distribution engineer prepared the Hopkinton forecast, and that he also coordinated with BECo personnel responsible for preparing the system-wide forecast (Tr. 4, at 130).

23. 23 The Company stated that projections of new load for the residential sector were based on housing development expectations in Hopkinton, and that projections of new load for the commercial/industrial sector were based on evaluation of new projects within that sector (Exh. HO-N-7a).

24. 24 BECo indicated that the expected growth of peak summer load in Hopkinton above the 1995 level would be 10.5 MW by 1997, 15.5 MW by 1998 and 19.5 MW by 2000, of which EMC2's expanded facilities on South Street would account for 9 MW by 1997, 13 MW by 1998 and 17 MW by 2000 (Exhs. BE-1, at 1-3 to 1-4; ATS-1b; HO-N-9b; AG 1-1(att.) at table 2). BECo further indicated that, of the projected

9 MW increase in EMC2 peak load between 1995 and 1997, 2 MW in added load had materialized as of 1996 (Exhs. HO-N-9b; AG 1-8).

25. 25 The Company indicated that the residential forecast is based on appliance-specific end-use analysis, the commercial forecast is based on end-use analysis by building type, and the industrial forecast is based on projections for 19 standard industrial classifications (Exh. HO-N-7a).

26. 26 The Siting Board notes that Mr. Fitzgerald's testimony states "[e]xisting generation is sufficient to meet our projected needs. Existing distribution and transmission, however, are woefully and critically insufficient" (Exh. DJF-1, at 2-3). The Siting Board further notes that BECo's proposed project is one of distribution and transmission, not generation.

27. 27 In previous Siting Board reviews of transmission lines, investor-owned utilities generally have used a top-down forecast approach to support their need analyses, based on allocation of system-wide growth to system subareas and/or substations. 1997 ComElec Decision, EFSB 96-6, at 12-13; 1996 NEPCo Decision, EFSB 95-2, at 10-12. In a recent review of a new transmission line proposed by a municipal light plant, the Siting Board accepted as reviewable and appropriate a stand-alone forecast for the affected community based on econometric and other regression analysis. Norwood Decision, EFSB 96-2, at 13-15.

28. 28 The Company acknowledged that it used manual calculations rather than load flow models to analyze the Hopkinton area distribution system (Tr. 3, at 143). The Company explained that it only recently acquired a user-friendly load-flow model program for distribution circuits, and that it was easier to use manual calculations (id.).

29. 29 The Company's 1993-1995 outage records show total outages as well as classes of outages such as (1) outages attributable to particular types of conductor faults including fallen tree/limb, struck pole and similar incidents, and (2) outages attributable to failures of other types of equipment, including transformers, line taps, regulators, and capacitors (Exh. DV-1.4A; HO-N-6). Over the three-year period, the 11.4-mile long 455-H2 circuit from Framingham showed the highest incidence of both total outages and outages attributable to conductor faults relating to fallen tree/limb, struck poles, and similar incidents (Exhs. DV-1.4A; HO-N-6; HO-N-3). The remaining circuits, ranging from 9.9 to 12.8 miles in length and originating in Sherborn and Medway, show incidences of total outages of approximately one third to two thirds that shown for the 455-H2 line, and also show similarly lower incidences of outages attributable to conductor faults related to fallen tree/limb, struck poles and similar incidents (Exh. DV-1.4A; HO-N-6). The Company also indicated that the 455-H2 line is primarily an on-street distribution line, but that the circuits originating in Sherborn and Medway are routed along separate ROWs for portions of their length (Exhs. BE-1, figures 2-1, 4-2, 4-3; BE-3, at 4).

30. 30 Although the record indicates that the Company used manual calculations, in other Siting Board reviews where distribution system issues were significant, applicants have

provided relevant analyses of distribution circuits based on load flow models. 1991 NEPCo Decision, 21 DOMSC at 345-358; 1988 ComElec Decision, 17 DOMSC at 271-273, 276-278. For purposes of future petitions, the Siting Board notes that load flow models are preferable to manual calculations, as such models allow results to be more fully developed and provide greater flexibility in analyzing a range of load scenarios and operating contingencies.

31. 31 Further, the Siting Board notes that the fact that not all entities who were surveyed relative to electrical outage or voltage problems they mat have experienced had reason to complain does not negate the existence of the complaints from those that did complain.

32. 32 Further, the fact that BECo's projected overload in 1999 is in Medway does not affect the conclusion that the HSA, which includes Hopkinton, will experience an unacceptable electric condition at that time.

33. 33 In response to an Attorney General information request concerning potential opportunities for the implementation of targeted C&LM in the Hopkinton area -- in light of the Company's anticipated 14-month delay of the proposed project's in-service date to December of 1998 -- BECo stated that said delay has no effect on the ability of C&LM to defer or eliminate some or all of the identified need (Exh. AG 1-15).

34. 34 Mr. Fitzgerald of EMC2 testified that his company has implemented C&LM programs, both in conjunction with BECo and on its own initiative (Exh. DJF-1, at 1; Tr. 7, at 59).

35. 35 The Siting Board notes that the terms C&LM and DSM, although not actually synonymous, were used that way by the parties in this proceeding.

36. 36 The Siting Board reviews distributed generation in its analysis of alternatives. See Section II.B, below.

37. 37 The Attorney General indicated that one of the reports concluded that the total avoided T&D cost for Hopkinton is 1.5 times BECo's system-wide average (Exh. AG-3, at 8; Attorney General Brief at 2).

38. 38 The Attorney General indicated that the reports were titled (1) "Application of the Distributed Utility Concept to the Boston Edison Company Creating Additional Value for the Customer" by David Schoengold of MSB Energy Associates, and (2) "Renewing Our Neighborhoods - DSM Renewables in the Boston Edison Service Area" jointly prepared by the Union of Concerned Scientists and MSB Energy Associates (Exhs. AG-3; AG-4).

39. 39 The Siting Board also notes that, even if accelerated C&LM could avoid identified needs, such an approach would require maintenance and likely reinforcement of an existing system of lengthy overhead feeder lines, each extending up to ten miles or more in length. In contrast, the proposed project involves the construction and operation of underground T&D facilities along a combined route of less than two miles -- a minimal

distance compared to the extended supply network the proposed project would replace (see Sections III.A & C, below).

40. 40 The alternative of distributed generation is discussed in Sections II.B, below.

41. 41 In response to the arguments raised by the Attorney General and CLF, the Siting Board notes that the record in this proceeding contains no foundation on which the Siting Board can base its acceptance of the conclusions contained in the two reports provided by the Attorney General. Although the Attorney General states that these two reports were "conducted on behalf of BECo," the "Acknowledgment" on page 2 of Exhibit AG-4b states that

The Union of Concerned [Scientists] ("UCS") has prepared this research on behalf of the Boston Edison DSM Settlement Board ("Settlement Board"). The Settlement Board consists of Boston Edison Company, the Massachusetts Office of the Attorney General, the Massachusetts Division of Energy Resources, and MASSPIRG. The views expressed in this report are those of UCS and do not necessarily reflect those of the Settlement Board or its members. (emphasis added)

In addition, in a Memorandum attached to Exhibit AG-3, David Schoengold, the author of the report states that the report was prepared by him "for the Distributed Utility Planning Workshop." To the extent that the authors of these two reports made assertions relative to T&D costs which were not subject to cross-examination by the Siting Board or parties to this proceeding, the Siting Board can find no basis to accept these assertions as uncontroverted. This is especially so in light of evidence in the record as to actual costs that was provided by the Company and that was subject to discovery and cross-examination which appears to contradict the assertions of the two authors.

42. 42 G.L. c. 164, § 69J also requires a petitioner to provide a description of "other site locations." The Siting Board reviews the petitioner's proposed site, as well as other site locations, in Section III.B, below.

43. 43 The Company stated that, after the proposed project was in operation, the existing distribution lines supplying Hopkinton would be electrically switched to serve as distribution supply circuits for Ashland, Framingham, and Holliston loads, as well as to provide backup to distribution circuits for the proposed BECo Substation on South Street (Exhs. HO-N-11; BE-AJ-1(att. 8)).

44. 44 BECo stated that it also considered as the "no build alternative" continued implementation of short-term supply reinforcements (Exh. BE-1, at 3-1). BECo indicated

that this alternative would have no relative environmental impacts, and would cost considerably less than the other alternatives (id. at 3-3 to 3-6). However, BECo stated that this alternative would provide no margin for additional load growth beyond that expected through 1997 (id.).

General Laws c. 169, § 69J requires the Company to consider the alternative of "no additional electrical power." However, the Siting Board has found that additional energy resources currently are needed for reliability purposes in Hopkinton (see Section II.A.3.e, above). Consequently, the Siting Board finds that the alternative of "no additional electric power" would be unable to meet the identified need. A more detailed analysis of this alternative is therefore unnecessary.

45. 45 In addition to the above approaches, the Company presented information to the Siting Board regarding a potential new substation to be shared by BECo and NEES ("shared substation alternative") (Exh. BE-2, at 3-1 to 3-5). The Company analyzed two Milford locations for the shared substation: East Main Street, which would require approximately seven miles of new underground duct work to supply Hopkinton; and Cedar Street, which would require approximately five miles of new underground ductwork to supply Hopkinton (id. at 3-2 to 3-3). Neither site would require the construction of a transmission station (id.). The Company stated that implementation of the shared substation alternative at the East Main Street site would not significantly reduce the overall length of the distribution circuits, contributing to costly annual line losses (id. at 3-3). Further, the Company concluded that there was no environmental advantage to the East Main Street shared site over the proposed project (id.).

The Company stated that it had similar concerns with the shared substation alternative at the Cedar Street site, although based on the shorter underground ductbank, the cost would be approximately $3 million less than if the East Main Street site were used. BECo indicated that it discussed the possibility of sharing a substation at the Cedar Street site with NEES, but NEES informed BECo that it did not foresee any benefits to pursuing a shared substation at the Cedar Street location and would not consider the proposal (id. at 3-3, 3-5).

The Siting Board notes that a shared substation would be a significant distance from BECo's Hopkinton load center, and the shared substation approach could not be resolved to meet each company's needs. Therefore, the Siting Board does not further analyze the shared substation alternative.

46. 46 The Company stated that the load on the proposed substation would be approximately 30 MW (Tr. 4, at 22, 71).

47. 47 The Company noted that fuel cells would convert natural gas or other fuel to hydrogen and then use a chemical process to combust the hydrogen with oxygen to create electricity (Exh. AG-4b at 35).

48. 48 The Company estimated that the proposed project would reduce the number of outages of less than five minutes to one-fourth that expected under the existing system with short-term reinforcements, and would reduce the number of "voltage sag" incidents to one-fifth that expected under the existing system (Exh. AG-1-1(att.), chart 1).

49. 49 The Company noted that, while the worst case contingency under the existing system is a bus section failure at Station 65 in Medway, the worst case contingency under the low voltage alternative would be a bus section failure at Station 274 in Sherborn, which is the starting point of the low voltage alternative (Tr. 4, at 108-109).

50. 50 The Company explained that the capacity of a single circuit is approximately 10 MW, therefore the capacity of the four circuits would be 40 MW, but the firm capacity would be 30 MW which is the emergency capacity if one circuit fails (Tr. 4, at 89).

51. 51 The record indicates that the Company has not fully demonstrated that a large number of voltage regulators contribute to a significant number of outages.

52. 52 The Siting Board also notes that the low voltage alternative would require installation of underground lines with the same type of impacts as the proposed project, and would be approximately eight miles in length as compared to less than two miles for the combined length of underground transmission and distribution lines for the

proposed project. Further, it provides no cost advantage over the proposed project.

53. 53 The Company indicated that in the event that the fuel cells were to be used for back-up purposes, the fuel cells would need to be connected to the BECo system (Tr. 1, at 188).

54. 54 The Siting Board notes that under different circumstances, when a system meets stability requirements and need focuses on capacity additions rather than the combination of capacity additions and removing long overhead distribution lines, local generation, whether located at a single site or multiple sites, could very well be a reliable project approach.

55. 55 BECo indicated that the CTG alternative would produce more air emissions than the proposed project in the Hopkinton area. The Siting Board notes that while the CTG alternative would result in air emissions in Hopkinton, it would displace generation elsewhere, potentially resulting in offsetting reductions in emissions.

56. 56 The Company did not indicate the space requirement for the CTG alternative.

57. 57 The Company did not provide O&M cost estimates for the fuel cell alternative.

58. 58 The record indicates that the assumed firm capacity of both the CTG alternative and the fuel cell alternative would be 30 MW, while the firm capacity of the proposed project would be 40 MW. The Siting Board notes that the estimated cost of the CTG alternative and the fuel cell alternative would be greater, if based on an initial firm capacity of 40 MW, or if future costs to meet possible longer term load growth are considered.

59. 59 The Company assumed that distribution circuits could be developed as needed anywhere in the identified geographic area and therefore did not consider the distribution component of the project at the threshold level (Exh. BE-1, at 4-3).

60. 60 The Company explained that in meeting the substation location criterion, the substation would be located proximate to the load (Tr. 5, at 33).

61. 61 The Company indicated that it identified both the highway median and eastern side of the Interstate 495 corridor as potential overhead routing options but did not assess routing along the eastern side due to Town of Milford concerns about potential residential impact (Exh. HO-S-1).

62. 62 The Company noted that the MHD "Policy on the Accommodation of Utilities Longitudinally, along Controlled-Access Highways" provides that: (1) permits shall not be granted where there are alternative locations for the utility facilities which would provide safe, efficient utility services at a reasonable cost; (2) no part of a utility facility, other than location markers, shall be visible above ground unless unusual terrain or other environmental conditions warrant a portion of the utility facilities to be placed above ground; and (3) rock cuts, wetlands or other difficult but common construction conditions would not necessarily be considered unusual terrain (Exh. BE-2, at 4-4). The Company asserted that the MHD policy encompasses the highway roadbed, highway median and side areas (Tr. 5, at 41-42).

63. 63 The Company explained that due to limited flexibility of underground transmission line facilities, underground construction cannot entail sharp bends or changes in elevation (Tr. 5, at 158-160). Therefore, BECo stated that, due to varying topography and bedrock within the Interstate 495 corridor, underground transmission line construction would require construction of a new level roadbed as far from the highway as possible (id. at 44-45). The Company stated that such a route would thus require blasting, wetland filling, and numerous stream crossings (id. at 44-45, 158-160; Tr. 6, at 15).

64. 64 The Company indicated that: (1) criteria of minor importance were surface waters, soils and noise; (2) criteria of moderate importance were groundwater, tree clearing,

geology, cultural resources, and traffic; and (3) very important criteria were wetlands/floodplain, protected waters, significant habitat, protected land, and visual impacts (Exh. BE-1, at 4-27 to 4-38).

65. 65 For example, the protected lands criterion was ranked as (1) high for the proposed facilities along South Street because they would not be located proximate to protected lands, and (2) low for the alternative facilities along School Street because they would be located within 500 feet of state and privately owned open space (Exhs. DV 1.1-2, 1.1-3). Accordingly, the raw scores for protected lands were three for the proposed facilities and one for the alternative facilities (id.). Since this criterion was very important, it was multiplied by 10.8 percent, resulting in a weighted score of 0.32 for the proposed facilities and 0.11 for the alternative facilities (id.).

66. 66 The Company stated that an increase in capacity was not used as a screening criteria because all the possible alternatives would meet the projected capacity requirements (Exh. BE-1, at 4-25).

67. 67 The Company stated that overhead distribution lines have greater exposure to damage and therefore are subject to a greater degree of service interruptions (Exh. BE-1, at 4-25). The Company further stated that overhead distribution lines have a higher impedance which, when exacerbated by long lines and heavy load, requires the use of voltage regulators to maintain the needed voltage and that the use of voltage regulators adds exposure to the circuit, increasing the likelihood of outages (id.).

68. 68 The Company stated that the expected number of interruption incidents each year was derived by adding the number of overhead distribution line miles times the overhead incidents per mile to the number of underground miles times the underground incidents per mile (Exh. BE-1, at 4-25, App. B). The Company explained that the overhead incidents per mile was based on the average for the Town of Hopkinton and that the underground incidents per mile was based on the average for the BECo territory (id. at 4-26).

69. 69 The Company stated that to calculate a reliability score, the minimum reliability index of all facility alternatives was subtracted from a facility alternative's reliability index and then divided by one-half of the difference between the maximum and minimum reliability index values for all facility alternatives (Exh. BE-1, at 4-26). The result was then subtracted from three to determine a score on a scale of one to three (id.).

70. 70 The Company stated that to calculate a cost score, the lowest cost of all facility alternatives was subtracted from a facility alternative's cost and then divided by one-half of the difference in the maximum and minimum costs of all facility alternatives (Exh. BE-1, at 4-26). The result was subtracted from three to determine a score on a scale of one to three (id.).

71. 71 The Siting Board notes that in accordance with the terms of the Settlement Agreement with the Milford Parties, the BECo changed the location of the transmission

station access road so that the access road would be constructed along the existing NEPCo ROW (Exh. HO-11(supp.)).

72. 72 The Siting Board notes that there is no reason to assume that cost, reliability, and environmental impacts should be equally weighted. What is most important is that a proponent must have a clear and convincing explanation for the weights that is has chosen.

73. 73 The Company stated that the process of directional drilling would require the construction of two pits, four to five feet in depth, on both sides of the wetland, and the boring of four holes at the bottom of one pit to the other to accommodate the two transmission lines and other transmission station utilities (Exh. BE-DS-4(att. D) at D-5).

74. 74 Based on consultation with the DEP, the Company stated that the Water Quality Certificate for the proposed project will address required actions in the event problems develop during the drilling process, such as migration of clay to the wetland's surface (Exh. BE-DS-4(att. D) at D-5). The Company added that upon completion of the drilling operation, any clay that has entered the wetland would be removed and the surface restored in accordance with the permit conditions (id.).

75. 75 The Company indicated that four culverts pass beneath South Street in this area that hydrologically connect some of the wetlands located on opposite sides of the road (Exh. BE-DS-4(att. D) at D-7).

76. 76 The Company explained that Louisa Lake and all of its tributaries, and wetlands bordering on them, are classified as Class A waters and ORWs (Exh. BE-1, at 5-6).

77. 77 The Siting Board notes that the record on tree clearing is contradictory. In response to a Siting Board information request, BECo stated that the preferred facilities would require the clearing of nearly three acres of trees, while its petition indicated an aggregate clearing of approximately two acres (Exhs. HO-E-16; BE-1, at 5-7). The Siting Board accepts the two-acre estimate based on additional record information indicating that a new access road originally planned for the transmission station will not be constructed (Exh. HO-RR-11(att.)).

78. 78 BECo indicated that this publication is provided by the Massachusetts Division of Fisheries and Wildlife (Exh. BE-1, at 5-7).

79. 79 BECo explained that in making this determination, it consulted the Milford Quadrangle for both "Estimated Habitats of Rare Wetlands Wildlife and Certified Vernal Pools" and "High Priority Sites of Rare Species Habitats and Exemplary Natural Communities" (Exh. BE-1, at 5-7).

80. 80 The Company stated that, for purposes of ambient sound level measurement, the nighttime is considered to be between 10:00 PM and 6:00 AM (Exh. BE-1, at 5-12).

81. 81 State Senator Richard T. Moore, State Representative Marie J. Parente, Douglas Vrooman, the Town of Milford, and the Company were parties to the Settlement Agreement (Exh. HO-RR-11(att.)).

82. 82 BECo stated that the elevation at the proposed transmission station site is approximately 20 to 25 feet below the elevation of homes along Purchase and Camp Streets, and thus would contribute to a minimal visual impact at the homes (Exh. BE-1, at 5-9). BECo further stated that the tallest structures at the station would be two lightning-shield masts at a maximum height of 75 feet, and added that this height would be below the height of the existing transmission line facilities on the NEES ROW immediately behind the site (Exhs. BE-AJ-1, at 4; BE-AJ-4; Hopkinton-RR-1).

83. 83 BECo indicated that it defines sensitive receptors as any homes, businesses, churches, and schools, etc., from where the proposed aboveground facilities can be viewed (Exh. Upton 6).

84. 84 The Siting Board focuses on magnetic field levels rather than electric field levels because perceived heath impact generally relate to magnetic field levels. See 1997 ComElec Decision, EFSB 96-6, at 41, n.23; 1996 NEPCo Decision, EFSB 95-2, n.22; 1995 NEPCo Decision, 4 DOMSB at 32, n.51.

85. 85 The Company indicated that the residence located closest to the transmission station is located 720 feet from the transmission station site and that existing maximum magnetic field levels are approximately 0.6 mG at the residence (Exhs. HO-E-10, Table E-10a-1; HO-E-11). The Company also indicted that the residence located closest to the substation and distribution line is located 1,080 feet from both and that existing maximum magnetic field levels are less than 0.2 mG at that residence (id.).

86. 86 BECo stated that under maximum full load conditions of power transmission of 80 MVA, the peak magnetic filed over the center line of the transmission line would be 2.6 mG (Exh. HO-RR-12).

87. 87 BECo indicated that an overhead line carrying the same near-term peak load current would produce magnetic fields of approximately 30 mG and also would produce electric fields (Exh. BE-DS-1(att. E)).

88. 88 The Company stated that underground conductors would produce no electric field impacts because the soil itself entirely shields the electric field (Exh. BE-DS-1(att. E); Tr. 6, at 125).

89. 89 The Company indicated that the same residence is the closest to both the distribution lines and substation site, and that it is located 1,080 feet from both (Exh. HO-E-10).

90. 90 The Company indicated that there are wetlands located along the commercial and industrial property frontages along the distribution line route (Exh. HO-E-3(att. 6),

Distribution Duct Banks, sheets 1-5).

91. 91 BECo stated that it did not estimate wheeling charges and transmission losses in calculating O&M costs, as the proposed project would not significantly change such costs (Exh. HO-RR-6).

92. 92 BECo stated that the underground pipes carrying the two transmission lines would be placed beneath an existing shallow culvert (Exh. BE-1, at 5-18). With regard to the placement of the underground distribution lines, BECo indicated that surface waters would be encountered in the vicinity where the two additional culverts would be crossed (id.).

93. 93 The Company indicated that the rare species in the wetland area off East Street is a Spotted Turtle (Clemmys guttata) (Exh. Upton 2). BECo's witness, Mr. Stuart, testified that the rare species in the wetland area near North Pond was not identified in a letter from the Massachusetts Division of Fisheries and Wildlife (Exh. Upton 2, (att.); Tr. 6, at 81-82).

94. 94 BECo stated that if any blasting is required within 100 feet of a private well, it would address any impacts from construction of the project through pre- and post-construction well surveys (Exhs. Upton 42; Upton 2-12).

95. 95 The Company stated that only two businesses are located along the alternative route between the transmission station site in Upton and the intersection of West Main and School Streets in Hopkinton (Exh. Upton 34).

96. 96 The Company confirmed that East Street would be opened for two-way traffic during non-construction hours, and that steel plates would be used to cover any open trenches (Exh. Upton 52).

97. 97 The Company indicated that the historic property is located on the west side of East Street, approximately 1,000 feet from the proposed location of the transmission station (Exh. HO-E-22, (att)).

98. 98 BECo stated that although no areas of shallow bedrock are expected along the alternative route, it would follow all applicable federal, state, and local guidelines if any blasting activities are necessary (Exhs. BE-1, at 5-24; Upton 41).

99. 99 BECo also identified Mr. Amato's home at 11 East Street as the closest residence, at six feet, to the alternative transmission line route (Exh. HO-E-10a, Table E-10a-2).

100. 100 Mr. Amato explained that a dormant electrical conduit that extends from his home's foundation and passes under East Street could be severed during excavation, causing damage to the foundation (Exh. RAA-1, at 4).

101. 101 The Siting Board notes that the Town of Milford was a signatory to a Settlement

Agreement with the Company in which the Town of Milford agreed to "withdraw [its] opposition to the preferred project as described in the [Siting Board and Department] proceedings" (Exh. HO-RR-11(att.)). Accordingly, the Town of Milford is not opposed to a determination that the proposed project is necessary and will serve the public convenience or to the granting of a zoning exemption for the proposed project. Further, the Town of Hopkinton specifically supported the approval of the Company's petitions in its Petition to Intervene (Hopkinton Petition at 2).

102. 102 In addition, the Massachusetts Environmental Policy Act ("MEPA") provides that "[a]ny determination made by an agency of the commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." G.L. c. 30, § 61. Pursuant to 301 C.M.R. § 11.01(3), these findings are necessary when an Environmental Impact Report ("EIR") is submitted by the company to the Secretary of Environmental Affairs, and should be based on such EIR. Where an EIR is not required, c. 30, § 61 findings are not necessary. 301 C.M.R. § 11.01(3). In the present case, the Secretary of Environmental Affairs issued her determination that no EIR was required for the proposed project (See Certificate of the Secretary of Environmental Affairs on the Environmental Notification Form, EOEA No. 10840, dated August 30, 1996), and, therefore, a finding is not necessary in this case under G.L. c. 30, § 61.

103. 103 Pursuant to the statute, the electric company must file with its petition a general description of the transmission line, provide a map or plan showing its general location, and estimate the cost of the facilities in reasonable detail. G.L. c. 164, § 72.