

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 and Transmission 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

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Hearing Officer

December 22, 1997

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FIGURES:

FIGURE 1: PRIMARY AND ALTERNATIVE ROUTES

FIGURE 2: NOTICED ROUTE SEGMENTS

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 hexafluoride 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(att.); 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 exceedances, 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,

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 Dwinell, 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. Dwinell 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 may 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

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 health 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 indicated 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 field 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, EOE 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.