COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of New England Power Company for Approval to Construct Two 115 kV Underground Electric Transmission Cables and Associated Equipment in Boston and Quincy, Massachusetts The Petition of New England Power Company for a Determination that the Two Proposed Electric Transmission Cables in the Cities of Boston and Quincy are Necessary and Will Serve the Public Convenience and be Consistent with the Public Interest The Petition of New England Power Company for Exemption of Proposed Electric Substation Improvements from the Zoning By-Laws of the City of Quincy	EFSB 97-3

FINAL DECISION

Jolette A. Westbrook
Hearing Officer
October 9, 1998

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
BECo	Boston Edison Company
BVW	Bordering vegetated wetland
C&LM	Conservation and Load Management
Company	New England Power Company
Company Brief	New England Power Company's brief
Court	Supreme Judicial Court
CTG	Combustion turbine generation
Department	Department of Telecommunications and Energy
Dorchester Bay	Dorchester Bay Economic Development Corporation
DPW	Department of Public Works
DSM	Demand Side Management
EIR	Environmental Impact Report
EMF	Electric and magnetic fields
HDD	Horizontal directional drilling
kV	Kilovolt
L_{90}	The level of noise that is exceeded 90 percent of the time
MBTA	Massachusetts Bay Transportation Authority
MDC	Metropolitan District Commission
MDEP	Massachusetts Department of Environmental Protection
MECo	Massachusetts Electric Company
MEPA	Massachusetts Environmental Policy Act
mG	Milligauss
MGIS	Massachusetts Geographic Information Systems
MHC	Massachusetts Historical Commission
MHD	Massachusetts Highway Department
MNHESP	Massachusetts Natural Heritage and Endangered Species Program

MVA	Megavoltamperes
MW	Megawatt
NEES	New England Electric System
NEPCo	New England Power Company
Neponset River ACEC	Neponset River Area of Critical Environmental Concern
NEPOOL	New England Power Pool
NEPSCo	New England Power Service Company
Quincy	City of Quincy
ROW	Right-of-way
RPA	Rivers Protection Act
Siting Board	Energy Facilities Siting Board
Siting Council	Energy Facilities Siting Council

The Energy Facilities Siting Board hereby APPROVES the petition of New England Power Company to construct two 115 kV underground electric transmission cables in the cities of Boston and Quincy, Massachusetts using the Company's primary route.

I. INTRODUCTION

A. Summary of the Proposed Project and Facilities

New England Power Company ("NEPCo" or "Company") is the wholesale generation and transmission subsidiary of New England Electric System ("NEES"), a public utility holding company (Company Brief at 1).

NEPCo has proposed to construct two 3.3-mile long, 115-kilovolt ("kV") underground transmission lines between the Boston Edison Company's ("BECo") existing Dewar Street substation in the Dorchester section of Boston and NEPCo's existing North Quincy substation on Spruce Street in Quincy (NEP-1, at 3-8, 3-12). The proposed project would establish an independent source of electric supply for the City of Quincy ("Quincy") (id.). NEPCo stated that Quincy is the primary commercial and industrial center in the South Shore area of Massachusetts Bay with approximately 40,000 customers (id. at 2-1). Quincy is an electrically isolated area and is presently supplied by NEPCo via two underground transmission lines located adjacent to each other in the city streets (id. at 1-1). NEPCo represents that these lines are vulnerable to a possible common mode failure that could interrupt the entire Quincy electrical supply for several days (id. at 2-6 to 2-10).[1]

For its primary route, NEPCo has proposed that the underground transmission lines generally follow the Southeast Expressway from BECo's Dewar Street substation in Boston to Victory Road (Exh. NEP-1, at 1-1, 1-3, Fig. 1-1). From Victory Road, the route would extend under the Neponset River to Quincy, then cross land owned by the Metropolitan District Commission ("MDC") and travel to Commander Shea Boulevard (id.). From there, the transmission lines would travel south along Commander Shea Boulevard and then under

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[1] Common mode failure refers to a single event on the system which results in the outage of more than one supply system component. (For a more detailed discussion of common mode failure, see Section II.A.3a, below).

Hancock Street and would pass under the tracks of the Massachusetts Bay Transportation Authority ("MBTA") to NEPCo's North Quincy substation (id.).

NEPCo also has identified an alternative route for the proposed transmission lines. NEPCo indicated that the alternative route is identical to the primary route from the Dewar Street substation to Victory Road, but that from Victory Road south, the route would follow the Southeast Expressway to Conley Street, then proceed west on Conley Street to Tenean Street (id. at 3-35 to 3-36). From there, the route would travel south on Tenean Street, then west, crossing the MBTA tracks to Norwood Street (id. at 3-36). The route would then continue south on Norwood Street to MDC land bordering Morrissey Boulevard, travel west across the Boulevard, then south along the median strip through Neponset Circle to the bridge abutment (id.). The alternate route would cross the Neponset River along the bridge structure (id.). The route would then proceed down the exit ramp to Hancock Street in Quincy, along Hancock Street and across a private right-of-way to the North Quincy substation (id. at 3-37). A map of the NEPCo's primary and alternative routes is included as Figure 1.

B. Procedural History

NEPCo filed its Occasional Supplement to the Long Range Forecast ("petition") with the Siting Board on August 19, 1997 for approval to construct two 115 kV underground transmission cables and associated equipment as described herein. This petition was docketed as EFSB 97-3. On December 10 and 11, 1997, the Siting Board conducted public hearings on the petition in the City of Boston and the City of Quincy, respectively. In accordance with the direction of the Hearing Officer, NEPCo provided notice of the public hearing and adjudication.

Timely petitions to intervene were submitted by: Charles R. Tevnan; the Massachusetts Highway Department ("MHD"); and the MBTA. In addition, a late-filed petition to participate as an interested person was filed by the Dorchester Bay Economic Development Corporation ("Dorchester Bay").

The Hearing Officer allowed the petitions to intervene of the MHD and the MBTA. The Hearing Officer denied the petition of Mr. Tevnan to intervene but allowed him to

participate as an interested person (Hearing Officer Procedural Order, January 26, 1998). The Hearing Officer also allowed the petition of Dorchester Bay to participate as an interested person (Hearing Officer Oral Ruling, March 19, 1998).

The Siting Board conducted evidentiary hearings on March 23 and March 24, 1998. NEPCo presented ten witnesses: Frank S. Smith, a consulting engineer for New England Power Service Company ("NEPSCo"), who testified regarding several project issues including need and site selection; Sharad Y. Shastry, a retail planning engineer with NEPSCo, who testified regarding transmission issues; Gabriel Gabremicael, an engineer, who testified regarding distribution issues; Gordon W. Whitten, a cable engineer with NEPCo, who testified regarding noise issues; Jonathan B. Lowell, manager of portfolio planning with NEPSCo, who testified regarding forecast issues; F. Paul Richards, senior program director in the environmental sciences and planning group for Earth Tech, who testified regarding environmental siting issues; Steven J. Pericola, an engineer in the substation engineering department at NEPSCo, who testified regarding environmental issues; John M. Zicko, lead engineer in the electrical engineering department at Boston Edison Company, who testified regarding construction impact issues; Daniel McIntyre, engineer at NEES, who testified regarding construction impact issues; and Dr. Peter A. Valberg, a consultant with Cambridge Environmental and facility member of the Harvard School of Public Health, who testified regarding electric and magnetic fields ("EMF") and their potential health effects.

The Hearing Officer entered 182 exhibits into the record, consisting primarily of NEPCo's responses to information and record requests. NEPCo entered one exhibit into the record.[2] NEPCo filed its brief on April 16, 1998 and Charles Tevnan filed a reply brief on April 27, 1998.

C. Jurisdiction

The Company's petition is filed in accordance with G.L. c. 164, § 69H, which requires

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[2] Absent objection, Mr. Tevnan and Dorchester Bay were permitted to enter into evidence written remarks they had prepared for this proceeding.

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.

The Company's proposal to construct two 3.5-mile long 115 kV electric transmission lines falls squarely within the second definition of "facility" set forth in G.L. c. 164, § 69G.[3] 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.

On October 28, 1997, NEPCo filed two petitions with the Department of Telecommunications and Energy (formerly the Department of Public Utilities) ("Department"): (1) requesting a determination of public convenience and necessity relative to the two proposed underground transmission cables; and (2) requesting a zoning exemption for proposed improvements at the North Quincy substation. These cases were docketed as D.P.U. 97-98 and D.P.U. 97-99, 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 precedent in a consistent manner. The Chairman referred these two petitions to the Siting Board on November 17, 1997 in an Order in which these matters were consolidated with the Siting Board docket in EFSB 97-3. The Siting Board hereby accepts for review these two petitions.

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[3] NEPCo's petition was filed with the Siting Board on August 19, 1997. Therefore, the statutes referenced in this proceeding are those that were in effect prior to the enactment of the Electric Restructuring Act, St. 1997, c. 164.

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 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).[4] 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. NEPCo is an electric company required to make such a filing and to make such a showing.[5]

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[4] 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 are described as 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 the purposes of the proceeding.

[5] To satisfy this requirement, NEPCo relies on the most recently approved Department forecast filed by Massachusetts Electric Company ("MECo"), NEPCo's affiliate. (For a detailed discussion of this issue see Section II.A.3.d, below.)

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[6] 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 stated that the City of Quincy is part of its South Shore Power Supply Area ("South Shore PSA"), and that the Quincy area load constitutes approximately 60 percent of the entire South Shore PSA load (Exh. HO-N-15c).[7] The Company stated that Quincy is an electrically isolated area of significant load supplied by two underground 115-kV transmission lines from the BECo Edgar Station in Weymouth (Exhs. NEP-1, at 2-1, 2-3; HO-N-10). The Company explained that the transmission lines supply Quincy's two major substations -- Field

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[6] In this discussion, the term "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").

[7] The Company indicated that Quincy is the second largest city served by NEPCo's retail distribution affiliate, MECo (Exh. NEP-1, at 2-1). The Company stated that there are approximately 40,000 customers (90,000 residents) in the City of Quincy (id.). The Company explained that Quincy is the primary commercial and industrial center in the South Shore area, and that Quincy customers include State Street Bank South, Marina Bay, Crown Colony Office Park, the Quincy shipyard, South Shore Hospital, and the MBTA (id.).

Street and North Quincy (id.). The Company stated that both pipe-type and self-contained underground lines are used along the existing supply route (Exh. NEP-1, at 2-1, 2-3).[8] The Company indicated that two pipe-type cables, designated 532S and 533S, extend for 2.1 miles from BECo's Edgar Station in Weymouth to NEPCo's Field Street substation in Quincy, which supplies 60 percent of the Quincy load (Exhs. NEP-1, at 2-1, 2-3; HO-N-3a).[9] The Company stated that two self-contained cables, designated 532N and 533N, extend for 3.3 miles from the Field Street substation to the North Quincy substation, which supplies the remaining 40 percent of the Quincy load via two 115/13.8 kV transformers (Exhs. NEP-1, at 2-1, 2-3; HO-N-3a).[10]

The Company indicated that there presently are no additional transmission voltage power sources or lines within Quincy (Exh. HO-RR-1, Att. 1; Tr. 1, at 23). The Company further indicated that no transmission links presently exist throughout the greater Quincy area to provide an interconnection between the northern and southern portions of BECo's area transmission system (Exhs. NEP-1, at 2-22 to 2-23; HO-RR-1, Att. 1).

3. Reliability of Supply

The Company asserted that the proposed project is needed in order to increase the reliability of the supply of electricity to the City of Quincy (Exh. NEP-1, at 2-11). The

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8 The Siting Board notes that throughout the record in this proceeding, the terms "line(s)" and "cable(s)" are used interchangeably.

9 The Company explained that residential, commercial, and industrial customers in east and south Quincy are supplied via 21 13.8 kV distribution feeders emanating from the Field Street substation (Exh. NEP-1, at 2-1). In addition, the Company stated that three 23 kV supply cables extend from the Field Street substation to the West Quincy distribution substation from where eight distribution feeders serve West Quincy customers (id.).

10 The Company explained that the North Quincy substation transformers serve the Atlantic and Wollaston substations and residential, commercial, and industrial customers in the North Quincy area via eight distribution feeders (Exh. NEP-1, at 2-1). The Company added that four distribution feeders from the Atlantic substation and eight distribution feeders from the Wollaston substation also serve customers in the North Quincy area (id.).

Company identified two problems with the present supply to the Field Street and North Quincy substations such that the existing supply configuration does not meet the reliability criteria of the Company (id. at 2-4, 2-6, Appendix C). First, the Company stated that the limited separation of the two existing underground cables, both from each other and from the surface of the pavement, make them vulnerable to simultaneous outage as the result of a single incident, termed a common mode failure (id. at 2-6 to 2-8). Second, the Company stated that the service restoration time for a repair of either the existing pipe-type or self-contained underground cables would exceed 24 hours (id. at 2-8). The Company maintained that, given the size of the Quincy load and the expected duration of a common mode failure, the adverse impacts of such a failure to the City of Quincy would be unacceptable (id. at 2-9 to 2-10).

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 and appropriate methods for assessing system reliability based on load flow analyses or other valid reliability indicators; (2) whether existing and future 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

NEPCo indicated that a number of its service reliability and system design criteria are applicable to the classes of transmission and distribution found in the proposed project area (Exh. NEP-1, at 2-4, Appendix C). Although the Company's outage criteria focus largely on single contingency outages, they also address common-mode outage contingencies where a single event on the system causes two or more elements to experience an outage at the same

time (id. at 2.6, Appendix C, Secs. 2.0 to 2.5.2, 2.5.4).[11] The possibility of a common-mode outage underlies the concerns about electric reliability in Quincy (id. at 2-6, Appendix C, Sec. 2.5.4).

The Company indicated that its common-mode outage criteria provide that "no load should be interrupted for more than 24 hours" (id., Sec. 2.5.4). The Company added that where a common mode outage would exceed 24 hours, its planning guidelines provide for mitigation measures if the affected facilities are identified as vulnerable to such a failure, and if the consequences of such a failure would be unacceptable (Exh. NEP-1, at 2-6).

The Siting Board has previously 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. Boston Edison Company Decision, EFSB 96-1, at 14-16 (1997) ("1997 BECo Decision"); Norwood Decision, EFSB 96-2, at 11-12 (1997); 1991 NEPCo Decision, 21 DOMSC 325, 339. Here, for the first time, an electric company has presented and applied reliability criteria based on the loss of two supply system components during a single contingency. NEPCo has set forth its criteria for unacceptable exposure to a common mode outage, based on the degree of vulnerability to and the likely consequences of such a contingency. This approach is similar to the Company's approach to setting reliability criteria for a single outage contingency in that both approaches address the consequences of outages in terms of their duration. However, while the single contingency outage criteria focus on a short-duration threshold coupled with an affected load threshold to establish unacceptable consequences of an outage, the common-mode outage criteria focus solely on a longer duration threshold -- 24-hour duration in this case -- to establish

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[11] The Company stated that its system design criteria for firm supply requires that: (1) the "nonfirm peak load in a contiguous area … not exceed 30 [megawatt] MW" and that "a 3-hour outage once in three years, or a 24-hour outage once in ten years … not [be] exceeded for load above 20 MW" (Exh. NEP-1, Appendix C, § 2.5.1). The Company explained that a supply is considered firm if loss of a single element will not cause a loss of load for longer than the time required for automatic switching (id.).

unacceptable consequences. The common-mode outage criteria also place more emphasis on evaluating the vulnerability to outage.

The Siting Board agrees that the Company's inclusion of a criterion regarding a common mode outage in its service reliability and system design criteria is reasonable. Although the Company's criteria for common-mode outage and single contingency outage place different emphasis on the two indicators of outage consequence -- duration and affected load -- both sets of criteria include provisions to ensure that both outage duration and affected load are taken into account. It is also reasonable that the Company's common mode outage criteria put significant emphasis on evaluating the vulnerability to outage, as the risk of common mode outage can vary greatly based on facility configuration.

Accordingly, the Siting Board finds that the Company's reliability criteria, including its common mode outage criteria, are reasonable for purposes of this review.

b. Configuration and Contingency Analysis

In this Section, the Siting Board considers whether there is a need for additional energy resources based on the Company's reliability criteria, including its reliability criteria with regard to common mode outages.

NEPCo stated that Quincy is the only major load center served by the NEES companies where its entire load, or a major part of the load, is susceptible to a common mode, double-circuit cable failure of significant duration, with unacceptable consequences for customers (Exh. NEP-1, at 2-11).

The Company also addressed a separate future need for additional energy resources related to expected deficiencies in facilities linking the regional 345 kV system ("bulk transmission system") to the regional 115 kV system within the southeastern Massachusetts area (id. at 2-22; Tr. 1, at 18-21). The Company noted that this future need could be met, for a period of time, by one of the identified approaches for meeting the need relative to common mode outage exposure in Quincy -- specifically the Company's proposed project (NEP-1, at 2-22; Tr. 1, at 18-21).

With respect to the need based on susceptibility to common mode outage, the Company explained that the City of Quincy is an electrically isolated area of significant load, supplied through two underground pipe-type 115 kV transmission cables from BECo's Edgar Station in Weymouth to its Field Street substation in southeastern Quincy (Exh. NEP-1, at 2-1 to 2-2). The Company indicated that each of the existing parallel pipe-type underground cables has a summer long-term emergency capability of 239 megavoltamperes ("MVA")[12] and could easily handle the entire Quincy load for the foreseeable future[13] in the event one of these cables were out of service (id. at 2-6).

The Company also stated that two parallel, self-contained underground cables extend from the Field Street substation to the North Quincy substation (id. at 2-1 to 2-2). The Company indicated that each of these cables has a summer long-term emergency capability of 93 MVA, and thus could easily handle the entire North Quincy substation load in the event one of these cables were out of service (id.).[14]

The Company presented evidence describing the exposure to common mode outages of its 115 kV facilities that supply Quincy (id.). The Company stated that each pipe-type cable is contained within an 8-inch diameter steel pipe of 1/4-inch thickness (id.). The Company stated that the self-contained cables are surrounded by a plastic-coated aluminum sheath of 1/10-inch thickness (id.). The Company also stated that both types of cables are buried in thermal sand, and protected by a 4-inch thick concrete cap (id.). The Company added that the typical

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[12] The Company explained that because the power system in Quincy is operated close to unity power factor, 1 MVA is approximately equal to 1 MW (Exh. NEP-1, at 2-6).

[13] The Company stated that the aggregate Quincy peak load was 130 MW during the summer of 1996, and is projected to reach 180 MW in the year 2016 (Exhs. NEP-1, at 2-6; HO-N-3b).

[14] The Company stated that during the Quincy aggregate peak load of 130 MW in 1996, each self-contained cable transferred approximately 25.5 MVA to the North Quincy substation (Exh. HO-N-3b). Based on both the Company's load apportionment and projected loading of the North Quincy substation, the Siting Board notes that in the year 2016, the self-contained cable(s) would be required to carry 72 MVA. The Siting Board further notes that either self-contained cable could carry this load based on the Company's long-term emergency rating of 93 MVA for each cable.

separation of the parallel cable assembly is 18 inches between cable centers, and the typical burial depth is approximately 42 inches (id. at 2-7).

In assessing the physical vulnerability of the existing 115 kV underground cables to a double-circuit outage, the Company divided the route into three sections that included (1) the 0.2-mile section of pipe-type cables underneath the Fore River[15] between Edgar Station and Quincy, (2) the 1.9-mile section of pipe-type cables buried beneath city streets in Quincy, and (3) the 3.3-mile section of self-contained cables also buried beneath Quincy streets (id.). The Company concluded that while the 0.2-mile section under the Fore River was not particularly vulnerable to cable damage, seven locations along the underground route of both the pipe-type and self-contained cables are susceptible to damage (id.). The Company explained that in these areas, due to subsurface obstructions, the cables are within two feet of the street surface pavement, and thus within the range of pavement cutting saws (id.). The Company added that because the on-center separation of the parallel cables is approximately 18 inches, the severing of both cables due to a common construction activity, such as excavation, is possible (id.).

The Company asserted that the underground transmission supply cables in Quincy are much more subject to common mode failure than they were at the time of their installation in 1973 because underground construction activities adjacent to the cable route have increased substantially in the last few years (id.). The Company explained that new commercial and industrial customers along the route who require services from various utilities accounted for the increase in such activities (id.).[16]

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[15] The Company stated that it reviewed an Army Corps of Engineers sounding survey of the Fore River and was able to determine that the cables crossing the river are buried deep enough below the river bottom to make it very unlikely that the cables could be damaged by dredging, or anchors dragging (Exh. NEP-1, at 2-7). The Company further stated that the cables cross the Fore River in a constricted area adjacent to the Route 3A Bridge, thereby decreasing the likelihood that a ship would drop anchor in the immediate vicinity (id.).

[16] The Company stated that the number of "Dig-Safe" requests made by various utilities for construction to serve, upgrade, and/or maintain facilities along the cable route was 340 percent higher in 1996 than in 1990 (Exh. NEP-1, at 2-7). The Company indicated

(continued…)

To assess the degree of cable vulnerability, the Company presented expected failure rates for its pipe-type and self-contained cables (id. at 2-8 to 2-9).[17] The Company estimated that the common mode failure rate is 1 in 2000 years for the pipe-type cables between Edgar Station and the Field Street substation, and about 1 in 60 years for the self-contained cables between the Field Street and North Quincy substations (id.). The Company stated that even though the expected failure rate for the pipe-type cables is much lower than that of the self-contained cables, it still regarded the potential of a double-circuit, pipe-type cable failure as serious (id.). The Company explained that its concern is due to the likely duration of a pipe-type outage, and the number and type of customers affected (id.). The Company stated that the annual average duration of interruption per MECo customer has been approximately 89 minutes over the past five years (id. at 2-10). The Company added that a common mode failure event on the existing facilities would increase MECo's per customer interruption duration in that year by a factor of one and a half to eight times (id.).

The Company next presented its assessment of the consequences of a common mode failure for its pipe-type and self-contained cables (id. at 2-9). The Company stated that such a failure would result in an interruption of electric service for three days or longer, affecting 40,000 customers with failure of the pipe-type cables supplying the aggregate Quincy load, and 20,000 customers with failure of the self-contained cables supplying North Quincy (id.).[18]

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16 (…continued)
that in spite of diligent attention to the Dig-Safe program, one of the 115 kV self-contained cables in Quincy was severely damaged and the other cable was superficially damaged by a contractor in 1987 (id.).

17 NEPCo stated that it based these estimates on Edison Electric Institute data pertaining to forced outages of underground cables (Exh. NEP-1, at 2-8).

18 The Company stated that because Quincy is the primary commercial and industrial center in the South Shore area, many of the electric customers provide jobs and services to the surrounding areas, thereby amplifying the effects of a long-term interruption of electric service beyond the City itself (Exh. NEP-1, at 2-9). The Company noted that although a large number of North Quincy customers are residential, several regional employers would also be affected, including the State Street Bank office complex,
(continued…)

In addition, NEPCo stated that it studied the needs of the southeastern Massachusetts transmission system which supplies Quincy and other area utilities serving communities south of Quincy (id. at 2-22). NEPCo stated that those studies indicated that it will be necessary to modify the regional transmission system to reinforce the power supply system (id.). Specifically, the Company testified that the primary link between the bulk (345 kV) transmission system and the 115 kV transmission system is a single 400 MVA, 345/115 kV transformer at Holbrook substation (Tr. 1, at 19). The Company's witness, Mr. Shastry, testified that in the event the transformer at Holbrook substation fails, 115 kV backup ties from the Auburn Street substation could become overloaded (id.). Mr. Shastry added that because there would be a need to reduce some of the 115 kV load at Holbrook substation under that contingency, the proposed project would transfer the Quincy load portion to the northern portion of the BECo transmission system using Dewar Street as the tie source (id.). Another Company witness, Mr. Smith, testified that in the event the proposed project were not constructed, installation of a second 345/115 kV transformer at Holbrook would likely be required to alleviate the potential overloading (id. at 19-20).

The record indicates that NEPCo's existing transmission and distribution facilities are not subject to overloading either under normal operating conditions, or during a single contingency affecting one of the two underground transmission lines that presently supply Quincy. Further, the record demonstrates that the present Quincy supply configuration is a firm supply under the Company's criteria, and would operate as such under a single contingency event on either of the two lines. However, the record also demonstrates that the close proximity of the two existing underground lines, both to each other and to the pavement surface in some areas along the route, render them vulnerable to damage. Physical damage of significant magnitude, such as a backhoe penetrating both cables, presents a potentially very serious outage scenario to the City of Quincy, with related impacts to the larger South Shore community. Under a double-circuit outage, there would be a loss of power for a minimum of

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[18] (…continued)
Boston Scientific, and Industrial Heat Treating (id.).

three days to either the entire City of Quincy or a large portion of Quincy, depending on where the common mode failure were to occur. This condition is in direct contravention of the Company's reliability criteria which seeks to limit such an outage to 24 hours. Accordingly, the Siting Board finds that the Company has established that supply to Quincy's two substations -- Field Street and North Quincy -- does not meet the Company's reliability criteria with respect to common mode outages.

In addition, the record indicates that the addition of energy resources to supply Quincy could alleviate potential overloading elsewhere on the southeastern Massachusetts transmission system within the next ten years by providing an independent 115 kV supply source for Quincy, thereby relieving contingency load on equipment at Holbrook substation. The Siting Board addresses benefits of the proposed project to the regional transmission system in Section II.B., below.

Consequently, the Siting Board finds that there is a need for additional energy resources based on the Company's reliability criteria with respect to common mode outages.

c. 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. The Company stated that the total Quincy load of 130 MW in 1996 accounted for approximately 60 percent of the entire South Shore PSA load, which it estimated at approximately 217 MW in the same year (Exh. HO-N-15c). The Company indicated that the Quincy load is approximately 32 percent residential and 68 percent commercial and industrial (Exh. HO-N-8). The Company also indicated that acceleration of both its conservation and its load management programs[19] could not substitute for an additional

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[19] Load management is a measure or action designed to modify the time pattern of customer electricity requirements, for the purpose of improving the efficiency of an electric company's operating system. 220 C.M.R., § 10.02. For example, a utility may reach an agreement with a manufacturer that uses electricity whereby that manufacturer will curtail its use during peak times when the utility's system, as a

(continued…)

electrical supply for Quincy given the large amount of load reduction that would be required to alleviate the concern of a common mode outage (Exh. NEP-1, at 2-11, n.4). The Company stated that its distribution affiliate, MECo, has been implementing a DSM program in Quincy, and added that its related load forecasts include the expectation that the DSM program will continue (id.).

The Siting Board notes that the need for the proposed facility is based, not on potential load growth or facility overloads, but on the unacceptable impacts of a minimum three-day power loss to much or all of the City of Quincy in the event of a common mode failure. Even the most aggressive pursuit of DSM will not reduce the likelihood of a common mode failure, the duration of the resulting power outage, or the number of customers affected. Therefore, the Siting Board concludes that accelerated conservation and load management ("C&LM") efforts would not eliminate the need for additional energy resources based on the Company's reliability criteria.

d. Consistency with Approved Forecast

i. Description

G.L. c. 164, § 69J requires that a jurisdictional facility be consistent with an electric company's most recently approved long-range forecast. As described above, the need for the proposed facility is based primarily on the configuration of transmission facilities serving the City of Quincy, rather than on projections of load growth. To satisfy the statutory

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[19] (…continued)
whole, is facing increasing demands for electricity for cooling or heating purposes. During non-peak times the manufacturer may then resume its use of electricity. The utility providing electricity has, therefore, managed its load, thereby decreasing its need for additional peak capacity.

Conservation, on the other hand, is a technology, measure, or action designed to decrease the kilowatt or kilowatthour requirements of an electric end-use, thereby reducing the overall need for electricity. Id. Both conservation and load management are demand side management ("DSM") measures.

requirement, the Siting Board reviews the consistency of the Company's analysis of need in this proceeding with its forecast of system load.

NEPCo stated that the petition for the proposed facilities as described in its filing is consistent with the most recent Department-approved forecast -- the 1994 long-term system forecast filed by MECo, NEPCo's retail affiliate ("1994 forecast") in D.P.U. 94-112 (1994) (Exh. HO-N-6b(s); Tr. 1, at 27-30). The Company stated that MECo filed two subsequent forecasts with the Department, one in 1995 and one in 1996, that updated components of the 1994 forecast, and added that both were methodologically consistent with the 1994 forecast (Exh. HO-N-14; Tr. 1, at 27-28).[20] The Company further stated that the PSA is the smallest unit for which it regularly develops forecasts (Exh. HO-N-6b). The Company indicated that the 1994 South Shore PSA load growth forecast used in this proceeding is consistent with the 1994 forecast (Exhs. HO-N-6b(S2); HO-A-2, Att. 1; Tr. 1, at 30).[21]

The Company stated that it conducts facility planning by developing projections of peak load growth for an area within a PSA (Exh. HO-N-15c). The Company indicated that it developed an updated load forecast for Quincy by apportioning future load within the South Shore PSA proportional to recent peak demands (id.). The Company indicated that facility

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[20] The Company's witness, Mr. Lowell, testified that in 1995, MECo filed an Integrated Resource Plan ("IRP") that updated the load forecast and other components of the 1994 filing (Tr. 1, at 27-28). Mr. Lowell explained that although the forecast that accompanied the 1995 IRP was not subsequently acted upon by the Department, it used essentially the same methods, models, and tools used for preparing the approved 1994 forecast (id.). Mr. Lowell added that updated information included economic drivers and demographic changes within the affected service territory (id. at 28). With respect to the 1996 IRP filing, Mr. Lowell stated that only minor adjustments were made updating the previous 1995 long-term forecast filing relative to the first one or two years of the forecast (id.). NEPCo noted that the Department chose not to adjudicate IRP filings after 1994 (id. at 30-31).

[21] The Company identified the original forecast supporting the selection of the proposed supply plan as that contained in Section 2.3 (Load Forecast/Cable Capability) of the Third Quincy 115 kV Supply Study prepared by the Company's affiliate, New England Power Service Company, and dated January, 1995 (Exh. HO-A-2, Att. 1).

area projections include the highest recorded area peak load, anticipated large new load additions, and the expected (50 percent probability) PSA peak load growth rate (id.).

The Company provided historical and forecast peak loads for the MECo system and the South Shore PSA for the years 1992 through 2000 (Exhs. HO-RR-2, Att. 1; HO-RR-3).[22] The Company also provided historical and forecast peak load for the City of Quincy for the years 1989 to 2016, based on MECo's most recent PSA forecast (Exh. NEP-1, at 2-4 to 2-5). The Company noted that the City of Quincy represents approximately 60 percent of the South Shore PSA load based on 1996 peak loads of 130 MW in Quincy and 217 MW in the South Shore PSA (Exh. HO-N-15c). The Company stated that load growth in the City of Quincy is forecasted to occur at a rate of 1.1 percent annually to the year 2006 (Exhs. NEP-1, at 2-4 to 2-5; HO-N-6a). Finally, the Quincy peak load forecast indicated that by the year 2016, the expected Quincy peak load[23] would be approximately 168 MW, while a high peak load forecast would be 180 MW (Exh. NEP-1, at 2-5, Figure 2-3).

ii. Analysis

In forecasting load for the two Quincy substations, the Company first relied on the 1994 MECo South Shore PSA forecast, which is based on forecast methods consistent with the Department-approved 1994 long-term system forecast. The Company then derived the Quincy

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[22] For the South Shore PSA, the Company provided this information relative to both coincident and non-coincident peak load levels, and indicated that the non-coincident peaks were slightly higher than the coincident peaks for every historical and forecast year included (Exh. HO-RR-2, Att. 1). With respect to the system wide forecast, the Company indicated that historical and projected summer peak loads ranged from 2,734 megawatt ("MW") to 3,014 MW between 1992 and 1996, while actual loads reached as high as 3,039 MW (id.). Regarding the South Shore PSA load during the same years, the Company indicated that the actual non-coincident peak load ranged from 216 MW to 238 MW (id.).

[23] The Company's assumed growth rate in Quincy results in an expected peak load of approximately 168 MW in the year 2016 (Exh. NEP-1, at 2-5, Fig. 2-3). The Company also presented a high-forecast projection of 180 MW in that same year (id.). For the years 2006-2016, the Company indicated that it assumed an average growth rate of 1.1 percent for the expected forecast, and 1.7 percent for the high forecast (id.).

substations' forecast from the MECo PSA forecast, based on the historical relationship of the Quincy substations' peak load to the PSA peak load. The Company adequately explained the PSA and sub-area specific adjustments that were applied to account for load data that would otherwise not be reflected in the forecast models. Thus, the Company relied on both quantitative and judgmental techniques in its forecast of PSA and area load growth. Further, the Company has provided a reasonable explanation for its estimation of load growth at the substation level, based on the PSA forecast. The Company's Quincy load forecast reflects some future expansion of existing load, at an average annual rate of approximately one percent. As was previously discussed in Section II.A.3.b, above, the proposed facilities are needed based on existing facility configurations and load levels. Accordingly, for purposes of this review, the Siting Board finds that the Company's load forecast methodology is reasonable and acceptable.

Also, as discussed above, the need for the identified facilities is based, not on the precise load projected for a specific future year, but on the unacceptable consequences of a three-day power loss to some or all of the City of Quincy in the event of a common mode failure. The Company's description of the impacts of such a power loss to a load of approximately 130 MW is consistent with the load forecasts contained in the 1994, 1995, and 1996 filings with the Department. Consequently, the Siting Board finds that the Company's identification of a need for additional energy resources in Quincy is consistent with its most recently approved long range forecast.

e. Conclusions on Reliability of Supply

The Siting Board has found that the Company's reliability criteria, including its common mode outage criteria, are reasonable for purposes of this review. The Siting Board also has found that the Company has established that existing supply to Quincy's two substations does not meet the Company's reliability criteria with respect to common mode outages. Consequently, the Siting Board has found that there is a need for additional energy resources based on the Company's reliability criteria with respect to common mode outages.

In addition, the Siting Board has found that accelerated C&LM efforts would not eliminate the need for additional energy resources based on the Company's reliability criteria. Further, the Siting Board has found that the Company's load forecast methods are reasonable and acceptable for purposes of this review. Finally, the Siting Board has found that the Company's identification of a need for additional energy resources in Quincy is consistent with its most recently approved long range forecast.

Based on the foregoing, the Siting Board finds that the Company has demonstrated that the existing supply system is inadequate to supply existing load supplied by the Edgar Station under certain contingencies. Accordingly, the Siting Board finds that additional energy resources are needed for reliability purposes in the City of Quincy.

B. Comparison of the Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69 H 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, § 69 J 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.[24]

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 BECo Decision, EFSB 96-1, at 37; 1997 ComElec Decision, EFSB 96-6, at 22; 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 BECo Decision, EFSB 96-1, at 38-42; 1997 ComElec

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[24] G.L. c. 164, § 69 J 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.

Decision, EFSB 96-6, at 23; Massachusetts Electric Company, 18 DOMSC at 383, 404-405 (1989).

2. Identification of Project Approaches for Analysis

The Company considered six alternative approaches for meeting the identified need in Quincy (Exh. NEP-1, at 2-11).[25] The Company identified Plans 1, 2, and 3 as transmission and distribution supply alternatives, and Plans 4, 5, and 6 as generation alternatives (id. at 2-11 to 2-14). The Company indicated that the Quincy peak load reached 130 MW during 1996 and is projected to reach approximately 150 MW by 2005 (id. at 2-5).

a. Plan 1 - The Proposed Project

Plan 1 ("proposed project") would establish a new 180 MW capacity, 115 kV transmission supply to Quincy via two new 3.3-mile underground transmission lines from BECo's Dewar Street substation to NEPCo's North Quincy substation (id. at 2-12, 3-8, 3-21). The Company indicated that the proposed project would include a 1,300 foot directional-drill crossing of the Neponset River, and installation in streets for approximately one-third of the route (id. at 1-2, 2-21, 3-26). The Company further indicated that the proposed project would cost $26.1 M, and provide a full backup of Quincy load as projected by NEPCo until the year 2016 (id. at 2-21).

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[25] NEPCo stated that it also considered both No Build and C&LM options (Exh. NEP-1, at 2-11, n..4). With respect to the No Build option, the Company stated that any options to provide an additional source of electrical supply to Quincy would, by their nature, require some form of additional facilities (id.). The Company stated that the No Build option could not address the identified need and therefore was not considered further (id.).

With respect to C&LM, the Company indicated that its affiliate, MECo, has been implementing a C&LM program in Quincy (id.). The Company further stated that the Quincy load growth forecasts include the expectation that the C&LM program will continue (id.). However, the Company added that C&LM efforts cannot substitute for an additional electrical supply and therefore were not considered further (id.). See Section II.A.3.c, above.

b. Plan 2

Plan 2 would establish a new 151 MW capacity supply with a 2.0-mile length of 115 kV transmission line from BECo's Edgar Station in Weymouth to NEPCo's Field Street substation in Quincy, and would also involve rearranging the existing low-voltage facilities and adding new low-voltage cables for a length of approximately 3.3 miles between the Field Street, Wollaston, and North Quincy substations (id. at 2-14, 2-23). The Company indicated that Plan 2 would cost $23.2 M and provide a full backup of Quincy load until 2006 (id. at 2-21).

The Company stated that it considered various routing options for the 115 kV line required under Plan 2, all of which would involve significant impacts to either built-up areas or natural resources (id. at 2-23).[26] The Company explained that it investigated an all-water route, and land and water routes, as well as all-street routes (id.). The Company stated that no route could be identified that did not have a potentially significant environmental impact such as long crossings of navigable waters, shellfish beds, and parkland, or lengthy segments along primary commuter routes or secondary streets (id.). The Company also noted that the installation under Plan 2 of the additional 3.3 miles of low-voltage underground cables between the Field Street and North Quincy substations would consist largely of in-street construction which would cause significant community disruption (id.).

c. Plan 3

Plan 3 would provide an additional 151 MW of supply capacity through reinforcement of the existing 2.0-mile, low-voltage cables from BECo's Edgar Station, and improvements to Edgar Station and the Fore River utility tunnel (id. at 2-14, 2-24). The Company indicated that Plan 3 also would require the installation of 3.3 miles of low voltage cable between the

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[26] The Company stated that, with the exception of an occasional vacant lot and some park land, the area is fully developed with industrial, commercial, residential, and waterfront developments (Exh. NEP-1, at 2-23). The Company added that Route 3A (Washington Street and Southern Artery), one of the primary commuter routes between Boston and the South Shore area, is the only major roadway through the area (id.).

Field Street, Wollaston, and North Quincy substations (id. at 2-16). The Company stated that Plan 3 would cost $22.6 M and provide a full backup of Quincy load until 2006 (id. at 2-21).

d. Plan 4

Plan 4 would involve the construction of 160 MW of combustion turbine generation ("CTG") capacity at the Field Street substation site, and the installation of a low-voltage link between the Field Street and North Quincy substations via the Wollaston substation (id. at 2-14, 2-17). The Company indicated that Plan 4 would cost $61.2 M and provide a full backup of Quincy load until approximately 2010 (id. at 2-5, 2-21). The Company stated that it eliminated consideration of Plan 4 because it would cost substantially more than the proposed project, Plan 2, or Plan 3, and would provide no clear reliability or environmental advantage (id. at 2-22).

e. Plan 5

Plan 5 would interconnect the North Quincy substation with the Deer Island Facility in Boston via 6.5 miles of underwater and underground 115 kV cable beneath the Neponset River (id. at 2-14, 2-18, 2-20). The Company stated that this interconnection would provide access to 110 MW of spare emergency generation capacity at Deer Island (id. at 2-20). The Company indicated that Plan 5 would cost $36.9 M, but would not be capable of fully serving the present load requirements for the City of Quincy (id. at 2-5, 2-21). The Company stated that it eliminated consideration of Plan 5 because it would cost significantly more than the proposed project, Plan 2, or Plan 3, and would provide no clear reliability or environmental advantages (id. at 2-22).

f. Plan 6

Plan 6 would interconnect the North Quincy substation with the Potter Generating Station in Braintree via 6.0 miles of underground 115 kV cable (id. at 2-14, 2-19 to 2-20). The Company stated that this interconnection would provide access to 103 MW of spare emergency generation capacity at the Potter Generating Station (id. at 2-20). The Company

indicated that Plan 6 would cost $34.9 M, but like Plan 5, it also would not fully serve present Quincy load requirements (id. at 2-5, 2-21). The Company stated that it eliminated consideration of Plan 6 because it would cost significantly more than the proposed project, Plan 2, or Plan 3, and would provide no clear reliability or environmental advantages (id. at 2-22).

g. Analysis

The Company has identified six possible project approaches, of which four -- the proposed project and Plans 2, 3, and 4 -- would fully serve projected Quincy load requirements through 2006 or later. The Siting Board agrees with the Company's conclusion that the generation plans -- Plans 4, 5, and 6 -- do not warrant further evaluation based on their relatively high costs and lack of offsetting reliability or environmental advantages over the proposed project and Plans 2 and 3.

With respect to the Company's three transmission and distribution project options, the Siting Board notes that Plans 2 and 3 exhibit a lower aggregate cost relative to the Company's preferred plan. However, considerable construction-related impacts to fully developed or environmentally sensitive areas would occur along the longer 5.3-mile route of Plan 2. The record demonstrates that the impacts to both the human and natural environments under Plan 2 would far outweigh the identified cost savings. Therefore, the Siting Board focuses on the two remaining transmission and distribution supply configurations -- the proposed project and Plan 3.

Accordingly, the Siting Board finds that both the proposed project and Plan 3 would meet the identified need in Quincy. In the following sections, the Siting Board compares the proposed project and Plan 3 with respect to reliability, environmental impacts, and cost.

3. Reliability

In this section, the Siting Board compares the proposed project with Plan 3 with respect to their ability to provide a reliable supply of electricity to the City of Quincy (see Section II.A.3.a, above).

The Company indicated that both the proposed project and Plan 3 could meet the identified need, although the proposed project could back up Quincy load until 2016, while Plan 3 could only do so until 2006 (Exh. NEP-1, at 2-21). The Company stated that only the proposed project would provide a new 115 kV connection between the northern and southern portions of the BECo system, thereby enhancing the reliability of electrical supply to both the City of Quincy and the City of Boston (Exh. NEP-1, at 2-22 to 2-23). The Company further stated that the proposed project would be capable of providing partial electrical backup to the Dewar Street substation if certain additions were made to the BECo transmission system (id.).

Regarding a separate reliability concern on the area 345 kV transmission system supplying southeastern Massachusetts (see Section II.A.3.b, above), the Company stated that the proposed project, but not Plan 3, could defer from 2005 until 2022 the need to make improvements at the Holbrook substation (Exh. HO-RR-12a; Tr. 1, at 113-116). Because improvements to address this reliability concern are already planned, the Company further addresses the deferral of those improvements as an economic savings (see Section B.5, below).

As previously found in Section II.A.3.b, above, Quincy is vulnerable to a common-mode outage affecting the two 115 kV underground transmission lines that presently are the city's only source of electricity. While any additional avenue of supply would likely diminish this vulnerability, in whole or in part, the record demonstrates that the proposed project would fully backup the Quincy load until 2016 while Plan 3 would be capable of doing so only until 2006. The record also demonstrates that the proposed project would provide other reliability advantages to area transmission systems by linking BECo's Boston service area to adjacent south shore service areas, including: (1) partial backup of the Dewar Street substation, and (2) backup to relieve load on a large 345 kV autotransformer at the Holbrook substation, thereby delaying the need for other corrective measures for an additional 17 years.

Accordingly, the Siting Board finds that the proposed project would be preferable to Plan 3 with respect to reliability.

4. Environmental Impacts

In this Section, the Siting Board compares the proposed project to Plan 3 with respect to environmental impacts resulting from: (1) facility construction; (2) permanent land use; and (3) magnetic field levels.

a. Facility Construction Impacts

NEPCo argued that the proposed project is environmentally superior to Plan 3 with respect to construction related impacts (Company Brief at 16). In support, the Company stated that the proposed project's 3.3-mile underground cable route between the Dewar and North Quincy substations would primarily run behind commercial lots or use open highway corridors, open space, and low-volume roadways, thereby minimizing disruption to natural resources and urban environments (Exhs. NEP-1, at 2-23; HO-A-13a). The Company stated that exceptions would include the crossing of Morrissey Boulevard and trenching along Victory Road (Exh. HO-A-13a). The Company further stated that the proposed route in Quincy would cross Squantum Point Park and extend along Commander Shea Boulevard, a low-volume roadway (id.). The Company noted that the proposed project would cross both the Neponset River (via horizontal directional drilling) and Billings Creek, but asserted that no serious impact to either waterbody is expected (id.).

With respect to Plan 3, the Company stated that construction impacts associated with reinforcing the existing low-voltage cables between Edgar Station and Field Street substation would be minor (id.). The Company explained that new 23 kV cables would be installed in an existing utility tunnel passing under the Fore River, extending approximately two miles to a new manhole at the intersection of Washington Street and McGrath Highway (id.; Exh. HO-A-12, Att. 1). The Company added that no additional cables would be necessary along McGrath Highway and Brackett Street to the Field Street substation (Exh. HO-A-12). However, the Company stated that road opening and trenching operations would be necessary to upgrade or install underground distribution facilities between the Field Street, Wollaston, and North Quincy substations (id.). The Company noted that these distribution facilities would proceed northwesterly along Route 3A (Southern Artery), crossing Furnace Brook Parkway

and Merrymount Park, and then proceed northwesterly beneath Fenno Street and other neighborhood streets in Quincy, terminating at the North Quincy substation for a total of 3.3 miles (id., Att. 1; Exh. HO-A-6).[27] The Company added that land use along the Plan 3 distribution facilities route is a combination of commercial and residential along the major roadways of Route 3A and Hancock Street and several of the minor roadways, while most of the local streets are residential (Exh. HO-A-12).

The Company stated that the proposed project also would require extending the existing Dewar Street substation facility by 4,000 square feet to accommodate foundations for new electrical equipment[28] and the layout of the new underground cables (Exh. NEP-1, at 3-31). The Company added that construction at the Dewar Street substation would occur over approximately six months but that the work would not be continuous (id.). The Company stated that the proposed project also would require extending the North Quincy substation facility by approximately 20,000 square feet, requiring that existing landscape trees be cleared, and that piles be driven to support new equipment foundations (id. at 3-28 to 3-30; Exh. HO-A-13b). The Company stated that residences are located on one side of the North Quincy substation (Exh. HO-A-13b). The Company added that work on the North Quincy substation addition would occur over an 18 month period but would not be continuous (Exh. NEP-1, at 3-28 to 3-30).

The Company indicated that Plan 3 would involve construction at three substations -- the Edgar Station, Field Street, and Wollaston substations (Exh. HO-A-13b).[29] The Company stated that facility additions and modifications at all three substations could be accommodated in existing cleared space, thereby minimizing construction impacts (id.). The Company also

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[27] NEPCo stated that the Plan 3 distribution facilities would traverse Merrymount Park for approximately 0.5 mile (Exh. HO-A-12).

[28] NEPCo stated that the new equipment would include high voltage bus supports, disconnect switches, and circuit breakers (Exh. NEP-1, at 3-31).

[29] The Company indicated that existing low-voltage lines from Wollaston substation to North Quincy substation would be reconductored under Plan 3 (Exh. NEP-1, at 2-13, 2-16).

stated that the greatest potential for substation construction impacts would be at the Wollaston substation, due to the presence of residences on three sides of the substation (id.).

The record indicates that Plan 3 would involve installation of underground distribution cables along 3.3 miles of city streets between Field Street, Wollaston, and North Quincy substations, resulting in considerable construction impacts to the affected communities. In contrast, construction of the proposed project, which is routed along open highway corridors and low-volume roadways and through open space, would have minimal community impacts. Further, significant substation work to accommodate the cable reinforcements would be necessary at three substations under Plan 3 -- Edgar Station, Field Street, and Wollaston -- while the proposed project would require such work at only the Dewar and North Quincy substations. However, substation construction under the proposed project would require a larger extent of expansion than under Plan 3, and would include limited clearing of trees and installation of piles at the North Quincy substation. On balance, the Siting Board concludes that the potential construction impacts of the installation of 3.3 miles of distribution cable outweigh the tree clearing and pile driving impacts associated with the proposed project. Accordingly, the Siting Board finds that the proposed project would be preferable to Plan 3 with respect to facility construction impacts.

b. Permanent Land Use and Community Impacts

NEPCo asserted that the permanent land use impacts of Plan 3 would be slightly greater than those of the proposed project (Exh. HO-A-13b). The Company stated that the occupants of residences located on three sides of the Wollaston substation could experience permanent land use impacts (id.). Specifically, the Company noted that Plan 3 would require expansion at the Wollaston substation, which is located in a mixed commercial and residential area, and that new facilities would be sited in what is presently an open but unused portion of the substation yard visible to residential neighbors (id.). The Company stated that significant amounts of this open space would be transformed into a view of mechanical/electrical structures, including two 23/13.8 kV, 20 MVA transformers and four 13.8 kV feeder cables with circuit breakers, but acknowledged that landscaping could partially shield such views (id.). The Company added

that the operation of two new transformers would be a new noise source at the Wollaston substation, potentially impacting the surrounding area (id.). The Company indicated that no permanent impacts are anticipated at either Edgar Station or the Field Street substation due to the commercial/industrial land use in the immediate area (id.).

The Company indicated that the proposed project would require changes to the Dewar Street and North Quincy substations (Exh. NEP-1, at 2-13). The Company indicated that BECo's Dewar Street substation is surrounded by commercial and industrial uses, and that in conjunction with the approximately 4,000 square foot expansion of the substation, the entrance would be screened by trees, shrubs, and architectural fencing (id. at 3-31; Exh. HO-A-13b). The Company stated that the only new noise source at the Dewar Street substation would be a heat exchanger which, during operation, would be inaudible at the nearest property line or at the nearest residence (Exh. NEP-1, at 3-31). At the North Quincy substation, the Company stated that nearby residences are located on one side of the substation while commercial property and MBTA rail tracks abut the other sides (id. at 3-32; Exh. HO-A-13b). The Company also committed to constructing a wall and additional landscaping in order to minimize the visual impacts of the approximately 20,000 square foot expansion of the substation (Exh. HO-A-13b). The Company indicated that no new permanent noise source would be installed at the North Quincy substation under the proposed project (id.).

The record indicates that NEPCo's proposed transmission line will be located underground along a route that generally avoids areas of sensitive natural environment and urban density, and once sited, would be nearly invisible (see Section III.C.2.a.iv). The record also indicates that associated substation expansions at both the Dewar and North Quincy substations would require the development of an aggregate 24,000 square feet. However, the permanent land use impacts of the proposed project would be minimized due to the location of the Dewar and North Quincy substations near primarily commercial and industrial land uses.

In comparison, the low-voltage lines required by Plan 3 would be located along more heavily travelled major roadways and residential streets, creating the potential for significant traffic interruptions in the event of a fault along such route sections. In addition, the record indicates that installation of new facilities, including two new transformers, likely would result

in noise and visual impacts affecting residences on three sides of the facilities at Wollaston substation. The Siting Board also notes that the major new equipment required there under Plan 3, relative to the Wollaston substation's present footprint in that community, would be significant. Thus, the record indicates that overall permanent land use impacts under Plan 3 would be greater than those under the proposed project.

Accordingly, the Siting Board finds that the proposed project would be preferable to Plan 3 with respect to permanent land use and community impacts.

c. Magnetic Field Levels

The Company stated that the existing transmission cables that presently supply the Field Street and North Quincy substations from Edgar Station and the existing low-voltage cables would continue to carry those loads during normal operating conditions, under either the proposed project or Plan 3 (Exh. HO-A-18). The Company therefore concluded that, under normal operating conditions, there would be no difference in the magnetic field levels associated with either the proposed project or Plan 3 (id.).

The Company also assessed the magnetic field levels associated with the proposed project during a common-mode outage (id.). The Company stated that, in the event of an outage affecting the existing supply cables between Edgar Station and the Field Street substation, the proposed project would carry the full Quincy load (id.). The Company stated that under such a contingency, magnetic field levels would be 1.9 milligauss ("mG") directly above the new transmission lines, and 0.7 mG at a distance 10 feet from the new lines (id.; Exh. NEP-1, at 3-45). The Company further stated that in the event of a common-mode failure affecting the existing cables between the Field Street and North Quincy substations, the proposed project would carry only North Quincy substation load -- 40 percent of full Quincy load (Exh. HO-A-18). The Company indicated that under this scenario, the magnetic field levels above the new transmission lines would be well below 1.9 mG (id.). The Company added that the load on the low-voltage lines, and the associated magnetic field levels, would be unaffected by a common-mode outage (id.).

The Company also assessed the magnetic field levels associated with Plan 3 during a common-mode outage (id.). The Company stated that a common-mode outage affecting the existing cables between Edgar Station and the Field Street substation would cause the new low-voltage cables between those substations to carry the entire Quincy load (id.). The Company explained that in such an event, the magnetic field level directly above these low-voltage cable ducts would be significantly higher than 1.9 mG until normal operation was restored (id.). The Company indicated that the higher magnetic field levels would be due to transmission of the entire Quincy load on a 23 kV system that requires proportionally higher line currents, as compared to a 115 kV system (id.). The Company stated that a common-mode failure between the Field Street and North Quincy substations would cause the low-voltage cables from the Field Street and West Quincy substations to carry the Wollaston and North Quincy substations loads, and noted that under such contingency, the magnetic field levels directly above these low-voltage cable ducts also would exceed 1.9 mG until normal operation was restored (id.).

With respect to ongoing EMF research, the Company argued that the current status of research regarding magnetic fields indicates there exists no established causal relationship between power frequency magnetic field exposure and adverse health effects (Company Brief at 22). In support, the Company's witness, Dr. Valberg, testified that recent studies concerning epidemiology (human incidence of disease), animal studies, and "in vitro"[30] studies have failed to establish, confirm, or replicate earlier reported associations of such a relationship, and in some instances, the likelihood of such a relationship has actually been diminished (Tr. 2, at 43-46, 63).[31]

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[30] Dr. Valberg explained that "in vitro" studies are laboratory studies that may analyze biological systems modeled in a cellular fashion or biochemical systems containing the molecules that support life (Tr. 2, at 43).

[31] Dr. Valberg testified that the results of recent epidemiological studies have additionally weakened some of the associations previously asserted as indicators of potential or likely causal factors of adverse health effects from EMF (Tr. 2, at 44). Dr. Valberg also testified that a 1997 Canadian study of animals in which subjects were exposed to

(continued…)

The record indicates that the proposed underground 115 kV transmission lines would not emit any magnetic fields under a normal Quincy supply condition. In the event of a common-mode outage or other such contingency, the record indicates that, for the duration of the outage, there would be a maximum magnetic field level above the proposed new underground pipe-type transmission lines of 1.9 mG, and 0.7 mG at a distance of 10 feet from the center line over the proposed cables. Under Plan 3, a common-mode outage or similar contingency would result in temporarily increased magnetic field levels along affected back-up supply routes, many of which traverse residential neighborhoods. While the record does not indicate the expected magnetic field levels under the contingency scenario, they are likely to be greater than 1.9 mG due to the higher currents necessary to convey an equal amount of power using lower voltage facilities.

Accordingly, the Siting Board finds that the proposed project is slightly preferable to Plan 3 with respect to EMF.

d. Conclusions on Environmental Impacts

In Sections II.B.4.a, b, and c, above, the Siting Board has found that: (1) the proposed project would be preferable to Plan 3 with respect to facility construction impacts; (2) the proposed project would be preferable to Plan 3 with respect to permanent land use and community impacts; and (3) the proposed project would be slightly preferable to Plan 3 with respect to EMF.

Based on the above analyses, the proposed project is preferable to the Plan 3 alternative. In addition, the record indicates that the capacity of the Plan 3 alternative would be 151 MW,

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[31] (…continued)
magnetic fields over the course of their lifetimes demonstrated no bioassay effect (id. at 45). Further, Dr. Valberg indicated that in vitro studies have not, to date, identified a mechanistic pathway by which power line magnetic fields or weak electric fields could alter biology (id.).

Dr. Valberg also noted that no magnetic field level or threshold has been identified by the Massachusetts Department of Public Health, or is otherwise externally cited with regularity as being of concern with regard to health effects (id. at 57-60).

sufficient to meet projected load requirements of the City of Quincy until the year 2006, while the 180 MW capacity of the proposed project would meet projected Quincy load until 2016. The Siting Board notes that the impacts of the Plan 3 alternative, already greater in aggregate to those of the proposed project, could be even greater if the impacts of future projects to meet load growth between 2006 and 2016 are considered. The Siting Board therefore concludes that the record demonstrates a clear environmental advantage for the proposed project relative to the Plan 3 low-voltage supply alternative.

Accordingly, the Siting Board finds that the proposed project would be preferable to the Plan 3 alternative with respect to environmental impacts.

5. Cost

As previously discussed in Sections II.B.2.a and c, above, the Company indicated that the total cost of the proposed project would be $26.1 million, while that of Plan 3 would be $22.6 million (Exh. NEP-1, at 2-21). The Company argued that even though the initial costs of the proposed project are greater than those of Plan 3, the proposed project would provide both an additional 29 MW of capacity for Quincy as well as a long-term regional financial benefit (Company Brief at 14-15). Specifically, the Company stated that with the proposed project it would realize a net present value ("NPV") cost savings of $5 million in 1997 dollars due to the deferral of the planned installation of a second 345 kV autotransformer at Holbrook substation from the year 2005 to 2022: this installation could not be deferred under Plan 3 (Exh. NEP-1, at 2-21 to 2-22; HO-RR-12a; Tr. 1, at 39-42).[32]

The record demonstrates that the net cost of the proposed project (i.e., the Company's estimates of capital costs less the $5 million in savings resulting from the 17 year deferral of a

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[32] The Company's witness, Mr. Shastry, testified that the $5 million figure represents NEPCo's expected 50 percent share of savings with a NPV of $10 million to several Massachusetts utilities/municipal light plants related to the delay of planned reinforcement of the bulk transmission system (Tr. 1, at 18-20, 40-41). Mr. Shastry noted that the aggregate financial benefit of the deferral to Massachusetts ratepayers would be $10 million (id. at 42, 115-116).

345 kV transformer at Holbrook substation), is $21.1 million, or $1.5 million less than the capital cost of Plan 3.

Accordingly, the Siting Board finds that the proposed project would be preferable to Plan 3 with respect to cost.

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

In comparing the proposed project to the Plan 3 low-voltage alternative, the Siting Board has found that both the proposed project and Plan 3 would meet the identified need in Quincy.

The Siting Board has also found that the proposed project would be preferable to Plan 3 with respect to reliability, environmental impacts, and cost. Accordingly, the Siting Board finds that the proposed project is preferable to Plan 3 with respect to providing a necessary energy supply for the Commonwealth, with the least environmental impacts, and at the lowest possible cost.

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 BECo Decision, EFSB 96-1, at 57; 1997 ComElec Decision, EFSB 96-6, at 47; 1991 NEPCo Decision, 21 DOMSC at 376.

A. Description of the Proposed and Alternative Facilities

1. Proposed Facilities

NEPCo proposes to construct two 3.3-mile long, underground 115-kV transmission lines in Dorchester and Quincy that will connect BECo's Dewar Street substation in Dorchester to NEPCo's North Quincy substation on Spruce Street in Quincy (Exh. NEP-1, at 1-1; 3-8; 3-21). In addition, the Company proposes to expand the North Quincy substation by 20,000 square feet and the Dewar Street substation to a lesser extent, and to upgrade both the Dewar Street and North Quincy substations by installing 115 kV cable terminals and circuit breakers for the two new transmission lines (Exh. NEP-1, at 1-1, 1-3).

The primary route generally follows the Southeast Expressway from BECo's Dewar Street substation in Boston and along Victory Road (id. at 3-34 to 3-35). From the end of Victory Road, the route extends under the Neponset River to Quincy, then across MDC land to Commander Shea Boulevard, and then south along the Boulevard and under Hancock Street. Finally, it passes under the MBTA tracks to NEPCo's North Quincy substation (id.). At several locations, including the Neponset River crossing, the Company plans to install the proposed two cables by horizontal directional drilling ("HDD") (id.).

2. Alternative Facilities

NEPCo indicated that the alternative route is identical to the primary route from the Dewar Street substation to Victory Road, but that from Victory Road south, the route follows the Southeast Expressway to Conley Street, proceeds west on Conley Street to Tenean Street, continues south on Tenean Street, then heads west, crossing the MBTA tracks to Norwood Street (id. at 3-36 to 3-37). The route continues south on Norwood Street to MDC land bordering Morrissey Boulevard, west across the Boulevard, south along the median strip through Neponset Circle to the bridge abutment, then across the Neponset River along the bridge structure (id.). It then proceeds down the exit ramp to Hancock Street in Quincy, along Hancock Street and across a private right-of-way, and finally terminates inside the enclosure of the North Quincy substation (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 Boston Edison Company Decision, EFSB 96-1, at 59 ("1997 BECo Decision"); 1997 ComElec Decision, EFSB 96-6, at 50; 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 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 BECo Decision, EFSB 96-1, at 59; Commonwealth Electric Company, EFSB 96-6, at 50 (1997) ("1997 ComElec Decision"); 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. 1997 BECo Decision, EFSB 96-1, at 59; 1997 ComElec Decision, EFSB 96-6, at 50; NEA Decision, 16 DOMSC 381-409.

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

2. Development of Siting Criteria

a. Description

The Company indicated that its site selection process incorporated the following stages: definition of a study area; identification of routing options; identification of routing constraints

and opportunities;[33] and ranking of routing options to determine a primary and an alternative route (Exh. NEPCo-1, at 3-2).

The Company indicated that the study area for its proposed project, approximately 12,000 feet long by 4,000 to 6,000 feet wide, was determined by general transit corridors and the most obvious routing options (id.). More specifically, the Company indicated that the northern and southern boundaries of the study area were determined by the location of the interconnecting North Quincy and Dewar Street substations (id.). The Company established the eastern study area boundary to include the Squantum Point area of Quincy, which, the Company asserted, allowed for a reasonable range of geographically and environmentally diverse alternatives, including water routes and routes within a less urban environment (id.). The Company indicated that the eastern study area boundary followed Commander Shea Boulevard, a private way about 4,000 feet to the east of Morrissey Boulevard, the study area "centerline" (id.). The Company stated that the western boundary, which was set along Dorchester Avenue, Adams Street and Neponset Avenue, was approximately 2,000 feet west of Morrissey Boulevard (id.). The Company asserted that to go further west would only lengthen the route unnecessarily and impact more people (id.). The Company stated that the study area included portions of two cities, Boston and Quincy, and encompassed a combination of urban, high density residential/business areas in the central and western sections with open space areas to the east (id.).

The Company stated that conceptual routes for the proposed project were identified initially as part of the Company's Third Quincy 115 kV Supply Study - January, 1995 ("Supply Study") (id. at 3-4). The Company stated that four conceptual routes, including two routes which crossed from Dorchester to Squantum Point in Quincy and two routes in Boston streets crossing into Quincy via the Neponset River Bridge, were presented to regulatory staff,

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[33] The Company defined routing opportunities as those factors which would facilitate siting and routing constraints as factors which might restrict or inhibit siting in a given location (Exh. NEP-1, at 3-8).

elected officials and neighborhood representatives beginning in the summer of 1995 (id.).[34] The Company indicated that, based on both its discussions with government agencies and the public and on field reconnaissance in the study area, it identified nine routing alternatives for evaluation (see Figure 2, below) (id.).

The Company stated that one of its chief goals in selecting routing criteria was to establish a balance between criteria related to urban environments and criteria related to open space environments, both of which were present in the study area (id. at 3-9).[35] The Company stated that its selected routing criteria included 11 environmental constraints and three environmental opportunities, and that these "environmental evaluation criteria" were used to compare the nine alternative routes previously identified by the Company (id. at 3-13).

The Company indicated that the comparison of the nine alternative routes was conducted by an interdisciplinary project team consisting of the project director, the cable project engineer, the project communications director and two environmental siting and licensing specialists (id.). The Company stated that the process for ranking the alternative routes based on the Company's 14 routing criteria involved several steps: a paired analysis of each route against every other route for each of the evaluation criteria; weighting of evaluation criteria; and, finally, the application of weights to produce weighted paired analyses and a final ranking of routes based on environmental factors (id.). The Company stated that comparisons were based on actual counts, measurements or the consensus of the interdisciplinary team with respect to the impact or opportunity presented by a specific criterion (id.).

The Company stated that its environmental constraint criteria included: (1) parkland crossings (which could result in temporary construction impacts to parkland use);

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[34] The Company indicated that early consideration of a route along the MBTA Old Colony Railroad right-of-way ("ROW") ceased after the project team determined, and MBTA officials concurred, that the ROW would be too narrow to accommodate both the transit system and the electric cables for the proposed project (Exh. NEP-1, at 3-4).

[35] The Company stated that it held over 100 meetings in Boston and Quincy with natural resource agencies, regulatory agencies, elected officials, city departments, private landowners, civic associations and the general public to solicit input on routing and permitting (Exh. NEP-1, at 3-9).

(2) waterway/waterbody crossings (which could result in a variety of potential construction impacts and permitting issues); (3) wetland/saltmarsh crossings (construction impacts to ecology and regulatory issues, with severity of impact based on linear distance of disturbance); (4) shellfish beds/tidelands crossings (possible temporary construction impacts, with severity of impact based on linear distance of disturbance); (5) crossings of an area of critical environmental concern (severity of impact based on linear distance of disturbance); (6) the number of proximate residential dwellings (temporary traffic, noise and accessibility issues); (7) the number of proximate business properties (potential temporary loss of revenue); (8) traffic impacts (disruption to traffic, with severity measured in vehicle miles, the product of traffic volumes times the length of a route in roadway, rounded to nearest 1,000 feet); (9) community acceptance (which was scored for each route based on total of values assigned to route segments using a range of one/"low" acceptance to five/"high" acceptance to reflect comments at public meetings); (10) street construction (re-opening of recently paved streets was considered undesirable); and (11) future development (likelihood of route/roadway usage by relocated traffic patterns as a result of existing and future civil projects in southeast Dorchester) (id. at 3-9 to 3-12).

The Company stated that its environmental opportunity criteria included: (1) use of highway/transit corridors, i.e., the length in feet of routing along major highways, away from local streets, residences and businesses; (2) use of off-street/private ROWs (impacts to general community limited, with benefit based on linear distance of route through the off-street/private ROW); and (3) use of preferred waterway crossing techniques (likelihood of use of a preferred crossing technique given the length of crossing required, with preference for bridges or horizontal directional drilling over jet plowing techniques, and preference for jet plowing over conventional cut and cover dredging) (id. at 3-12 to 3-13).

The Company stated that for each paired analysis, the route which had the lesser impact or greater opportunity received a score of "1", while the route with the greater impact or lesser opportunity received a score of "0" (id. at 3-13 to 3-14). Both routes received a "0" if their impact/opportunity was judged equivalent (id.). The Company indicated that a higher

cumulative value signified a route which was more advantageous from an environmental standpoint with respect to siting the proposed electric cables (id.).

The Company stated that each member of its team of evaluators assigned weights from "1" (lowest) to "5" (highest) to each criterion to reflect the relative importance of the various criteria in the route selection process (id. at 3-14). The Company stated that the team discussed the initial assignment of weights, each evaluator made a second assignment of weights in light of the team's discussion, and a final average weight was then calculated for each criterion (id.).

The Company stated that it multiplied the total value of each constraint or opportunity from its unweighted paired analysis for each study route by the applicable weighting factor to derive a weighted score, and that the weighted scores of all criteria for each route were then summed to derive a total route score (id.). The Company indicated that a higher total score signified a route which was more appropriate for the proposed project from the perspective of limiting environmental impacts (id.). The Company indicated that, of the nine identified routes, Route D8 (score = 220.6) and Route D6 (score = 186.0) received the highest total scores while Route D2 (score = 90.6) received the lowest total score (id. at 3-17, 3-18).

The Company stated that it also 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 (id. at 3-22). The Company indicated that outages would occur along the various route alternatives at essentially the same rate, but there would likely be some differences in the duration of outages depending on the route (id.). The Company indicated that repairing encased cables at a point of limited or no accessibility, for example at a segment of cable route involving a major thoroughfare, water crossing or railroad track, would extend repair time substantially (id. at 3-22 to 3-23). The Company noted that the nine evaluated alternative routes each had two to five segments which could potentially require lengthy repairs (id. at 3-23). The Company stated, however, that repair time for all routes would likely be comparable with the exception of Routes D3 and D4, which would involve underwater crossings of 3,750 feet and 9,750 feet, respectively (id.). The Company indicated that repairing cable failure at either of the two identified underwater crossings would

require significantly more repair time and cost, both for keeping spare materials on hand and for repairs, than cable failure at other locations along any of the evaluated routes (id.). Thus, the Company asserted, the evaluated routes fell into one of two categories with respect to reliability: Routes D1, D2, and D5 through D9 would be comparable with respect to reliability, but Routes D3 and D4 would be less reliable due to the potential for longer repair times along those routes (id.).

To determine the cost of each facility alternative, the Company summed the estimated costs of materials, construction and engineering for the underground transmission facilities for each route (id. at 3-18 to 3-19).[36] The Company provided a cost summary of alternative routes as follows:

Route #	Route Name	Length (mi.)	Total Cost ($M)	Ranking
D1	Freeport-Hancock	2.8	$20.3	2
D2	Neponset-Hancock	2.8	$21.0	4
D3	Dorchester Bay-Squantum Pt.	2.9	$22.8	6
D4	Neponset River	2.6	$35.8	9
D5	Clayton-Squantum Pt.	3.7	$23.3	8
D6	Expressway-Hancock	2.6	$19.9	1
D7	Freeport-Squantum Pt.	3.6	$23.0	7
D8	Expressway-Squantum Pt.	3.3	$22.4	5

[36] The Company stated that its estimated costs of material, construction and engineering included: (1) preliminary design and permit application/acquisition; (2) excavation, including removal of pavement (where applicable) and backfill; (3) unusual installation techniques such as pipe jacking (tunneling), directional drilling or bridge attachment; (4) installation of manholes and conduit; (5) temporary and/or permanent pavement or other surface restoration, as applicable; (6) cost of cable material and installation, including splicing, terminations and testing; and (7) engineering, design, contract administration and documentation (Exh. NEP-1, at 3-18 to 3-19).

D9	Clayton-Expressway-Hancock	3.0	$20.6	3

(id. at 3-18).

The Company stated that the cost of line losses and the cost of additions and modifications to the North Quincy and Dewar Street substations would be the same for all routes, as would the cost to upgrade BECo's existing underground transmission circuits to accommodate the proposed circuits (id.). The Company indicated that the construction costs at the North Quincy substation would total $4.4 million; construction costs at the Dewar Street substation would total $1.6 million; and costs for upgrading BECo's existing underground transmission circuits would total $1.6 million (id. at 3-22).

The Company indicated that it considered the environmental, cost and reliability rankings of evaluated routes in selecting a primary and alternative route for its proposed project (id. at 3-23). The Company stated that with respect to environmental rankings, Route D8 was judged most compatible and Route D2 least compatible with the existing environmental setting (id.). Other routes were assigned relative rankings as a percent of the difference between the weighted scores for Routes D8 and D2 (id. at 3-23 to 3-24).

The Company stated that a similar analysis was undertaken for the cost comparison (id. at 3-24). First the most expensive (Route D4) and least expensive (Route D6) route options were identified (id.). Relative cost rankings were then assigned to the remaining routes as a percent of the difference between the cost of Route D4 and Route D6 (id.).

With respect to reliability, the Company ranked routes in two categories: Routes D3 and D4 were judged less reliable than other routes due to the length of their respective water crossings (id. at 3-23). The Company judged all other routes to be of similar reliability (id.). The Company combined the environmental and cost ratios of its nine route options[37] and selected the option with the highest combined ratio (184.3), Route D8, as its primary route and the option with the second highest combined ratio (173.4), Route D6, as its alternative route (id. at 3-25). The Company stated that because the expected reliability of the primary and

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[37] The combined environmental and cost ratios of the nine evaluated route options ranged from a high of 184.3 to a low of 45.4 (Exh. NEP-1, at 3-25).

alternative routes was the same as, or better than, the expected reliability of the other seven route options, no further consideration of reliability in the route selection process was necessary (id.).

b. Analysis

NEPCo has developed a set of criteria for identifying and evaluating route options that addresses natural resource issues, land use issues, human environmental issues, 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 BECo Decision, EFSB 96-1, at 68; 1997 ComElec Decision, EFSB 96-6, at 53; New England Power Company, 4 DOMSB 109, 167 (1995) ("1995 NEPCo Decision").

To identify route options for further evaluation, the Company first identified an area that would encompass all viable siting options given the limitations imposed by the location of the interconnecting North Quincy and Dewar Street substations. The Company used four conceptual routes within the identified area as a starting point for discussions with regulatory agency staff, elected officials and neighborhood representatives. These discussions resulted in the development of nine routing alternatives for comparison. The Company developed a comprehensive list of environmental constraints and opportunities to evaluate these nine routing alternatives. The weighting of specific environmental constraint and opportunity factors appropriately reflects their relative significance; in particular, the desirability of siting transmission lines within existing corridors where possible is appropriately stressed, as is the need to route the proposed facilities to minimize disruptive construction in residential and commercial areas. The Company also ranked its identified alternatives with respect to cost and reliability.

For each of the identified alternatives, the Company calculated environmental ratio scores based on their weighted environmental scores and cost ratio scores based on estimated costs. The Company used the environmental and cost ratio scores for the identified alternatives, along with their reliability rankings, to balance the environmental impacts,

reliability and cost of the nine evaluated route options for its proposed facilities.[38] Thus, the Company has provided a comprehensive, quantitative method to compare identified alternatives on the basis of environmental impacts, cost and reliability.

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 it has not overlooked or eliminated any siting options which are clearly superior to the proposed project.

3. Geographic Diversity

NEPCo considered nine geographically diverse transmission line routes between BECo's Dewar Street substation and the North Quincy substation to which the Company proposes modifications to accommodate its proposed transmission lines. Although each identified route between the existing substation sites overlaps a segment of at least one other route, each identified route is clearly distinct: each offers a unique set of environmental, reliability and cost constraints and advantages within the area designated by the Company as encompassing all viable siting options for its proposed transmission lines. Consequently, the

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[38] In summing the environmental ratio scores and cost ratio scores to derive combined ratio scores, the Company effectively attributed equal weight to (1) the net environmental advantage of the route with the highest environmental score over that with the lowest environmental score and (2) the cost advantage of the least-cost route over the highest-cost route. In other words, the range of net environmental differences was equated to the $15.9 million range of costs. The Siting Board accepts that equal weighting of the range of environmental differences and range of cost differences was reasonable, based on the record in this review.

Siting Board finds that the Company has identified a range of practical transmission line routes with some measure of geographic diversity.

4. Conclusions on the Site Selection Process

The Siting Board has found that the Company developed and applied a reasonable set of criteria for identifying and evaluating alternatives to the proposed project in a manner which ensures that it has not overlooked or eliminated any alternatives which are clearly superior to the proposed project. In addition, the Siting Board has found that the Company has identified a range of practical transmission line routes with some measure of geographic diversity. Consequently, the Siting Board finds that NEPCo has demonstrated that it examined a reasonable range of practical facility 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 BECo Decision, EFSB 96-1, at 72; 1997 ComElec Decision, EFSB 96-6, at 60; 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 BECo Decision, EFSB 96-1, at 72; 1997 ComElec Decision, EFSB 96-6, at 60; 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 BECo Decision, EFSB 96-1, at 287; 1997 ComElec Decision, EFSB 96-6, at 60; 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 BECo Decision, EFSB 96-1, at 73; 1997 ComElec Decision, EFSB 96-6, at 60; 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 BECo Decision, EFSB 96-1, at 73; 1997 ComElec Decision, EFSB 96-6, at 60-61; 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 BECo Decision, EFSB 96-1, at 73; 1997 ComElec Decision, EFSB 96-6, at 61; Boston Edison Company (Phase II), 1 DOMSB 1, at 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 BECo Decision,

EFSB 96-1, at 73; 1997 ComElec Decision, EFSB 96-6, at 61; Boston Edison Company (Phase II), 1 DOMSB 1, at 40 (1993).

Accordingly, in the sections below, the Siting Board examines the environmental impacts, cost and reliability of the proposed facilities along NEPCo'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 impacts 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 Along the Primary Route

a. Environmental Impacts of the Proposed Facilities Along the Primary Route

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.[39] The Siting Board then addresses whether the environmental impacts of the proposed facilities along the primary route would be minimized.

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[39] The Siting Board notes that in the current proceeding there are no differential reliability issues to be balanced against environmental and cost issues (Exh. NEP-1, at 3-47).

(i) Water Resources

The Company indicated that certain portions of the primary route, including Squantum Point, the mouth of the Neponset River, and a section along Commander Shea Boulevard, were within the boundaries of the Neponset River Area of Critical Environmental Concern ("Neponset River ACEC") (Exh. NEP-1, at 3-53). The Company asserted, however, that any impacts to water resources[40] along these segments of the primary route would be insignificant and temporary, as discussed below (Company Brief at 23). The Company stated that it anticipated restoring to their pre-existing condition any resources of the Neponset River ACEC disturbed by construction along the primary route, except as otherwise directed by the MDC and other permitting agencies (Exh. NEP-1, at 3-55).

The Company stated that the primary route would cross the estuarine portion of the Neponset River between Commercial Point and Squantum Point on the Boston and Quincy sides of the river, respectively (id. at 3-48 to 3-49). The primary route would cross the navigational channel of the river and a portion of Buckley's Bar in Quincy (id.). The Company indicated that shellfish beds located on Buckley's Bar are highly productive but contaminated (id.).[41,42]

To minimize the impacts to Buckley's Bar and other Neponset River resources, the Company stated that it would use HDD along the primary route to install the proposed

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[40] Impacts to water resources include impacts to wetlands, surface water, groundwater and wells, as applicable.

[41] Shellfish harvest is prohibited in the Neponset River due to high fecal material concentrations (Exh. NEP-1, at 3-48).

[42] The water quality of the estuarine portion of the Neponset River is classified as SB, i.e., suitable for the following use designations: aquatic life, fish consumption, primary and secondary contact recreation, aesthetics, agricultural and industrial uses, and shellfish harvesting (Exh. NEP-1, at 3-48). However, a 1995 study reported that Neponset River water quality did not meet standards for the SB designation (id.). Specifically, the study indicated that the water quality of the Neponset River failed to fulfill standards for primary contact recreation, aquatic life and aesthetics and only partially fulfilled standards for secondary contact recreation (fishing, boating, and incidental water contact)(id.).

transmission lines across the Neponset River (id. at 3-49). The Company explained that to effect the crossing, a drilling rig would tunnel 15 to 40 feet beneath the river bottom (id.; Exh. HO-E-1). The Company anticipated no sediment disruption or water column impact in association with its use of HDD (Exh. HO-E-1). The Company stated that a NEPCo inspector would be on-site during the drilling process and that a drilling mud recovery plan would assure preservation of the river's biotic resources in the unlikely event of a drilling blow-out (id.; Exh. NEP-1, at 3-49).

The Company stated that crossing of the Neponset River and construction along Commander Shea Boulevard would result in limited construction in the 200-foot Riverfront Area ("Riverfront Area"), recently designated a resource area under the Rivers Protection Act ("RPA") (Exhs. NEP-1, at 3-49; HO-E-4). The Company indicated that it satisfied the two-tier test for work in the Riverfront Area, first, by conducting the alternatives assessment in the instant filing and, second, by ensuring that the proposed facility would have no significant adverse impact in the Riverfront Area based on the proposed restoration of contours and vegetation and the proposed use of HDD for the Neponset River crossing (Exhs. NEP-1, at 3-49; HO-E-4). The Company asserted that impacts to the Neponset River and the Riverfront Area related to construction of the proposed facilities along the primary route would be temporary, and that no shellfish habitat would be lost due to construction (Exhs. NEP-1, at 3-49; HO-E-4).

The Company indicated that it identified one bordering vegetated wetland and one isolated wetland north of Victory Road common to both the primary and alternative routes. The Company stated that along either route, the proposed facilities would skirt a bordering vegetated wetland ("BVW"), and an isolated wetland (Exh. HO-E-5). The Company also stated that the proposed transmission lines would traverse about 200 feet of buffer zone of the BVW, and noted that the isolated wetland has no regulatory buffer zone (id.). There is no anticipated disturbance to wetlands south of Victory Road along the primary route (id.). Buffer zone would be crossed for about 3,150 linear feet along Commander Shea Boulevard, not including routing through Squantum Point Park (id.). The Company indicated that its

primary route through Squantum Point Park, finalized in conjunction with the MDC, was designed to avoid crossing wetlands (id.; Exhs. NEP-1, at 3-52, 3-55; HO-RR-8; HO-RR-11).[43]

The record demonstrates that the Company plans to use HDD to cross the Neponset River and to install its proposed transmission lines in a manner that avoids impacts to other water resources, including wetlands. The record also demonstrates that the Company anticipates restoring to their pre-existing condition any resources of the Neponset River ACEC disturbed by construction along the primary route, including resources of the Riverfront Area, the Neponset River and Squantum Point Park, and wetland resources. Based on its analysis of the record, the Siting Board concludes that there would be no permanent impact and only minimal temporary impacts to water resources resulting from construction of the proposed facilities along the primary route.

Accordingly, the Siting Board finds that with implementation of the proposed mitigation measures, the environmental impacts of the proposed facilities along the primary route would be minimized with respect to water resources.

(ii) Land Resources

The Company indicated that some brush, mostly smooth sumac, would be cut in the vicinity of the IBEW buildings along Freeport Street in Boston; some small trees and brush would be cut for construction on Squantum Point; several trees would be removed for the substation expansion at the Dewar Street substation site; and some landscaping and a few landscape trees would be removed for the substation expansion at the North Quincy substation (Exh. HO-E-14). The Company anticipated no additional tree removals for operation of the proposed facilities, and planned no use of herbicides during the clearing or future maintenance

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[43] The Company indicated that the primary route would follow the northern edge of an old abandoned airstrip through Squantum Point Park, and would thereafter follow the Boston Scientific property line to Commander Shea Boulevard (Exhs. NEP-1, at 3-53 to 3-54; HO-RR-8; HO-RR-11). The Company's proposed route through Squantum Point Park would involve no disturbance to wetlands or associated buffer zones (Exhs. HO-RR-8; HO-RR-11).

of the primary route (id.). The Company stated that after construction, both the Dewar Street and North Quincy substation sites would be landscaped with trees and shrubs, and that revegetation would take place at Squantum Point as directed by the MDC (id.). Finally, the Company made a commitment to maintain a constant level of vegetation along the route of the proposed facilities, including at the Dewar Street and North Quincy substations, before and after construction (Tr. 1, at 73 to 74).

The Company indicated that the potential for soil erosion is low along the primary route due to the generally flat terrain of the area and stated that it would control soil erosion through final grading of topsoil, heavy mulching of soil with hay or wood chips, and stockpiling of trench spoil off-site rather than along streets or open space associated with the primary route (Exh. HO-E-15). The Company also stated that it would use silt fences and hay bales when constructing in the buffer zones of wetlands (id.).

The Company indicated that a walkover of the primary route and a search of existing MDEP and other data sources produced no evidence of contaminated soils that would preclude construction of the proposed facilities along the primary route (Exh. HO-E-16). The Company stated that a Licensed Site Professional ("LSP") would determine procedures for the handling of contaminated soil encountered during construction, if any, including disposal at an approved off-site landfill or as backfill in the construction trench, as appropriate (id.).

No federally-protected or proposed endangered or threatened species is associated with the primary route (Exh. HO-E-20). In addition, a site reconnaissance by the Massachusetts Natural Heritage and Endangered Species Program ("MNHESP") indicated that no endangered species breeding habitat would be affected by the proposed cable installation (id.).[44] The Company indicated its commitment to work with the MNHESP and the MDC to ensure that impacts to bird habitat at Squantum Point Park would be minimized and temporary (Tr. 1, at 79 to 80).

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[44] The analysis by the MNHESP assumes the restoration to natural habitat of any area of Squantum Point which would be impacted by construction (Exh. HO-E-20).

The record demonstrates that, along or in the vicinity of the primary route, there would be minimal clearing of trees and vegetation associated with the proposed project and that the Company has made a good faith commitment to replace trees and vegetation removed during construction; that loss of soil would be insignificant and that the Company plans measures to minimize soil erosion and to dispose properly of contaminated soils, if any; and that no known rare or endangered species, or endangered species habitat, including breeding habitat, would be adversely affected by the proposed construction.

Accordingly, the Siting Board finds that the environmental impacts of the proposed facilities along the primary route 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 along the primary route with respect to land use, zoning, traffic, safety and noise.

The Company submitted a description and map of land uses along the primary route based on data from the Massachusetts Geographic Information Systems ("MGIS") office (Exh. NEP-1, at 3-56 to 3-57). Land use tracts along the primary route include areas of public utility, industrial, commercial and business use, vacant land bordering a major highway, several smaller roadways, recreational facilities (a yacht club), public parkland, and residential apartments (id.).

The Company asserted that construction and operation of the proposed facilities would cause minimal disruption of existing land use (id. at 3-58, 3-65 to 3-66). Active business, commerce, and residential areas would be avoided to the maximum extent practicable, and construction in major thoroughfares would be limited to two highway crossings (Morrissey Boulevard and Victory Road) (id.). The Company stated that access during construction to business and recreational operations along the primary route would be maintained, as would access to residential locations (id.).

The Company stated that the portion of the primary route in Boston is located within industrial and light manufacturing districts along the Southeast Expressway and a waterfront

service district at Commercial Point (id. at 3-55 to 3-56). In the City of Quincy, the initial segment of the route is within a "planned unit development" zone on Squantum Point, owned by the MDC (id.).[45] The majority of the primary route in Quincy is located in business districts adjacent to Commander Shea Boulevard (id.). A short segment lies in an industrial district (id.). The final 1,300 linear feet in Commander Shea Boulevard is adjacent to a residential district and a city park which is classified as an open space district (id.).[46]

The Company stated that neither the City of Boston Zoning Code nor the City of Quincy Zoning Ordinance specifically addresses underground facilities as an allowed use (id.; Exh. HO-E-9S). In discussions with the Company, however, the Boston Redevelopment Authority and the Quincy Building Inspector indicated that an underground cable is not a regulated use, and that construction and operation of the proposed underground cable therefore would not conflict with zoning regulations (Exhs. NEP-1, at 3-56; HO-E-10).

The Company stated that its conversations with the Quincy Building Department indicated that expanding the North Quincy substation as proposed was allowed within the business district where it was located, but would require a special permit from the City of Quincy or a zoning exemption from the Department (Exh. HO-E-12). The Company indicated that it had filed a petition (D.P.U. 97-99) with the Department for such a zoning exemption (Exh. HO-E-41). The Company also indicated that expansion of the Dewar Street substation was allowed under the City of Boston Zoning Code in the Industrial District where it was located (Exhs. NEP-1, at 3-56; HO-E-11S).

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[45] The referenced planned unit development is an area which the MDC is in the process of developing into a park, its designated use (see Section III.C.a.(1), above).

[46] The Company indicated that the primary route for its proposed facilities would pass through three Boston zoning districts, General Manufacturing (3,650 feet, 21 percent), Light Manufacturing (1,000 feet, six percent), and Waterfront Industry (1,100 feet, six percent) as well as three zoning districts in Quincy, Planned Unit Development (3,400 feet, 20 percent), General Business (6,050 feet, 35 percent) and Multifamily/Low Density Residential (2,050 feet, 12 percent) (Exh. HO-RR-9).

The Company provided a letter from the Massachusetts Historical Commission ("MHC") which indicated that the MHC anticipated no impact along the primary route to any significant historic or archaeological resources (Exh. HO-E-22, Att. 1).

The Company stated that the primary route would avoid major roadways for most of its length (Exh. NEP-1, at 3-67 to 3-68). Between Dewar Street substation and Victory Road, approximately 0.8 miles, the primary route would be constructed in open space adjacent to the MBTA tracks and the bottom of the slope adjacent to the Southeast Expressway (id.). Traffic impacts along this segment of the primary route would be limited to disruption caused by moving equipment and materials into and out of construction areas (id.). The Company indicated that the flow of traffic at the Morrissey Boulevard and Freeport Street intersection and off the Southeast Expressway at Victory Road would be maintained at all times during the construction period (id.). The Company estimated installation time for the proposed conduits between the Dewar Street substation and Victory Road at four to six weeks (id.).

The Company indicated that the proposed transmission lines would be installed along Victory Road for a length of approximately 1000 feet and along Commander Shea Boulevard in Quincy for a length of nearly one mile (id. at 3-26). The Company stated that traffic volumes on Victory Road, including the off-ramp to Victory Road from the Southeast Expressway, and on Commander Shea Boulevard were relatively low -- 4500 and 4000 vehicles per day, respectively -- and noted that two-way traffic would be maintained along Commander Shea Boulevard during construction (id. at 3-67 to 3-68). To minimize traffic impacts the Company would: undertake construction at off-peak hours to the extent practicable; maintain traffic access by use of steel plates; use traffic control officers and signage; drill or bore under major road crossings as feasible; and keep the community informed of progress and construction timetables (id.). The Company stated that the proposed transmission lines would be installed along Victory Road and along Commander Shea Boulevard in Quincy, and noted that two-way traffic would be maintained along Commander Shea Boulevard (id.).

The Company indicated that installation of the proposed conduits in Victory Road would require one to two weeks, and that manhole installation and directional drilling in Victory

Road would require an additional week to two weeks (id.). Installation of the proposed facilities in Commander Shea Boulevard would require four to five weeks (id.).

The Company stated that in paved areas, roadways would receive temporary pavement immediately after backfill, with permanent paving in conformance with the rules, regulations and policies of the City of Boston Department of Public Works ("DPW") and the City of Quincy DPW (Exh. HO-E-17). The Company has committed to curb-to-curb paving of Commander Shea Boulevard in Quincy and will oversee paving operations there and elsewhere along the route of the proposed facilities as required by the Cities of Boston and Quincy (id.). If the City of Boston chooses to require payment in lieu of paving, the City of Boston will oversee the paving at a later date (id.).

The Company guaranteed access for fire and safety equipment at all times (Exh. NEP-1, at 3-66).

The Company stated that all substation and cable construction, maintenance and operations work would be performed in accordance with relevant OSHA standards and the safety policy of the NEES companies and BECo, as applicable (Exh. HO-E-30). In addition, the Company indicated that safety impacts would be minimized by measures including, but not limited to, maintenance of a fence at least seven feet high around the substation sites during and following construction, the use of police details during construction occurring in a traveled way, and the required development and use by contractors of a safety plan approved by the Company (id.).

The Company indicated that normal construction noise would be associated with the installation of the proposed transmission lines along the primary route, but would typically be confined to the hours of 7:30 a.m. to 4:30 p.m., Monday through Friday (Exhs. NEP-1, at 3-64; HO-E-27). The Company stated that night work would occur for only two reasons: to minimize impacts when installing the proposed transmission lines across heavily traveled roadways, and to carry out construction activities such as cable splicing and horizontal directional drilling which require round-the-clock operations (Exh. HO-E-26). With respect to such round-the-clock operations, the Company indicated that cable splicing, which might take

place in the vicinity of residences, would generate very little noise, and that nearby residences would be notified of the splicing schedule (id.).

The Company anticipated that Dewar Street substation construction would take place over a period of about six months and North Quincy substation construction would take place over an 18-month period, but that the work would not be continuous at either substation (Exh. HO-E-28). Noise sources specific to the two proposed substations would include installation of a heat exchanger and pile foundations at the Dewar Street substation and pile foundations at the North Quincy substation (id.; Exh. HO-E-29). The Company provided documentation showing that projected operating noise levels at the Dewar Street substation with the proposed heat exchanger installed would not exceed existing nighttime ambient L_{90} noise levels at the nearest property line and at the property line closest to the nearest residence (Exh. HO-E-29). With respect to pile installation, the Company indicated that pile driving would occur over a three to four week period at Dewar Street substation and over a four to six week period at the North Quincy substation (id.). The Company stated that it would limit pile driving to Mondays through Fridays, starting no earlier than 8:00 a.m. and ending no later than 4:30 p.m., to the extent possible (Tr. 2, at 11, 40).[47]

With respect to land use impacts, an interested person in the instant proceeding, Mr. Charles Tevnan, questioned whether the public would have reasonable access to the boat ramp, fishing pier, and parking lot located in Boston Gas Company's Rainbow Park at the Neponset River end of Victory Road (Tevnan Reply Brief at 4). In addition, Mr. Tevnan raised the issue of potential noise impacts to residents in the vicinity of the Dewar Street substation (id. at 2).

The record demonstrates that the land use impacts of the construction of the proposed underground transmission lines would be temporary and minimized along the preferred route. Specifically, the Company will take steps to limit disruption to residences and businesses and

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[47] The Company indicated that it might be necessary to plan outages to drive piles in areas where live underground cables are located. The Company would coordinate the timing and extent of such outages based on system load and flows. In the event that weekday outages could not be arranged, pile-driving would take place during weekend hours (Tr. 2, at 40).

ensure access to recreational activities such as boating and fishing, repave or ensure repaving of streets disturbed by construction, and otherwise ensure the restoration of the primary route to its original condition to the extent possible. The record further demonstrates that the Company will follow all OSHA and other regulations applicable to construction and operation of the proposed facilities, and maintain the flow of traffic and passage of emergency vehicles.

In addition, the record demonstrates that noise impacts associated with construction will be minimized by limiting such noise to normal working hours, Monday through Friday, to the extent possible, and that the operating noise of the proposed heat exchanger will not increase the noise level in the vicinity of the Dewar Street substation.

Accordingly, the Siting Board finds that, with the implementation of all proposed mitigation, the environmental impacts of the proposed facilities along the primary route would be minimized with respect to land use.

(iv) Visual

In this Section, the Siting Board reviews the visual impacts of establishing the proposed facilities along the primary route.

The Company asserted that no visual impact would result from installation of the proposed underground transmission lines or associated manholes except on a temporary basis during the construction period (Exh. NEP-1, at 3-63). The Company stated that manholes for the proposed underground transmission lines would be flush mounted on the ground and would not be visible except in the immediate vicinity of the manholes (id.).

The Company asserted that the two substations to be expanded, the Dewar Street and North Quincy substations, were not in visually sensitive areas and that contemplated changes would be consistent with existing land uses (id. at 3-64). With respect to the Dewar Street substation, the Company provided illustrations of the substation with surrounding land uses and landscaping, both before and after the proposed expansion (Exh. HO-S-2, Att. 12, at 5, 6). The illustrations indicated that the closest residential buildings were located at a distance of 400 to 500 feet from the existing substation facilities, opposite the entrance to the substation property, and that the Company planned to install landscaping at the property entrance where

none currently exists (id.; Exh. NEP-1, at 1-2). In addition, expansion of substation facilities would occur on the side of the substation property farthest from abutting residential land use (Exh. HO-S-2, Att. 12, at 5, 6).

With respect to the North Quincy substation, the Company stated that the proposed expansion would result in a three-fold increase in the footprint of the buildings and electrical switchgear, but would not extend beyond the existing fenceline of the substation site (Exh. NEP-1, at 3-64). The Company also would extend an existing textured concrete wall to screen most substation yard structures from view (id.). The Company submitted initial landscaping plans designed to minimize visual impacts on residences abutting the North Quincy substation and provided details of meetings held by the Company with owners of property abutting the substation to refine the proposed landscaping (Exhs. HO-E-24; HO-E-25; HO-E-48).

With respect to visual impacts, Mr. Tevnan argued that the Company erred in describing the vicinity of the Dewar Street substation as not visually sensitive (Tevnan Reply Brief at 2). Mr. Tevnan also contended that the plantings proposed for the entrance gate of the substation would not adequately screen the proposed substation expansion from the nearby Savin Hill Apartments (id. at 2 to 3).

The record demonstrates that visual impacts of the proposed underground transmission lines along the primary route would be temporary and limited to the construction period. The record also demonstrates that the proposed changes at the North Quincy and Dewar Street substations would expand the current substation facilities within their current site boundaries, and that the proposed expanded facilities would be screened to the extent practicable from surrounding land uses. In the case of the North Quincy substation, the Company has worked with abutting property owners to ensure adequate vegetative screening. At the Dewar Street substation, the Company's planned landscaping at the entrance of the substation property would soften and screen views from the closest residence, the Savin Hill apartment complex, 400 to 500 feet away. In addition, the visible expansion of the Dewar Street substation facilities would occur only on the side of the substation property farthest from abutting residential land use.

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 along the primary route would be minimized with respect to visual impacts.

(v) Magnetic Field Levels

The Company calculated that magnetic fields generated by the proposed transmission lines operating at maximum load (i.e., during a common mode outage) would be 1.9 mG at one meter above the ground over the center of the cables (Exhs. NEP-1, at 3-45; HO-A-18). The corresponding magnetic field strength at ten feet away from the centerline of the proposed cables would be 0.7 mG (id.).

To simulate the effect of the proposed facilities on existing magnetic field strength, the Company provided magnetic field levels for the Dewar Street substation given three scenarios, the first, under conditions of normal operation, in which full Quincy load is supplied from BECo's Edgar facility, the second in which North Quincy load is supplied via the Dewar Street substation because two cable sections between Field Street and North Quincy substations are out of service, and the third in which full Quincy load is supplied via the Dewar Street substation because key transmission lines in the BECo system are out of service (Exh. HO-E-32).

The Company anticipated no change in the existing magnetic field levels around the perimeter of the Dewar Street substation under normal operating conditions (Exh. HO-E-34).[48] The Company calculated the present maximum operating magnetic fields around the four sides of the North Quincy substation at 0.1 mG (on the side closest to the MBTA rail lines), 2 mG (on the residential property side), 12.5 mG (on the M & P Partners side) and 19 mG (on the SCI building parking lot side of the fence) (Exh. HO-E-32). The Company anticipated that, with cable service failure between the Field Street and North Quincy substations, magnetic field levels would remain at 2 mG on the residential property side of the substation and

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[48] The Company explained that with the existing cables from BECo's Edgar facility in operation, the proposed new transmission lines would be energized but would not carry any load (Exh. HO-E-34).

increase to between 11 and 23 mG on the remaining three sides of the substation property for the duration of the outage (id.). Under the Company's worst case scenario, in which the entire load of the City of Quincy would be supplied via the Dewar Street substation, magnetic field levels would remain at 2 mG on the residential property side of the substation and increase to between 28 and 47 mG on the remaining three sides for the duration of the outage (id.).[49,50]

The Company also provided magnetic field levels for the Dewar Street substation given two scenarios, the first, under conditions of normal operation, in which full Quincy load is supplied from BECo's Edgar facility, and the second in which full Quincy load is supplied via the Dewar Street substation because key transmission lines in the BECo system are out of service (Exh. HO-E-33). As at the North Quincy substation, the Company anticipated no change in the existing magnetic fields around the perimeter of the Dewar Street substation under normal operating conditions (Exh. HO-E-34). Under the second scenario, the Company anticipated an increase of 48 mG on the east side of the substation closest to the MBTA rail line and 28 mG on the south side of the substation for the duration of the outage (id.; Exh. NEP-1, at 3-26, 3-32).

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, particularly along the primary transmission line route, but also in the vicinity of the North Quincy and Dewar Street substations, would be unaffected by the proposed project under normal operating conditions

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[49] The Company indicated that its worst case scenario represents an unlikely contingency (Tr. 2, at 52).

[50] The Company's expert witness indicated that readings of magnetic field strength from substation transformers typically diminish quickly with distance from the source of the measured magnetic fields (Tr. 2, at 57).

and would remain far below the levels found acceptable in the 1985 MECo/NEPCo Decision, even assuming the Company's worst case scenario, i.e., supply of full load for the City of Quincy via the Dewar Street substation.

Accordingly, the Siting Board finds that the environmental impacts of the proposed facilities along the primary route would be minimized with respect to magnetic field impacts.

(vi) Conclusions on Environmental Impacts

In Section III.2.a, above, the Siting Board has reviewed the information in the record regarding environmental impacts of the proposed facilities along the primary route and the potential mitigation measures. The Siting Board finds that the Company has provided sufficient information regarding environmental impacts of the proposed facilities along the primary route and potential mitigation measures for the Siting Board to determine whether environmental impacts would be minimized and whether the appropriate balance among the environmental impacts and between environmental impacts and cost 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 along the primary route would be minimized with respect to water resources; (2) the environmental impacts of the proposed facilities along the primary route would be minimized with respect to land resources; (3) with the implementation of all proposed mitigation, the environmental impacts of the proposed facilities along the primary route 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 along the primary route would be minimized with respect to visual impacts; and (5) the environmental impacts of the proposed facilities along the primary route 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 along the primary route 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 Along the Primary Route

The Company estimated the total cost for installation of the proposed transmission lines along the primary route at $14,800,000 (in 1997 dollars) broken down into six categories, as follows: construction, $6,200,000; materials, $3,900,000; engineering, $1,900,000; permitting $800,000; contingencies, $1,800,000; and right-of-way acquisition, $200,000 (Exh. HO-C-1). The Company indicated that it derived material costs from estimates provided by various material suppliers; construction costs -- modified by projected labor equipment rates for 1999 -- from the Company's experience on recent, similar projects and in consultation with outside contractors; and engineering and permitting costs from the estimated hours required for project completion plus contracted and estimated costs of engineering consultants (id.). Overhead costs, including interest during construction, supervision, payroll taxes and insurance were assigned to various cost categories as appropriate (id.). Annual cost of operation and maintenance for the proposed transmission lines along the primary route was estimated at $60,000 to $70,000 (Exh. HO-C-2).

The Company estimated the total cost for the proposed expansion of the Dewar Street substation at $1,600,000 (in 1997 dollars), as follows: construction $570,000; materials, $360,000; engineering, $500,000; permitting, $25,000; and contingencies, $145,000 (Exh. HO-RR-15). The estimated total cost of the proposed heat exchangers and related work on the K Street to Dewar Street 115 kV pipe type cables was $1,600,000, broken down into four categories as follows: construction, $200,000; materials, $1,200,000; engineering, $100,000; and contingencies, $100,000 (id.).

The Company submitted an estimated total cost for the proposed expansion of the North Quincy substation of $4,400,000 (in 1997 dollars), broken down into five categories: construction, $1,900,000; materials, $1,200,000; engineering, $500,000; permitting $400,000; and contingencies, $400,000 (id.).

The Siting Board finds that NEPCo 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 NEPCo has provided sufficient information regarding the environmental impacts of the proposed facilities along the primary route 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 NEPCo 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 along the primary route with respect to water resources, land resources, land use, visual impacts and magnetic field levels. For each category of environmental impacts, NEPCo demonstrated that, with the mitigation discussed above, the impacts would be minimized.

Accordingly, the Siting Board finds that the proposed facilities along the primary route 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

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 route to the environmental impacts of the alternative route.

(i) Water Resources

The Company indicated that, like the primary route, the alternative route crosses the Neponset River, but further upstream at the Neponset River Bridge (Exh. NEP-1, at 3-52). The Company indicated that it would use an empty utility bay beneath the Neponset River Bridge to install its proposed transmission lines across the Neponset River (id.). The Company stated that using this bridge structure for the cable crossing would result in no impact to Neponset River sediments, water quality or biota, or on the Riverfront Area (id.). The Company noted that although trenching would be required near or within the 200-foot Riverfront Area where the cable meets surface roads in Quincy, the cable trench area would be restored to pre-existing conditions (id.).

The Company stated that the alternative route would pass the same isolated wetlands as the primary route from the MBTA tracks to Victory Road, and that it would pass through one more isolated wetland just south of the Victory Road and Freeport Street intersection for about 130 feet (Exh. HO-E-5). This would result in disturbance to about 3900 more square feet of wetland area, assuming a 30-foot construction easement, but no impacts to wetland buffer zone because the wetland is isolated (id.). The Company stated that the disturbed area would be restored to its pre-construction condition and that no permanent impacts to wetlands were anticipated (Exh. NEP-1, at 3-52).

In comparing the water resource impacts of the proposed facilities along the primary and alternative routes, the Company made three assertions: first, that the primary and alternative routes would be comparable with respect to impacts to the Neponset River, but that by keeping the Neponset River Bridge utility bay open, the primary route would potentially avoid impacts to the river from future projects; second, that the primary route would be

preferable to the alternative route with respect to wetlands since it would cross a slightly lesser length of wetland area than the alternative route; and third, that the alternative route would not infringe upon the Neponset River ACEC and would therefore be slightly preferable with respect to impacts to Neponset River ACEC water resources (id. at 3-50, 3-52, 3-55).

The record demonstrates that the primary route would result in fewer impacts to wetlands than the alternative route. In addition, use of HDD along the primary route minimizes impacts to Neponset River resources. The alternative route also minimizes impacts to Neponset River resources, but would require use of limited remaining utility bay space in the Neponset River Bridge.

While the primary route, but not the alternative route, passes through the Neponset River ACEC, the primary route avoids water resource impacts within the Neponset River ACEC by passing under Buckley's Bar, along the wetlands-free edge of an abandoned airstrip in Squantum Point Park, and in the pavement of Commander Shea Boulevard until that roadway leaves the ACEC. Thus, the primary route offers benefits over the alternative route with respect to wetlands impacts and is comparable to the alternative route with respect to surface water resources impacts. The primary route also provides a potential long-term benefit for surface water impacts by leaving the Neponset River Bridge utility bay open for any future projects which must cross the Neponset River.

Accordingly, the Siting Board finds that the primary route is preferable to the alternative route with respect to impacts to water resources.

(ii) Land Resources

The Company indicated that construction of the proposed facilities along the alternative route would require clearing of trees and other vegetation in a number of the same locations required along the primary route, including in the vicinity of the Freeport Street IBEW buildings, and at the North Quincy and Dewar Street substations (Exh. HO-E-14). Mitigation and restoration of impacts to trees and vegetation at the substations and along Freeport Street along the alternative route and primary route would be comparable (id.). The alternative route would involve no clearing of trees and other vegetation at Squantum Point, but might require

removal of a few shrubs in the area of Neponset Circle (id.). The Company anticipated no removal of trees or vegetation after construction of its proposed facilities along the alternative route, and stated that no herbicides would be used (id.).

The Company indicated that due to its flat terrain, the potential for soil erosion along the alternative route was minimal and comparable to that along the primary route (Exh. HO-E-15). The Company also stated that techniques for mitigating soil loss along both routes would be comparable (id.).

The Company indicated that a walkover of the alternative route and a search of existing MDEP and other data sources produced no evidence of contaminated soils that would preclude use of the alternative route for construction of the proposed facilities (Exh. HO-E-16). The Company stated that an LSP would determine procedures for the handling of contaminated soil encountered during construction, if any, including disposal at an approved off-site landfill or as backfill in the construction trench, as appropriate (id.).

The Company indicated that there are no known federally-protected or proposed endangered or threatened species in the vicinity of the alternative route (Exhs. HO-E-20, Att. 1; NEP-1, at 3-2).

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. No contaminated soils would preclude construction of the proposed facilities, and no known rare or endangered species, or endangered species habitat would be adversely affected by the proposed construction. Thus, with respect to land resources, the primary and alternative routes are essentially comparable in all aspects with the exception of length: the alternative route is approximately 2.6 miles, or 0.7 miles shorter than the 3.3-mile primary route. Because impacts are minimal, however, the slightly greater length of the primary route would result in no additional impacts to land resources relative to the alternative route.

Accordingly, the Siting Board finds that the primary route would be comparable to the alternative route with respect to land resources.

(iii) Land Use

The Company submitted a description and map of land uses along the alternative route based on data from the MGIS office (Exh. NEP-1, at 3-57 to 3-59).

Land uses along the alternative route are the same as for the primary route from the Dewar Street substation to Victory Road (id. at 3-59). The alternative route then continues through a densely developed area marked by mixed residential and commercial land uses (id.). Thereafter the alternative route follows major commercial and commuter roadways to its southern end at the North Quincy substation (id.).

The Company anticipated more construction-related impacts along the alternative route south of Victory Road than along the segment of the primary route from Victory Road to the North Quincy substation due to the need to work in narrower, more congested commercial streets (id. at 3-66). The Company anticipated that work on the alternative route in Neponset Circle and at the Neponset River Bridge also would have temporary impacts on nearby businesses and residences (id.). The Company stated, however, that it would meet with businesspeople and residents along the alternative route to minimize disruption during construction as much as practicable (id.).

The Company indicated that 76 percent of the alternative route is within industrial and manufacturing zoning districts in the City of Boston (Exh. HO-RR-9). The remaining segment in Boston, approximately 1,000 feet, or seven percent of the total route, is in a district zoned for two-to-three family housing (id.). The portion of the alternative route in Quincy is located in a central business district (id.).

Zoning codes regulating the expansion of the Dewar Street and North Quincy substations would be the same for the proposed facilities along either the primary or alternative routes (Exh. NEP-1, at 3-58).

The Company submitted a letter from the MHC certifying that the MHC anticipated no impacts to significant historic or archaeological resources along the alternative route (Exh. HO-E-22, Att. 1).

Traffic impacts of the alternative route between Dewar Street substation and Victory Road would be the same as for the primary route (Exh. NEP-1, at 3-67, 3-68). The Company

indicated that from Victory Road to Conley Street, traffic impacts would mainly consist of traffic disruptions resulting from the movement of equipment and material to and from the Company's work area (id. at 3-68 to 3-69). The Company anticipated that construction of the proposed facilities along the portion of the alternative route starting at Conley Street and ending at the North Quincy substation would involve limiting traffic to one lane in Conley, Tenean, and Norwood Streets for one to two weeks (id.). Installation of conduits in the approach to and along the Neponset River Bridge would also require lane closings: one southbound lane of the approach would be closed for one to two weeks and one southbound lane on the bridge itself would be closed occasionally as necessary over a three week period (id. at 3-69). In addition, the Company stated that due to construction, no on-street parking would be possible on Conley Street for one to two weeks or on Hancock Street, the street leading into the North Quincy substation, for four to five weeks (id.).

The Company indicated that, as along the primary route, access to fire and safety vehicles would be maintained and all applicable federal, professional and Company safety standards and policies would be followed (Exhs. HO-E-30; NEP-1, at 3-66).

The Company indicated that the source and nature of noise impacts along the alternative route would be the same as those along the primary route (Exh. NEP-1, at 3-65). The Company contended, however, that the greater number of residences and businesses in the vicinity of the alternative route would result in greater noise impacts (id.).

The Company stated that businesses and residents along the alternative route strongly urged the Company to construct its proposed facilities along the primary route because of existing and anticipated traffic impacts along the alternative route (id. at 3-69). The Company indicated that it held a total of over 100 meetings with diverse elements of the community in Boston and Quincy to discuss its proposed facilities (id.). The Company contended that there was a high degree of community acceptance of the proposed facilities along the primary route (id. at 3-69, App. A).

The record demonstrates that while zoning and safety impacts along the primary and alternative routes would be comparable, construction of the proposed facilities along the alternative route would occur in more densely commercial and residential areas than along the

primary route, magnifying land use and noise impacts during the construction period. The record also demonstrates that construction along the narrower, more thickly settled streets along the alternative route would result in greater traffic congestion than is anticipated along the primary route. In addition, abutters have expressed serious concerns about land use impacts of the proposed facilities along the alternative route: the community and abutters have not expressed the same level of concern with respect to land use impacts of the proposed facilities along the primary route. Thus, the alternative route, though slightly shorter than the primary route, would likely generate significantly more land use impacts.

Accordingly, the Siting Board finds that the primary route would be preferable to the alternative route with respect to land use impacts.

(iv) Visual Impacts

The Company indicated that, as along the primary route, its proposed transmission lines along the alternative route would be installed underground (Exh. NEP-1, at 3-63). The Company stated that manholes for access to the proposed transmission lines would be flush mounted to ground level (id.). The Company also noted that the expansion of the Dewar Street and North Quincy substations would be the same whether the proposed facilities were constructed along the alternative or the primary route, with the same visual impacts (id. at 3-64).

The record demonstrates that there would be no permanent visual impacts associated with construction of the proposed transmission lines along the alternative route due to their installation underground. The record also demonstrates that the design and visual impacts of the expansions of the Dewar Street and North Quincy substations would be unaffected by the choice of transmission line route.

Accordingly, the Siting Board finds that the primary route and the alternative route would be comparable with respect to visual impacts.

(v) Magnetic Field Levels

The Company provided magnetic field levels for its proposed transmission lines and expanded facilities at Dewar Street and North Quincy substations (Exhs. HO-E-32; HO-E-33). The proposed transmission lines, when activated, would create the same level of magnetic fields along the primary and alternative routes (Exh. NEP-1, at 3-45). Magnetic field levels in the vicinity of the Dewar Street and North Quincy substations as a result of expansion of those facilities would also be the same, regardless of the choice of route (id. at 3-30, 3-33; Exhs. HO-E-32; HO-E-33; Company Brief at 20).

The record demonstrates that magnetic field levels in the vicinity of the proposed transmission lines and expanded Dewar Street and North Quincy substations would be the same along the primary and alternative routes, and far below levels found acceptable in previous Siting Board decisions (see Section III.2.a.v, above). While the alternative route is slightly shorter than the primary route, south of Victory Road it would pass through streets with more residential and commercial settlement than along the primary route. Consequently, the magnetic field impacts of the alternative route would be marginally greater than the magnetic field impacts of the primary route.

Accordingly, the Siting Board finds that the primary route would be slightly preferable to the alternative route with respect to magnetic field impacts.

(vi) Conclusions on Environmental Impacts

In Sections III.C.3.a(1) to (5), above, the Siting Board has found that the proposed facilities along the primary route would be preferable to the proposed facilities along the alternative route with respect to water resources and land use impacts, slightly preferable with respect to magnetic field impacts, and comparable with respect to land resources and visual impacts. Accordingly, the Siting Board finds the proposed facilities along the primary route would be preferable to the proposed facilities along the alternative route with respect to environmental impacts.

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

The Company estimated that the installation of the proposed transmission lines along the alternative route would cost $12,300,000, or approximately $2,500,000 less than along the primary route (Exhs. HO-C-1; NEP-1, at 3-21).[51] The total costs (in 1997 dollars) of the proposed expansions of the Dewar Street and North Quincy substations -- $1,600,000 and $4,400,000, respectively -- would be the same for the primary and alternative routes (Exh. HO-RR-15) (see Section III.C.2.b, above). Thus, the estimated total cost of the proposed facilities along the alternative route, $20,900,000, would be approximately 89 percent of the $23,400,000 total cost estimated for the proposed facilities along the primary route (Exhs. HO-C-1; HO-RR-15).

The record demonstrates that the installation costs of the proposed facilities along the alternative route would be approximately 11 percent lower than corresponding costs for the proposed facilities along the alternative route. Accordingly, the Siting Board finds that the alternative route would be preferable to the primary route with respect to cost.

c. Conclusions

In comparing the proposed facilities along the primary and the alternative routes, the Siting Board has found that the primary route would be preferable with respect to environmental impacts, but that the alternative route would be preferable with respect to cost.

The additional costs of constructing the proposed project along the primary route are associated with the installation of the proposed transmission lines. Construction costs for the proposed expansion of the Dewar Street and North Quincy substations would be the same for the proposed facilities along either the primary or the alternative route.

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55 The Company indicated that the alternative route would result in savings of $2,300,000 in costs of construction and materials (Exhs. HO-C-1; NEP-1, at 3-21). Additional savings would stem from slightly lower engineering (-$100,000) and contingency (-$200,000) costs (Exh. HO-C-1). Right-of-way acquisition would be slightly higher (+$100,000) along the alternative route (id.).

While more costly, installing the proposed facilities along the primary route would substantially reduce a variety of land use impacts because it would avoid areas of denser business and residential development. The communities of both Boston and Quincy have also expressed their strong support for the primary route.

On balance, therefore, the Siting Board concludes that the additional expenditure of $2.3 million is warranted to avoid the significant impacts on residential neighborhoods and businesses associated with routing the proposed facilities through the built-up areas along the alternative route.

Accordingly, the Siting Board finds that the proposed facilities along the primary route would be preferable to the proposed facilities along the alternative 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 NEPCo's proposed electric transmission lines 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 City of Quincy Zoning Ordinance with respect to the proposed modifications to the Company's existing North Quincy substation in the City of Quincy. 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.

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.[52]

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[52] 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 (continued...)

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.[53]

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

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(...continued)

> 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. 11477, dated February 11, 1998), and, therefore, a finding is not necessary in this case under G.L. c. 30, § 61.

[53] 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.

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

NEPCo is an electric company as defined by G.L. c. 164, § 1, authorized to generate, distribute and sell electricity. New England Power Company, D.P.U. 92-255, at 2 (1994). Accordingly, NEPCo is authorized to petition the Department as a public service corporation 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 exemption from the operation of the special permit requirement of the Quincy Zoning Ordinance.[54] Based on its review of the City of Quincy Zoning Ordinance, the Siting Board concludes that the special permit requirement could impede the construction, operation and maintenance of the Company's proposed project. Therefore, the Siting Board finds that the Company requires exemptions from the above section of the City of Quincy Zoning Ordinance 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 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

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[54] The Company has identified this section as the provision "shown on page 32 of the Quincy Zoning Ordinance" (Exh. HO-E-12(S)).

analyses in Sections II and III, above. In those sections, the Siting Board found that the Company's reliability criteria are reasonable for purposes of this review, and that there is a need for additional energy resources based on the Company's reliability criteria with respect to common mode outages (see Sections II.A.3.a. and b, above). The Siting Board also found that the supply to Quincy's two substations -- Field Street and North Quincy -- does not meet the Company's reliability criteria with respect to common mode outages. Specifically the Siting Board stated that the need for the proposed facilities is based, not on the precise load projected for a specific future year, but on the unacceptable consequences of a three-day power loss to some or all of Quincy in the event of a common mode failure.

In addition, the Siting Board found that the Company has demonstrated that acceleration of C&LM programs could not eliminate the identified need in Quincy for additional energy resources (see Section II.A.3.d, above). The Siting Board also noted that the addition of energy resources to supply Quincy could alleviate potential overloading elsewhere on the southeastern Massachusetts transmission system within the next ten years by providing an independent 115 kV supply source for Quincy, thereby relieving contingency load on equipment at Holbrook substation. Consequently, the Siting Board found that additional energy resources currently are needed for reliability purposes in Quincy.

The Siting Board notes above that the Company evaluated a reasonable range of alternatives to the proposed project, including six alternative approaches for meeting the identified need in Quincy. The record further indicates that the Company considered possible environmental impacts of the proposed project 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 also 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 lines and modifications to the existing North Quincy substation outweighs the minimal impacts of the Company' proposed project on the local community. Accordingly, the Siting Board finds that the proposed transmission lines and

proposed modifications to the existing North Quincy substation are reasonably necessary for the convenience or welfare of the public and exempts NEPCo from the operation of the special permit requirement (as identified by the Company) of the City of Quincy Zoning Ordinance.

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 lines, provide a map or plan showing the general location of the transmission lines, and estimate the cost of the transmission lines in reasonable detail. Consistent with Department precedent and the public interest analysis above, the Siting Board here finds that NEPCo's proposed transmission lines are necessary for the purpose alleged, and will serve the public convenience and are consistent with the public interest.

V. DECISION

The Siting Board has found that additional energy resources are needed for reliability purposes in the City of Quincy. The Siting Board also has found that the Company's identification of a need for additional energy resources in Quincy is consistent with its most recently approved long range forecast. Consequently, the Siting Board finds that the proposed project is consistent with the most recently approved long-range forecast of NEPCo.

The Siting Board has found that both the proposed project and a low voltage reinforcement alternative would meet the identified need. The Siting Board also has found that the proposed project is preferable to the low voltage 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 along the primary route would be minimized.

The Siting Board further has found that the proposed facilities along the primary route 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 along the primary route would be preferable to the proposed facilities along the alternative route with respect to providing a necessary energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

Accordingly, the Siting Board APPROVES the Company's petition to construct two 3.3-mile, 115-kilovolt underground electric transmission lines and to expand its Dewar Street and North Quincy substations in the Cities of Boston and Quincy, Massachusetts using the Company's primary route.

In addition, the Siting Board has found that NEPCo's proposed transmission lines are necessary for the purpose alleged, and will serve the public convenience and are consistent with the public interest; and

The Siting Board GRANTS the Company's petition for an exemption from the operation of the special permit requirement of the City of Quincy Zoning Ordinance for the purposes of expanding its substation in North Quincy in conjunction with constructing and operating its two proposed transmission lines.

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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Jolette A. Westbrook
Hearing Officer

Dated this 9th day of October, 1998.

Unanimously APPROVED by the Energy Facilities Siting Board at its meeting of October 8, 1998 by the members and designees present and voting. Voting for approval of the Tentative Decision as amended: Janet Gail Besser (Chair, EFSB/DTE); James Connelly (Commissioner, DTE); W. Robert Keating (Commissioner, DTE); and David L. O'Connor (for David A. Tibbetts, Director, Department of Economic Development).

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Janet Gail Besser
Chair

Dated this 9th day of October, 1998.

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).