COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of Cape Wind Associates, LLC and Commonwealth Electric Company, d/b/a NSTAR Electric for Approval to Construct Two 115 kV Electric Transmission Lines	)	EFSB 02-2

FINAL DECISION

M. Kathryn Sedor
Presiding Officer
May 11, 2005

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ABBREVIATIONS

1997 BECo Decision	Boston Edison Company, 6 DOMSB 208 (1997)
1997 Restructuring Act	"the 1997 Electric Restructuring Act" (Chapter 164 of the Acts of 1997)
1998 NEPCo Decision	New England Power Company, 7 DOMSB 333 (1998)
AC	alternating current
ACEC	Area of Critical Environmental Concern
ACOE	U.S. Army Corps of Engineers
Act	Massachusetts Ocean Sanctuaries Act
Alliance	The Alliance to Protect Nantucket Sound, Inc.
ANP Bellingham	ANP Bellingham Energy Company, EFSB 97-1 (1998), 7 DOMSB 39
ANP Blackstone	ANP Blackstone Energy Company, EFSB 97-2/98-2 (1999), 8 DOMSB 1
ANSI	American National Standards Institute
Barnstable Interconnect	project approach of interconnecting to the grid at Barnstable Switching Station
Cape Wind	Cape Wind Associates, LLC
CCC	Cape Cod Commission
CELCo Decision	Cambridge Electric Light Company, 12 DOMSB 305 (2001)
CELT	Capacity, Energy, Loads, & Transmission (yearly reports provided by NEPOOL)
CEMP	comprehensive environmental monitoring program
cm	centimeter
CO_2	carbon dioxide
ComElec Decision	Commonwealth Electric Company, 5 DOMSB 273 (1997)
Commonwealth Electric	Commonwealth Electric Company, d/b/a NSTAR Electric
Company	Cape Wind, and/or Commonwealth Electric Company d/b/a NSTAR Electric
CZM	Massachusetts Office of Coastal Zone Management
dB	decibels, unweighted

dBA	A-weighted decibels
DC	direct current
DEM	Massachusetts Department of Environmental Management
Department	Department of Telecommunications and Energy
DOER	Massachusetts Division of Energy Resources
DOMSB	Decisions and Orders of Massachusetts Energy Facilities Siting Board
DOMSC	Decisions and Orders of Massachusetts Energy Facilities Siting Council
DPW	Town of Yarmouth Department of Public Works
DRI	Development of Regional Impact
D.T.E.	Department of Telecommunications and Energy
EEI	Edison Electric Institute
EFSC	Energy Facilities Siting Council
EFH	Essential Fish Habitat
EIR	Environmental Impact Report [not memorialized]
EIS	Environmental Impact Statement
EMF	electromagnetic field
EMI	EMI Cape, LLC
EOEA	Executive Office of Environmental Affairs
ERL	effects range limited
ESP	electrical service platform
ESS	Environmental Science Services, Inc.
FAA	Federal Aviation Administration
GIS	Generation Information System
GPS	Global Positioning System
GWh	gigawatt-hours
HDD	horizontal directional drill
Hz	hertz (cycles per second)
I&M	installation and maintenance

ICAP	Installed Capacity
ISO-NE	Independent System Operator of New England, Inc.
kV	kilovolts
L_{90}	sound level exceeded 90% of time
L_{eq}	time-averaged sound levels
L_{max}	maximum sound levels
La Capra	La Capra Associates, LLC
LOLE	a one-day-in-ten-years loss-of-load expectation
m/s	meter per second
Mashpee Town Landing	Mashpee Neck Road town landing
Mass Audubon	Massachusetts Audubon Society
MBUAR	Massachusetts Board of Underwater Archaeological Resources
MDEP	Massachusetts Department of Environmental Protection
MDMF	Massachusetts Division of Marine Fisheries
MECo	Massachusetts Electric Company
MECo/NEPCo Decision	Massachusetts Electric Company/New England Power Company, 18 DOMSC 383 (1989)
MEPA	Massachusetts Environmental Protection Act
mG	milligauss
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MHC	Massachusetts Historical Commission
MLLW	mean lower low water
mm	millimeters
MMWEC Decision	Massachusetts Municipal Wholesale Electric Company, EFSB 97-4 (2001), 12 DOMSB 18
mph	miles per hour
MVA	mega-volt-amperes
MVAR	mega-volt-amperes-reactive
MW	megawatts

MWh	megawatt-hours
NEPA	National Environmental Policy Act
NEPCo	New England Power Company
NEPOOL	New England Power Pool
NHESP	Natural Heritage and Endangered Species Program
1995 NEPCo Decision	New England Power Company, 4 DOMSB 109 (1995)
1997 Restructuring Act	1997 Electric Restructuring Act
NO_X	nitrogen oxides
NSTAR	Commonwealth Electric Company, d/b/a NSTAR Electric
NPCC	Northeast Power Coordinating Council
Ocean Sanctuaries Act	Massachusetts Ocean Sanctuaries Act
proposed transmission lines	the Company's proposed 115 kV transmission lines
reconnaissance survey	terrestrial reconnaissance archeological survey
ROW	right-of-way
RPS	Renewable Portfolio Standard
Section 72 petition	"A petition pursuant to G.L. c. 164, § 72, seeking a determination that the proposed lines are necessary . . ."
SE Kendall Decision	Southern Energy Kendall, LLC, 11 DOMSB 255 (2000)
Sithe Mystic Decision	Sithe Mystic Development LLC, 9 DOMSB 101 (1999)
Siting Board	Energy Facilities Siting Board
Siting Board petition	joint petition seeking approval to construct the proposed transmission project
SO_2	sulfur dioxide
SPB	Save Popponesset Bay, Inc.
transmission project	the Company's proposed 115 kV transmission lines
Turners Falls Decision	Turners Falls Limited Partnership, 18 DOMSC 141 (1988)
USFWS	U.S. Fish & Wildlife Service
wind farm	offshore wind generating project in Nantucket Sound

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Pursuant to G.L. c. 164, § 69J, the Energy Facilities Siting Board hereby approves, subject to the conditions set forth below, the joint petition of Cape Wind Associates, LLC and Commonwealth Electric Company, d/b/a NSTAR Electric for approval to construct two new 115 kV electric transmission lines, approximately 18 miles in length, for the purpose of interconnecting a proposed offshore wind generating facility in Nantucket Sound with the regional electric grid in New England.

I. INTRODUCTION

A. Summary of the Proposed Project

On September 17, 2002, Cape Wind Associates, LLC ("Cape Wind") and Commonwealth Electric Company, d/b/a NSTAR Electric ("NSTAR") (together, "Company")[1] jointly filed a petition with the Energy Facilities Siting Board ("Siting Board") and a petition with the Department of Telecommunications and Energy ("Department") to construct, operate and maintain two new 115 kilovolt ("kV") electric transmission lines, for the purpose of interconnecting an as yet unconstructed and unpermitted offshore wind generating facility in Nantucket Sound ("wind farm") with the regional electric grid in New England ("proposed transmission lines" or "transmission project").[2] Cape Wind is a Massachusetts limited liability corporation, established for the purpose of developing an offshore wind generating project in Nantucket Sound (Exhs. EFSB-LE-1; CW-1, at 1-3 to 1-4). Commonwealth Electric Company is an electric company pursuant to G.L. c. 164, § 1, and is an operating subsidiary of NSTAR, a Massachusetts business trust (Exhs. EFSB-LE-2; EFSB-LE-3).

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[1] Because Cape Wind and NSTAR are co-applicants, statements of fact generally will not be attributed to an individual company. For ease of reference, "Company" shall mean Cape Wind, NSTAR, or both companies jointly.

[2] The Siting Board lacks jurisdiction to review the proposed wind farm because, as currently proposed, it would lie solely in federal waters. Aspects of the wind farm are discussed in this decision, however, because in determining the need for a transmission line intended to interconnect a non-jurisdictional generating facility to the grid, past Siting Board decisions have required an applicant to consider aspects of the power to be produced by the generating facility. See Appendix A of this Decision.

The record shows that the proposed wind farm would consist of 130 interconnected wind turbines spaced approximately one-third to one-half mile apart, encompassing an approximately 24 square-mile area on Horseshoe Shoal in Nantucket Sound (Exhs. CW-1, at 1-4; EFSB-SS-22-S, Att. at Table 5-6, and App. 5-B at 9; Tr. 12, at 1749-1750).[3] The Company indicated that the wind farm would be located 11.0 miles from Great Point, Nantucket; 5.5 miles from Cape Poge and 9.3 miles from Oak Bluffs on Martha's Vineyard; 6.0 miles from Cotuit; 6.8 miles from Craigville Beach; and 4.7 miles from Point Gammon, which would be the closest point of land to the wind farm (Exh. EFSB-RR-23, Att.).

The Company stated that the wind farm would include an electrical service platform ("ESP"), which would connect to the individual wind turbines and step up the voltage from 33 kV to 115 kV (Exhs. CW-1, at 1-4; APNS-N-64). Transmission from the ESP would consist of two parallel 115 kV circuits, with each circuit consisting of two cables, each with three conductors, for a total of four cables and twelve conductors (Exh. CW-1, at 1-5). Each circuit would be buried approximately 6 feet below the sea bottom in a separate trench, and the two trenches would be placed 20 feet apart (id. at 1-8, and Fig. 1-7). At landfall, the twelve conductors would feed into a single underground duct bank for the upland portion of the route (id. at 1-6, and Fig.1-4).

The Company stated that the primary route[4] would be approximately 18.1 miles in length, 12.2 miles of which would be submarine and 5.9 miles of which would be on land (id. at 1-11, 1-12; Exh. EFSB-RR-84). The primary route would extend from the ESP through Nantucket Sound and then through Lewis Bay, making landfall at New Hampshire Avenue in Yarmouth,

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[3] The wind farm initially included 170 turbines; the Company subsequently reduced that number to 130 (Exhs. CW-2, at 1-2; EFSB-SS-22-S, Att. at Table 5-6).

[4] A Siting Board petition to construct a jurisdictional transmission line must present both the applicant's preferred route (primary route) and at least one alternative to that route (alternative route). Published notice of each route is required, and only a route that has been noticed may be approved by the Siting Board. In this case, the Company has noticed two routes: the primary route, through Lewis Bay, and the alternative route, through Popponesset Bay. Maps showing the marine and land-based portions of the primary and alternative routes are attached as Figs. 1, 2, 3 and 4.

and then traveling underground along town streets and an existing NSTAR right-of-way ("ROW") to an interconnection with the grid at NSTAR's Barnstable Switching Station (Exh. CW-1, at 1-1).[5] The Company stated that the alternative route would be approximately 24.2 miles in length, 10 miles of which would be submarine and 14.2 miles of which would be on land (id. at 1-12, 1-13). The Company stated that the alternative route would extend from the ESP through Nantucket Sound, and then beneath Popponesset Spit into Popponesset Bay, through Popponesset Bay to a landfall at the Mashpee Neck Road Town Landing ("Mashpee Town Landing"), traveling underground to NSTAR's existing Mashpee Substation, and then proceeding aboveground for approximately 12.3 miles to the Barnstable Switching Station (id. at 1-13).[6]

Cape Wind stated that it would own, operate and maintain the proposed wind farm, the ESP, the submarine cables connecting the wind farm to the ESP and all on-land facilities up to the point where the proposed transmission lines would enter the NSTAR ROW (Exhs. EFSB-LE-4; EFSB-LE-5; EFSB-11). The Company stated that NSTAR would own, operate, and maintain the transmission facilities in the ROW at Cape Wind's expense (Exh. EFSB-11).

B. Procedural History

1. Consolidation of Dockets

On September 17, 2002, Cape Wind and NSTAR filed a joint petition with the Siting Board seeking approval, pursuant to G.L. c. 164, § 69J, to construct the proposed transmission project ("Siting Board petition"). The Siting Board petition was docketed as EFSB 02-2. The Company also filed a petition with the Department, pursuant to G.L. c. 164, § 72, seeking a determination that the proposed transmission lines are necessary, would serve the

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[5] The Company also noticed an alternative landfall for the primary route, on a parcel of privately owned property at 43 Shore Road in Yarmouth. The Company did not pursue this alternative in the adjudicatory hearing, and we accordingly neither review nor approve the Shore Road landfall as an alternative to the New Hampshire Avenue landfall.

[6] Figure 1 shows the location of the proposed wind farm relative to certain onshore locations, and relative to the primary and alternative transmission line routes.

public convenience, and would be consistent with the public interest ("Section 72 petition"). The Section 72 petition was docketed as D.T.E. 02-53.

At the time the Company filed its Siting Board and Section 72 petitions, it requested that the petitions be consolidated for consideration by the Siting Board in a single adjudicatory proceeding. On September 27, 2002, the Chairman of the Department granted the Company's request, issuing a Consolidation Order which directed the Siting Board to render a final decision in both cases ("consolidated proceeding"). The consolidated proceeding was docketed as EFSB 02-2/D.T.E. 02-53. Accordingly, the Siting Board conducted a single adjudicatory proceeding, and a single evidentiary record was developed.

2. Siting Board Adjudicatory Proceeding

The Siting Board formally commenced the consolidated proceeding with a public comment hearing on the Company's petitions in the Town of Barnstable on November 12, 2002.[7] On December 20, 2002, the Presiding Officer issued a ruling granting five petitions to intervene and four petitions for limited participant status in the proceeding. The Town of Yarmouth, the Massachusetts Department of Environmental Management ("DEM") Ocean Sanctuaries Program,[8] the Alliance to Protect Nantucket Sound ("Alliance"), Save Popponesset Bay, Inc. ("Save Popponesset Bay") and the Massachusetts Audubon Society ("Mass Audubon")[9] were granted intervenor status. Nantucket Electric Company, the Cape Cod Commission ("CCC"), Mr. Emil Masotto, and Dr. Charles Levy were granted limited participant status.[10] The Siting

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[7] Siting Board staff, including the Presiding Officer, also conducted a site visit on the same day as the public comment hearing. The site visit included views of the on-land portion of the primary and alternative routes, and of the proposed landfalls for both routes.

[8] In July 2003, DEM merged with the Metropolitan District Commission to form the Massachusetts Department of Conservation and Recreation.

[9] Mass Audubon is the owner of property on Sampson Island and Egg Island, in the vicinity of the primary route (Exh. MA-ALJ at 2). Mass Audubon also owns a portion of Popponesset Spit, on the alternative route (Audubon Brief at 2).

[10] See Ruling re Petitions to Intervene and Petitions to Participate, December 20, 2002; (continued...)

Board staff, the Alliance, Mass Audubon, and Save Popponesset Bay each issued two sets of information requests to the Company. The Town of Yarmouth issued one set of information requests to the Company. The Siting Board and the Company each issued Information Requests to the Alliance, Save Popponesset Bay, and Mass Audubon.

a. Prefiled Testimony

i. Company

On February 14, 2003, the Company submitted its direct case, in the form of written prefiled direct testimony. Cape Wind presented the testimony of nine witnesses: Craig Olmsted, Vice President of Projects for EMI Cape, LLC ("EMI"),[11] who testified regarding multiple aspects of the proposed transmission project, including project approach, route selection, and comparison of the proposed facilities along the primary and alternative routes; Leonard J. Fagan, Vice President of Engineering for EMI, who provided testimony regarding project approach and route selection; Charles J. Natale, Jr., Senior Vice President and Principal Scientist at Environmental Science Services, Inc. ("ESS"), and Stephen B. Wood, Vice President and Senior Project Manager at ESS, who provided testimony regarding project approach, route selection, comparison of the proposed facilities along the primary and alternative routes, and consistency with current health, environmental protection and resource use and development policies for the Commonwealth; Douglas C. Smith, Technical Director of La Capra Associates ("La Capra"), who testified regarding project need; Daniel Peaco, President of La Capra Associates, who testified regarding project need; Peter A. Valberg, Ph.D., who provided testimony regarding electric and magnetic fields and public health; Christopher M. Bryan, P.E., owner of CBX Energy Engineering, who provided testimony regarding electrical engineering and transmission

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[10] (...continued)
Supplemental Ruling re: Petitions to Intervene and Petitions to Participate, January 17, 2003; Second Supplemental Ruling on Petitions to Intervene and Participate, February 7, 2003.

[11] Cape Wind's membership interests are owned by EMI, which is a Massachusetts limited liability corporation.

interconnection issues; and David P. Estey, P.E., Principal Electrical Engineer at E/PRO Engineering and Environmental Consulting, who provided testimony regarding the measurement and calculation of electric and magnetic fields.

NSTAR submitted the direct testimony of two witnesses: Charles P. Salamone, Director of System Planning for the electric subsidiaries of NSTAR, who testified regarding design, cost and reliability of the transmission project, and Robert J. Connors, Lead Engineer in the Transmission Engineering Department for the electric subsidiaries of NSTAR, who provided testimony regarding the evaluation of the NSTAR ROW. On September 8, 2003, Cape Wind filed written rebuttal testimony of six witnesses. Four of the Company's witnesses, Craig Olmsted, Charles Natale, Stephen Wood, and Douglas Smith, had previously submitted direct testimony on the Company's behalf. Two additional witnesses testified for the first time: Paul Kerlinger, Ph.D., Principal at Curry & Kerlinger, who provided testimony regarding potential avian impacts of the wind farm, and Peter H. Guldberg, President of Tech Environmental, Inc., who testified regarding potential noise impacts of the wind farm.

ii. Intervenors

On June 20, 2003, the Alliance, Save Popponesset Bay, and Mass Audubon each submitted prefiled direct testimony. The Alliance filed the direct testimony of five witnesses: Jeffrey D. Byron, an independent energy consultant, doing business as Byron Consulting Group, who testified regarding reliability need and economic need for the proposed wind farm; Michael L. Morrison, Ph.D. who testified regarding the potential impacts of wind-generated power on birds and bird habitat; Mark Weissman, Member, the Massachusetts Marine Fisheries Commission, who provided testimony regarding potential impacts on fisheries; Erich Bender, Sc.D., an acoustical engineer who provided testimony regarding acoustical impacts of the proposed wind farm; and Richard S. LeGore, Ph.D., President of Mote Environmental Services, Inc., and Senior Scientist at Mote Marine Laboratory, who provided testimony regarding potential benthic impacts.

Save Popponesset Bay filed the testimony of Peter J. Williams, P.E., Project Manager for Vine Associates, Inc., who provided testimony regarding coastal processes and coastal

engineering.

Mass Audubon filed the testimony of Stanley M. Humphries, Senior Project Manager at Ocean and Coastal Consultants, Inc., who provided testimony regarding coastal zone geology; Andrea L. Jones, Director of Mass Audubon's Coastal Waterbird Program, who provided testimony regarding rare and endangered coastal shorebirds; and Robert N. Buchsbaum, Ph.D., Southeast Regional Conservation Scientist for Mass Audubon, who testified regarding potential impacts of cable installation on subtidal habitats near Mass Audubon properties in Lewis Bay and Popponesset Bay.

b. Adjudicatory Hearing and Evidentiary Record

The Siting Board held twenty-one days of evidentiary hearings, beginning on July 29, 2003, and concluding on October 21, 2003.[12] The parties' witnesses under oath adopted their prefiled written direct testimony, provided certain limited direct testimony, and were subject to cross-examination by the Company, certain intervenors, and Siting Board staff.[13] Approximately 930 exhibits were entered into the evidentiary record. On November 25, 2003, initial briefs were filed by the Company, the Alliance, Mass Audubon ("Audubon Brief") and Save Popponesset Bay ("SPB Brief"), including responses to briefing questions posed by the Siting Board staff. On December 9, 2003, the Company, the Alliance, and Mass Audubon filed reply briefs. The evidentiary record was closed on December 18, 2003.[14]

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[12] On May 5, 2003, the Alliance moved to suspend the proceeding, and filed a similar motion at the conclusion of the adjudicatory hearing. The Presiding Officer denied both motions. See Ruling on Motion to Suspend Procedural Schedule, June 6, 2003; see Summary Ruling on Motion to Suspend the Briefing Schedule, October 30, 2003.

[13] On June 25, 2003, Cape Wind filed a motion to strike portions of the prefiled direct testimony filed by the Alliance. In a ruling issued on July 22, 2003, the Presiding Officer denied Cape Wind's motion, finding that the disputed testimony was potentially relevant to one of the findings the Siting Board would be required to make in its final decision, relative to a claim raised by Cape Wind itself. See Ruling on Petitioner's Motion to Strike, July 22, 2003.

[14] On March 16, 2004, after conclusion of the adjudicatory hearing, the Presiding Officer (continued...)

On July 2, 2004, the Siting Board staff issued a Tentative Decision approving the transmission project. The parties and limited participants were given 60 days, until August 31, 2004, to review and comment on the Tentative Decision. Thereafter, the Siting Board met on November 30, 2004, to consider the Tentative Decision.

On November 8, 2004, the U.S. Army Corps of Engineers issued a Draft Environmental Impact Statement/Draft Environmental Impact Report/Development of Regional Impact for the combined transmission and wind farm projects ("DEIR"). On November 24, 2004, the Alliance filed a motion to reopen hearings to allow the DEIR and any written comments on the DEIR into the evidentiary record. On November 29, 2004, Cape Wind filed its opposition to the Alliance's motion.

At the November 30, 2004, Siting Board meeting, the Siting Board directed the parties to submit written briefs on the issue of reopening and directed the presiding officer to rule on the motion. Cape Wind and the Alliance each filed an initial brief on December 30, 2004, and a reply brief on January 13, 2005.

In a ruling issued on March 21, 2005, the Alliance's motion to reopen was denied. Cape Wind Associates, LLC and Commonwealth Electric Company d/b/a NSTAR Electric, EFSB 02-2 / D.T.E. 02-53, Ruling on Motion to Reopen Adjudicatory Hearing (March 21, 2005).

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[14] (...continued)
issued a Sequencing Ruling recognizing that, pursuant to the Massachusetts Environmental Policy Act ("MEPA") the Siting Board cannot issue a decision in the Section 72 docket until the Massachusetts Executive Office of Environmental Affairs ("EOEA") has completed its review of the proposed transmission project, and that, as of the date of this decision, EOEA has not yet completed that review. The Sequencing Ruling confirms, however, that a final decision in the EFSB docket may be issued at this time, pursuant to the Siting Board's statutory exemption from MEPA, set forth in G.L. c. 164, § I. See Ruling Re Sequencing of Decisions, March 16, 2004, at 2-4. The Siting Board will issue a decision in the Section 72 docket after the Secretary's Certificate on the FEIR has been issued. Pursuant to G.L. c. 30, § 61, that decision must incorporate "a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact".

C. Jurisdiction and Scope of Review

1. Jurisdiction Pursuant to G.L. c. 164

The Company filed its petition to construct the proposed transmission project in accordance with G.L. c. 164, § 69H, which requires the Siting Board to implement the energy policies in its statute to provide a reliable 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 a project applicant to obtain Siting Board approval for the construction of proposed energy facilities before a construction permit may be issued by another state agency.

As a new electric transmission line with a design rating of 69 kV or greater and a length in excess of one mile, the Company's proposed project falls within the definition of "facility" set forth in G.L. c. 164, § 69G, which provides that a "facility" includes:

> a new electric transmission line having a design rating of 69 kV or more and which is one mile or more in length on a new transmission corridor.

In accordance with G.L. c. 164, § 69J, before approving a petition to construct facilities, the Siting Board requires an applicant to justify its proposal 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, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, reliability, and ability to address the identified need (see Section II.B, below). Finally, the Siting Board requires the applicant to show that it has considered a reasonable range of practical facility siting alternatives 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 Sections III.A and III.C.5, below.)

2. The Ocean Sanctuaries Act

a. Alliance

In its initial brief, the Alliance asserts for the first time that the Ocean Sanctuaries Act, G.L. c. 132A et seq, requires the Siting Board to deny the Company's petition (Alliance Brief at 3). Although this assertion does not technically constitute a challenge to the Siting Board's

subject matter jurisdiction, we address the Alliance's argument here because it does purport to limit the Siting Board's authority to review marine-based projects, and to grant the Company's petition if the record supports such an outcome.

Section 18 of the Massachusetts Ocean Sanctuaries Act ("Ocean Sanctuaries Act" or "Act") provides, in relevant part, that Massachusetts agencies must issue permits "consistently with" the Act. G.L. c. 132A, § 18 ("Section 18"). The Alliance argues that approving the transmission project would violate the Siting Board's obligation under Section 18 to issue permits that are consistent with the Act because, the Alliance asserts, the project would be located within the Cape and Islands Ocean Sanctuary and transmission facilities of the type proposed by the Company are not permitted in that Ocean Sanctuary (Alliance Brief at 3-7, 18).[15,16]

b. Company

The Company agrees with the Alliance that a portion of the proposed transmission project would be located within the Cape and Islands Ocean Sanctuary (Company Reply Brief at 8-10). However, the Company asserts that the Ocean Sanctuaries Act expressly allows the construction of transmission facilities in the Cape and Islands Sanctuary (id.). G.L. c. 132A, §§ 15 and 16. In particular, the Company points to the language of Section 16 of the Act ("Section 16"), one portion of which provides that all "activities, uses and facilities associated with the generation, transmission and distribution of electrical power" may be located within the five designated Massachusetts ocean sanctuaries, except for the Cape Cod Ocean Sanctuary (Company Reply Brief at 9). The Company also points to language in Section 16 which provides that "the laying of cables approved by the [D]epartment of [T]elecommunications and [E]nergy"

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[15] The Alliance argues that both the wind farm project and the transmission project are precluded by the Act. However, the Company has not requested Siting Board approval to construct the wind farm. Arguments regarding the application of the Ocean Sanctuaries Act to the wind farm accordingly are not relevant to the Siting Board's review of the transmission project and will not be substantively addressed.

[16] In addition to Section 18, the Alliance cites to Sections 15 and 16 of the Ocean Sanctuaries Act.

may take place in any ocean sanctuary except for the Cape Cod Ocean Sanctuary (id.).

c. Analysis

Massachusetts has five ocean sanctuaries, the location and boundaries of which are identified in Section 13 of the Ocean Sanctuaries Act. G.L. c. 132A, § 13. A portion of the Company's proposed transmission project, whether along the primary or alternative route, will lie within the Cape and Islands Ocean Sanctuary.

Certain types of activities, such as offshore drilling and the construction of electric generating facilities, are prohibited in Massachusetts' ocean sanctuaries. G.L. c. 132A, § 15 ("Section 15"). However, this prohibition is not an absolute one; Section 15 expressly provides that the activities enumerated in that section are prohibited "[e]xcept as otherwise provided [in the Act]". Id. Consequently, in determining whether a particular activity is prohibited in an ocean sanctuary, one must review not only the list of prohibited activities set forth in Section 15, but the Act as a whole, to determine whether it contains an exemption or qualification applicable to the activity under consideration.

The Siting Board generally does not engage in interpretations of statutes other than its own enabling legislation, on the ground that such determinations generally are outside the scope of the Siting Board's expertise and lie more properly within the province of the courts. See Massachusetts Municipal Wholesale Electric Company, 12 DOMSB 18 (2001) ("MMWEC Decision"), Hearing Officer Ruling on Motion to Dismiss (March 16, 2000) (scope of applicant's statutory authority under its enabling legislation not appropriately determined in a proceeding before the Siting Board). In this case, however, the language of the statute in question is not ambiguous, and its interpretation is necessary if we are to address the claim by the Alliance that the Siting Board is required by the Ocean Sanctuaries Act to deny the proposed project.

Turning first to the list of prohibited activities set forth in Section 15 of the Act, there is only one category of activity that, if construed broadly, may be read to encompass the installation of transmission cables in the seabed of an ocean sanctuary: that of "the building of [a] structure on the seabed or under the subsoil." G.L. c. 132A, § 15.

We are uncertain whether the Legislature intended to define the term "structure" so broadly as to include buried electric transmission cables, and thus decline to make a finding on this issue. Fortunately, however, we do not need to make such a finding, because even if the proposed cables were deemed to constitute "structures" within the meaning of the Ocean Sanctuaries Act, the laying of such cables is an activity that is expressly permitted in certain ocean sanctuaries, including the Cape and Islands Ocean Sanctuary, under Section 16 of the Act.

The counterpart to Section 15 of the Act and its list of prohibited activities is Section 16, which identifies categories of activities that are allowable in ocean sanctuaries. Section 16 provides, inter alia, that

> Nothing in this act is intended to prohibit the following activities: In all ocean sanctuaries except the Cape Cod Ocean Sanctuary the planning, construction, reconstruction, operation, and maintenance of industrial liquid coolant discharge and intake systems and all other activities, uses and facilities associated with the generation, transmission, and distribution of electrical power . . .; [and] the laying of cables approved by the department of telecommunications and energy . . ..

G.L. c. 132A, § 16 (emphasis added).

The express language of Section 16 is unambiguous. We conclude that the Company's proposed transmission project fits within two of the categories of permissible activity set forth in this section: as facilities associated with the transmission of electrical power, and as cables which, if installed, will necessarily have been approved by the Department under G.L. c. 164, § 72.[17] Thus, even assuming the applicability of Section 15, the proposed transmission project constitutes a clearly permissible activity under Section 16 and may be sited

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[17] G.L. c. 164, § 72 requires Massachusetts electric companies such as NSTAR to obtain Department approval for the construction of new electric transmission lines like the transmission lines proposed by the Companies. The Department will approve such construction if it finds that a proposed line is necessary, will serve the public convenience, and is consistent with the public interest. Without such approval, construction of the lines cannot occur. See, e.g., Boston Edison Company v. Town of Sudbury, 356 Mass. 406 (1969). Thus, even if approved by the Siting Board, construction of the Companies' proposed transmission line cannot occur unless the construction also is approved by the Department under Section 72. The Companies filed a Section 72 petition, which is docketed as D.T.E. 02-53.

within the Cape and Islands Ocean Sanctuary without violation of the Massachusetts Ocean Sanctuaries Act. Siting Board approval of the proposed transmission project accordingly would be consistent with the Act.

II. ANALYSIS OF THE PROPOSED PROJECT

A. Need Analysis

1. Standard of Review

a. Background

In accordance with G.L. c. 164, § 69H, the Siting Board is charged with the responsibility for implementing energy policies to provide a reliable 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 electrical transmission facilities in the Commonwealth, the Siting Board is required to evaluate whether there is a need for additional transmission resources.[18]

Both Cape Wind and the Alliance have argued that the Siting Board should review the need for the proposed project using as guidance the standards applied in Turners Falls Limited Partnership, 18 DOMSC 141, at 154-155 (1988) ("Turners Falls Decision") and in Massachusetts Electric Company/New England Power Company, 18 DOMSC 383, at 394-395 (1989) ("MECo/NEPCo Decision"). In Turners Falls, the Siting Board reviewed a proposal to construct a 1.2-mile, 115 kV transmission line designed to interconnect a 20 megawatt ("MW") coal-fired

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[18] The Siting Board's review of proposed transmission facilities is conducted pursuant to G.L. c. 164, § 69J. This section states, in part, that "[n]o applicant shall commence construction of a facility at a site unless . . . in the case of an electric or gas company which is required to file a long-range forecast pursuant to section sixty-nine I, that facility is consistent with the most recently approved long-range forecast for that company." The Siting Board notes that, pursuant to the Department's Order in D.T.E. 98-84A, Massachusetts electric companies are now exempt from the requirements of G.L. c. 164, § 69I. Because NSTAR is no longer required to file a long-range forecast pursuant to G.L. c. 164, § 69I, and Cape Wind has never been subject to this requirement, the Siting Board need not consider whether the proposed transmission facilities are consistent with a recently-approved long range forecast.

power plant,[19] and required the proponent to show: (1) that there was a need within New England for the power generated by the non-jurisdictional generating facility; and (2) that the facility would provide benefits to Massachusetts. Turners Falls Decision, 18 DOMSC 141, at 144, 153-155. The Siting Board rejected the possibility of determining need for the transmission line based solely on whether a physical connection was needed to connect the power plant to the grid, noting that "[a]ddressing the need issue here so narrowly would be inconsistent with our analysis of other utility and non-utility facilities, as well as with our statutory mandate". Id. at 154, n.10.

In MECo/NEPCo, the Siting Board reviewed a proposal to construct a 3.2-mile, 69 kV transmission line intended to interconnect a 40 MW gas- and oil-fired power plant.[20] MECo/NEPCo, 18 DOMSC at 386. The Siting Board, adapting its analysis in Turners Falls, required the proponent to show: (1) that power from the non-jurisdictional cogeneration plant was needed on either economic efficiency or reliability grounds, and (2) that the existing transmission system was inadequate to support this new power source and that additional energy resources were necessary to accommodate the new power source. Id. at 395. The Siting Board again stated that limiting the need review to an analysis of the need for a physical interconnection "would be inconsistent with our need analysis for other facilities, as well as with our statutory mandate." Id.

The parties' proposal in this proceeding to review the need for the proposed transmission lines under some variant of the standards used in Turners Falls and MECo/NEPCo initially appears reasonable, because these two cases represent the entire body of Siting Board precedent relating to the construction of jurisdictional transmission lines to interconnect non-jurisdictional power plants with the regional electric grid. However, since these two cases were decided, the Siting Board's statute has been amended in ways which undercut the stated rationale for the standards of review used in those cases.

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[19] The Siting Board lacked jurisdiction over the power plant because its capacity was less than 100 MW.

[20] Again, the Siting Board lacked jurisdiction over the power plant because its capacity was less than 100 MW.

First, the 1997 Electric Restructuring Act ("1997 Restructuring Act") amended the Siting Board's general mandate in G.L. c. 164, § 69H to reflect market-based principles. Prior to the enactment of the 1997 Restructuring Act, the Siting Board was charged with reviewing the need for all major energy facilities to be built in the Commonwealth. Pursuant to Section 69H, as amended in 1997, the Siting Board continues to review the need for proposed transmission and natural gas facilities, but may no longer review the need for proposed generation. Now, the Siting Board is required:

> . . . to provide a reliable energy supply for the commonwealth with a minimum impact on the environment at the lowest possible cost. To accomplish this, the [B]oard shall review the need for, cost of, and environmental impacts of transmission lines, natural gas pipelines, facilities for the manufacture and storage of gas, and oil facilities; provided, however, that the [B]oard shall review only the environmental impacts of generating facilities, *consistent with the commonwealth's policy of allowing market forces to determine the need for and cost of such facilities* (emphasis added).

Second, consistent with the change to G.L. c. 164, § 69H, the Restructuring Act added a new section, G.L. c. 164, § 69J¼, to the Siting Board statute. Section 69J¼ governs the review of proposed generating facilities, and explicitly states that "[n]othing in this chapter shall be construed as requiring the [B]oard to make findings regarding the need for, the cost of, or alternate sites for a generating facility . . ."; in addition, it explicitly prohibits the Siting Board from seeking data regarding the need for or cost of a proposed generating facility, except for certain narrowly-defined cost data. In March 1999, the Siting Board issued a request for comments on the standard of review to be used in future generating facility reviews; and, beginning with its decision in Sithe Mystic Development LLC, 9 DOMSB 101 (1999) ("Sithe Mystic Decision"), the Siting Board has applied a standard of review for generating facilities that excludes any review of project need.

Since the Siting Board no longer reviews the need for power to be generated by power plants, applying a Turners Falls-style analysis in this case would not be consistent with the Siting Board's practice and statutory mandate. Rather, it would be inconsistent both with current practice – the limited review of jurisdictional generating facilities now undertaken pursuant to G.L. c. 164, § 69J¼ – and with the Commonwealth policy, articulated in G.L. c. 164, § 69H, of

allowing market forces to determine the need for new generation.

b. Revised Standard of Review

Given the statutory changes that have taken place since Turners Falls (1988) and MECo/NEPCo (1989), the Siting Board finds that the application of a revised standard of review, one more consistent with the Siting Board's mandate as set forth in the 1997 Restructuring Act, is appropriate in this case. Further, in order to avoid any confusion about the standard to be applied in future cases, the Siting Board takes this opportunity to articulate a single standard of review for need to be applied in all cases where a transmission line is proposed to interconnect new or expanded generation. This new standard must be broad enough to encompass both transmission lines serving generators subject to the Siting Board's jurisdiction, and transmission lines serving generators that are too small to be subject to our jurisdiction, generators that are located in another state, or generators that are located in federal territory.

In a recent review of a transmission line designed to interconnect a generating facility also subject to its jurisdiction, the Siting Board found a need for the line based on: (1) the Siting Board's earlier approval of the power plant to be served by the transmission line,[21] and (2) a showing by the proponent that "some form of electrical interconnection is required to provide the regional transmission system with the additional energy provided by" that power plant. Cambridge Electric Light Company, 12 DOMSB 305, at 318 (2001) ("CELCo Decision"). Taken together, the two findings in CELCo establish that a transmission line, with its attendant costs and potential construction and permanent impacts, is not built unnecessarily. While the Siting Board's approval of a jurisdictional generating facility does not encompass the question of whether the power plant is "needed," it does provide reasonable assurance that the generating project is environmentally sound and buildable at the chosen site. The finding regarding the need for electrical interconnection provides assurance that new transmission facilities will be built

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[21] The Siting Board noted that, pursuant to G.L. c.164, § 69J¼, the Siting Board's approval of a jurisdictional power plant demonstrated that the plant "would contribute to a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost". CELCo Decision, 12 DOMSB 305, at 318.

only when existing transmission facilities are inadequate to the task of supporting the new generation. The Siting Board regards these two factors as critical elements in the analysis of the need for any transmission line intended to interconnect a power plant with the regional electric grid. Therefore, the Siting Board will require an applicant seeking to construct a transmission line to interconnect a new or expanded generating facility to show: (1) that the existing transmission system is inadequate to interconnect the new or expanded generator, and (2) that the new or expanded generator is likely to be available to contribute to the regional energy supply. If the new or expanded generator exists, or is under construction, the availability showing will be deemed to have been made.[22] If the generator is planned, and is subject to the Siting Board's jurisdiction, that showing may be made by obtaining the Siting Board's approval of the generating facility. If the generator is planned, and not subject to the Siting Board's jurisdiction, the showing may be made on a case-by-case basis based on indicators of project progress (e.g., progress in permitting or in obtaining project financing).

In the sections below, the Siting Board reviews the need for the proposed transmission lines pursuant to the standard of review set forth above. However, we are mindful that parties before an administrative agency such as the Siting Board have a "right to expect and obtain reasoned consistency" in our decisions, and we recognize the uncertainties inherent in setting forth a new standard of review during the course of an adjudication, even where the new standard is prompted by statutory changes. Boston Gas Company v. Department of Public Utilities, 367 Mass. 92, 104 (1975). Therefore, in Appendix A, the Siting Board provides an analysis of the need for the transmission lines using the Turners Falls/MECo/ NEPCo precedent.

2. Description of the Existing Transmission System

The Company stated that, without the proposed transmission line, there would be no means by which to deliver energy from the proposed wind farm to potential customers in Massachusetts (Exh. CW-1, at 2-30). The Company stated that the 345 kV transmission system

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[22] The generators served by the Turners Falls and MECo/NEPCo transmission lines each were under construction at the time those cases were filed. Turners Falls Decision, 18 DOMSC 141, at 144; MECo/NEPCo Decision, 18 DOMSC 383, at 387.

on Cape Cod consists of: (1) two 345 kV lines connecting NSTAR's Canal Station switchyard to off-Cape locations, with capacities of 1261 mega-volt-amperes ("MVA") and 2169 MVA (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att; EFSB-RR-57); and (2) a ring bus at Canal Switchyard, which is connected via transformers both to the Canal Electric power plant in Sandwich and to two 115 kV transmission lines that are part of the Cape Cod 115 kV transmission system (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.; Tr. 1, at 23-25).

The Company indicated that 115 kV transmission on the south (Nantucket Sound) side of Cape Cod extends from the Falmouth Bulk Substation in the west to the Harwich Bulk Substation in the east (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.). Existing substations and switching stations on Cape Cod also include the Mashpee Substation, the Barnstable Switching Station, the Hyannis Junction Substation, and the new Oak Street Substation in West Barnstable (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.; Tr. 1, at 29). Among these stations, Barnstable Switching Station is centrally located on the Cape and has six connections to 115 kV transmission lines (Exh. EFSB-3(2)). Transmission lines connecting at Barnstable Switching Station are listed in Table 1, below:

Table 1. Existing Interconnections to Barnstable Switching Station

Line No.	Termini*		Voltage	Capacity
120	Canal	Barnstable	115 kV	398 MVA
122	Bourne	Barnstable	115 kV	398 MVA
115	Falmouth	Barnstable	115 kV	227 MVA
118	Harwich Tap	Barnstable	115 kV	227 MVA
119	Harwich Tap	Barnstable	115 kV	227 MVA
124	Hyannis	Barnstable	115 kV	227 MVA

Sources: Exhs. EFSB-3(1), Att.; EFSB-3(2), Att; EFSB-RR-57; EFSB-RR-69

* Although some of these lines bifurcate to multiple termini, this table lists only two termini per line.

NSTAR does not expect additional transmission capacity to be needed on the Cape Cod system for at least ten years, following the addition of one transformer in 2003 (Tr. 3, at 386).

The Company indicated that an existing 46 kV transmission cable, operated by National Grid, extends from Lothrop Avenue Station in Harwich under Nantucket Sound to Nantucket

Island, passing approximately four miles east of Horseshoe Shoal (Exhs. EFSB-1, Att.; EFSB-3(1), Att.; Tr. 1, at 25-26). The Nantucket cable has a capacity of 35.8 MVA (Exh. EFSB-RR-57). In addition, four 23 kV transmission cables to Martha's Vineyard are located at the west end of Nantucket Sound; these cables have capacities of 8.5 MVA, 18.2 MVA, 20 MVA, and 22.8 MVA, respectively (Exhs. EFSB-3(1), Att.; EFSB-RR-57). There are no transmission cables traversing the Horseshoe Shoal area in Nantucket Sound (Exhs. EFSB-1, Att.; EFSB-3(1), Att.).

3. Project Permitting and Status

Cape Wind proposes to build its wind farm in Horseshoe Shoal, an area of Nantucket Sound located in federal, rather than Massachusetts, waters (Exh. CW-1, at 1-1 and 1-2). Consequently, the wind farm does not fall under the Siting Board's jurisdiction. Because it is built in navigable waters, it will require a Section 10 permit[23] from the United States Army Corps of Engineers ("ACOE"), which is the lead agency for the environmental review of the entire wind farm project, including the proposed transmission lines, under the National Environmental Policy Act ("NEPA") (Exhs. EFSB-4; EFSB-G-7). Pursuant to NEPA, a draft and final Environmental Impact Statement (respectively, "DEIS" and "FEIS") are required for the project (Exh. APNS-N-2).

In addition, Cape Wind has filed an Expanded Environmental Notification Form ("ENF") initiating review of the entire Cape Wind project, including the wind farm, under the Massachusetts Environmental Policy Act ("MEPA"); a draft and a final Environmental Impact Report ("DEIR" and "FEIR") also will be required for the project (Exhs. CW-2, at 6-2; EFSB-4). The scope of the MEPA review of the wind farm includes alternative generating technologies and locations for the wind farm, avian impacts, fisheries impacts, visual impacts, noise, rare species, marine archeological resources, navigation, and decommissioning and environmental monitoring programs (Exh. CW-2, at 4-1 to 4-9, 7-1 to 7-47).

In an addition to the EIR/EIS requirements, the wind farm will undergo a Federal

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[23] The Section 10 permit is issued by the ACOE pursuant to Section 10 of the Rivers and Harbors Act of 1899, 33 USC §§ 401 et seq.

Consistency Review conducted by the Massachusetts Office of Coastal Zone Management ("CZM") and review by the Cape Cod Commission ("CCC") as a Development of Regional Impact ("DRI") (Exh. EFSB-4). The NEPA, MEPA, and CCC reviews have been coordinated, and a joint EIS/EIR/DRI will be prepared for the wind farm and transmission line (Exhs. EFSB-4; EFSB-9). A draft EIS/EIR/DRI has not yet been issued.

As of March 2003, Cape Wind stated that it had not sought financing for the project (Exh. APNS-N-32).

4. Analysis

Pursuant to the standard of review set forth in Section II.A.1, above, the Siting Board requires an applicant seeking to construct a transmission line to interconnect a new or expanded generating facility to show: (1) that the existing transmission system is inadequate to interconnect the new or expanded generator, and (2) that the new or expanded generator is likely to be available to contribute to the regional energy supply.

With respect to the first element of the standard of review, the record indicates that Cape Wind is proposing to build its wind farm in Horseshoe Shoal, several miles distant from the nearest transmission cable. In addition, the record indicates that the total capacity of all existing transmission cables in Nantucket Sound would be insufficient to transmit the output of the proposed wind farm, even if they could be totally dedicated to that purpose. The Siting Board therefore finds that the existing transmission system is inadequate to interconnect the proposed wind farm.

As the wind farm is not yet under construction, and is not subject to the Siting Board's jurisdiction, we consider its availability based on its progress in permitting. The record indicates that, although scoping documents for the joint EIS/EIR/DRI process were issued in early 2002, the ACOE (which is the lead agency for the joint review) has not yet issued a Draft Environmental Impact Statement. Thus, environmental permitting for the wind farm is in its early stages, and the Siting Board cannot yet find that the wind farm will be available to contribute to the regional energy supply. Given the complexity of the federal, state and local permitting process for this project, the Siting Board concludes that acquisition of all permits

required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound is necessary before the Siting Board could make such a finding.[24] Accordingly, the Siting Board finds that, to establish that the wind farm is likely to be available to contribute to the regional energy supply, Cape Wind shall submit to the Siting Board copies of all permits required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound. The Siting Board finds that, at such time as Cape Wind complies with this condition, Cape Wind will have demonstrated that there is a need for additional transmission resources to interconnect the wind farm with the regional transmission grid. Cape Wind and NSTAR may not commence construction of the proposed transmission project until they have complied with this condition.

B. Comparison of the Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69H requires the Siting Board to evaluate proposed projects in terms of their consistency with providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. In addition, G.L. c. 164, § 69J requires a project proponent to present "alternatives to planned action" which may include: (a) other methods of generating, manufacturing, or storing electricity or natural gas; (b) other sources of electrical power or natural gas; and (c) no additional electric power or natural gas.[25]

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. CELCo Decision, 12 DOMSB 305, at 321; Boston Edison Company, 6 DOMSB 208, at 252 (1997) ("1997 BECo Decision"); Boston Edison Company, 13 DOMSC 63, at 67-68, 73-74 (1985). In addition, the Siting Board

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[24] Moreover, in light of the expansive scope of the MEPA and ACOE reviews of the wind farm, acquisition of these approvals also would provide reasonable assurance that the wind farm would be constructed and operated with a minimum impact on the environment.

[25] G.L. c. 164, § 69J also requires a petitioner to provide a description of "other site locations." The Siting Board reviews the Company's primary route, as well as other possible routes, in Section III.A, below.

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, 6 DOMSB 208, at 262-263; Commonwealth Electric Company, 5 DOMSB 273, at 300 (1997) ("ComElec Decision"); Massachusetts Electric Company, 18 DOMSC 383, at 404-405 (1989).

2. Identification of Project Approaches for Analysis

The Company considered four approaches for the interconnection of the wind farm (Exh. CW-1, at 3-2 to 3-4). These four approaches include connecting the wind farm: (1) to NSTAR's 115 kV Barnstable Switching Station; (2) to NSTAR's 115 kV Harwich Substation; (3) to NSTAR's 115 kV Pine Street Substation in New Bedford; and (4) to a new 115 kV substation on Martha's Vineyard, then proceeding on to the mainland.[26, 27]

The Company used the following criteria to identify possible approaches to interconnecting the wind farm to the grid: (1) proximity of the electric power system to the wind farm; (2) ability of the electric power system to accept the wind farm's full output; (3) suitability of voltage levels for delivery of the output; and (4) availability of multiple transmission lines at the tie-in point (Exh. CW-1, at 3-1). Cape Wind stated that it considered only approaches that would provide firm capacity for the full output of the wind farm, and excluded approaches that might require curtailing output during a full load (Tr. 1, at 58). The Company stated that Cape Cod is served by a number of 115 kV lines, which generally range in capacity from 200 MVA to

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[26] The Company also considered a no-build alternative. The Company determined that this approach would prevent the wind farm from being interconnected to the regional transmission grid, and would preclude operation of the wind farm (Exh. CW-1, at 3-5). Therefore, this approach was not considered further (id.).

[27] At the request of the Siting Board, the Company also analyzed an interconnection at the Mashpee Substation (Exh. EFSB-PA-11). The Company stated that existing transmission lines out of the Mashpee substation could not accommodate the 420 MW of power generated by the wind farm (id.). The Company explained that the Mashpee Substation supports two 115 kV transmission lines – one that extends west to the Hatchville Substation and one that extends northeast to the Barnstable Switching Station – each of which has a short-term emergency rating of 291 MVA (id.; Exh. EFSB-1). Because neither line is capable of carrying the full output of the wind farm, the loss of either line would result in the overload of the remaining line (Exh. EFSB-PA-11).

over 400 MVA, but noted that only two of these lines – Lines 120 and 122, which extend west from the Barnstable Switching Station – could accommodate power flows in excess of 400 MVA (id. at 31, 35). The Company stated that approaches which allowed transmission at higher voltages, with lower line losses, were preferred due to their greater ability to deliver large blocks of power more efficiently (Exh. CW-1, at 3-1).

a. The Barnstable Interconnect

The Company's preferred approach ("Barnstable Interconnect") would interconnect the wind farm with the grid at NSTAR's 115 kV Barnstable Switching Station via an approximately 18- to 24-mile transmission line, 9 to 12 miles of which would be submarine cable (Exhs. CW-1, at 3-2; EFSB-RR-84). The Barnstable Switching Station is located south of Route 6 off Mary Dunn Road in Barnstable (Exh. CW-1, at 3-2). Six 115 kV lines emanate from the Barnstable Switching Station, including three that run to the west (Lines 115, 120, and 122), two that run to the east (Lines 118 and 119), and one that runs to the south (Line 124) (Exh. EFSB-3, at Figs. 3-1 and 3-2). The distance from landfall to the Barnstable Switching Station ranges from approximately 5.9 miles (for the New Hampshire Avenue landfall in Yarmouth), to approximately 14.2 miles (for the Mashpee Town Landing landfall) (Exh. CW-1, at 1-4 and 1-13). If the alternative route were used, a new riser station would need to be constructed in the NSTAR ROW in Mashpee, to connect the proposed transmission lines to the existing NSTAR 115 kV line and to the new overhead transmission lines (id. at 1-13 to 1-14). The Company indicated that the capital cost of the Barnstable Interconnect would be $79.5 million (Exh. EFSB-PA-2, Table 3-1).[28]

b. Harwich Alternative

The Harwich Alternative would interconnect the wind farm with the grid at NSTAR's 115 kV Harwich Substation, located south of Route 6 off Great Western Road and Lothrop Avenue in Harwich, via an approximately 21-mile transmission line, 17 miles of which would be

[28] The cost estimate of the Barnstable Interconnect is based on 11 miles of submarine cable (Exh. EFSB-PA-2, Table 3-1).

submarine cable (Exh. CW-1, at 3-3). The Harwich Substation is connected to two 115 kV transmission lines (Lines 118 and 119) that run generally from the Harwich Substation to the Harwich Tap and then to the Barnstable Switching Station (id. at 3-3).[29] The Company noted that the transmission lines from the wind farm would be connected to Lines 118 and 119 at the Harwich Substation (Tr. 1, at 102). The Harwich Alternative would then require the construction of an additional 115 kV line extending 12.3 miles from the Harwich Substation to the Barnstable Switching Station (14 miles from landfall), necessitating an expansion of the Harwich Substation (Exhs. CW-1, at 3-3; EFSB-PA-10). The Company indicated that the capital cost of the Harwich Alternative would be $126.8 million (Exh. EFSB-PA-2).[30]

c. New Bedford Alternative

The New Bedford Alternative would interconnect the wind farm with the grid at NSTAR's Pine Street Substation in New Bedford via an approximately 32-mile submarine cable (Exh. CW-1, at 3-4). The cable would pass through Horseshoe Shoal in Nantucket Sound, Vineyard Sound, Buzzards Bay, and New Bedford Harbor before making landfall at New Bedford and proceeding several hundred feet overland to the Pine Street Substation (id. at 3-3 to 3-4; Tr. 1, at 106). The Company noted that the Pine Street Substation is connected to the grid through three transmission lines – two that are capable of carrying 60 MVA each and one that is capable of carrying 130 MVA– for a total existing transmission capacity of 250 MVA (Tr. 1, at 49). The Company therefore concluded that use of the New Bedford Alternative would require construction of another line to transmit the wind farm's maximum output; it would also

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[29] The Lothrop Avenue Low Voltage Substation is located adjacent to the Harwich Substation, and the 23kV Nantucket Cable runs from this low voltage substation to Nantucket (Tr. 1, at 102). The Company explained that although there are plans for a second cable to Nantucket, Nantucket's load is appropriate for low-voltage service and attempting to upgrade the system for use by both the Nantucket Cable Project and the wind farm would add substantial cost and complexity without providing any cost benefits (id. at 72-73,75).

[30] The Company estimated that the cost of the Harwich Alternative would be $102.5 million if the on-land cable were installed overhead instead of underground (Exh. EFSB-PA-21).

necessitate an expansion of the Pine Street Substation (Exh. EFSB-PA-27; Tr. 1, at 54, 104).[31] The Company indicated that the capital cost of the New Bedford Alternative would be $129.2 million (Exh. EFSB-PA-2).

The Company initially proposed using a 150 kV direct current ("DC") transmission cable for the New Bedford Alternative, rather than the alternating current ("AC") cable proposed for the other alternatives, due to the length of the submarine cable (Exh. CW-1, at 3-3 to 3-4). However, the Company later concluded that the cost and line loses associated with the use of DC would be greater than for AC, that the DC technology was new and unproven, and that AC was appropriate for cable lengths of less than 50 to 100 miles (Tr. 1, at 46-47). In addition, the Company noted that the use of DC technology would require the installation of converter stations at both the ESP and the Pine Street Substation (Exh. CW-1, at 3-3 to 3-4). The Company indicated that converter stations have large space requirements and high losses, and that the installed cost of the converter stations would be $124 million (Exh. EFSB-PA-1). The cost of the New Bedford Alternative with DC cable would be $292.4 million as opposed to $129.2 million with AC cable (Exh. CW-1, at Table 3-1). The Company therefore indicated that it would use AC technology for the New Bedford Alternative (Exh. EFSB-PA-2).

d. Martha's Vineyard Alternative

The Martha's Vineyard Alternative would connect the wind farm first to Martha's Vineyard to serve load on the Island, and then to a substation on the mainland. A 13.5-mile 115 kV submarine cable would run from the wind farm to a new 115 kV substation on Martha's Vineyard (Exh. CW-1, at 3-4).[32] The Company stated that the most recently recorded summer peak load on Martha's Vineyard was 42.3 MW (August 2002) (Exh. EFSB-PA-8). From

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[31] With the wind farm at the maximum output of 420 MW, the Company noted that even adjusting the output to subtract out up to 70 MW of output to the New Bedford area load served from the Pine Street Substation, transmission capacity of at least 350 MW would be required on lines connecting the Pine Street Substation to the rest of the grid to carry the remaining output from the wind farm (Tr. 1, at 51).

[32] The highest voltage level currently serving Martha's Vineyard is 23 kV (Exh. EFSB-3, Fig. 3-1).

Martha's Vineyard, a new 115 kV line would extend either to the Mashpee Substation (a distance of 14 miles), or to the Falmouth Substation (a distance of approximately 5 miles) (Exh. CW-1, at 3-4). The Company indicated that the Mashpee tie-in would be preferable (id.).

The Company estimated that the capital cost of the Martha's Vineyard Alternative would exceed that of the Barnstable Interconnect by $109 million, for a total cost of $188.5 million (id.).[33] The Company indicated that it eliminated this alternative from further consideration due to these substantial additional costs (id.).[34]

e. Analysis

The Company has identified four approaches to meeting the identified need, each of which could provide reliable service for the proposed wind farm. The Siting Board agrees with the Company's conclusion that the Martha's Vineyard Alternative does not warrant further consideration due to the magnitude of increased cost over the Barnstable Interconnect without any offsetting benefits.[35] The Martha's Vineyard Alternative would involve increased lengths of

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[33] In making this estimate, the Company assumed that the Martha's Vineyard Alternative would make landfall in Mashpee and would follow the Mashpee route for the Barnstable Interconnect to the Mashpee Substation and then on to the Barnstable Switching Station (Exh. CW-1, at 3-4). The additional cost includes the cost of 27.5 miles of submarine cable from the ESP to Martha's Vineyard and then to landfall at Mashpee at $3.7 million per mile, and $7.2 million for the new facilities on Martha's Vineyard (id.).

[34] The Company noted that it also considered an interconnection via Nantucket, but rejected it for the same reasons that it rejected the Martha's Vineyard Alternative (Exh. CW-1, at 3-4). A Nantucket alternative would require construction of new 115 kV facilities on the Island and a longer submarine cable than that required for the Martha's Vineyard Alternative (id.).

[35] The Siting Board notes the $109 million cost differential is overstated, as the Company failed to subtract out the submarine cable costs of the Barnstable Interconnect when making its calculation. A more accurate incremental cost estimate would be $68 million (based on subtracting the cost of 11 miles of marine lines for the Barnstable Interconnect at $3.7 million per mile). Therefore, the recalculated cost of the Martha's Vineyard Alternative would be approximately $147.5 million, versus the original estimate of $188.5 million. However, this cost is still significantly greater than the $79.5 million cost of the Barnstable Interconnect, the $127 million cost of the Harwich Alternative, and the

(continued...)

the marine route and the associated impacts of such construction, with potentially the same land route as the Barnstable Interconnect.

The Harwich and New Bedford Alternatives are somewhat less costly than the Martha's Vineyard Alternative, although each would cost approximately $50 million more than the Barnstable Interconnect. The Harwich Alternative provides an alternative interconnection point on Cape Cod, while ultimately transmitting most of the wind farm output via the Barnstable Switching Station. The New Bedford Alternative connects to the regional transmission system at a point off Cape Cod, and thus presents a different set of advantages and disadvantages. The Siting Board finds that the Barnstable Interconnect, the Harwich Alternative, and the New Bedford Alternative each would meet the identified need and provide potential tradeoffs between reliability, environmental impacts and cost worthy of further analysis. Therefore, in the following sections, the Siting Board compares the three approaches with respect to reliability, environmental impacts, and cost.

3. Reliability

The Company stated that, while each of the project approaches could provide a reliable interconnection with the regional transmission grid, the best interconnection point would be the Barnstable Switching Station, which is the major bulk substation on Cape Cod, and is connected to the grid by six separate transmission lines (Exhs. CW-1, at 3-5; EFSB-RR-57). The Company explained that interconnecting at a point served by multiple transmission lines would ensure that the loss of one of those lines would not force the curtailment of the wind farm's output (Exh. EFSB-PA-5). The Company also asserted that only the Barnstable Switching Station could accept the wind farm's full output and transport it to the transmission grid without substantial transmission upgrades elsewhere on the system (Tr. 1, at 53). The Company explained that the Barnstable Switching Station already has a ring bus; consequently, the work required for interconnection would involve only the extension of that ring bus to accommodate the cables from the wind farm, which would limit the construction to inside the fence line and would not

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[35] (...continued)
$129.2 million cost of the New Bedford Alternative.

require expansion of the existing substation (id. at 110-111).[36] The Company acknowledged that a system impact study has not yet been conducted, and that it consequently does not have the benefit of system impact study analyses simulating the effect of wind farm operations on the system (id. at 79).

The Company stated that interconnecting at the Harwich Substation would be a less reliable approach, since the new capacity generated by the wind project would be "connected at a greater distance from the core of the Cape Cod transmission system" (Exh. CW-1, at 3-5). Interconnecting at the New Bedford Substation also was deemed less reliable due to the greater length and complexity of the associated submarine cable (id.).

The record shows that the Barnstable Switching Station is the major bulk substation on Cape Cod, with six 115 kV transmission lines available to carry energy to various parts of Cape Cod. Interconnection at this location provides high reliability in that energy from the wind farm can be reliably delivered to the grid even if one of the lines emanating from the Barnstable Switching Station is out of service. Both the Barnstable Interconnect and the Harwich Alternative provide added transmission capacity ultimately reaching the Barnstable Switching Station; however, the Company argues that the Barnstable Interconnect provides a more direct connection to this substation, since the Harwich Alternative first interconnects at the Harwich Substation. The Siting Board agrees that, all other considerations being equal, a direct connection at the Barnstable Switching Station provides greater reliability than an indirect connection through another, smaller substation 12.3 miles distant from the Barnstable Switching Station. However, this reliability advantage would be diminished if for any reason the Company selected the alternative route for the Barnstable Interconnect, which includes an intermediate connection at the Mashpee Substation, and 14.2 miles of upgraded transmission lines, 12.3 miles of which are on new overhead lines, before reaching the Barnstable Switching Station.

The record suggests that the length of the New Bedford marine line – 32 miles, as opposed to 9 to 12 miles for the Barnstable Interconnect and 17 miles for the Harwich

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[36] The Company explained that interconnecting at the Harwich, Mashpee, or Falmouth Substations would require either the construction of a new substation or the expansion of an existing substation's footprint (Tr. 1, at 111).

Alternative – may make the New Bedford Alternative less reliable than interconnection at the Barnstable Switching Station. Further, at the point of interconnection to the grid, the number and capacity of the existing interconnecting lines is significantly lower under the New Bedford Alternative than the Barnstable Interconnect. The record shows that with the Barnstable Interconnect, the wind farm's maximum output is well matched to the transmission capacity at the Barnstable Switching Station. In contrast, with the New Bedford Alternative, the wind farm's output would be six times the existing peak load supplied from the interconnection point, and the excess output could not be fully transferred to other load areas via the available interconnection lines.

Accordingly, the Siting Board finds that the Barnstable Interconnect is slightly preferable to the Harwich Alternative and preferable to the New Bedford Alternative with respect to reliability.

4. Environmental Impacts

The Company asserted that the environmental impacts associated with the Barnstable Interconnect would consist predominantly of temporary impacts associated with the construction of the marine and underground facilities (Exh. CW-1, at 3-6). The Company stated that these temporary impacts could be mitigated through the design of the facilities and through optimization of the route (id.). Asserting that the marine-based construction impacts were essentially equivalent, the Company argued that the only differences would be associated with the lengths of the routes, and concluded that construction of a longer submarine cable might cause greater impacts than construction of a shorter cable (Tr. 1, at 89).[37] The Company concluded that the Barnstable Interconnect would have fewer temporary impacts since it is the shortest project alternative (Exh. CW-1, at 3-7).

The Company also assessed construction impacts on traffic and navigation associated with the three project approaches. With respect to traffic impacts, the Company noted that the

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[37] However, the Company also noted that each of the submarine cable routes has its own set of particular environmental constraints or opportunities, and that the New Bedford route is quite different than any of the other project approaches (Tr. 1, at 109).

land portion of the Harwich Alternative is routed through a slightly less dense residential and commercial area, and that the traffic volumes are lighter than along the land portion of the Barnstable Interconnect (id; Tr. 1, at 97). With respect to navigational impacts, the Company noted that the likely route through Vineyard Sound, Buzzards Bay, and New Bedford Harbor is complicated by a number of factors, including the presence of surface bedrock, limited channel work space, and heavy commercial marine traffic (Tr. 1, at 90-92). In addition, the Company noted that construction of the New Bedford Alternative would be complicated by federal navigation channels and a hurricane barrier located in New Bedford Harbor (id. at 91). The Company asserted that, of the three approaches under consideration, the Harwich Alternative would have the fewest impacts on navigation (id. at 90).

The Company noted differences in the permanent land use impacts of the three project approaches. It noted that, depending on the route selected, the Barnstable Interconnect could have some permanent land use impacts resulting from the construction of the Mashpee riser station structures and overhead lines within the existing NSTAR ROWs (id. at 3-6). The Company stated that the impacts of the Harwich Alternative would include permanent impacts associated with the expansion of the Harwich Substation to accommodate the new underground transmission lines (Exhs. CW-1, at 3-7; EFSB-PA-9). The Company explained that the Harwich Substation site is constrained due to the number of existing facilities, including two transformers and distribution equipment (Tr. 1, at 103). The Company indicated that the site is bordered by Lothrop Avenue to the east, by wetlands to the west, open land to the south, and the ROW to the north (Exh. EFSB-PA-9; Tr. 1, at 98, 108, 109). The Company also noted that additional ROW might need to be acquired and cleared to accommodate the Harwich Alternative, since the existing ROW already is cleared to its full width (Exh. EFSB-PA-9; Tr. 1, at 98). The Company noted that Lothrop Avenue is a low-lying road, subject to flooding, that passes through the Parkers River Area of Critical Environmental Concern ("ACEC") (Tr. 1, at 101).

The Company explained that upgrades to the Pine Street Substation with the New Bedford Alternative would consist of additional interconnection work and bus work (Tr. 1, at 104). The Company stated that the Pine Street Substation is located at an industrial waterfront facility, surrounded by urban waterfront, industrial, and commercial uses (id. at 105). Further,

although the Pine Street Substation is fairly compact, there appears to be potential for expansion on the site (id.). The Company estimated that the distance from the New Bedford landfall to the Pine Street Substation is several hundred feet, giving the New Bedford Alternative the shortest and easiest on-land route of the project alternatives (id. at 106).

The Company provided a detailed analysis of magnetic field impacts for the Barnstable Interconnect, but did not measure existing magnetic fields or predict future magnetic fields for the Harwich Alternative and the New Bedford Alternative (Exh. EFSB-PA-12). The Company posited that since the same type of submarine cable would be used for all project approaches, the magnetic fields along the marine portions of the Harwich and New Bedford Alternatives would be similar to those for the Barnstable Interconnect (id.). The Company indicated that on-land electromagnetic field ("EMF") of the Barnstable Interconnect would be limited by the underground design, but they acknowledged that it is not possible, given the existing data, to predict with any accuracy the combined fields associated with the new and existing on-land facilities (id.).

The record indicates that use of the Harwich Alternative or the New Bedford Alternative would require the construction of transmission upgrades at existing substations, and that this construction could result in permanent land use impacts. The Barnstable Interconnect, if constructed along the primary route, would not require substation expansion. If the alternative route for the Barnstable Interconnect were used, some construction would be required at the Mashpee Substation. However, this work would be less extensive and have fewer impacts than the work required for the Harwich Alternative, due to space constraints at the Harwich Substation site, and the presence of wetlands to the west. In addition, the existing ROW in the immediate vicinity of the Harwich Alternative has been cleared to its full width; therefore, additional ROW may need to be acquired and cleared if the Harwich Alternative were used.

The New Bedford Alternative appears to have fewer permanent impacts than the Harwich Alternative; however, it has potential temporary impacts on navigation due to construction of the route through New Bedford Harbor. Construction in New Bedford Harbor may be complicated by bedrock, limited work space, and the hurricane barrier. Further, the marine portion of the New Bedford route is approximately three times the length of the Barnstable Interconnect and

twice that of the Harwich Interconnect.

Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to both the Harwich Alternative and the New Bedford Alternative with respect to environmental impacts.

5. Cost

The Company estimated that the total capital cost of the transmission project would be $79.5 million if the Barnstable Interconnect is used, $126.8 million if the Harwich Alternative is used, $102.5 million if an overhead version of the Harwich Alternative is used, and $129.2 million if the AC version of the New Bedford Alternative is used (Exh. EFSB-PA-2).

The record demonstrates that the capital cost of the Barnstable Interconnect would be $47.3 million less than the Harwich Alternative, $23 million less than an overhead version of the Harwich Alternative, and $49.7 million less than the AC version of the New Bedford Alternative. Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to the Harwich Alternative and the New Bedford Alternative with respect to cost.

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

The Siting Board has found that the Barnstable Interconnect, the Harwich Alternative, and the New Bedford Alternative each would meet the identified need. The Siting Board also has found that the Barnstable Interconnect would be slightly preferable to the Harwich Alternative and preferable to the New Bedford Alternative with respect to reliability, and that the Barnstable Interconnect would be preferable to the Harwich Alternative and the New Bedford Alternative with respect to environmental impacts and cost. Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to both the Harwich Alternative and the New Bedford Alternative with respect to providing a reliable energy supply for the Commonwealth, with a minimum impact on the environment at the lowest possible cost.

III. ANALYSIS OF THE PRIMARY AND ALTERNATIVE ROUTES

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69J-69Q to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, §§ 69H and 69J. Further, G.L. c. 164, § 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In implementing this statutory mandate, the Siting Board requires a petitioner to demonstrate that it examined a reasonable range of practical siting alternatives, and that its proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 89; New England Power Company, 21 DOMSC 325, at 376 (1991).

A. Site Selection

1. Standard of Review

G.L. c. 164, § 69J provides that a petition to construct a proposed facility must include "a description of alternatives to [the applicant's] planned action" including "other site locations." In past reviews of alternative site locations identified by an applicant, the Siting Board has required the applicant to demonstrate that it examined a reasonable range of practical siting alternatives. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 119; New England Power Company, 7 DOMSB 333, at 374 (1998) ("1998 NEPCo Decision"). In order to determine whether an applicant has considered a reasonable range of practical alternatives, the Siting Board has required the applicant to meet a two-pronged test. First, the applicant must establish that it developed and applied a reasonable set of criteria for identifying and evaluating alternative sites in a manner which ensures that it has not overlooked or eliminated any sites which, on balance, are clearly superior to the proposed site. Second, the applicant must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 119; 1998 NEPCo Decision, 7 DOMSB 333, at 374.

2. Site Selection Process

a. Description

The Company indicated that its site selection process consisted of two parts – the identification of potential routes connecting the ESP to the Barnstable Switching Station, and the screening and ranking of the identified routes (Exh. CW-1, at 4-2 to 4-3; Tr. 2, at 188). Cape Wind explained that it identified several potential interconnection points through the use of U.S. Geological Survey maps, aerial photography, and consultation with NSTAR; then, potential landfall locations were identified along the southern shore of Cape Cod using the same methods (Exh. EFSB-SS-2). The Company then conducted site visits to screen the potential landfall locations and assessed the viability of the routes (id.).

The Company stated that it used two categories of "siting criteria" – land use criteria and environmental protection criteria – to identify potential routes for the transmission line (Exh. CW-1, at 4-2). With respect to land use, the Company sought to: (1) use landfall locations in close proximity to the Barnstable Switching Station; (2) use interconnection locations with transmission at 115 kV in order to minimize transmission upgrades; (3) maximize use of underground construction for the land portion of the route; (4) use previously developed and disturbed land; (5) use developed waterfront and near shore areas for the transmission cable landfall; (6) use existing ROWs with available workspace; (7) minimize bends or turns in the ROW; and (8) use roadways, sidewalks, and shoulder areas to maintain vehicle and pedestrian travel access (id. at 4-2 to 4-3). With respect to environmental protection, the Company sought to: (1) select a direct route between the ESP and the landfall; (2) avoid or minimize surface or subsurface disturbance of terrestrial, wetland and aquatic resources; (3) maximize use of existing developed land and waterfront areas and avoid encroachment on undeveloped areas; (4) minimize impacts to regional land-based and waterborne commerce and transportation networks; (5) avoid or minimize impacts to aquatic resources, water quality, seabed conditions and benthic habitat; and (6) minimize the number of marine transmission line trenches and the width of the trenches (id. at 4-3).

Based on these criteria, the Company identified six potential routes for the transmission lines, as follows: (1) an approximately 17-mile route making landfall at New Hampshire Avenue

in Yarmouth, continuing along Yarmouth streets and along an NSTAR ROW in Barnstable ("New Hampshire Avenue Route" or "Alternative 1"); (2) an approximately 24-mile route making landfall at the Mashpee Road Town Landing, via Popponesset Bay, continuing along Mashpee streets and along the NSTAR ROW ("Mashpee Town Landing Route" or "Alternative 2"); (3) an approximately 23.25-mile route making landfall at Bryants Cove in Mashpee, via Popponesset Bay, continuing along a cart path and along the NSTAR ROW ("Bryants Cove Route" or "Alternative 3"); (4) an approximately 21-mile route making landfall at Main Street in Cotuit, continuing along Main Street and along the NSTAR ROW ("Cotuit Route" or "Alternative 4"); (5) an approximately 17.5-mile route making landfall at Whale Road/Point Gammon in Yarmouth continuing along Yarmouth streets and along the NSTAR ROW ("Point Gammon Route" or "Alternative 5"); and (6) an approximately 14.5-mile route making landfall at Lewis Bay Road in Hyannis Harbor continuing along Hyannis streets and the Barnstable Airport to the NSTAR ROW and the Barnstable Switching Station ("Hyannis Harbor Route" or "Alternative 6") (Exh. CW-1, at 4-4 to 4-21 and Table 4-1).

The Company stated that it considered, but did not include, routes that would make landfall in an approximately 10-mile long coastal area lying between the Lewis Bay area, where Alternatives 1, 5, and 6 make landfall, and the Popponesset Bay/Cotuit Bay area, where Alternatives 2, 3, and 4 make landfall (Exh. EFSB-SS-23).[38] The Company explained that this in-between area lacked commercially available property for a landfall, and would necessitate use of on-land routing extending toward the Barnstable Switching Station that was likely to present construction difficulties due to congested roadways and utilities (id.).

The Company also considered but rejected routes that would come ashore in the Popponesset Bay/Cotuit Bay area but that, instead of using a lengthy overhead alignment along the NSTAR ROW, would follow an underground alignment along area roadways extending all the way to the terminus at the Barnstable Switching Station, or extending most of that distance before joining and following the NSTAR ROW at a point near the terminus (id.). The Company explained that it sought routes which minimized roadway construction, citing traffic, utility

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[38] The coastal area includes Sea View Avenue in Wianno, Craigville Beach, Coville Beach and Keyes Beach (Exh. EFSB-SS-23).

congestion and cost, and added that it deemed the primary route to be clearly superior to other possible routes, beyond the identified alternatives, that would predominantly use roadway alignments (id.; Tr. 2, at 239-240). The Company further stated that it favored overhead construction where possible, based on differences in electrical line losses, environmental impacts and cost (Exh. EFSB-SS-23).

The Company stated that it evaluated the six route alternatives using 26 screening criteria, including cost, reliability, 11 installation and maintenance ("I&M") complexity criteria, and 13 environmental and land use criteria (Exh. CW-1, at 4-21). The Company explained that it started with the same unit price per foot to calculate the cost of each route alternative, but then factored in cost differences due to specific installation and design difficulties, including the number of horizontal directional drills ("HDD"), state highway crossings or railroad crossings, and installation in areas with congested underground utilities (id. at 4-28; Tr. 2, at 247).

The Company stated that the only factor used to assess differences in reliability between the route alternatives was the extent of overhead versus underground construction (wherein an underground line was considered to have a small reliability advantage (Exh. EFSB-SS-18; Tr. 2, at 229). The Company noted that routes which interconnect to the Barnstable Switching Station from the east would use underground lines for their full length, and thus were considered more reliable than those which interconnected from the west (Exh. EFSB-SS-18). The Company stated that the marine route segments all were deemed to be equally reliable because the length of the circuits, installation techniques, burial depths and materials used would be similar (Tr. 2, at 231).

The Company categorized eight of the I&M criteria as land and three as marine (Exh. CW-1, Tables 4-1, 4-2, and 4-3). The I&M criteria for the land portions of the routes included: (1) underground utility congestion; (2) intersection crossings; (3) traffic; (4) street width; (5) transmission line length; (6) number of manholes/splicing vaults; (7) railroad crossings; and (8) road access during construction (id. at 4-21 to 4-24, Table 4-3). The I&M criteria for marine portions of the routes included: (1) marine transmission line distance; (2) marine HDD; and (3) navigational impacts (id.).

Finally, the Company categorized twelve of the environmental criteria as land and one as

marine (id. at Tables 4-1, 4-2, 4-3). The environmental criteria for the land portions of the routes included: (1) wetlands; (2) terrestrial rare and endangered species habitat; (3) tree and vegetation removal; (4) shade tree removal; (5) percentage of new ROW; (6) water supply and groundwater (Zone I); (7) water supply and groundwater (Zone II); (8) disruption to properties during construction;[39] (9) prehistoric and historic archeological sites; (10) historic districts; (11) community facilities; and (12) hazardous waste sites (id. at 4-25 to 4-28, Table 4-3). The Company identified three environmental criteria for the marine transmission cable – eelgrass, fish runs, and shellfish; however, of these, only eelgrass was carried forward to a quantitative analysis (id.. at 4-28).[40]

The Company stated that it evaluated and ranked the six alternative routes using the 26 screening criteria described above (id. at 4-30).[41] For each route, the Company assigned scores for each criterion on a scale of 0 to 5, where 5 was the most favorable (id.). Each of the criteria was assigned a weight of 1, 2, or 3, with very important criteria given a weight of 3, moderately important criteria given a weight of 2, and minor criteria given a weight of 1 (id. at 4-31; Tr. 2, at 214).[42] The scores were multiplied by the relevant weights and totaled to develop an overall weighted score for each route (Exh. CW-1, at 4-31). This scoring is shown in Table 2, below.

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[39] The Company indicated that the property disruption criteria reflected traffic and property access concerns resulting from construction along streets (Exh. EFSB-SS-19).

[40] The Company asserted that fish runs and shellfish were present along all of the routes, and that impacts could be addressed by construction techniques (Exh. CW-1, at 4-28). The Company concluded that impacts to fish runs and shellfish would be essentially equivalent along all routes, and therefore did not carry the fish run and shellfish criteria forward to the quantitative stage of the analysis (id. at 4-28, Tables 4-1, 4-2, 4-3).

[41] The Company assessed the land and marine portions of each route separately (Exh. CW-1, at 4-30).

[42] The total weights of all of the 26 criteria equaled 52 (based on a 1, 2, or 3 weight assigned to each criterion) (Exh. CW-1, at Table 4-3). Of the total weight of 52, the land installation criteria accounted for 16, the upland environmental/land use criteria accounted for 22, the marine installation criteria accounted for 9, the marine environmental/land use criterion accounted for 2, the cost criterion accounted for 2, and the reliability criterion accounted for 1 (id.).

Table 2. Site Selection Scoring

Criteria Category	Total Weighting	New Hampshire Avenue	Mashpee Town Landing	Bryants Cove	Cotuit	Point Gammon	Hyannis Harbor
UPLAND CRITERIA							
Installation & Maint. Criteria	31%	45	43	53	39	39	35
Environ./ Land Use Criteria	42%	73	73	60	41	74	60
Subtotal	73%	118	118	113	80	113	95
SUBMARINE CRITERIA							
Installation & Maint. Criteria	17%	39	28.5*	24	42	36	30
Environ./ Land Use Criteria	4%	10	10	10	10	2	10
Subtotal	21%	49	38.5	34	52	38	40
COST	4%	2	10	8	6	0	4
RELIABILITY	2%	5	1	1	1	5	5
TOTAL	100%	174	165.5*	156	139	156	144

Sources: Exh. CW-1, at Table 4-3; Tr. 8, at 1059; Company Brief at 136-138.

* As originally presented, the score for submarine I&M was 30: during the course of the proceeding the raw score for marine HDD on the Mashpee Town Landing Route was revised from 3 to 2.5, which lowered the weighted score by 1.5; the submarine I&M score dropped from 30 to 28.5, and the total score decreased from 167 to 165.5 (id.).

In response to questions from staff and intervenors, the Company provided additional information about its approach to assessing marine impacts, noise impacts, visual impacts and cultural resource impacts as part of the site selection process. With respect to marine impacts, the Company explained that for Alternatives 2 and 3, impacts to the landfall barrier beach (Popponesset Spit) were reflected in its site screening analysis, specifically under the criteria of marine HDD, rare and endangered species, and wetlands (Tr. 2, at 296, 297, 332).[43] The

[43] For the two alternatives that pass under Popponesset Spit (Mashpee Town Landing and (continued...)

Company noted that the evaluation of rare and endangered species reflected the presence of plant or wildlife species and habitat on the NSTAR ROW as well as on Popponesset Spit (Exh. EFSB-SS-3A). The Company stated that while wetlands along the marine portion were considered, they were determined to be the same along all six routes within the three mile length of coastal wetlands (Tr. 8, at 1063). Therefore, only the land portions were included in the scoring of routes for wetlands issues (id.).[44]

The Company asserted that, although noise was not used as a siting or screening criterion, and was not explicitly discussed as part of another criterion, it was nonetheless subsumed in the actual rankings and analysis (Tr. 8, at 1060). The Company asserted that the HDD criterion served as a marker for community disturbance and disruption of endangered species caused by HDDs, and the scoring for each route thus incorporated such impacts (id. at 1060).[45]

The Company stated that it did not include visual impacts as a separate screening

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[43] (...continued)
Bryants Cove), Tables 4-1 and 4-3 of the Petition provide the following detail for the wetlands criteria: they were described as "no direct impact – buffer zone" (score of 3), and "temporary impact – intermittent stream" (score of 1), respectively (Exh. CW-1, at Tables 4-1, 4-3). The rare and endangered plant and animal species habitat criteria were described as "present – direct impact" (score of 1) for both routes (id.).

[44] The record indicated that within the NSTAR ROW, Alternatives 2, 3, and 4 cross 15, 14, and 13 jurisdictional wetlands respectively (Exh. CW-1, at 4-11, 4-13, 4-16, 5-69). However, while Popponesset Spit was not included as a jurisdictional wetland area in the site scoring, the Company indicated that the wetlands associated with Popponesset Spit were considered an upland wetland area (Tr. 8, at 1013, 1064). The record indicates that all of the routes received an unweighted score of three (i.e., no direct impact) for wetlands, with the exception of Alternative 3 which received an unweighted score of one (i.e., temporary impact), due to the crossing of an intermittent stream (Exh. CW-1, at Tables 4-1, 4-3).

[45] The Company stated that it did not specifically consider the potential impact of noise from an HDD on nesting and breeding habits of the piping plover (or any other species) in its site selection process, but rather assumed that the impact of noise from HDDs was the same for all route alternatives under all conditions (Tr. 8, at 1038-1040). The Company stated that it did consider whether there were sensitive receptors that could be affected by the noise from HDDs; however, it concluded that the receptors and noise level would be the same for all routes (id. at 1040).

criterion because transmission lines installed underground would have no visual impact, and overhead transmission lines would be limited to the NSTAR ROW where 115 kV structures already exist (Exh. EFSB-SS-20; Tr. 2, at 206-207). The Company argued that visual impacts were reflected in both the tree/vegetation removal criterion and the shade tree removal criterion,[46] since the visual impacts of transmission lines result mainly from the clearing of vegetation for new overhead lines (Tr. 8, at 1064-1065). The Company stated that the north side of the NSTAR ROW was not previously cleared by NSTAR, and therefore currently is wooded for much of the 8-mile distance from the Mashpee Substation to Shootflying Hill Road in Barnstable (Exh. EFSB-L-27; Tr. 2, at 203-204; Tr. 6, at 729). The Company noted that use of this length of ROW would require clearing an additional 55-60 feet width of the ROW and thereby would increase the visibility of transmission lines from some of the nearby residential areas (Exh. EFSB-L-27; Tr. 2, at 203-204; Tr. 6, at 729).

The Company noted that it based its evaluation of the potential impacts on historic resources only on that portion of each route between the landfall and the point at which it joined the NSTAR ROW (Exh. EFSB-SS-19; Tr. 2, at 195). The Company stated that NSTAR's existing ROWs have been disturbed by existing transmission facilities and on-going maintenance, and that the potential for impacts on historic resources therefore was assumed to be generally equivalent for those segments of each route that occurred on the ROW (Exh. EFSB-SS-19).

Based on the results of the route screening analysis, the Company selected the New Hampshire Avenue Route, which had the highest weighted score, as its primary route, and the

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[46] The Company indicated that these criteria each received a weight of 3 (Exh. CW-1, at Table 4-3). Unweighted scores for tree/vegetation removal were: one for Alternative 3, based on clearing in the NSTAR ROW and in an undeveloped area between the route landfall and the NSTAR ROW; three for Alternatives 2 and 4, in each case based on clearing in the NSTAR ROW; and five for Alternatives 1, 5 and 6, which each require little or no ROW clearing (id. at 4-12, Tables 4.1, 4.3). Unweighted scores for shade tree removal focused on in-street construction and ranged from one for Alternative 4, where a route segment along Main Street in Cotuit is very narrow and within a historic district, to five for all the other alternatives where the Company expected no impact (id. at 4-16, Table 4-1).

Mashpee Town Landing Route, which received the second highest weighted score, as its alternative route (Exh. CW-1, at 4-31). The Company asserted that the New Hampshire Avenue Route scored well on both land and marine installation criteria and was superior to all other routes for environmental criteria (id.).[47] It stated that the Mashpee Town Landing Route scored well on land installation criteria, scored second highest on environmental criteria, and had the lowest estimated cost of the six routes; however, it scored on the lower end for marine installation criteria, due to necessary work under and within Popponesset Bay (id.).

b. Positions of the Parties

Two intervenors – Mass Audubon and Save Popponesset Bay – argued that the Company's site selection process understates the environmental impacts associated with construction in and through the Popponesset Bay area, and that the record would not justify the approval of the Company's noticed alternative route, the Mashpee Town Landing Route. The intervenors' arguments and the Company's response are summarized below.

i. Mass Audubon

Mass Audubon stated that it participated in this proceeding to protect the environmental interests affected by the alternative route through Popponesset Beach and Popponesset Bay (Audubon Brief at 1). It argued that the Company's analysis does not justify approval of this route, and notes that because the primary route is clearly superior, there should be no need to use the alternative route (id.). However, Mass Audubon argued that, if the Siting Board were to approve the alternative route, it should impose a condition requiring Cape Wind to "negotiate with the Massachusetts Audubon Society a mutually acceptable easement for construction, placement, and use of the proposed transmission line beneath Popponesset Spit" (id. at 28).

Mass Audubon noted that the Siting Board's standard of review requires an applicant to establish "that it developed and applied a reasonable set of criteria for identifying and evaluating

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[47] However, Table 4-3 of the Petition, and Table 2, above, show that the New Hampshire Avenue and the Mashpee Town Landing Routes were scored equally for environmental criteria (Exh. CW-1, at Table 4-3).

alternative sites . . .” (citing CELCo, 12 DOMSB 305, at 327). Mass Audubon asserted that route selection standards should capture all environmental, cost and reliability features of the various alternatives, based upon a reasonable evaluation of available and relevant information (Audubon Brief at 14).

Mass Audubon further asserted that the Company’s consideration of environmental impacts in the site selection process was unreasonable and incomplete (id. at 14). Mass Audubon argued that, out of a total of 26 site selection criteria, only four applied to the installation of the submarine cable, and there was only one environmental criterion for the marine portion of the cable (id.; Tr. 2, at 218-219). Mass Audubon noted that for projects with far fewer marine impacts, companies have in the past used criteria based upon wetland/saltmarsh crossings, shellfish bed/tideland crossings, crossings of ACECs, and use of preferred waterway techniques (Audubon Brief at 15 citing 1998 NEPCo Decision, 7 DOMSB 333, at 374). Mass Audubon asserted that Cape Wind inappropriately limited the number of marine criteria based on its belief that the routes were essentially equivalent at the screening level for these criteria (id.). Mass Audubon noted that the Company used numerous marine criteria to distinguish between the primary and alternative routes when comparing noticed routes; it argued that these criteria cannot therefore rationally be said to be essentially equivalent (id.).

Mass Audubon stated the following factors associated with the marine portion of the route either were not included, or were insufficiently addressed, at the screening stage of the site selection process: (1) impacts on rare and endangered marine species and habitat; (2) impacts on finfish resources and habitat; (3) benthic and shellfish impacts; (4) impacts on wetland resources; (5) presence of underwater archeological resources; (6) differences in sediment characteristics; (7) number of HDD operations, in terms of both cost and the potential marine impacts; and (8) project cost (id. at 17-26).

Specifically, Mass Audubon argued that Cape Wind included rare and endangered plant and animal species and habitats as a criterion for the land portion of the route, but not the marine portion (Audubon Brief at 17). Therefore, Mass Audubon asserted, serious impacts on birds, and the associated impact on the project’s construction schedule at Popponesset Bay, were not considered in site selection (id. at 18). Mass Audubon stated that the site selection criteria do not

account for the differences in impacts on anadromous fish runs, with respect to either the number of fish runs or the presence of physical constraints upon the fishes' ability to avoid impacts (id. at 10). Mass Audubon pointed out that Popponesset Bay has two mapped anadromous fish runs that coincide with the noticed Alternative Route (Exhs. CP-1, at 5-19; EFSB-W-3(B); Audubon Brief at 9). Mass Audubon noted that sediment characteristics were not reflected in the site selection criteria, in terms of either sediment metal concentrations or grain size (Audubon Brief at 11, 12). Mass Audubon explained that sediment characteristics can affect suspension times associated with sediment displacement during marine construction, and that longer suspension times result in greater impacts upon shellfish and other benthic organisms (id. at 12 -13; Exh. EFSB-RR-43). Mass Audubon pointed to Cape Wind's data indicating that the Popponesset Bay routes have twice the benthic abundance as one or more of the alternatives and have a recreational shellfish area and two privately licensed shellfish grants, and argued that impacts to shellfishing areas would be more difficult to avoid in Popponesset Bay than along other routes (Audubon Brief at 22).

Further, Mass Audubon stated that Cape Wind did not include Popponesset Spit as a jurisdictional wetland resource (barrier beach), nor did it identify the Popponesset Bay alternatives as involving an additional coastal resource, the barrier beach (id. at 22). Mass Audubon asserted that the Company failed to account for the added marine impacts of multiple HDD operations, for the additional construction time needed for work in Popponesset Bay, or for the cost of potential seasonal restrictions on construction (id. at 25). Finally, Mass Audubon asserted that, because the cost of Alternatives 2, 3, and 4 are within 1.2% of each other, the three routes should have been scored as essentially equivalent in cost (id. at 26).

ii. Save Popponesset Bay

Save Popponesset Bay asserted that Cape Wind did not consider the status of Popponesset Spit as a barrier beach in the site selection process (SPB Brief at 2). Save Popponesset Bay argued that the Company incorrectly estimated the true costs of installing the cable along Alternative Routes 2 and 3 by ignoring the slower rates of installation within Popponesset Bay, the cost of mitigating adverse impacts, and the costs resulting from potential

time of year restrictions (id. at 6). Save Popponesset Bay noted that Popponesset Bay is a designated shellfish growing area, and that the costs of shellfish mitigation work for Alternatives 2 and 3 were not included in the analysis (id.). Save Popponesset Bay pointed out that the Company has not done any subsurface testing on Popponesset Spit to determine whether HDD will work as described (id. at 12). Save Popponesset Bay also stated that Cape Wind did not consider the possible effects of open trenching across Popponesset Spit, which the Company reserved the right to carry out as a last resort (id. at 2, 12).

iii. Company Response

Cape Wind argued that its site selection process meets the Siting Board's standard of review, in that: (1) the Company developed and applied a reasonable set of criteria to identify and evaluate potential routes for the transmission project; (2) the process ensured that Cape Wind did not overlook or eliminate any routes that are clearly superior to the primary route; and (3) Cape Wind noticed two routes that are geographically diverse (Company Reply Brief at 48). The Company suggested that Mass Audubon is arguing that the same level of information should be required for all routes considered in the route selection process; it contends that such a requirement would be impractical, unworkable, and at odds with the practices required by the Siting Board (id. at 49).

The Company argued that the Mass Audubon and Save Popponesset Bay complaints "lie with the reasonable exercise of discretion and judgment by Cape Wind's experts" in the selection of the noticed alternative route (id. at 50-51). The Company defended certain rankings challenged by Mass Audubon or Save Popponesset Bay, arguing, for example, that it was appropriate to consider Lewis Bay and Popponesset Bay as essentially similar with regard to metals in sediments, since the level of metals in both bays were below the ranges in which adverse biological impacts are observed (id.). The Company argued that the appropriate question is not whether other parties agree with its rankings, but whether its experts exercised reasonable judgment in ranking the routes (id. at 52).

The Company also disputed Mass Audubon and Save Popponesset Bay arguments regarding descriptions of its site selection process, suggesting that these parties confused:

(1) the siting criteria, used to identify the six routes; (2) the screening criteria, used to evaluate the six routes and select the primary and alternative routes; and (3) the process of comparing the impacts of the primary and noticed alternative routes (id. at 52). The Company stated that it used 14 siting criteria, of which seven focused on considerations for the submarine cable route and landfall, and 26 screening criteria, of which six involved specific marine considerations (Company Reply Brief at 54). The Company therefore concluded that, overall, it applied 13 marine-based criteria in its route selection process, not just four as stated by Mass Audubon (id.).

c. Analysis

To identify route options for further evaluation, the Company first identified an area that would encompass all viable routing options given the limitations imposed by the location of the ESP and the Barnstable Switching Station. The Company used 14 site identification criteria, which it referred to as siting criteria, to identify six potential routes within this area. It then used 26 screening criteria, including installation, environmental, cost and reliability factors, to evaluate these six routing alternatives. The Company weighted the importance of each criterion as low, medium and high, and for each of the identified alternatives, multiplied the unweighted assigned scores for the 26 criteria by the weights to produce weighted scores. The Company used the weighted scores to balance the environmental impacts, technical issues, costs and reliability of the six routing alternatives.

In past decisions, the Siting Board has found various types of criteria to be appropriate for identifying and evaluating route options for transmission lines and related facilities. These types of criteria include natural resource issues, land use issues, community impact issues, cost and reliability. CELCo Decision, 12 DOMSB 305, at 331; 1998 NEPCo Decision, 7 DOMSB 333, at 381; New England Power Company, 4 DOMSB 109, at 167 (1995) ("1995 NEPCo Decision"). The Siting Board also has found the specific design of scoring and weighting methods for chosen criteria to be an important part of an appropriate site selection process, and in some cases has identified the appropriate allocation of weights among the broad categories of environmental

concerns, cost and reliability.[48] CELCo Decision, 12 DOMSB 305, at 331; 1997 BECo Decision, 6 DOMSB 208, at 285; Boston Edison Company, 19 DOMSC 1, at 38-42 (1989).

Here, the Company developed 14 siting criteria, which it used to identify potential routes, and 26 screening criteria, which it used to evaluate the routing options. These criteria generally encompass the types of criteria that the Siting Board previously has found to be acceptable. The Company also developed a quantitative system for ranking routes based on compilation of weighted scores across all criteria; this is a type of evaluation approach the Siting Board previously has found to be acceptable.

However, questions have been raised about whether certain categories of environmental criteria, including marine impacts from underwater cable installation and visual impacts of overhead construction, were under-represented in the Company's site selection process. As a related matter, the Company also has been asked about the merits of other possible routes, which might have been preferred if marine and visual impacts had been given greater weight. The Siting Board addresses these questions below.

As an initial matter, the Siting Board notes that it requires applicants to analyze the primary route in greater detail than the alternative route, and to analyze both the primary and alternative routes in far greater detail than the routes which are discarded as a result of the site selection process. Thus, a disparity in the level of detail available in the record on the different routes does not indicate a flaw in the site selection process. However, the site selection analysis must be detailed enough to capture any significant differences between the route options, and the criteria used to evaluate the various route options must be carefully selected and weighted to ensure that an unintended bias does not lead the applicant to overlook or eliminate superior routes.

Mass Audubon and Save Popponesset Bay argue that the 26 screening criteria did not sufficiently address the environmental impacts associated with the marine portion of the routes;

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[48] For example, the CELCo Decision, 12 DOMSB 305, at 331, the Company used weighted scores to balance the community/environmental impacts, technical issues and costs, and the Siting Board stated that the allocation of approximately half of the overall weight to community/ environmental and half to technical/cost was reasonable.

they therefore conclude that the development of the screening criteria was unreasonable and incomplete. They assert that the following specific areas should have been included or addressed in more depth: rare and endangered marine species and habitat; finfish resources and habitat; benthic and shellfish habitat; wetland resources; archeological resources; sediment characteristics; costs and impacts of multiple HDD operations; and costs. The Company counters that the routes were deemed to be essentially equivalent for certain of these criteria, and that other criteria were appropriately analyzed. In addition, it notes that a total of 13 marine-related criteria were used in the Company's analysis, when both the siting and screening criteria are taken into account.

Regarding the Company's argument that a total of 13 marine-related criteria were applied, the Siting Board notes that it is not appropriate to point to a combination of the siting and screening criteria, as they each address one iteration of the siting process, and therefore should be assessed separately. Mass Audubon and Save Popponesset Bay have not challenged the Company's choice of siting criteria; instead, their critique focuses on the screening criteria used to evaluate, score and rank the six routes. In its quantitative screening analysis, the Company used four marine-based criteria – marine transmission line length, number of marine HDDs, navigational impacts, and eelgrass – which together accounted for 21% of the total weight for screening criteria.[49] The Company asserted that it qualitatively considered two other marine-based criteria – fish runs and shellfish – but did not incorporate them into the quantitative analysis, as it considered the impacts to be equivalent along all routes. The Siting Board notes that the inclusion of these two criteria in the quantitative analysis would have increased the weight given to marine criteria, but not altered the Company-generated ranking of the six routes, given the Company's qualitative opinion of the two criteria. The Siting Board urges future applicants to include all important criteria in any quantitative ranking of potential routes, in order to eliminate confusion about the decision-making process.

The record indicates that the Company considered, in greater or lesser detail, six marine-

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[49] The total weight of all the screening criteria is 52, of which the discrete marine transmission criteria account for 21%, compared to 73% for land-based criteria, 4% for cost, and 2% for reliability.

related criteria in ranking the six routes, although only four were formally quantified. Of these four, only one (eelgrass) was classified as "environmental," although two others – HDD and navigational impacts – represent environmental criteria for which project impacts appeared significant and necessary mitigation potentially costly. However, even assuming that the Company were correct in treating the impacts of fish runs and shellfish as equivalent along all routes, the Company's analysis appears to be missing certain criteria that would help distinguish the level of environmental impacts and construction difficulties associated with the different landfalls. Specifically, the review of endangered species appears to have been limited to species along the land portion of the route, leading the Company to overlook impacts to the piping plover; and there was no recognition of the status of Popponesset Spit as a barrier beach. In short, the Company's screening criteria addressed the costs and impacts of on-land construction in greater detail than the costs and impacts of construction under water or at the landfall; this disparity may have led the Company to overlook screening-level differences between routes using the Lewis Bay and Popponesset Bay landfalls.

With respect to visual impacts, the record shows that three routes, including the Mashpee Town Landing Alternative, would require extensive tree clearing along an approximately eight-mile segment of the NSTAR ROW through a largely built-up area, significantly increasing the visibility of existing and any new transmission lines that occupy the ROW. The Company maintained that the overhead segment of each route would be located where there are existing overhead transmission facilities, and that the tree/vegetation removal criterion was a suitable proxy for visual impacts along the NSTAR ROW. Given that the visual impacts of overhead construction would be a long-term issue affecting half or more of the on-land portion of the three routes, it is unclear that the issue was adequately represented by one criterion[50] encompassing a range of issues of which visual impacts was one, and which accounted for only 1 of 13 environmental and 26 total criteria, in the screening analysis. Further, by relying on tree removal as the sole indicator of visual impacts along the NSTAR ROW, the Company failed to take into account other factors relating to visual impact sensitivity, such as the residential density of

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[50] As indicated in n.45, above, the shade tree criterion was applied to the in-street portion of the route, not the NSTAR ROW.

affected areas, potential visibility from different directions, and potential visibility of the new substation facilities. In recent Siting Board cases concerning transmission lines with overhead construction options, two companies included visual impacts specifically, and several companies included residential density and other visual sensitivity indicators, as discrete environmental/land use criteria for selecting routes. ANP Blackstone Energy Company, 8 DOMSB 1, at 216-217 (1999) ("ANP Blackstone"); 1997 BECo Decision, 6 DOMSB at 208, 278; New England Power Company, 5 DOMSB 1, at 44-47 (1996); 1995 NEPCo Decision, 4 DOMSB 109, at 163-166.

Overall, the record indicates that the Company's choice of screening criteria may not have captured fully (1) the screening-level differences between the costs and impacts of the Lewis Bay and Popponesset Bay landfalls, and (2) the potential visual impacts associated with overhead lines. The Siting Board notes that the Company's primary route uses the lower-impact Lewis Bay landfall, and has no overhead component. The parties do not claim, and the record does not indicate, that the Company erred in selecting the primary route as the first choice among its identified routes. Similarly, the Company's consideration of additional possible routes identified by staff provided no indication that the Company may have overlooked a route that would be superior to the primary route. Accordingly, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner which ensures that it has not overlooked or eliminated any routes which are clearly superior to the proposed project.

However, the Siting Board notes that the issues raised about the Company's site selection process were significant to the Company's ranking of the Mashpee Town Landing Route, which resulted in its selection as the noticed alternative route. The identified shortcomings in the site selection process call into question the merit of the alternative route as a fallback to the primary route. The Siting Board notes that, if the Company were to abandon its primary route and seek approval of the alternative route, it might have difficulty demonstrating that it had not overlooked a clearly superior route without significant further analysis.

3. Geographic Diversity

The Company stated that its site selection process resulted in a spectrum of alternative routes that reflects an appropriate degree of geographical diversity (Exh. CW-1, at 4-32). The Company stated that the primary and alternative routes are geographically diverse, noting that the primary route makes landfall in Yarmouth and traverses Barnstable, while the alternative route makes landfall nearly 10 miles away in Mashpee (Company Reply Brief at 48).

The Company considered six geographically diverse transmission line routes to connect the wind farm with the Barnstable Switching Station. Consequently, the Siting Board finds that the Company has identified a range of practical route alternatives with some measure of geographic diversity.

4. Conclusions on the Site Selection Process

The Siting Board has found that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner which ensures that it has not overlooked or eliminated any routes 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 the Company has demonstrated that it examined a reasonable range of practical siting alternatives.

B. Description of the Primary and Alternative Routes

The proposed project along the primary route would be an approximately 18.1-mile transmission line connecting at one end to the ESP of the wind farm and at the other end to the Barnstable Switching Station, located off Mary Dunn Road (Exhs. CW-1, at 1-1; EFSB-RR-84). The primary route would begin in Nantucket Sound, in the area of Horseshoe Shoal, pass to the west of underwater ledges known as Bishop and Clerks, proceed northerly across WSW Ledge, turn northeast at a point west of Great Island, follow near the east edge of the Hyannis ship channel past the Egg Island sandbar, then turn east-northeast across Lewis Bay to a landfall at New Hampshire Avenue in Yarmouth (Exhs. CW-1, at 1-11; EFSB-5(b)).

At the landfall, the primary route would connect with a 115 kV transmission line at an underground transition vault located on New Hampshire Avenue approximately 10 feet south of Shore Road; from there it would proceed in a single underground in-street ductbank for approximately 4 miles to the existing NSTAR ROW at Willow Street in Yarmouth (Exhs. CW-1, at 1-4; CO-3; EFSB-RR-14; Tr. 6, at 755).[51] The in-street route would follow New Hampshire Avenue northward, merging with Berry Avenue, continuing across Route 28 and north on Higgins Crowell Road (Exh. CW-1, at 1-12). The route then would continue north on Willow Street, passing under Route 6, to an intersection with the existing NSTAR 115 kV line north of Summer Street (id.). The route would then proceed underground along NSTAR's ROW, at a depth of 32 inches for approximately 1.9 miles to the Barnstable Switching Station, crossing again under Route 6 (id. at 1-10 and 1-12).[52]

The alternative route would run approximately 24.2 miles from the ESP to the Barnstable Switching Station, with an intermediate connection point at NSTAR's Mashpee Substation (Exh. CW-1, at 1-12 to 1-13). The alternative route would begin in Horseshoe Shoal, traveling in Nantucket Sound to Popponesset Spit at the entrance of Popponesset Bay (id. at 1-12, 4-8). The alternative route would cross under Popponesset Spit via an approximately 1000-foot HDD to avoid impacts to the barrier beach (id. at 4-8; Exh. MA-32). The alternative route would then continue through Popponesset Bay to a landfall at the Mashpee Town Landing (Exh. CW-1, at 1-13).

The Company stated that the alternative route would make landfall via a second HDD, connect with a 115 kV transmission line in an underground transition vault, and then proceed in a single underground in-street ductbank for approximately 1.9 miles to the existing NSTAR ROW off Orchard Road (id. at 1-4). From the transition vault, the alternative route would follow Mashpee Neck Road north to Orchard Road, then turn onto a proposed street located off Orchard Road and follow it to NSTAR's Mashpee Substation, a 115 kV substation located on an

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[51] The ductbank would be approximately 5 feet, 8 inches wide by 2 feet deep and would be buried approximately 64 inches in-street (Exh. CW-1, at 1-10).

[52] The 1.9-mile portion of the NSTAR ROW begins in Yarmouth and enters Barnstable approximately 1,000 feet in from Willow Road (Exh. EFSB-2, Att. 2-e).

NSTAR-owned 10.6-acre parcel at the intersection of Orchard Road and Route 28 (id. at 4-10). At the Mashpee Substation, a new riser station would be built in an approximately 50 by 100 foot area within the site (id.).[53] The alternative route would then travel easterly for 12.3 miles overhead along the NSTAR ROW from the Mashpee Substation to the Barnstable Switching Station, crossing numerous roads including Main Street, Route 28, Route 149, Osterville-West Barnstable Road, Old Stage Road, Shootflying Hill Road, Route 132 and Phinney's Lane, and would terminate at the Barnstable Switching Station off Mary Dunn Road (id.; Exh. EFSB-L-28).

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

1. Standard of Review

In implementing its statutory mandate to ensure a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, the Siting Board requires a petitioner to show that its proposed facility is sited at a location that minimizes costs and environmental impacts while ensuring a reliable energy supply. To determine whether such a showing is made, the Siting Board requires a petitioner to demonstrate that the proposed site for the facility is superior to the noticed alternatives on the basis of balancing cost, environmental impact, and reliability of supply. CELCo Decision, 12 DOMSB 305, at 334; MMWEC Decision, 12 DOMSB 1, at 127; 1997 BECo Decision, 6 DOMSB 208, at 287.

An assessment of all impacts of a proposed 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. A facility which achieves that appropriate balance thereby meets the Siting Board's statutory requirement to minimize environmental impacts at the lowest possible cost. CELCo Decision, 12 DOMSB 305, at 335; MMWEC Decision, 12 DOMSB 1, at 128; 1997 BECo Decision, 6 DOMSB 208, at 287.

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[53] The riser station would include a new ring bus, consisting of five new circuit breakers, providing connections to NSTAR's existing Line 115 (Exh. CW-1, at 1-13 and 1-14).

The Siting Board recognizes that an evaluation of the environmental, cost and reliability trade-offs associated with a particular proposal must be clearly described and consistently applied from one case to the next. Therefore, in order to determine if a petitioner has achieved the proper balance among various 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 to enable the Siting Board to make such a determination. The Siting Board then can determine whether environmental impacts would be minimized. Similarly, the Siting Board must find that the petitioner has provided sufficient cost and reliability information in order to determine if the appropriate balance among environmental impacts, cost, and reliability would be achieved. CELCo Decision, 12 DOMSB 305, at 336; MMWEC Decision, 12 DOMSB 1, at 128; Commonwealth Electric Company, 5 DOMSB 273, at 337 (1997) ("ComElec Decision").

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

2. Environmental Impacts

a. Marine Construction Impacts

In this section, the Siting Board reviews the environmental impacts associated with installing the proposed underwater transmission lines seaward of the seawall at New Hampshire Avenue, for the primary route, and seaward of the landfall in Mashpee, for the alternative route.

i. Construction Techniques

The Company stated that it would use jet-plowing as the primary means of installation for the submarine transmission cables (Exh. EFSB-C-3). The Company described jet-plowing as the installation and burial of submarine cables using a jet plow blade mounted on two skids that can serve as pontoons by adjustment of their buoyancy (id.; Tr. 7, at 940). The jet plow has no propulsion of its own, but is towed along the seabed by a cable-laying barge, generally within 50 feet of the designated centerline (Exh. EFSB-C-3; Tr. 7, at 913-914). In deeper water, the cable-laying barge progresses forward by winching itself toward anchors placed ahead of it by anchor-handling tugs (Exh. MA-10; Tr. 7, at 943-944). The Company stated that the blade of the jet plow is fitted with nozzles that release a total of 2500 to 9000 gallons of seawater per minute at velocities of 143 to 235 feet per second (Exh. EFSB-RR-41). As the jet plow is towed along the seabed, the blade cuts a continuous trench by fluidizing the sediments in the trench to a predetermined depth (Exh. EFSB-C-3; Tr. 7, at 936-937). The Company stated that there are no indications of shallow bedrock beneath the seafloor sediments, and that the entire route is suitable for jet-plowing (Exhs. EFSB-W-11; CW-CJN/SBW-2-R at 13; Tr. 8, at 1066-76).[54] The Company indicated that, as the trench is formed by the jet plow, cable is fed from a turntable on the barge and settles into the trench under its own weight (Exh. EFSB-C-3). Depth of burial is controlled by the depth of the jetting blade (Exh. MA-6). The Company stated that the sediment temporarily suspended by the pressurized seawater then resettles, burying the cable to depth (id.; Exh. EFSB-RR-44).

The Company indicated that near the shore, it would use anchors and spuds to station the cable-laying barge and would use either a smaller jet plow or the same jet plow tended by a smaller barge to carry the hydraulic pumps (Exh. MA-10; Tr. 7, at 943-944, 952). The Company stated that the construction equipment would be diesel powered and that it expected no refueling of vessels within the job site (Exhs. MA-40; MA-42; Tr. 2, at 318). The Company stated that the tugboats that would be used are standard for the region (Exh. MA-42).

The Company explained that the jet-plowing process would be conducted twice, to create

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[54] The Company stated that the existing cable from Harwich to Nantucket was installed by jet plow to the same depth as the proposed transmission line (Exh. EFSB-W-11).

two trenches, one for each cable circuit (Exh. MA-6). The Company stated that the cables would be buried at a depth of 6 to 8 feet below the seabed, and that the two trenches would be spaced approximately 20 feet apart (Exhs. CW-1, at 1-8, Fig. 7; MA-4).

The Company stated that it would use hand jet-plowing and direct trenching to install cable in inshore areas of the primary route (Tr. 7, at 882-884). Direct trenching would be used for the first 40 feet from the seawall, and hand-jetting would be used the next 50 feet (Exhs. EFSB-RR-38; EFSB-RR-39). Hand jets fluidize sediments to allow the cable to descend to a depth within the seabottom, like ordinary jet-plowing, but the jets are hand carried (Tr. 7, at 951). Also on the primary route, the Company stated that installation of the cables at the landfall would require the excavation of an area at the foot of the existing seawall, construction of a temporary cofferdam, and replacement of the seawall (Exh. CW-CO-3; Tr. 17, at 2218-19).

On the alternative route, the Company specified the use of HDDs at two locations – at the landfall, and underneath Popponesset Spit. The Company indicated that at each HDD location there would be four separate holes drilled from the entrance point, each involving boring a pilot hole, reaming out the pilot hole, pulling 12-inch diameter plastic conduit back through the borehole, and then pulling transmission cable through the conduit (Exh. CW-1, at 1-8; Tr. 2, at 775; Tr. 7, at 866-869). Before the conduit is installed, the hole would be maintained by keeping it pressurized with bentonite (Tr. 7, at 869). The Company explained it would excavate a pit at the exit point, prior to boring the HDDs, in order to receive the borehole beneath the seabottom, and to transition to jet-plowing (Exh. CW-1, at 1-8).

The Company stated that the HDD under Popponesset Spit would consist of four 1000-foot long boreholes extending approximately 60 feet below the mean low water elevation (Exh. EFSB-C-2(B), Att.; Tr. 20, at 2742). The Company stated that the Popponesset Spit boreholes would be staged from barges positioned in sub-tidal areas off the spit, with the entrance point approximately 300 feet into Nantucket Sound and the exit point approximately 300 feet into Popponesset Bay (Exhs. EFSB-C-1; EFSB-W-16; SPB-3; MA-28; Tr. 2, at 261; Tr. 7, at 860; Tr. 8, at 1026). A 45-foot by 63-foot area around the entrance point would be isolated by a cofferdam (Exh. EFSB-RR-37). The Company stated that if the Popponesset Spit HDDs were to prove unsuccessful, another site on the spit would be tried (Exh. EFSB-C-5). The