COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Council

In the Matter of the Petitions of Boston Edison Company for Approval of Its 1990 Long Range Forecast of Electric Requirements and Resources and for Approval to Construct a Bulk Generating Facility and Ancillary Facilities	)	EFSC 90-12/90-12A (PHASE I)

FINAL DECISION

Frank P. Pozniak
Michael D. Ernst
Robert D. Shapiro
Hearing Officers
April 10, 1992

On the Decision:

Robert J. Harrold
Brian J. Abbanat

John Howat
Michael Jacobs
Marla Simon

APPEARANCES: Douglas S. Horan, Esq.
William S. Stowe, Esq.
Mary Elizabeth Stanton-Cotter, Esq.
Boston Edison Company
800 Boylston Street
Boston, MA 02199
FOR: Boston Edison Company
Petitioner

Jerrold Oppenheim, Esq.
Assistant Attorney General
Regulated Industries Division
Office of the Attorney General
131 Tremont Street
Boston, MA 02108
FOR: Scott Harshbarger, Attorney General
Intervenor

John J. O'Brien, Esq.
Testa, Hurwitz & Thibeault
52 State Street
Boston, MA 02109
FOR: Town of Weymouth
Town of Weymouth Board of Health
Weymouth Department of Public Works
Intervenors

Alan Nogee
MASSPIRG
29 Temple Place
Boston, MA 02111
FOR: MASSPIRG
Pro Se
Intervenor

Armond Cohen, Esq.
Conservation Law Foundation
3 Joy Street
Boston, MA 02108
FOR: Conservation Law Foundation
Intervenor

Jeffrey M. Bernstein, Esq.
Kenneth Kimmel, Esq.
Bernstein & Bronstein
31 State Street, Suite 300
Boston, MA 02109
FOR: Town of Uxbridge
Town of Uxbridge Planning Board
Blackstone River Valley National
Heritage Corridor Commission
Intervenors

Mary Beth Gentleman, Esq.
Foley, Hoag & Eliot
One Post Office Square
Boston, MA 02109
FOR: New England Cogeneration Association
Intervenor

Nancy M. Zerfoss
15 Fisk Avenue
East Weymouth, MA 02189
FOR: Weymouth Against the Edgar Revitalization
Pro Se
Intervenor

Andrew J. Newman, Esq.
Rubin and Rudman
50 Rowes Wharf
Boston, MA 02110
FOR: Energy Consortium
Intervenor

Cynthia Walenty, Recording Secretary
South Uxbridge Community Association
170 Providence Street
Uxbridge, MA 01569
FOR: South Uxbridge Community Association
Pro Se
Intervenor

Daniel Richardson
South Street
Uxbridge, MA 01569
Pro se
Intervenor

Gail Epstein
RFD 1 Box 130
Uxbridge, MA 01569
FOR: Uxbridge Parents for Clean Air and Water
Pro Se
Intervenor

Richard and Suzanne Dauphin
328 Elmwood Avenue
Uxbridge, MA 01569
Pro Se
Intervenor

Michael J. Lang
74 Cotton Avenue
Braintree, MA 02184
FOR: East Braintree Civic Association
Pro Se
Intervenor

Rep. Richard T. Moore
State House, Room 167
Boston, MA 02133
FOR: Blackstone River and Canal Commission
Pro Se
Intervenor

Richard and Leslie Sahagian
282 Elmwood Avenue
Uxbridge, MA 01569
Pro Se
Interested Person

Terrance J. Hamilton, Esq.
Casner & Edwards
30 Federal Street
Boston, MA 02110
FOR: Save the Bay, Inc.
Interested Person

Jennifer L. Miller, Esq.
General Counsel
Boston Gas Company
One Beacon Street
Boston, MA 02108
FOR: Boston Gas Company
Interested Person

Richard and Jacquelyn Aloise
385 Chestnut Street
Uxbridge, MA 01569
Pro Se
Interested Person

Ross D. Ain, Esq.
Van Ness, Feldman & Curtis
1050 Thomas Jefferson St., N.W., 7th Fl.
Washington, D.C. 20007
FOR: Cogen Technologies
Interested Person

Stephen Ostrach, Esq.

New England Legal Foundation
150 Lincoln Street
Boston, MA 02111
FOR: New England Council
Associated Industries of Massachusetts
Greater Boston Chamber of Commerce
Interested Person

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The Energy Facilities Siting Council hereby APPROVES the 1990 demand forecast of the Boston Edison Company at the time of the reforecast.

I. INTRODUCTION

A. Background

Boston Edison Company ("Boston Edison," "BECo," or "the Company") is an investor-owned utility engaged in the generation, purchase, transmission, distribution, bulk power sale, and retail sale of electrical energy. In 1991, Boston Edison provided retail service to 40 cities and towns in the greater Boston metropolitan area (Exh. BE-2, p. 1), sold approximately 12,812,000 megawatt-hours ("MWh") of electricity (Exh. HO-D-111), and experienced a peak demand of 2,652 megawatts ("MW") (id.). In the same year, residential customers received approximately 26 percent of the Company's total annual energy sales; commercial customers received 55 percent; industrial customers received 13 percent; and the Massachusetts Bay Transportation Authority ("MBTA"), Massachusetts Water Resources Authority ("MWRA"), street lighting, and municipal sales combined received 6 percent (id.). Losses and internal use accounted for an addition of 8.8 percent of sales to energy requirements (id.). Boston Edison is a summer peaking system (Exh. BE-2, p. 145).

In its review of Boston Edison's previous filing, the Siting Council approved the Company's demand forecast without orders or conditions. Boston Edison Company, 18 DOMSC 201, 208-223 (1989) ("1989 BECo Decision"). In that decision, the Siting Council also approved BECo's supply plan but ordered the Company to: (1) include as part of its supply planning process a comprehensive analysis of the Pilgrim power plant, including sensitivity analyses for certain operating and cost variables; (2) consider for inclusion in its array of available resource options a wider range of the generation technologies which could contribute to a least-cost supply plan; (3) implement a methodology which includes an adequate consideration

of the environmental impacts of alternative resource options; and (4) diversify the sources consulted inside and outside of the Company for the purposes of developing the probabilities assigned to each variable forecast in the company's risk management process. 1989 BECo Decision, 18 DOMSC at 224-282.

B. Procedural History

On May 1, 1990, the Company filed with the Siting Council its 1990 long-range demand forecast, supply plan and a proposal to build a 306 MW gas-fired electric generating facility in the Town of Weymouth, Massachusetts ("Weymouth"), with an alternative site in the Town of Uxbridge, Massachusetts ("Uxbridge") (Exhs. BE-1, BE-2, BE-3, BE-6).

On June 22, 1990, the Siting Council and Department of Public Utilities ("Department" or "DPU") issued a joint notice of adjudication and public hearing concerning this proceeding (EFSC 90-12/12A) and three petitions filed with the DPU by BECo as follows: (1) a petition for a zoning exemption to site the proposed generating facility, the Edgar Energy Park Project ("Edgar") (D.P.U. 90-106); (2) a petition for approval of investments in a new subsidiary to construct and operate Edgar (D.P.U. 90-117); and (3) a petition for preapproval of the Edgar construction costs and the Edgar power purchase agreement[1] (D.P.U. 90-118). On July 27, 1990, the Siting Council and DPU signed a joint memorandum of understanding ("MOU") which set forth the procedure and a tentative schedule for these interrelated proceedings.[2]

1/ See 220 C.M.R. 9.00 et seq.

2/ The MOU was designed to coordinate the review by the Siting Council and the DPU of the various Edgar-related proceedings. The MOU was designed to eliminate unnecessary overlap in the two agencies' proceedings while preserving the rights of all parties to the proceedings. The MOU proposed a schedule for joint publication and notice, time periods for intervention, initial joint public hearings, a joint procedural conference, pre-filed testimony, discovery and the start of evidentiary hearings.

The Siting Council held public hearings in Uxbridge, Massachusetts, on July 23, 1990, and in Weymouth, Massachusetts, on July 24, 1990. BECo provided notice of the public hearings and adjudication as directed by the Hearing Officer.

A notice of intervention was filed by the Office of the Attorney General of the Commonwealth ("Attorney General") on July 6, 1990. Motions to intervene subsequently were filed by the Conservation Law Foundation ("CLF"), Distrigas of Massachusetts Corporation ("DOMAC"), the Energy Consortium ("TEC"), Massachusetts Public Interest Research Group ("MASSPIRG"), Nancy Zerfoss, Weymouth, the Weymouth Board of Public Health, the Weymouth Department of Public Works, Richard and Suzanne Dauphin, East Braintree Civic Association, Blackstone River and Canal Commission, Blackstone River Valley National Heritage Corridor Commission, Uxbridge, the Uxbridge Planning Board, Uxbridge Parents for Clean Air and Water, Daniel Richardson, and South Uxbridge Community Association. Motions to participate as interested persons were filed by Richard and Jacquelyn Aloise, Robert and Leslie Sahagian, Boston Gas Company, Cogen Technologies, Save the Bay, Inc., and New England Cogeneration Association ("NECA").

On August 16, 1990, NECA filed a motion to substitute its petition to participate as an interested person with a petition to intervene. On August 30, 1990, Nancy Zerfoss submitted a letter clarifying her motion to intervene. Ms. Zerfoss stated that the intent of her original motion was to request intervenor status on behalf of the citizen group, Weymouth Against The Edgar Revitalization ("WATER"). On September 14, 1990, DOMAC requested that its motion to intervene be considered instead as a motion to participate as an interested person. At a prehearing conference on September 14, 1990, all motions for intervention and all motions for interested person status were granted (September 14, 1990 Prehearing Conference, Tr. pp. 6-19).

On November 28, 1990, MASSPIRG filed a Motion to Compel Boston Edison to respond to an information request which asked the Company to recalculate its forecast of energy and peak load requirements utilizing updated inputs. At a technical session on December 20, 1990, Boston Edison agreed to provide revised base case and low case energy and peak load forecasts. On February 6, 1991, the Company filed a reforecast using August, 1990 Data Resources, Inc. ("DRI") data.

The Siting Council held 49 evidentiary hearings beginning on February 22, 1991, and ending on June 21, 1991. During the course of the hearings, BECo presented 12 witnesses: Robert J. Cuomo, manager of forecasting and market analysis at BECo, who testified regarding energy and peak demand forecasts; Gregory R. Sullivan, manager of the distribution and planning section of the electrical engineering and station operations department at BECo, who testified concerning the need for transmission and distribution facilities; Johannes H. Baumhuaer, principal engineer at BECo, who testified regarding the Performance Management Study; William P. Killgoar, manager of energy resource planning and forecasting at BECo, who testified concerning BECo's long-range integrated resource plan ("BECo Resource Plan"); Paul D. Vaitkus, head of supply planning at BECo, who testified regarding the supply-side planning portion of the BECo Resource Plan; Richard S. Hahn, vice-president of marketing at BECo, who testified concerning the BECo Resource Plan and Pilgrim Analysis; Kathleen A. Kelly, manager of demand-side planning, monitoring, and evaluation at BECo, who testified regarding demand-side planning; John F. Carlin, manager of fossil fuel planning, procurement, regulation and performance at BECo, who testified concerning fuel supply; Cameron H. Daley, senior vice-president for power supply at BECo, who testified regarding project approach and least cost analysis; John J. Reed, president of Reed Consulting Group, who testified concerning the power purchase agreement between BECo and Edgar Electric Energy Corporation ("EEEC"); Douglas C. Schmidt, project manager for

engineering and licensing for Edgar, who testified regarding project design and costs, water supply and alternative sites; and Lillian N. Morgenstern, principal environmental planner at BECo, who testified concerning potential environmental impacts of Edgar and alternative sites.

Weymouth presented the testimony of 13 witnesses: John F. Buckley, water and sewer superintendent for Weymouth, who testified regarding water supply; James J. Pescatore, engineer for Camp, Dresser & McKee, who testified concerning water supply; William C. Woodward, conservation administrator for Weymouth, who presented testimony regarding water quality; Jeffrey R. Coates, inspector of buildings for Weymouth, who presented testimony concerning zoning issues; Robert S. Knorr, deputy director of the Division of Environmental Health Assessment at the Massachusetts Department of Public Health, who testified regarding health-related issues; Jane Gallahue, commissioner of public health in the City of Quincy, who testified concerning health issues; Mary McAdams, chairperson of the Weymouth Board of Health, who testified regarding health issues; Karen M. Durgin, chemicals management and surveillance officer for the Weymouth Board of Health, who testified concerning hazardous conditions at the primary site; Maura Kelly, member of the Weymouth Board of Health, who presented testimony regarding elevated cancer rates in the area around the primary site; Robert Hedlund, State Senator for Weymouth, who testified concerning health problems; Robert A. Cerasoli, State Representative for Weymouth and Quincy, who presented testimony regarding health problems; David Jenkins, a former member of the Weymouth Local Assessment Committee, who testified regarding existing health problems in Weymouth; and Brian J. McDonald, vice chairman of the Weymouth Board of Selectmen, who presented testimony concerning health issues.

The Attorney General presented one witness: Susan Geller, an economist for the Attorney General, who testified regarding the BECo Resource Plan.

CLF presented two witnesses: Paul L. Chernick, president of Resource Insight, Inc., who testified concerning demand-side analysis and the BECo Resource Plan; and Susan E. Coakley, technical coordinator for CLF, who testified regarding demand-side analysis.

Uxbridge presented five witnesses: Russell Cohen, Blackstone River coordinator for the Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement, who testified concerning water supply and water quality issues at the alternative site; Noelle F. Lewis, water quality specialist for Save the Bay, Inc., who testified regarding water quality issues at the alternative site; and James Cormier, former chairman of the Growth Study Committee for Uxbridge, who testified concerning land use issues; James Pepper, executive director of the Blackstone River Valley National Heritage Corridor Commission ("Corridor Commission"), and Douglas M. Reynolds, historian for the Corridor Commission, who both testified on issues related to the alternative site in Uxbridge.

The Hearing Officers entered 569 exhibits into the record, primarily consisting of responses to information requests and record requests. The Attorney General entered 161 exhibits into the record. BECo entered 125 exhibits into the record. CLF entered five exhibits into the record. MASSPIRG entered 73 exhibits into the record. NECA entered 40 exhibits into the record. TEC entered one exhibit into the record. Uxbridge entered 101 exhibits into the record. WATER entered 52 exhibits into the record. Weymouth entered 26 exhibits into the record.

The initial briefs of the Attorney General, CLF, MASSPIRG, NECA, Uxbridge, WATER, Weymouth and of the New England Council, the Associated Industries of Massachusetts and the Greater Boston Chamber of Commerce ("Business Associations")[3] were filed on July 26, 1991. BECo's initial brief was filed on August 16, 1991. The reply briefs

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3/ On June 17, 1991, the Business Associations filed a motion, subsequently granted, to participate as an interested person for the sole purpose of filing a brief.

of the Attorney General, MASSPIRG, NECA and WATER were filed on September 3, 1991. BECo's reply brief was filed on September 13, 1991.

At a procedural conference on October 16, 1991, the Hearing Officers denied two motions by WATER to reopen the record and a third such motion, in part, but reminded all parties of their ongoing obligation to update existing exhibits and testimony to ensure that the decision is based upon an accurate record (Procedural Conference, October 16, 1991, Tr. pp. 4-52).[4] The Hearing Officers also granted motions by Boston Edison to include new peak load data in the record and by MASSPIRG to supplement the record with new DRI data on the economy (id., pp. 52-69).

On January 13, 1992, the Siting Council staff issued a Tentative Decision for the first phase of this proceeding ("Phase I").[5] After reviewing the comments from parties on the Tentative Decision, the Siting Council staff presented a memorandum to the Siting Council on January 24, 1992, withdrawing the Tentative Decision for further review and consideration. On January 31, 1992, the Siting Council staff issued its Fifth Set of Information Requests to the Company, including a request for BECo to recalculate its load forecast using updated inputs. The Company prepared this reforecast using August, 1991 DRI data and filed it on February 28, 1992.[6]

4/ All three WATER motions were entitled "W.A.T.E.R. Motion to Compel Correction of the Record," filed with the Siting Council on July 25, July 26, and September 26, 1991, respectively. The Hearing Officers, however, considered these motions as motions to reopen the record, because each contained an attachment which WATER asked to be included in the record.

5/ For a discussion of the division of this Decision into Phase I and Phase II, see Section I.C, below.

6/ This reforecast and related information filed on February 28, 1992 have been marked for identification as "Exhibit HO-D-111" and entered into the record. Subsequent references in this Decision to "reforecast" shall mean this February, 1992 forecast.

MASSPIRG and the Attorney General submitted comments on the reforecast on March 12 and March 13, 1992, respectively.[7]

By letters dated January 31 and February 14, 1992, Boston Edison also notified the Siting Council that it was revising its projected in-service date for Edgar from January 1, 1994 to January 1, 1996. At a procedural conference on March 2, 1992, the Siting Council directed the Company to update the record on four Phase I issues after consultation with the other parties (March 2, 1992 Procedural Conference, Tr. pp. 56, 77, 79-80).[8] On March 12, 1992, the Company filed an update to the record on those four Phase I issues plus additional information, including a new plan to reduce its load management programs ("March 1992 Record Update").[9] The March 1992 Record Update included a two-page cover letter with comments on the update. On March 16, 1992, the Attorney General and MASSPIRG filed comments on the March 1992 Record Update.

7/ Although the Company did not submit comments on the reforecast, we assume, where appropriate, that the Company's comments on the first reforecast filed in February, 1991 also apply to the reforecast, because both reforecasts used the same methodology (see Section II.B.2, below).

8/ The Company was directed to update the record on four specific issues: (1) the status of the Massachusetts Yankee nuclear power plant in Rowe, Massachusetts ("Yankee Rowe"), (2) the status and projected attrition rates for planned capacity additions from BECo's second request for proposals ("RFP") for capacity additions from non-Company sources (RFP #2), (3) the status and projected attrition rates for planned capacity additions from BECo's RFP #3, and (4) the projection of savings from BECo's conservation and load management ("C&LM") programs, specifically from BECo's commercial and industrial ("C&I") conservation programs (March 2, 1992 Procedural Conference, Tr. pp. 26-30, 56-57, 67-74, 77, 79-80). The parties were expressly asked whether any other issues needed updating in order to determine BECo's resource need for 1996 and 1997, and none were specified by any parties (March 2, 1992 Procedural Conference, Tr. pp. 77-79).

9/ On March 9 and March 13, 1992, the Attorney General issued information requests to the Company. On March 18 and March 19, 1992, the Company filed its response to each of these information requests.

C. Outstanding Motions Relating to Phase I

In its comments submitted on March 12, 1992, MASSPIRG included a Motion to Compel, requesting that the Company recalculate its residential load forecast using an updated projection or the actual figures, if currently available, for the number of BECo residential customers.

In its comments submitted on March 16, 1992, MASSPIRG included a motion to defer consideration of "Edgar cost-effectiveness and other supply options such as the Company's load management curtailment proposal," to the upcoming BECo Integrated Resource Management ("IRM") review[10] or to Phase II, or, in the alternative, to allow discovery, additional hearings and cross-examination on the updated information in Phase I. MASSPIRG argued, inter alia, that the proposed new plan to reduce load management programs was not a status update but a new proposal which required a cost-benefit analysis in the context of the Phase II evaluation to determine the least-cost resources available to the Company to meet its future resource needs.

In his comments filed on March 16, 1992, the Attorney General also moved that the Siting Council defer consideration of the Company's March 1992 Record Update to the IRM proceeding, or, in the alternative, allow discovery, cross-examination of Company witnesses and additional briefing in Phase I. In his motion, the Attorney General asserted that the Company's conservation projections were substantially understated, the new load management cuts were unsubstantiated, the residential demand was probably overstated, the

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10/ The IRM process was developed jointly by the Siting Council and the Department to review the demand forecasts and supply plans of investor-owned utilities within the Commonwealth, except for the Nantucket Electric Company. Final Order of the Siting Council on IRM Rulemaking, 21 DOMSC 91 (1990) ("1990 Final IRM Order"); 980 C.M.R. 12.00 et seq.; Final Order of the Department on IRM Rulemaking, D.P.U. 89-239 (1990); 220 C.M.R. 10.00 et seq.

Company's reserve requirement was overstated, and the availability of BECo's own resources was understated.[11]

At a procedural conference on March 19, 1992, MASSPIRG and the Attorney General reiterated their positions contained in their comments.[12] BECo asserted that it had updated the record as requested and provided sufficient supporting documentation, but also acknowledged that the determination of which resource options are optimal for the Company is a Phase II issue[13] (March 19, 1992 Procedural Conference, Tr. pp. 18-43).

The Siting Council hereby grants MASSPIRG's March 16 motion pertaining to deferral of the consideration of BECo's new load management plans to Phase II of this proceeding. In its filing, BECo presented projections for its conservation and load management programs, existing facilities and planned capacity additions as required by the General Laws, Chapter 164, Section 69I. The replacement of any existing or planned supply resources, such as BECo's RFP #2 resources, must be justified based on a comprehensive least-cost, comparative analysis with other resource options. Similarly, the replacement of existing or planned conservation or load management programs must be supported with the same justification. That analysis has not been presented by the Company

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11/ We hereby take administrative notice of the fact that the owners of Yankee Rowe have announced its retirement, and further note that no parties have contested the corresponding adjustment proposed by the Company in the March 1992 Record Update. Therefore, the Siting Council relies upon the updated information on Yankee Rowe in its determination of resource need (see Section III.D, below).

12/ The Attorney General noted that the Company had not consulted with him prior to submission of its updates as requested by the Siting Council on March 2, 1992 and as the Company had agreed (March 19, 1992 Procedural Conference, Tr. pp. 4-18, 32-43, 74, 84).

13/ The Company also noted that "(m)any of the concerns that the Attorney General and MASSPIRG are raising are indeed Phase II concerns and should be addressed there and not attempted to be resolved in this need portion in the next few weeks" (March 19, 1992 Procedural Conference, Tr. p. 32).

as yet, and is appropriately within the scope of Phase II of this proceeding. Therefore, we do not consider the new load management data further in Phase I, but instead consider it in Phase II.[14]

For reasons set forth in Sections III.D.3 and III.D.4, below, the Siting Council denies all other portions of MASSPIRG's March 16 motions and all other motions discussed above.[15]

D. Scope of Review

This is the first case in which the Siting Council has reviewed a utility's demand forecast and supply plan together with a proposal by that utility to construct a generating facility. Due to the unique nature of this combined docket as well as the extensive record compiled in this docket, the Siting Council determined that the decision should be separated into two phases.[16]

This decision, Phase I, will address issues associated with the Company's demand forecast and resource need. More specifically, the Phase I decision will include: (1) an analysis of the Company's demand forecast, an examination of its projections of existing and planned resources, and the integration of those factors to achieve

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14/ Full opportunity for discovery and comment on the new load management proposal, including more than 200 pages of supporting documentation (but not including a cost-benefit analysis), will be afforded in Phase II (Exhs. BE-121, AG-91, AG-92, AG-98 to AG-102). We further note that this additional information included key documents dated as early as June 1990 and November 1991, which had not been filed with the Siting Council previously (Exh. AG-98, AG-100).

15/ The information submitted in the March 1992 Record Update, except for the two-page cover letter with comments on the update, is marked for identification as "Exhibit BE-121" and entered into the record. The Company responses to the information requests submitted by the Attorney General on March 9 and March 13, 1992, and filed by the Company on March 18 and March 19, 1992, are marked for identification as "Exhibit AG-87" to "Exhibit AG-103" in numerical order and entered into the record.

16/ The two phases of this decision generally correspond to the phases of the IRM process.

various levels of system reliability; (2) a determination of the level of resource need; and (3) a determination of the adequacy of the Company's supply plan in the short run.

The Phase II decision will address (1) the adequacy of the Company's supply plan in the long run, (2) the least-cost nature of the Company's supply plan, including consideration of the Edgar project and other resource options available to serve the resource need identified in Phase I, (3) the Company's site selection process, and (4) the Edgar project, including the cost, environmental and reliability impacts of the proposed facility at both the primary and alternative sites.

II. ANALYSIS OF THE DEMAND FORECAST

A. Standard of Review

As part of its statutory mandate "to provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost" (G.L. c. 164, sec. 69H), the Siting Council determines whether "projections of the demand for electric power...are based on substantially accurate historical information and reasonable statistical projection methods." G.L. c. 164, sec. 69J. To ensure that the foregoing standard is met, the Siting Council applies three criteria to demand forecasts: reviewability, appropriateness, and reliability.

A demand forecast is reviewable if it contains enough information to allow a full understanding of the forecasting methodology. A forecast is appropriate if the methodology used to produce that forecast is technically suitable to the size and nature of the utility that produced it. A forecast is reliable if the methodology provides a measure of confidence that its data, assumptions, and judgments produce a forecast of what is most likely to occur. Commonwealth Electric Company and Cambridge Electric Light Company, EFSC 90-4, pp. 4-5, (1991) ("1991 CECo/CELCo Decision"); Nantucket Electric Company, 21 DOMSC 208, 214 (1991) ("1991 Nantucket Decision"); Massachusetts Municipal Wholesale Electric Company, 20 DOMSC 1, 14 (1990) ("1990 MMWEC Decision"); Massachusetts Electric Company/New England Power Company, 18 DOMSC 295, 302 (1989) ("1989 MECo/NEPCo Decision"); 1989 BECo Decision, 18 DOMSC at 208; Eastern Edison Company/Montaup Electric Company, 18 DOMSC 73, 79 (1988) ("1988 EECo/Montaup Decision"); Northeast Utilities, 17 DOMSC 1, 6 (1988) ("1988 NU Decision"); Boston Edison Company, 15 DOMSC 287, 294 (1987).

B. Overview of Demand Forecast Process

BECo stated that its forecast filing covered a 25 year time period, from 1990 to 2014 (Exh. BE-2, p. 2). In its forecast of energy requirements, BECo indicated that the forecast period was divided into short-run and long-run segments, with each segment utilizing a different forecasting methodology (id., p. 2). BECo indicated that its short-run forecast methodology generally covered three years, from 1990 to 1992, while its long-run forecast covered the remaining years of the forecast period (id., pp. 1-3, 128). BECo stated that its short-run forecast was designed to measure the month-to-month response of energy sales to changing conditions (id., p. 128). The Company noted that its overall energy requirements were based on a blending of its short-run and long-run forecast results (id., p. 2).[17] The Company stated that forecasts of electricity price, demographics, and employment were prepared for use as primary inputs to both its short-run and long-run forecast methodologies (id., pp. 2-7, 128). The Company also stated that customer usage characteristics and energy forecast results were included in its peak load forecast (id., p. 7).

In addition to its initial forecast filing of energy and peak load requirements, the Company prepared a reforecast of energy and peak load requirements during the course of the proceeding (Exhs. BE-9, HO-D-111).

The following sections contain a brief description of BECo's initial forecast and its reforecast. Table 1, below, contains the base case initial forecast of annual sales and peak load. Table 2, below, contains the base case reforecast of annual sales and peak load as presented in the Company's reforecast.

17/ BECo's forecast of energy requirements was divided by customer class as follows: residential, commercial, industrial, streetlighting, MBTA, MWRA, municipal sales, and losses and company use (Exh. BE-2, p. 1).

1. BECo's Initial Forecast

a. BECo's Short-Run Methodology

BECo stated that it developed econometric equations for use in forecasting the short-run energy requirements of the residential, commercial, and industrial classes (Exh. BE-2, p. 128). In each instance, the Company stated that its equations were predicated on selected economic and weather variables (id., pp. 128-138). The Company stated that its econometric equations were used to project sales for the foregoing customer classes on a monthly basis (id., p. 128).[18] In addition, the Company stated that it forecasted short-run energy requirements for the streetlighting class by utilizing adjusted historical data; for municipal sales by utilizing regression equations; for the MBTA by utilizing assumed growth rates; and for the MWRA by utilizing rainfall variables (id., pp. 140-143).[19] The Company did not indicate whether losses and company use were included in its forecasts of short-run energy requirements. For a discussion of the Company's short-run forecasts of energy sales, see Sections II.C.4.a.i, II.C.5.a.i, and II.C.6.a.i, below.

b. BECo's Long-Run Methodology

BECo stated that end-use models were used to project long-run energy requirements for its residential, commercial, and industrial classes (id., pp. 48-57, 69-88, 103-110). BECo stated that residential energy requirements were driven primarily by changes in personal income, while commercial and industrial requirements were

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18/ The Company stated that its short-run forecast is also used for capacity planning, demand-side management planning, revenue projections, budgeting, reliability studies, and fuel procurement (Exh. BE-2, p. 128).

19/ BECo indicated that the short-run and long-run forecast methodologies for streetlighting, municipal sales, MBTA, and MWRA classes were essentially identical (Exh. BE-2, pp. 121-123, 140-143). However, for its 1990-1992 short-run period, the Company disaggregated forecasted energy requirements for the foregoing classes into monthly quantities (id., pp. 140-143).

driven primarily by changes in employment (id., pp. 48, 70, 104; Exh. MP-1, pp. 2-3). In addition, BECo indicated that its forecast for losses and company use was based on a loss factor calculated by its load research department (Exh. BE-2, pp. 122-123). For a discussion of the Company's long-run forecasts of energy sales, see Sections II.C.4.a.ii, II.C.5.a.ii, and II.C.6.a.ii, below.

c. BECo's Peak Load Forecast Methodology

BECo stated that it developed its peak load forecast based on end-use and load shape characteristics associated with each of its major customer classes (id., pp. 145-146). In addition, BECo claimed that its peak load forecast accounted for varying consumption patterns reflective of hours of the day, days of the week, and seasons of the year (id.). For a discussion of the Company's peak load forecast, see Section II.D, below.

2. BECo's Reforecast Methodology

BECo stated that its reforecast utilized August, 1991 DRI economic data while January, 1989 DRI data was used in the Company's initial forecast filing (id.; Exh. BE-9).[20] BECo also stated that the basic load forecasting methodology used in its reforecast remained the same as that used in its initial forecast filing (id.).

To allow for a comprehensive evaluation of BECo's energy and peak load forecast, the Siting Council reviews both the Company's initial forecast and its reforecast.

20/ BECo indicated that at the time its most recent reforecast was prepared and filed -- February, 1992 -- actual sales data was available for 1991 (Exh. HO-D-111).

C. Energy Forecast

1. Employment Forecast

a. Description

i. Initial Forecast

Boston Edison indicated that it developed its forecast of employment with an econometric model based on territory-specific employment data from the years 1967 through 1987 (Exh. BE-2, p. 36), and on statewide employment projections supplied by DRI (id.). The Company stated that it first disaggregated total employment into the commercial and industrial sectors (id.). BECo stated that it next separated commercial sector employment into 12 building types, and industrial sector employment into 19 two-digit Standard Industrial Classification ("SIC") categories (id.). The Company stated that its initial employment forecast was based on data inputs from DRI's January, 1989 base case forecast of Massachusetts employment (Tr. 4, p. 138).

The Company stated that its econometric equations were subjected to statistical tests[21] and were backcast[22] against the performance of previous forecasts (id., pp. 71-72). The Company noted that it used the results of its employment forecast as inputs to both its commercial and industrial energy sales forecasts (Exh. BE-2, p. 36).

21/ Boston Edison stated that it applies R-squared, T-statistic, and Durbin-Watson tests to the equations of its employment forecast model to gauge statistical significance (Tr. 4, pp. 71-72).

22/ Backcasting is the practice of testing the accuracy of a model by comparing the results of the model with actual historical data.

BECo stated that, to forecast employment in the commercial sector, the Company used DRI data[23] as inputs to econometric equations designed to project employment in 12 building types[24] (Exh. BE-2, pp. 36-37, 44-45; Tr. 3, pp. 95-99). The Company stated that it then tested each of the equations used to derive the commercial sector employment forecast for statistical significance (Exh. BE-2, pp. 43-45).[25]

23/ Major data inputs to the commercial sector employment equations include: Massachusetts employment growth in respective employment categories; U.S. employment in the services, transportation, communication and utilities sectors; federal grants to state and local governments; population in Massachusetts; population in the U.S.; personal income in Massachusetts; and per capita income in Boston and New England (Exh. BE-2, pp. 43-45).

24/ The 12 building types are: (1) offices, (2) restaurants, (3) grocery stores, (4) other retail trade, (5) warehouses, (6) colleges, (7) primary and secondary schools, (8) hospitals, (9) other health services, (10) non-office government, (11) hotels, and (12) miscellaneous (Exh BE-2, pp. 43-45). In the cases of offices, warehouses, colleges, schools, hospitals, other health services and miscellaneous, the Company broke down the broad building type categories into sub-categories (id.). The Company used separate econometric equations to calculate employment within the sub-categories (id.).

25/ R-squared is a measure of the amount of variation in the dependent variable which is explained by the variation in the independent variables. R-squared values range between 0.00 and 1.00, where 0.00 indicates no variation explained by the independent variables and where 1.00 indicates complete explanation by the independent variables. The equation used to project employment in the sub-category of private schools produced an R-squared of 0.39 (Exh. BE-2, p. 44). The equation used to project employment in the grocery stores category produced an R-squared of 0.56 (id., p. 43). The equation used for the sub-category of transportation, communication and utility warehouses produced an R-squared of 0.62 (id.). All other building types produced an R-squared of 0.75 or higher (id., pp. 43-45).

To forecast employment in the industrial sector, Boston Edison stated that it used DRI data[26] as inputs to econometric equations designed to project employment in each of 19 two-digit SIC categories[27] (id., pp. 36-37, 46-47; Tr. 3, pp. 95-99). Boston Edison then applied tests of statistical significance to determine the strength of each industrial sector employment equation (Exh. BE-2, pp. 46-47).[28]

BECo noted that non-manufacturing employment was one of the "key drivers of commercial energy sales and total energy sales in general in the Boston Edison service territory..." (Exh. MP-1, p. 3). The Company also acknowledged that it was aware at the time it filed its initial forecast that "(t)he Massachusetts economy continued to deteriorate rapidly during the first quarter of 1990..." (id., p. 2). The Company indicated that the January, 1989 DRI Massachusetts employment forecast projects employment levels to range between 3.2 million jobs and 3.5 million jobs for the years of 1990 through 2000 (Exh. MP-11, p. 3). The Company also acknowledged that more recent DRI employment data "differ(ed) significantly" from the January, 1989 DRI data, and that "(t)his difference will impact the BECo energy forecast" (id., p. 3).

26/ Major data inputs to the industrial sector employment equations include: Massachusetts employment growth in respective SIC categories, and U.S. industrial production index in respective SIC categories (Exh. BE-2, pp. 36-37, 46-47; Tr. 3, pp. 95-99).

27/ The SIC categories are: (1) food and kindred, (2) textile mills, (3) apparel products, (4) lumber and wood, (5) furniture and fixtures, (6) pulp and paper, (7) printing and publishing, (8) chemicals, (9) petroleum products, (10) rubber and plastics, (11) leather products, (12) stone, clay and glass, (13) primary metals, (14) fabricated metals, (15) machinery, except electrical, (16) electrical and electronic machinery, (17) transportation equipment, (18) instruments, and (19) miscellaneous (Exh. BE-2, pp. 36-37, 46-47; Tr. 3, pp. 95-99).

28/ The equation for stone, clay and glass produced an R-squared of 0.60; the lumber and wood equation produced an R-squared of 0.62 (Exh. BE-2, pp. 46-47). All other equations produced an R-squared of 0.73 or above (id.).

ii. Reforecast

As part of its reforecast, the Company filed a reforecast of employment (Exh. HO-D-111, Base Case Attachment, p. 12). The Company stated that, although new values for employment, income, population, industrial production and government grants were used in the employment reforecast, the methodology used in the employment reforecast was the same methodology used in the initial employment forecast (id.). The Company stated that its employment reforecast was based on data from DRI's August, 1991 forecast (id.).[29] The Company indicated that the August, 1991 DRI Massachusetts employment forecast projects employment levels to range between 2.8 million jobs and 3.1 million jobs for the years of 1990 through 2000 (Exh. BE-119, p. 2).

b. Positions of Parties

i. MASSPIRG

MASSPIRG argued that Boston Edison's initial employment forecast was developed using obsolete economic inputs from DRI, resulting in (1) an overestimation of employment, and (2) ultimately, an unrealistically high long-run load forecast (MASSPIRG Initial Brief, p. 2). MASSPIRG contended that since DRI issued its January, 1989 base case forecast of Massachusetts employment, the state of the Massachusetts economy had deteriorated considerably (id., pp. 7-8). MASSPIRG asserted that subsequent DRI forecasts from 1990 and 1991 project five-year to eight-year lags in reaching the employment levels predicted in DRI's January, 1989 forecast (id.).

ii. Company

The Company argued that its current employment forecasting methodology was basically the same as the methodology approved by the

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29/ During the course of this proceeding, the Company also provided DRI employment data from February, 1991 (Exh. MP-RR-10).

Siting Council in its previous filing and that therefore, the initial forecast should be approved (BECo Brief, pp. 41-42). Boston Edison also contended that the January, 1989 DRI employment projections used in its initial forecast were the most current available at the time its resource plan was being developed (BECo Brief, p. 44).

With respect to DRI's August, 1991 forecast, Boston Edison contended that the new data "should not significantly affect the Siting Council's review of (its) long-range forecast..." (Exh. BE-119, p. 1). To support this position, the Company argued: (1) that the initial forecast was designed to address uncertainty in forecast variables; and (2) that there needs to be some closure to consideration of new information in a forecast review (Exh. BE-119, pp. 1-2).

c. Analysis and Findings

i. Initial Forecast

In the 1989 BECo Decision, the Siting Council approved the Company's employment forecasting methodology. 1989 BECo Decision, 18 DOMSC at 216. In that decision, the Siting Council approved the Company's use of a widely accepted forecasting firm to supply inputs to its employment forecast. Id. at 215. The Siting Council also approved the Company's use of econometric techniques to obtain projections of territory-specific employment levels. Id. at 216. Here, the Siting Council finds the initial employment forecast to be reviewable and appropriate.

With respect to reliability, the record indicates that Boston Edison's initial employment forecast is based on January, 1989 DRI data. Those data indicate that Massachusetts employment will range between 3.2 million jobs and 3.5 million jobs during the period of 1990 and 2000. These data were 16 months old at the time the Company filed its initial forecast in May, 1990. In addition, the Company was aware at the time of this filing that (1) the Massachusetts economy was deteriorating rapidly, (2) more current DRI employment

data which reflected the economic decline were available, (3) the more recent data differed significantly from the January, 1989 data, and (4) the difference in the new data would affect the Company's energy forecasts. In fact, the August, 1990 DRI forecast projects an average of nearly 202,000 fewer jobs statewide each year between 1991 and 2000 than the number of jobs projected in the January, 1989 DRI forecast. Even when a forecast methodology is sound, a forecast cannot be reliable if the data inputs used to develop the forecast are obsolete. In the past, the Siting Council has rejected a Company's forecast that used outdated inputs. 1991 CECo/CELCo Decision, EFSC 90-4 at 44-45.

Accordingly, the Siting Council finds that Boston Edison has failed to establish that its initial employment forecast is reliable.

ii. Reforecast

The Siting Council notes that the methodology used by the Company to prepare its reforecast of employment is basically the same as the methodology used to prepare its initial employment forecast. Consistent with the finding regarding the methodology used by the Company to prepare its initial employment forecast, the Siting Council finds that Boston Edison has established that its reforecast of employment is reviewable and appropriate.

With respect to the reliability of the reforecast, the Siting Council first rejects the Company's argument that the initial forecast was designed to address uncertainty in forecast variables. The Siting Council notes that employment levels predicted in the 1991 DRI employment forecasts differ significantly from the levels

predicted in the January, 1989 DRI forecast.[30] Table 3, below, sets out the various employment levels predicted by four DRI forecasts: January, 1989; August, 1990; February, 1991; and August, 1991. In this proceeding, the Company has not established that its initial forecast is designed to address changes in employment variables of the magnitude indicated by the DRI data. The record clearly illustrates a continuous and marked downward trend in the levels of employment predicted in each DRI forecast issued subsequent to the January, 1989 forecast.

The Siting Council acknowledges, however, the need to reach closure on the consideration of new information in a forecast review. We recognize that some measure of closure must be accorded to a company presenting a demand forecast methodology which is dynamic and flexible. Without such closure, companies could be subjected to endless requests to prepare new forecasts; requests that could have reliability implications when additional resources, in fact, are needed.

Nevertheless, the Siting Council would be remiss in its statutory obligation under G.L. c. 164, sec. 69H "to provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost" if it were to simply ignore significant changes such as substantial variations in economic conditions.

Here, the August, 1991 DRI data shows a decline of 10 percent to 14 percent in projected non-agricultural employment in the state

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30/ The difference in employment levels predicted in the two reports peaks at nearly 458,000 jobs in 1992, with employment levels over the range of the forecast years averaging between 10 percent and 14 percent lower in the August, 1991 report relative to the January, 1989 report (Exhs. MP-RR-11, MP-RR-10). Employment levels in the August, 1991 DRI forecast lag 11 to 17 years behind the levels predicted in the January, 1989 DRI forecast (id.). For example, the Massachusetts employment level predicted for 1994 (about 3.3 million jobs) in the January, 1989 DRI forecast is not reached until the year 2006 in the August, 1991 DRI forecast (id.).

over the forecast period. For the years 1991 through 2000, the projected average employment level is nearly 193,000 jobs lower in the August, 1991 DRI forecast relative to the August, 1990 DRI forecast. See Table 3. Over the same time period, the projected average employment level is about 394,000 jobs lower in the August, 1991 DRI forecast relative to the January, 1989 DRI forecast. See Table 3. Such declines must be considered significant changes in economic conditions. The substantial and continuous declines in economic conditions identified early in this proceeding necessitated the reforecast in order to determine with sufficient accuracy the Company's resource need.

The Siting Council notes that the August, 1991 DRI data used by the Company in the reforecast was only about six months old at the time of the filing of the employment reforecast. Accordingly, the Siting Council finds BECo's reforecast of employment to be reliable.

d. Conclusions on the Employment Forecast

The Siting Council has found that the Company's initial employment forecast and reforecast of employment are reviewable and appropriate. The Siting Council also has found that the Company failed to establish that its initial employment forecast is reliable. In addition, the Siting Council has found the Company's reforecast of employment to be reliable. Therefore, the Siting Council finds BECo's reforecast of employment to be reviewable, appropriate and reliable.

2. Demographic Forecast

a. Initial Forecast

Boston Edison stated that it generated a forecast of population and households to predict the number of residential customers it will serve each year throughout the forecast period (Exh. BE-2, p. 19). BECo indicated that its demographic forecasting methodology remained essentially the same as that used in its

previous filing before the Siting Council (id.). The Company stated that it utilized a forecast model which took population at the beginning of a given year, added births and net migration, and then subtracted deaths that were projected to occur during that year (id.).

BECo stated that it forecasted births and deaths by applying U.S. Census Bureau fertility and survival rate data to appropriate sex and age populations within its service territory (id., pp. 19-21).

The Company stated that its forecast of net migration[31] was based on an econometric equation which used economic inputs supplied by DRI (id., p. 22). BECo stated that the economic indicators used in the net migration equation were annual changes in U.S. wage and salary disbursements, Massachusetts employment, and the U.S. civilian labor force (id.).[32] BECo stated that the theoretical basis for the equation was the assumption that if the Massachusetts job market, the U.S. labor force, and U.S. wage and salary disbursements remain constant, a net in-migration to the Boston Edison service territory will result (id.).

The Company indicated that it conducted statistical analysis of its migration model to test the model's reliability and predictive capabilities (id.).[33]

31/ Net migration is equal to the difference between the number of persons moving into a territory and the number of persons moving out of a territory.

32/ The Company indicated that for the years between 1990 and 2000, January, 1989 DRI projections for U.S. wage and salary disbursements ranged between $2.8 trillion and $5.8 trillion (Exh. MP-11, p. 3), Massachusetts employment ranged between 3.2 million and 3.5 million (id.), and the U.S. labor force ranged between 125 million and 139 million (id.).

33/ Boston Edison stated that its migration equation produced an R-squared value of .80 (Exh. BE-2, p. 22).

b. Demographic Reforecast

Boston Edison stated that, in the computation of its reforecast, new values for U.S. wage and salary disbursements, Massachusetts employment, and U.S. labor force were used in the migration equation (Exh. HO-D-111, Base Case Attachment, p. 11). The Company indicated that the new inputs were taken from DRI's macroeconomic and regional forecasts from August, 1991 (id.).[34] Other than the use of new DRI data inputs, Boston Edison reported no methodological modifications to its reforecast of demographic change (id.).

c. Positions of Parties

MASSPIRG argued that the Company's migration equation failed to account for the effects of the current economic recession, and that, therefore, use of this equation is likely to result in an overestimate of population (MASSPIRG Initial Brief, p. 10). MASSPIRG further contended that, in BECo's demographic forecast, out-migration decreased and overall population increased, while DRI's forecasts predicted statewide population losses during the same time frame (id.). Thus, MASSPIRG argued, the Company's population forecast is at odds with the population forecast prepared by its own consultant (id.). MASSPIRG reiterated its concerns regarding the Company's migration equation in its March 12, 1992 comments on the Company's reforecast (HO-D-121, p. 1). In those comments, MASSPIRG also stated that the Company failed to distinguish between actual and projected population figures in its demographic reforecast (id.).

34/ The Company indicated that for the years between 1990 and 2000, August, 1991 DRI projections for U.S. wage and salary disbursements ranged between $2.7 trillion and $4.8 trillion (Exh. HO-D-111, p. 31), Massachusetts employment ranged between 3.0 million and 3.1 million (Exh. BE-119), and the U.S. labor force ranged between 125 million and 141 million (Exh. HO-D-111, p. 31).

Boston Edison contended that its demographic forecast is sound, and that its forecast methodology is virtually the same methodology that was approved in the 1989 BECo Decision (BECo Initial Brief, p. 25). The Company stated that its migration equation is statistically significant and that the reforecast's projection of a slight in-migration over the long-term is the result of a relatively more pessimistic national economic outlook (id., p. 45). In addition, the Company has indicated that since its previous filing, it has repeatedly tested its migration equation to confirm its continued statistical strength (Exh. BE-2, p. 19).

d. Analysis and Findings

The Siting Council notes that the Company's demographic forecasting methodology remains essentially the same as that used in its previous filing before the Siting Council. In the 1989 BECo Decision, the Siting Council found that Boston Edison's approach to forecasting demographic change within its service territory was basically sound (18 DOMSC at 213). In addition, the Company's use of data inputs supplied by DRI is consistent with input data approved in a number of other cases. See 1991 CECo/CELCo Decision, EFSC 90-4, p. 6; 1990 MMWEC Decision, 20 DOMSC at 14; 1988 EUA Decision, 18 DOMSC at 82; 1988 NU Decision, 17 DOMSC at 5. Further, the statistical strength of BECo's migration equation instills a high level of confidence in the reliability of the equation.

The Siting Council agrees with MASSPIRG that the Company's population projections run counter to the population projections of DRI. However, the differences between the DRI data and Boston Edison's projections are minimal, and therefore do not warrant rejection of the Company's migration equation or demographic forecast. Finally, the Siting Council notes that, although the January, 1989 data inputs to the Company's net migration equation for the initial demographic forecast were 16 months old at the time of filing, the updated August, 1991 data inputs did not substantially

alter the results of the Company's demographic reforecast compared to the initial forecast.

Based on the foregoing, the Siting Council finds that, for the purposes of this review, both the Company's initial demographic forecast and demographic reforecast are reviewable, appropriate and reliable.

3. Electricity Price Forecast

a. Initial Forecast

BECo stated that, to project electricity price growth rates for its service territory, it developed independent forecasts for a base price component and a fuel price component (Exh. BE-2, p. 13). The Company stated that annual growth rates then were applied to electricity prices in each customer class (Exh. HO-D-89). The Company indicated that its electricity price forecast is an important input into its residential, commercial and industrial energy forecasts (id.).

To forecast the base price component, the Company stated that it used a simplified cost-of-service model (Exh. BE-2, p. 14). BECo stated that through the model, it estimated the value of net plant, which included existing plant, plant additions[35] and accumulated depreciation.[36] The Company stated that the net plant estimate was used to calculate a return on debt and equity (id.). BECo stated

35/ To estimate the value of plant additions, the Company stated that it assumed that the annual capital cost escalation rate will be 6.5 percent (Exh. BE-2, p. 14). BECo stated that capital cost escalation rates are based on forecasts that the Company received from DRI (id.).

36/ The Company indicated that it assumed annual depreciation rates to be: 3.90 percent for nuclear generating facilities; 3.87 percent for fossil fuel generating facilities; 2.94 percent for transmission and distribution facilities; and 4.72 percent for other plant (Exh. BE-2, p. 14).

that projected operation and maintenance ("O&M") expenses[37] and taxes were then added to the estimated return on debt and equity[38] (id.).

Boston Edison stated that it used information supplied by DRI to arrive at projected O&M expenses and projected capital costs (id.). The Company further stated that depreciation rates and rate of return assumptions were derived from a recent Company filing before the MDPU in D.P.U. 89-100 (Exh. HO-D-86).

Finally, Boston Edison stated that it used DRI fuel forecast data as the basis for its fuel component forecast (id.). The Company indicated that oil and nuclear fuel prices were included in this projection (Exh. BE-2, pp. 16-17).

b. Electricity Price Reforecast

Boston Edison stated that, in the computation of its reforecast, the methodology and data inputs for the price forecast were exactly the same as those used to compute its initial forecasts (Exh. HO-D-111, Base Case Attachment, p. 10).

c. Analysis and Findings

The Company's electricity price forecasting methodology has remained basically unchanged since its previous filing. In the 1989 BECo Decision, the Siting Council approved BECO's electricity price forecast (18 DOMSC at 210). BECo's forecast of electricity price is generally sound. The strengths of this forecast include: (1) the breakdown of the total electricity price into base and fuel components, and (2) the application of projected price growth rates to each of the individual customer classes. Further, the Siting Council notes that although the data used to prepare the Company's

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37/ The Company stated that annual O&M cost escalation is assumed to be 5.8 percent (Exh. BE-2, p. 14).

38/ BECo stated that the MDPU allowed Boston Edison a 13.75 percent rate of return on equity (Exh. BE-2, p. 14). The Company projected that it would pay 11.0 percent on debt (id.).

initial electricity price forecast were 16 months old at the time of filing, more recent data are not likely to be substantially different.[39]

The Siting Council finds that, for the purposes of this review, both Boston Edison's initial electricity price forecast and reforecast of electricity price are reviewable, appropriate and reliable.

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4. Residential Energy Forecast

BECo stated that its residential sector energy demand was 3,382 gigawatthours ("GWH") in 1991, or approximately 26 percent of its overall energy sales in that year (Exh. HO-D-111). In its initial forecast, BECo's unadjusted residential energy demand was projected to increase from 3,523 GWH in 1991 to 4,124 GWH in 2000, a compound annual growth rate of 1.76 percent (Exh. BE-2, p. 68).[40] See Table 4, below. In its reforecast, BECo's unadjusted residential energy demand was projected to increase from 3,382 GWH in 1991 to 4,217 GWH in the year 2000, a compound annual growth rate of 2.48 percent (Exh. HO-D-111). See Table 5, below. As described in Sections II.B.1.a and II.B.1.b, above, the Company's ten-year residential forecast is derived from a combination of its short-run residential forecast and its long-run residential forecast. Each of these is described below.

39/ The Siting Council notes that none of the intervenors opposed the Company's electricity price forecast.

40/ The projections for energy demand in its initial forecast do not reflect savings resulting from Company-sponsored conservation and load management ("C&LM") programs (Exh. BE-2, p. 68). If these savings are included, residential energy demand is forecasted to increase from 3,482 GWH in 1991 to 4,059 GWH in 2000, a compound annual growth rate of 1.72 percent (id.).

a. Initial Forecast

i. Short-Run Forecast

(A) Description

BECo stated that it forecast residential energy sales in the short run using an econometric model (Exh. BE-2, p. 128). BECo stated that its short-run model is similar to the short-run model used in its previous forecast reviewed by the Siting Council (id., p. 129). However, BECo noted three modifications to its current short-run model: (1) its current model uses DRI economic projections, while its previous model used Wharton Economic Forecasting Associates projections; (2) its current model's database has been supplemented with 1988 and 1989 actual data; and (3) its current model was used to project energy sales for the initial four years of the forecast period as compared to the initial two years in its previous forecast filing (id.).

BECo stated that its residential short-run model was used to predict residential energy sales on a monthly basis for the 1990-1993 time period (id.; Tr. 3, p. 74). BECo stated that it assumed that residential energy sales in the short run would be driven largely by economic, weather, and customer behavior factors (Exh. BE-2, p. 129). BECo noted that it used seven variables to reflect the effects of economic, weather, and customer behavior factors: (1) disposable income, (2) temperature humidity index, (3) calendar use days, (4) heating degree days, (5) number of residential customer bills, (6) lighting hours, and (7) electricity price (id., pp. 131;

Exh. HO-D-104).[41] BECo stated that disposable income data were obtained from DRI, but data for the remaining variables were obtained from Company sources (Exh. BE-2, pp. 128-130; Exh. HO-D-104). BECo asserted that its short-run residential model was theoretically sound and statistically valid (Exh. BE-2, p. 131).[42]

The Company's witness, Dr. Cuomo, stated that in the Company's initial forecast filing, short-run models generally were used for the 1990-1992 time period (Tr. 3, pp. 73-74). However, Dr. Cuomo noted that in the case of the residential sector that time period was extended to include 1993 (id.).
Dr.Cuomo stated that use of its long-run model for 1993 would have resulted in a "very, very high" growth rate for the interface between the short-run forecast in 1993 and the long-run forecast in 1994 (id., p. 74). Dr. Cuomo stated that use of an additional year of short-run forecasting gave "relatively reasonable results" (id.).

(B) Analysis and Findings

In previous decisions, the Siting Council has accepted econometric equations for forecasting purposes. 1991 CECo/CELCo Decision, EFSC 90-4 at 29-30; 1990 MMWEC Decision, 20 DOMSC at 29-32.

41/ BECo stated that its "temperature humidity index" variable was designed to reflect the effect of summer weather on short-run energy sales (Exh. BE-2, p. 132). BECo stated that its "temperature humidity index" was estimated based on cooling degree day and cooling dewpoint data (id., p. 131). BECo stated that "calendar use days" are the actual number of calendar billing days during a month as established by the Company's meter reading schedule (id., pp. 128, 132, 138). BECo further stated that energy sales increase as a function of the number of billing days in a month (id.). Finally, BECo stated that "residential customer bills" reflected the number of bills sent out in any given month (id., p. 132).

42/ BECo stated that its seven variables were statistically significant to a confidence level of 96 percent or higher, and that its residential short-run equation produced an R-squared statistic of 0.95 (Exh. BE-2, pp. 130-131). For a discussion of R-squared statistical tests, see Footnote 25, above.

Here, the Siting Council notes (1) the Company has supported its residential short-run forecast model with demonstrations of statistical strength based on standard statistical tests, and (2) the Company continues to add to its informational database. The Siting Council also notes that the Company's short-run forecast methodology was accepted in the previous forecast filing review. 1989 BECo Decision, 18 DOMSC at 221.

However, in this proceeding, the Siting Council notes its concern regarding the expansion -- from two years to four years -- of BECo's residential short-run forecast period. While the Company's short-run model has demonstrated significant strengths, those strengths are based largely on the short-run model's statistical performance. Yet, the residential short-run model's statistical performance -- in and of itself -- has not been shown to warrant further use of that model over ever-increasing periods of time. By definition, the Company's short-run model is designed for use over a limited period of time. Moreover, extended implementation of BECo's econometric short-run model reduces usage of the Company's more detailed end-use residential model. In previous decisions, the Siting Council has recognized the enhanced forecasting capabilities of detailed end-use models relative to econometric models. 1991 CECo/CELCo Decision, EFSC 90-4 at 15, 21, 42-43; 1991 Nantucket Decision, 21 DOMSC at 229-230, 241. In addition, the Siting Council notes that another electric company used an econometric model to forecast its short-run energy sales over a one-year time period. See Northeast Utilities, EFSC 90-17, p. 11 (1992) ("1992 NU Decision"); 1988 NU Decision, 17 DOMSC at 9.

Nevertheless, for purposes of this review, the Siting Council finds the Company's residential short-run forecast to be reviewable, minimally appropriate, and minimally reliable at the time of filing. However, in order for the Siting Council to approve the short-run residential forecast in BECo's next filing, the Company must furnish full justification for the incorporation of the results of the short-

run residential forecast and the period over which those results are applied.

ii. Long-Run Forecast

(A) Introduction

BECo stated that its long-run residential energy forecast extended from 1994 through 2000 (Exh. BE-2, p. 128; Tr. 3, p. 74). BECo forecasted its long-run residential energy demand to increase from 3,709 GWH in 1994 to 4,065 in 1999, a compound annual growth rate of 1.85 percent (Exh. BE-2, p. 68).

BECo indicated that its annual forecast of residential energy sales is based on three underlying components: (1) the number of residential customers; (2) the number of appliances per customer; and (3) the average annual electricity use per appliance (id., pp. 48-49, 54). BECo stated that residential energy consumption is projected as the sum of 20 residential appliances or end-uses (id., pp. 48-68).[43] BECo asserted that its current residential forecast methodology was similar to the methodology presented in its previous forecast filing, but included enhancements with respect to household income data, appliance efficiency standards, and further applications of elasticity (id., p. 48). BECo also stated that its assumptions regarding the projected number of electric space heating systems and miscellaneous appliance use were revised upward in the current forecast filing (Exh. HO-D-9).

43/ The 20 end-uses are: electric range, electric range (self-cleaning), refrigerator (frost-free), refrigerator (standard), refrigerator (second), freezer (frost-free), freezer (standard), dishwasher, room air conditioner, central air conditioner, clothes washer, electric dryer, electric water heater, microwave oven, television (color), television (black & white), electric space heating, heat pump, portable electric heater, and miscellaneous and lighting (Exh. BE-2, p. 48).

(B) Number of Residential Customers

BECo stated that the number of residential customers was projected from its demographic forecast, which contained projections of population and households (Exh. BE-2, p. 19). BECo assumed that every household would represent one residential electricity customer (id.). In Section II.C.2, above, the Siting Council has found BECo's demographic forecast to be reviewable, appropriate, and reliable.

Based on the foregoing, the Siting Council finds that BECo's forecast of the number of residential customers is acceptable.

(C) Number of Appliances

(1) Description

BECo stated that it established the average number of appliances for 17 residential appliances by employing saturation-income equations (Exh. BE-2, p. 48). BECo maintained that saturation-income equations were suitable because household income is the major determinant of appliance saturations for most appliances (id., pp. 48, 55-57; Tr. 1, pp. 57-58, 103). However, BECo stated that saturation-income equations were not used for lighting and miscellaneous appliances because those appliances were assumed to be 100 percent saturated (Exh. BE-2, pp. 48-49). In addition, BECo indicated that saturations of electric space heating were forecast based on Company-derived data rather than saturation-income equations (id.).

BECo stated that its saturation-income equations were developed using 1986 customer survey data (id., p. 48).[44] BECo indicated that data from its 1989 customer survey would be used to update saturation-income equations for its next forecast filing

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44/ BECo stated that its 1986 customer survey was a service territory-specific random sample of about 10,000 residential customers (Exh. HO-D-9). The Company indicated that its 1986 customer survey had a 50 percent response rate (id.). BECo also indicated that residential customers were surveyed approximately once every three years (Tr. 1, p. 156).

(id.).[45] BECo asserted that its saturation-income equations were theoretically sound and statistically valid (id., pp. 55-57; Tr. 1, pp. 157-158).[46]

BECo stated that saturation of electric space heating systems was forecast based on a combination of two components (Exh. BE-2, p. 49; Tr. 1, pp. 59-60).[47] BECo stated that the first component of electric space heating saturation was the number of existing electric space heating systems (Exh. BE-2, p. 49). BECo stated that its estimate of the number of existing electric space heating systems was established through its residential customer survey (Tr. 1, p. 146). BECo stated that the second component of saturation was the projected number of new electric space heating systems due to new residential construction or conversions to electric space heating from another type of heating system (Exh. BE-2, p. 49, Exh. HO-D-9; Tr. 1, pp. 146-147, Tr. 5, pp. 24-25).[48] BECo defined that second component as "penetration" (Exh. BE-2, p. 49). BECo noted that its estimate of penetration for the current forecast filing was based on data covering the 1985-1988 period (Tr. 5, p. 43). BECo stated that its estimate of penetration over that period was developed as a single

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45/ BECo stated that its estimate of median household income was established through its 1986 customer survey (Exh. BE-2, pp. 49, 58; Exh. HO-D-1). BECo indicated that its forecast of household income was developed by applying DRI's growth rates to its 1986 median household income data (id.).

46/ BECo stated that its current saturation-income equations produced R-squared statistics ranging from 0.60 to 0.98 (Exh. BE-2, pp. 55-57).

47/ BECo stated that statistical test results were not "good" with respect to forecasting electric space heating saturation using saturation-income equations (Tr. 1, p. 60). BECo did not provide those statistical test results (id.).

48/ BECo stated that electric space heating penetration rates were determined by its energy services department based on accumulated historic data regarding electric space heating installations in the BECo service territory (Exh. HO-D-9; Tr. 2, pp. 168-172).

"weighted average" of actual electric space heating installations in new homes, new apartments, converted homes, and converted apartments (id., p. 38).[49] BECo noted that its penetration estimate did not include electric heat installations associated with room additions to existing residences (id., pp. 46, 57). However, Dr. Cuomo stated that electric space heating effects due to room additions were likely to be "extremely small" (id., p. 34; Tr. 1, p. 87). BECo noted that its weighted average penetration was applied to its forecast of new residences which included new homes and new apartments only (Tr. 5, p. 45).[50] BECo stated that the combination of the existing number of electric space heating systems and the estimated number of electric space heating systems to be added based on an application of its penetration estimate to its forecast of new households was used to project the total number of electric space heating systems for each year of the forecast period (Exh. HO-D-9; Tr. 1, p. 147).

In a change from its previous forecast filing, BECo stated that its level of electric space heat penetration had been increased from 35 percent to 40 percent for the period 1991 to 2000 (Exh. HO-D-9; Tr. 1, p. 78, Tr. 5, pp. 25-26). As justification for that increase, BECo noted that over the 1985-1988 period actual electric space heating penetration rates averaged 67 percent (Exh. MP-4).[51] As further justification for that increase, Dr. Cuomo stated that residential energy consumption had been "underforecast" over the 1986-1989 winter periods, even with weather adjustment

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49/ BECo later provided 1989 and 1990 penetration data for new homes, new apartments, converted homes, converted apartments and new and converted condominiums (Exh. MP-RR-2).

50/ BECo stated that its forecast of new residences consisting of new homes and new apartments was established through its forecast of the number of households (Tr. 5, p. 46).

51/ BECo stated that actual electric space heating penetration rates for each year between 1985 and 1988 were: 81, 71, 66, and 49 percent, respectively (Exh. MP-4). BECo noted that the foregoing penetration rates were developed through its weighted average calculation (id.).

(Tr. 1, pp. 82-83, Tr. 5, p. 76). Specifically, BECo indicated that residential energy sales had been underforecast by amounts ranging from 1.0 percent to 11.1 percent per month when compared to actual energy sales over the 1986-1989 winter periods (Exh. MP-4, Attachment 1).[52] Dr. Cuomo stated that consistent underforecasting indicated that BECo's residential model was "missing something" (Tr. 1, pp. 143-145). Dr. Cuomo concluded that the underforecast was attributable to an underestimation of electric space heating penetration (id., pp. 82-83, Exh. HO-D-12).[53] Dr. Cuomo stated that selection of a 35 percent penetration rate had been based on an adjustment of penetration that "probably adjusted it downward too far" (Tr. 1, p. 83). BECo indicated that its electric space heating penetration forecast -- at the 40 percent level -- contributed a total of about 84 MW of new peak load by the year 2014 (Exh. MP-22; Tr. 5, pp. 76-79).[54] Dr. Cuomo stated that the 5 percent increase in penetration -- from 35 percent to 40 percent -- amounted to "less than 10 MW" of that 84 MW peak load amount (Tr. 5, pp. 78-79).

BECo used a single average rate to represent electric space heating penetration for both new homes and new apartments (id., pp. 45, 47). BECo noted that over the 1985-1988 period electric space heat penetration rates for new homes and new apartments were "very close" (id., pp. 43-44). Specifically, BECo indicated that for

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52/ For 1986-1988, winter sales were represented by six months of data, from October through March (Exh. MP-4, Attachment 1). However, 1989 sales were represented by only three months of data, from October through December (id.).

53/ Dr. Cuomo also stated that "quite possibly" furnace fan usage could contribute to the winter sales underforecast (Tr. 1, p. 99). Dr. Cuomo stated that furnace fans operate in conjunction with fossil-fueled forced-air heating systems, and that a furnace fan consumes an average of 650 kilowatthours ("kwh") per year (id., p. 98).

54/ The Company indicated that annual additions to peak load due to its electric space heating penetration forecast ranged from approximately 2 to 6 MW per year over the forecast period (Exh. MP-22).

each year over the 1985-1988 period, electric space heating penetration rates for new homes were 50, 47, 34, and 20 percent, respectively, while those of new apartments were 38, 25, 43, and 28 percent, respectively (Tr. 5, p. 45; Exh. MP-RR-2). Dr. Cuomo stated that based on those data, a 35 percent average penetration rate for both new homes and new apartments was "not at all distorted" (Tr. 5, p. 47). However, Dr. Cuomo stated that use of that average for both new homes and new apartments for 1989 and 1990 was "becoming distortive" (id., p. 52). BECo provided data for 1989 and 1990 that showed electric space heating penetration rates for new homes as 6.9 and 15.0 percent, respectively, while those of new apartments were 25.3 and 19.5 percent, respectively (Exh. MP-RR-2). Nonetheless, Dr. Cuomo stated that 1989 and 1990 data were less than representative for forecasting purposes because those years were "recession" years (Tr. 5, pp. 44, 50).[55]

(2) Positions of Parties

MASSPIRG argued that BECo has failed to substantiate its forecast of increased electric space heating penetration and that the Company's assumptions regarding electric space heating resulted in an overstated forecast of residential energy sales (MASSPIRG Initial Brief, pp. 3, 14-16). Specifically, MASSPIRG asserted that BECo's 40 percent level of electric space heating penetration was unsubstantiated because: (1) winter sales data provided by the

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55/ BECo stated that in 1991 new residential construction and conversion activity has been less than expected "due to the current economic decline" (Exh. MP-RR-15). Specifically, BECo indicated that for 1991, 402 single-family homes would be newly constructed or converted to electric heat as compared to 1,454 originally forecast; 103 multi-family homes would be newly constructed or converted to electric heat as compared to 1,391 originally forecast (id.). However, BECo contended that over the long run, new construction and conversion activity for homes would be consistent with the average for that activity over the 1979-1988 period (id.). BECo did not state what that average was, nor did BECo provide any justification for use of an average based on the 1979-1988 time period (id.).

Company failed to include weather adjustment and were not statistically analyzed; (2) room additions and furnace fan usage could have contributed to BECo's underforecast of winter sales; and (3) recent electric space heating penetration data trends indicated penetration of less than 40 percent (id., pp. 3, 14-16, MASSPIRG Reply Brief, p. 7). MASSPIRG further asserted that BECo's forecast of electric space heating penetration based on a single average for homes and apartments was faulty because home and apartment electric space heating penetration rates actually were different and average electricity usage for electrically space heated apartments was less than one-third that of electrically space heated homes (MASSPIRG Initial Brief, pp. 3, 14-16).

BECo argued that its use of a penetration rate of 40 percent for electric space heating was valid because: (1) that rate was developed based on actual data covering the most complete historical record available, i.e., 1985-1988; (2) overall electric space heating penetration averaged 67 percent over the 1985-1988 time period; (3) its underforecast of winter energy sales supported an increase from its previously used 35 percent level of electric space heating penetration; and (4) its winter energy sales data in fact reflected weather adjustment (BECo Initial Brief, p. 47; BECo Reply Brief, p. 23). BECo further argued that averaging penetration rates of homes and apartments was reasonable because: (1) taken individually the penetration rates for homes and apartments each were considerably above 40 percent over the 1981-1988 time period,[56] and (2) 1991 penetration data was atypical of long-run penetration trends since it included only three months of 1991 experience and 1991 was a severe recession year (BECo Reply Brief, pp. 23-24).

56/ Although previous statements by BECo relating to electric space heating penetration rate estimates referred to 1985-1988 data, in its Reply Brief BECo referred to the 1981-1988 time period (pp. 23-24).

(3) Analysis and Findings

In previous decisions, the Siting Council has approved methodologies for forecasting the number of appliances that are similar to BECo's methodology. 1990 MMWEC Decision, 20 DOMSC at 20; 1988 EECo/Montaup Decision, 18 DOMSC at 85-86. Here, BECo's saturation-income functions exhibit reasonable levels of statistical validity, and its assumed 100 percent levels of saturation for lighting and miscellaneous end-uses are accepted throughout the industry. However, several questions were raised regarding support for the Company's forecast of electric space heating penetration. The Siting Council addresses those questions below.

First, the Company presented several years of comparative data to support its contention of an underforecast of its winter residential energy sales. The Siting Council notes that the Company maintained that those data had been weather adjusted. While the Siting Council agrees with MASSPIRG that statistical analysis could have been used to provide an additional level of description regarding the Company's underforecast, the absence of statistical analysis does not disprove the Company's contention regarding an underforecast of winter residential energy sales. In fact, the record clearly indicates a disparity between actual and forecasted winter residential energy sales over the time period indicated by BECo.

Second, the Siting Council agrees generally with MASSPIRG's assertion regarding omissions of room additions as a possible contributory element to the Company's winter underforecast. Here, the Company has demonstrated that it determined its overall electric space heating penetration rate based on four dwelling types (new and converted homes and new and converted apartments). Yet, the Company's forecast of residences which are multiplied by that penetration rate encompasses only new homes and apartments. In addition, for 1989 and 1990 the Company included new and converted condominiums in its overall penetration rate calculation, yet omitted

those same dwellings from previous years' calculations. In no instance did the Company include room additions in its electric space heating penetration calculations. The failure to systematically account for all dwelling space that is subject to electric space heat penetration, including condominiums and room additions, indicates a weakness in the Company's methodology. In future forecast filings the Company should provide a more complete and systematic assessment of all dwelling space subject to electric heat penetration, including complete documentation as to how each category of dwelling space is weighted in the Company's weighted average calculations. A more systematic approach may well provide additional insights into specific causes of the winter energy sales underforecasts reported by BECo. The Siting Council also notes that furnace fan usage data was not fully developed as a contributing factor to BECo's winter energy sales underforecasting. No evidence was introduced to indicate whether furnace fan usage had a major effect on winter energy sales or to indicate that furnace fan usage had been significantly understated over the 1986-1989 winter periods identified by BECo.

Third, as argued by MASSPIRG, recent data trends regarding actual installations of electric space heating demonstrate a marked decline when compared to the Company's 40 percent penetration level. The Siting Council recognizes that the Company's initial forecast filing was prepared at a time when that decline was not fully discernable. Yet, the Siting Council notes that the Company's database consisted of relatively few years -- a total of three. Despite that relatively limited database, which is likely to reflect only higher levels of economic activity rather than lower, the Company asserted that recent trends which are based on reduced economic activity are unrepresentative of long-run outcomes. The Siting Council disagrees with that assertion. To the extent that the Company's long-run forecast of electric space heating penetration encompasses the full range of economic activity, including lower levels as well as higher ones, that long-run forecast becomes more

representative, not less. In the future, the Company should provide electric space heating penetration rate assumptions based on a broad range of economic activity and should address any long term trends indicated by their data. See 1991 Nantucket Decision, 21 DOMSC at 226-228.

Fourth, with respect to the Company's use of a single average electric space heating penetration rate for both homes and apartments, the Siting Council notes that electric space heating penetration rates of homes and apartments show considerable variation when compared on an annual basis. In 1986, for example, electric space heating penetration in homes was 47 percent while in apartments it was 25 percent. Thus, the Siting Council agrees with MASSPIRG's assertion that the difference between electric space heat penetration rates of new homes and that of new apartments raises a question regarding the continued validity of a single average penetration rate as representative of both dwelling types. In the future, the Company should monitor electric space heating penetration rates for both homes and apartments, and if those penetration rates continue to diverge, the Company should abandon its averaging approach in favor of developing separate electric space heating penetration rate forecasts for homes and apartments.

Nevertheless, the Siting Council notes that while annual increases to peak load in the range of from 2 to 6 MW are not insignificant, in this instance those amounts add to winter peak load requirements. Since BECo is a summer peaking system and is expected to remain so over the forecast period, the effects of the foregoing additional winter peak loads should not have a major effect on the Company's capacity requirements.

Finally, despite the foregoing criticisms regarding certain aspects of the Company's methodology for forecasting the number of residential appliances, that methodology relied largely on statistically valid saturation-income equations and recent historical experience. To support its forecast of the number of appliances,

BECo has developed service-territory-specific data based on customer surveys taken at regular intervals. In the future, the Company can strengthen its forecast methodology by addressing the weaknesses associated with its forecast of electric space heating penetration.

Accordingly, for purposes of this review, the Siting Council finds that BECo's forecast of the number of appliances is acceptable.

(D) Average Use Per Appliance

(1) Description

BECo stated that it forecasted average use per appliance (i.e., kilowatthours ("kwh") per year) based on two major components: (1) a base year usage estimate, and (2) price-elasticity responses (Exh. BE-2, p. 49; Tr. 2, p. 184). BECo stated that the combination of those two components produced its forecast of average use per appliance for most of its residential appliances (id.). However, BECo stated that average use estimates for seven residential appliances also included the effects of government-sponsored appliance efficiency standards (Exh. BE-2, pp. 50-51).[57]

BECo stated that its methodology for establishing average use per appliance was similar to the methodology employed in its previous forecast filing (id., p. 48). However, BECo noted three enhancements to its current average use per appliance methodology: (1) price-elasticity responses are now included in its estimate of electric space heating average use, (2) state and national appliance efficiency standards are applied to average use estimates of standard, frost-free, and second refrigerators; standard and

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57/ BECo stated that two sets of appliance efficiency standards were employed in its forecast of appliance average use: (1) Massachusetts appliance efficiency standards were used for the 1988-1989 time period, and (2) national appliance efficiency standards were used for the 1990-2014 time period (Exh. HO-D-5). Although BECo noted that appliance efficiency standards were applied to second refrigerators, the Company's second refrigerator forecast was identical to the forecast for standard refrigerators (Exh. BE-2, p. 64).

frost-free freezers; and room and central air conditioners, and (3) the growth rate assigned to the miscellaneous end-use category has been revised upward (id., p. 48; Tr. 1, pp. 73-74).

BECo stated that base year usage was an estimate of energy consumption of an appliance prior to modification by price elasticity effects and appliance efficiency standards (Exh. HO-D-15). BECo indicated that its base year usage estimates relied on non-Company as well as Company data sources (id.). BECo noted that its primary non-Company source of base usage data was the Edison Electric Institute ("EEI") (Exh. BE-2, p. 49).[58]. EEI data was used to establish base usage energy consumption levels for 12 residential appliances (id.). BECo stated that the vintage of EEI base year data was 1971 for all appliances except microwave ovens, which was based on 1982 data (Exh. HO-D-17).[59] BECo further stated that EEI developed its data by accumulating appliance usage information on a national basis (id.). BECo noted that it was unaware of any information indicating that territory-specific data would be significantly different from the nationally-based data obtained from EEI (id.). BECo also stated that base usage estimates for room and central air conditioning were based on a combination of Association of Home Appliance Manufacturers ("AHAM") data and estimates from BECo's energy services department (Exh. BE-2, pp. 49-50). BECo indicated that central and room air conditioning base year data was also 1971 vintage (Exh. HO-D-15).

BECo stated that base year usage estimates for the seven remaining end-uses were based on Company-derived data (id., p. 49).

58/ BECo stated that it relied on EEI data to estimate base year usage for the following appliances: electric range, electric range (self-cleaning), refrigerator (standard), refrigerator (second), freezer (standard), dishwasher, lighting, electric dryer, microwave oven, television (color), television (black & white), and portable electric heater (Exh. BE-2, p. 49).

59/ BECo stated that EEI is presently updating its base usage data and that EEI's updated data will be analyzed for use in the Company's next residential forecast (Exh. HO-D-17).

Base year usage estimates for frost-free refrigerators, frost-free freezers, and clothes washers were based on the results of a Company-sponsored survey -- the Household Appliance Metering Study ("HAMS") (Exhs. HO-RR-1, HO-RR-2).[60] BECo stated that its HAMS data showed much higher usage for frost-free refrigerators, frost-free freezers, and clothes washers than the EEI data which had been used previously (Exh. BE-2, p. 49). BECo stated that the vintage of its HAMS data used in establishing base usages for frost-free refrigerators, frost-free freezers, and clothes washers was 1988 (Exh. HO-D-15). BECo further stated that its base usage estimates for electric space heating, heat pumps, and electric water heating were derived by averaging actual sales data (Exh. BE-2, pp. 49-50).[61] BECo stated that sales data for electric space heating and electric water heating covered six years -- 1983-1988 -- and that those data had been weather normalized (id., p. 49). BECo indicated that the vintage of its electric water heating base year usage estimate was 1988, while the vintage for its electric space heating base year estimate was the "mid-80's" (Exh. HO-D-15; Tr. 2, pp. 173-174).[62]

Dr. Cuomo stated that the miscellaneous end-use category had no identifiable base year (Tr. 2, pp. 174-175). BECo noted that usage for its miscellaneous end-use was forecast as a "residual," i.e., miscellaneous energy use was based on energy use that was left

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60/ The Company described HAMS as a territory-specific survey based on random sampling and metering of frost-free refrigerators, frost-free freezers, and clothes washers over the 1987-1988 time period (Exh. HO-D-3).

61/ BECo stated that heat pump usage was estimated as 75 percent of electric resistance space heating usage (Exh. BE-2, p. 50).

62/ BECo stated that it participated in the Joint Utility Monitoring Project ("JUMP") which accumulated appliance usage data for frost-free refrigerators, uncontrolled electric water heaters, electric ranges, and electric clothes dryers (Exh. BE-2, p. 49). BECo stated that JUMP usage data was not used in its residential forecast due to sampling problems or similarity to existing data (id.).

over after accounting for energy use attributable to the specific end-uses included in its residential forecast (Exh. HO-D-18; Tr. 1, p. 63). BECo stated that its miscellaneous end-use residual was calculated as the difference between actual average use per household for 1989 and forecasted average use per household for 1989 (Exh. HO-D-18). BECo noted that its miscellaneous end-use category included major appliances such as lighting and furnace fans as well as numerous diverse appliances (id.; Exh. MP-3).[63]

BECo stated that the average use estimates of all of its residential appliances were modified on an annual basis by the effects of price-elasticity responses (Exh. BE-2, pp. 49-50; Tr. 2, pp. 184-185). BECo noted that elasticity was estimated on a short-run and long-run basis, and that the same short-run and long-run elasticities were now applied to all of its residential appliances (Exhs. HO-D-7, HO-D-8). In response to a Siting Council directive, BECo stated that its forecast of electric space heating average use included price-elasticity responses (Exh. BE-2, p. 50). See 1989 BECo Decision, 18 DOMSC at 218. BECo noted that, with one exception, average use per appliance decreased over the forecast period due to price-elasticity responses based on rising electricity prices (Exh. BE-2, p. 50; Tr. 2, p. 186).[64] Dr. Cuomo stated that appliance manufacturers responded to rising prices by developing and marketing residential appliances that are "more efficient" over time

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63/ Based on a list developed by AHAM and EEI, BECo indicated that its miscellaneous end-use category reflected usage associated with appliances such as blender, broiler, carving knife, coffee maker, deep fryer, frying pan, mixer, roaster, sandwich grill, toaster, trash compactor, waffle iron, waste dispenser, iron, bed covering, dehumidifier, attic fan, circulating fan, rollaway fan, window fan, heating pad, humidifier, hair dryer, shaver, toothbrush, radio, radio/record player, clock, sewing machine, vacuum cleaner, VCR, and home computer (Exh. MP-2).

64/ BECo noted that its miscellaneous end-use category was forecast to increase its average use over the forecast period (Exh. BE-2, p. 64).

(id.). Dr. Cuomo stated that the Company's elasticity estimates were designed to reflect the price-elasticity responses of consumers as well as the efficiency responses of manufacturers (Tr. 3, p. 47).

With respect to appliance efficiency standards, BECo stated that state appliance efficiency standards had been applied to its average use forecasts of standard and frost-free refrigerators, second refrigerators, standard and frost-free freezers, and room and central air conditioner average use for 1988 and 1989 (Exh. HO-D-5). The Company applied national appliance efficiency standards to its forecast of those appliances for 1990 and beyond because the national standards took effect in 1990 and were more "stringent" than the state standards (Tr. 1, p. 185).[65] In addition, Dr. Cuomo stated that national standards would "probably" be enforced more rigorously than state standards (id.). BECo stated that appliance efficiency standards were implemented on a new and replacement basis (Exh. BE-2, pp. 50-51).[66]

Dr. Cuomo stated that the Company had no direct information regarding effects on its residential forecast stemming from appliances which are designed to exceed national appliance efficiency

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65/ BECo stated that national standards set maximum standard refrigerator use at 763 kwh per year while state standards set that use at 864 kwh per year; national standards set maximum frost-free refrigerator use at 1,012 kwh per year while state standards set that use at 1,060 kwh per year; national standards set maximum standard freezer use at use at 614 kwh per year while state standards set that use at 848 kwh per year; national standards set maximum frost-free freezer use at 1,063 kwh per year while state standards set that use at 1,683 kwh per year; and that national and state efficiency standards for room and central air conditioning were identical (Exh. HO-D-5).

66/ For example, Dr. Cuomo stated a frost-free refrigerator's useful life was assumed as 19 years (Tr. 1, pp. 189-190). Consequently, BECo forecast replacements of existing frost-free refrigerators by efficient frost-free refrigerators at a rate of 1/19 per year (id.). New additions to the number of frost-free refrigerators were forecast at a rate consistent with the Company's forecast of new residential customers (id.).

standards (Tr. 1, p. 94). However, as an indirect means of assessing those effects, BECo analyzed the impacts of increased sales of the most efficient models of refrigerators, freezers, and room air conditioners included in its Appliance Labelling Program ("ALP") (Exh. MP-25).[67] BECo indicated that the highest level of increased sales analyzed -- represented by 40 percent of new and replacement frost-free refrigerators, frost-free freezers, and room air conditioners -- produced an overall savings of 32 GWH out of total residential sales of 5,142 GWH in the year 2014 (Exh. MP-25).[68] Based on that analysis, Dr. Cuomo concluded that the effect of appliances which are designed to exceed mandated efficiency standards on the residential forecast would be "almost imperceptible" (Tr. 1, p. 94; Exh. MP-25).

BECo provided one detailed example indicating how appliance efficiency standards were applied to its forecast of average use

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67/ BECo stated that its ALP was a residential C&LM program designed to (1) educate consumers and retailers regarding energy efficiency, and (2) promote sales of the most efficient models of refrigerators, freezers, and air conditioners (Exh. BE-42, pp. 80-82). BECo stated that only the top 15 percent of efficient refrigerators, freezers, and air conditioners were eligible to receive a high visibility "efficiency" label through its ALP (id.). BECo stated that its ALP would produce estimated energy savings of 100 kwh per year for refrigerators and freezers each, respectively, and energy savings of 40 kwh per year for room air conditioners (id.). BECo stated that its net forecast, i.e., including the impacts of C&LM programs, assumed maximum ALP-based sales of 12 percent of new refrigerators, 9 percent of new freezers, and 7 percent of new room air conditioners (id.).

68/ Usage differences between (1) standard and frost-free refrigerators, and (2) standard and frost-free freezers were not noted by BECo in its ALP documentation (Exh. BE-42, pp. 80-86). However, BECo's analysis of increased sales was based on frost-free refrigerators and freezers (Exh. MP-25).

(Exh. MP-RR-4; Exh. HO-D-6).[69] In that example, BECo applied the annual effects of appliance efficiency standards to its forecast of frost-free refrigerator average use (id.). Based on appliance efficiency standards in effect for 1989, BECo forecasted frost-free refrigerator average use as about 1,600 kwh for that year (id.).[70]

In a change from previous forecasts, BECo noted that the annual growth rate assigned to its miscellaneous end-use category had been increased from three percent to five percent (Exh. MP-2). BECo indicated that under its assumed five percent level of growth, miscellaneous energy use is projected to grow four-fold over the forecast period, increasing from 13 percent of total residential use in 1989 to about 33 percent of total residential use in 2014 (Exh. BE-2, p. 66). By the year 2000, the miscellaneous end-use becomes the single largest end-use in the Company's residential sector (id., p. 66).

Dr. Cuomo stated that miscellaneous was "the most difficult" end-use to forecast in the residential sector (Tr. 1, p. 66). Further, Dr. Cuomo stated that neither the three percent nor the five percent growth rate had been based on "anything empirical" (id., p. 74). Nonetheless, as justification for that increase, Dr. Cuomo stated that BECo's residential energy sales had been underforecast

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69/ BECo stated that appliance efficiency standards were applied using appliance-specific formulae (Exh. BE-2, p. 63). For example, average use for a standard refrigerator was calculated as the sum of (1) a constant of 316, and (2) the "adjusted volume" of the refrigerator multiplied by a factor of 16.3 (id.). BECo stated that a standard refrigerator's "adjusted volume" consisted of the sum of: (1) its refrigerator volume, and (2) its freezer volume multiplied by 1.63 (id.). BECo stated that its volume data was based on 1987 weighted averages calculated by AHAM (id., p. 51).

70/ In its ALP, BECo estimated average use for refrigerators as 940 kwh per year prior to any savings due to the ALP (Exh. BE-42, p. 80). BECo did not indicate whether that usage estimate was for a frost-free or standard refrigerator (id.). While BECo did not indicate the date of that usage estimate, BECo's ALP covered a three-year period commencing in 1990 (id., p. 86).

for the past five years, and that the miscellaneous category was the "real driver" of that underforecast (id., p. 64). As further justification for that increase, BECo stated that: (1) its forecast of miscellaneous average use did not compare favorably to an assumed level of miscellaneous use which utilized AHAM/EEI data; (2) dual-earner households were accounting for increasing levels of miscellaneous appliance use; and (3) rising household income should stimulate increasing levels of miscellaneous use (id., pp. 65-68).

BECo stated that for 1989 its residual forecast methodology resulted in a miscellaneous use level of 789 kwh (id., pp. 65-66). Nonetheless, Dr. Cuomo asserted that BECo's forecast level of 789 kwh was too low when compared with a miscellaneous use estimate derived from assumptions (id., Tr. 5, pp. 95-96).[71] [72]

Dr. Cuomo stated that characteristics of dual-earner households were also a major factor supporting an assumed higher level of increased miscellaneous energy use (Tr. 1, p. 68). Dr. Cuomo noted that no formal studies had been undertaken to establish the number of such households in BECo's service territory, but that dual-earner households represented "more than half" of BECo's

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71/ BECo stated that the energy use of all of the miscellaneous appliances shown in its AHAM/EEI-based list of miscellaneous appliances amounted to about 3,200 kwh for 1989 (Exh. MP-2) (See Footnote 52). Dr. Cuomo asserted that a "conservative" level of miscellaneous use for BECo's service territory was represented by one-third of 3,200 kwh per year, or about 1,000 kwh per year (Tr. 1, p. 101). Since BECo's miscellaneous category also included lighting, Dr. Cuomo added 300 kwh to the miscellaneous category for that appliance (id., pp. 65-66). Thus, BECo's assumed level of miscellaneous use reached 1,300 kwh for 1989, an amount higher than that of its forecast.

72/ With respect to energy use associated with lighting, Dr. Cuomo stated that BECo has not had "very good" historic lighting estimates (Tr. 1, p. 153). Dr. Cuomo stated that household lighting usage estimates have become "fluid" since lighting technologies have "improved so much" (id.). Dr. Cuomo stated that in the Company's next forecast filing, lighting would be forecast as a separate end-use, i.e., disaggregated from the miscellaneous end-use category (id.).

residential households in his opinion (id., p. 151).[73] Dr. Cuomo asserted that miscellaneous energy increases were anticipated for all households, but that these increases would likely be "most pronounced" for dual-earner households (id., p. 152). Dr. Cuomo stated that preferences for "convenience in the homes" of dual-earners supported a higher level of miscellaneous usage (id., p. 75).[74]

Dr. Cuomo stated that rising income levels were also a key element supporting higher estimates of miscellaneous energy use (id., pp. 67-68). Dr. Cuomo asserted that income levels were "clearly" higher than those of the past (id., p. 68). Dr. Cuomo stated that miscellaneous appliance use was "more sensitive" to changes in income than appliances such as refrigerators (id., p. 164). For example, Dr. Cuomo stated that if increased income resulted in a two percent increase in refrigerator use, that same level of increased income would produce miscellaneous use of "greater than two percent" (id., p. 164). Dr. Cuomo asserted that increased use of "gadgets" such as stereos and carving knives were related to income to "a great extent" (id., p. 61).[75] In addition, Dr. Cuomo noted that the costs of owning and using most miscellaneous appliances were "not exorbitant" (id., p. 75). However, Dr. Cuomo also contended that even falling income conditions would lead to increased miscellaneous use (id., pp. 75-76). Dr. Cuomo stated that unemployed workers "spend more time" at home, leading to an increased levels of miscellaneous energy use despite reduced levels of income (id., pp. 75-76).

73/ Dr. Cuomo stated that the number of dual-earner households was "informally" estimated as 50 to 65 percent of BECo's households (Tr. 1, p. 151).

74/ Dr. Cuomo offered VCRs, personal computers, security systems, and control systems as examples of convenience appliances (Tr. 1, p. 149).

75/ However, Dr. Cuomo stated that certain miscellaneous appliances such as toasters would be owned and operated "regardless of your income level" (Tr. 1, p. 62).

(2) Positions of Parties

MASSPIRG raised three major arguments with respect to the Company's forecast of average use per appliance (MASSPIRG Initial Brief, pp. 3, 12-14, 16-17; MASSPIRG Reply Brief, p. 7).

First, MASSPIRG argued that BECo's estimates of appliance average use were erroneous because the Company assumed that no appliances would be purchased that are more efficient than required by minimum national appliance efficiency standards (MASSPIRG Initial Brief, pp. 3, 16-17; MASSPIRG Reply Brief, p. 7). Second, MASSPIRG asserted that BECo miscalculated the effects of appliance efficiency standards on its forecast of frost-free refrigerator average use (MASSPIRG Initial Brief, pp. 3, 16-17; MASSPIRG Reply Brief, p. 7).

Third, MASSPIRG argued that BECo has failed to support its assumed increased growth rate for the miscellaneous end-use category (MASSPIRG Initial Brief, pp. 3, 12-14). MASSPIRG argued that the Company's assumptions regarding the growth rate results in an overstated forecast of residential energy sales (id., p. 12). Specifically, MASSPIRG asserted that BECo's increased rate of growth as applied to its forecast of miscellaneous appliance average use is arbitrary and overstated because: (1) that increase was unsupported by evidence; (2) the Company's assumed level of miscellaneous use for 1989 -- amounting to about 1,300 kwh -- was purely subjective, and in addition, that level of usage raises serious questions regarding average use levels assigned to the remaining residential appliances; (3) household income has been forecast to decline, not increase, and therefore miscellaneous usage also should be forecast to decrease; and (4) appliances such as furnace fans and lighting are unlikely to increase at the five percent growth rate selected by BECo (id., pp. 3, 12-14; MASSPIRG Reply Brief, p. 7).

BECo responded that its estimates of average use per appliance assumed appliance efficiencies which exceeded those mandated by national appliance efficiency standards (BECo Reply Brief, p. 24). BECo asserted that forecasted increases in the

price of electricity will lead to the design and production of improved-efficiency appliances (id.). BECo contended that its residential model captured that trend through its price-elasticity response (id.). Thus, BECo claimed that its "price-induced" response effectively represented improvements in appliance efficiencies beyond those required by mandated national efficiency standards (BECo Initial Brief, p. 47).

BECo further argued that its estimate of frost-free refrigerator average use was accurate (id.). BECo asserted that its calculations of frost-free refrigerator average use were based on territory-specific "adjusted volume" data and that the effects of mandated efficiency standards were properly taken into account in its calculations (id., BECo Reply Brief, p. 24).

Finally, BECo argued that its forecast of average use associated with the miscellaneous end-use category was valid and appropriately adjusted because: (1) the miscellaneous category consists of a large number of diverse appliances including new appliances that are difficult to forecast in the absence of a historical database; (2) average use for the miscellaneous category has been estimated as 1,300 kwh as opposed to 789 kwh projected by the Company's forecast; (3) using estimates of 1,300 kwh as a base level and applying a growth rate of three percent rate -- a growth rate which was approved by the Siting Council in its previous review of the Company's residential methodology -- yields an average use of 2,720 kwh in the year 2014, an amount that is above the Company's year 2014 estimate of 2,674 kwh as presented in its current forecast filing; and (4) the residential sector was previously underforecast, and therefore, if the effects of that underforecast cannot be attributed elsewhere, the effects must logically fall into the miscellaneous end-use residual (BECo Initial Brief, p. 46; BECo Reply Brief, pp. 22-23).

(3) Analysis and Findings

In a previous decision, the Siting Council accepted a methodology for forecasting average use per appliance that was similar to the methodology presented by BECo in this proceeding. 1990 MMWEC Decision, 20 DOMSC at 23-26. The Siting Council also approved BECo's residential forecast methodology in its previous review. 1989 BECo Decision, 18 DOMSC at 218. However, the Siting Council's previous review of BECo's residential appliance average use forecast was limited in scope, focussing primarily on the effects of elasticity on the Company's forecast of electric space heating average use. In recent decisions, the Siting Council has expanded its reviews to accommodate a wider range of issues related to residential appliance average use forecasting. 1991 CECo/CELCo Decision, EFSC 90-4 at 17-21; 1991 Nantucket Decision, 21 DOMSC at 223-231; 1990 MMWEC Decision, 20 DOMSC at 18-23; 1989 MECo/NEPCo Decision, 18 DOMSC at 305-310. Here, the Siting Council reviews BECo's forecast of average use per appliance consistent with recent decisions.

First, the Siting Council notes that the Company relied on non-service-territory-specific data for base year usage estimates for 12 residential appliances. In previous decisions, the Siting Council has criticized electric companies for use of non-service-territory-specific residential forecast data. 1991 Nantucket Decision, 21 DOMSC at 228-230; 1988 EECo/Montaup Decision, 18 DOMSC at 90. In addition, the Siting Council notes that BECo's 1971 non-Company base year usage data is of a vintage older than that used by another electric company reviewed recently by the Siting Council. 1990 MMWEC Decision, 20 DOMSC at 22-23. In previous decisions, the Siting Council has criticized electric companies for reliance on older residential data. 1991 CECo/CELCo Decision, EFSC 90-4 at 19-21; Eastern Edison Company/Montaup Electric Company, 14 DOMSC 41, 63-64 (1986); Eastern Edison Company/Montaup Electric Company, 11 DOMSC 61, 77 (1984); Commonwealth Electric Company/Cambridge Electric Light

Company, 9 DOMSC 222, 313 (1983). However, the Siting Council recognizes that BECo has developed service-territory-specific data for seven major residential appliances representing about 60 percent of its residential energy requirements, and that those data are much more current than the non-service-territory-specific data also used in its average use forecast. Still, in future forecast filings, the Company should demonstrate that any non-service-territory-specific average use data is representative and current in terms of its own residential sector.

The Siting Council also notes that BECo's consideration of elasticity as a factor in the forecast of electric space heating average use is consistent with the Siting Council's directive in the 1989 BECo Decision. The Siting Council also notes that the Company's elasticity estimates were formulated to include market-based efficiency responses of appliance manufacturers, reflecting development of efficient appliances in response to rising electricity prices. The Company's use of elasticity -- and its quantitative analysis of increased purchases of highly efficient appliances -- counter MASSPIRG's claim that the Company failed to consider effects due to purchase of appliances which exceed mandated efficiency requirements.

In regard to MASSPIRG's argument that BECo miscalculated the effects of appliance efficiency standards on its forecast of frost-free refrigerator average use, the Siting Council notes that the question of frost-free refrigerator usage was subject to information requests, hearing time, and a record request. Despite the amount of evidence pertaining to that question, the Siting Council notes that in one exhibit the Company identified frost-free refrigerator use at 1,060 kwh per year including appliance efficiency standards, while in another exhibit that usage level is identified as 1,595 kwh per year. Further, in its arguments, MASSPIRG raised specific references to inconsistencies in the Company's frost-free refrigerator usage levels which were not responded to by the Company.

While the Company argued that appliance efficiency standards were applied to frost-free refrigerators on an "adjusted volume" basis, the Company failed to demonstrate what level of usage would actually result from an application of its identified appliance efficiency standards. The Siting Council recognizes that "adjusted volume" may in fact represent a critical component of the Company's forecast of frost-free refrigerator average use. However, the Siting Council cannot fully review a forecast when pertinent information is presented in an inconsistent manner and not explained fully. In previous decisions, the Siting Council has criticized electric companies for use of inconsistent data and inadequate explanations. 1991 Nantucket Decision, 21 DOMSC at 241; 1990 MMWEC Decision, 20 DOMSC at 22; 1989 MECo/NEPCo Decision, 18 DOMSC at 308-310.

With regard to the increased growth rate for the forecast of miscellaneous end-use energy sales, the Company maintained that (1) residential energy sales had been underforecast in the past; (2) miscellaneous use was a key component of that energy underforecast; (3) dual-earner households were the most significant users of miscellaneous end-uses; and (4) increasing household income would lead to increased miscellaneous energy sales. Yet, in each of the foregoing instances, the Company provided little supporting evidence. First, BECo provided no information to support its claim of an underforecast in the residential sector. No data was provided to indicate the extent or magnitude of that underforecast. Second, BECo failed to provide analyses to indicate that any other residential end-uses had been examined as possible contributors to its residential underforecast. BECo's miscellaneous end-use methodology -- essentially derived as a "residual" -- should not be based on an assumption that forecast deficiencies which could be associated with other end-uses are to be assigned automatically to the miscellaneous end-use. Third, the Siting Council notes that BECo's claim regarding the convenience requirements of dual-earner households was not supported by evidence. While the Company asserted that dual-earner

households would lead all other households in increased usage of miscellaneous appliances, no comparisons or other studies were provided to substantiate that assertion. Fourth, BECo presented contradictory claims regarding the effects of income on miscellaneous end-use energy sales. While BECo asserted that miscellaneous use was sensitive to income, BECo also asserted that reductions in income would have no effect on projected increasing levels of miscellaneous use. Further, the Company's reforecast of residential energy sales indicated a reduced level of household income growth (see Footnote 76, above). To the extent that the Company's forecast of miscellaneous end-use growth is sensitive to income, MASSPIRG's assertion regarding the effects of reduced household income growth would be valid. While the Company argued that its miscellaneous end-use category is difficult to forecast and lacks a historic database, the record indicates that major underlying factors of the Company's forecast of miscellaneous use were not substantiated. Consequently, the Siting Council agrees with MASSPIRG regarding the lack of supporting documentation for BECo's miscellaneous end-use category growth rate.

In addition, no evidence was offered by BECo to indicate that its assumed level of miscellaneous use, amounting to 1,300 kwh for 1989, was representative of miscellaneous use for BECo's residential customers or that such a level of use had been determined through a systematic methodology. Further, the Company's contention -- that a base level of 1,300 kwh combined with a three percent growth rate would yield greater miscellaneous usage in the year 2014 than that initially forecast by the Company -- is unpersuasive in the absence of documentation to support the base level of 1,300 kwh per year assumed by BECo.

In a previous decision, the Siting Council required an electric company to fully explain and justify its forecast of miscellaneous end-use energy sales. 1990 MMWEC Decision, 20 DOMSC at 23-24. Here, the Siting Council notes that the Company has

identified a number of factors which could affect miscellaneous use, such as dual-earner households and household income. However, the Company's identified factors have not been supported by sufficient evidence to provide a sound basis for the increased growth rate applied to the Company's miscellaneous end-use category.

Nonetheless, the Siting Council notes that BECo has developed service-territory-specific data to support its forecasts of seven appliances which total about 60 percent of the Company's residential energy requirements for 1991 and has incorporated price-elasticity responses to all of the appliances identified in its forecast of average use.

Accordingly, based on the foregoing, the Siting Council finds the the Company's forecast of average use per appliance is minimally acceptable. However, in order for the Siting Council to approve BECo's residential forecast in its next filing, the Company must furnish (1) a complete explanation of how appliance efficiency standards were applied to its forecast of average use per appliance along with an average use forecast consistent with an application of those standards, and (2) full supporting documentation of its forecast of miscellaneous use including analyses of the major factors identified as contributing to miscellaneous use, and a complete justification of its selection of a growth rate for the miscellaneous end-use category based on those analyses.

(E) Conclusions on the Long-Run Forecast

The Siting Council has found that (1) BECo's forecast of the number of residential customers is acceptable; (2) BECo's forecast of the number of appliances is acceptable, and (3) BECo's forecast of the average use per appliance is minimally acceptable.

Accordingly, the Siting Council finds BECo's forecast of long-run residential energy requirements to be reviewable, minimally appropriate and minimally reliable at the time it was filed.

iii. Conclusions on the Initial Forecast

The Siting Council has found that BECo's residential short-run energy forecast is reviewable, minimally appropriate and minimally reliable at the time of filing. The Siting Council has also found that BECo's long-run residential energy forecast is reviewable, minimally appropriate and minimally reliable at the time it was filed. Accordingly, the Siting Council finds BECo's initial residential forecast to be reviewable, minimally appropriate and minimally reliable at the time it was filed.

b. Reforecast

i. Description

BECo stated that it reforecasted residential energy sales employing the same methodology used in its initial residential sales forecast (Exh. HO-D-111). However, BECo noted that its reforecast utilized updated economic inputs (id.). Specifically, the Company indicated that its reforecast relied on August, 1991 DRI data as opposed to the January, 1989 DRI data which was used in its initial forecast filing (id., Exh. BE-9). Based on that August, 1991 DRI data, BECo noted changes in two key variables: (1) DRI's August, 1991 projection of income was lower than its January, 1989 income projection, and (2) the number of residential customers -- derived from a projection of population -- was higher based on DRI's August, 1991 data (Exh. HO-D-111).[76] In its reforecast, BECo projected residential energy sales to grow at a compound annual growth rate of 2.48 percent per

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76/ BECo reported that income was projected to grow at a compound annual growth rate of 0.9 percent in DRI's August, 1991 projection, as opposed to a growth rate of 1.5 percent based on DRI's January, 1989 projection (Exh. HO-D-111). BECo did not specify the time period related to that growth rate comparison (id.). BECo indicated that over the period 1991-2000, the number of new residential customers was projected to grow at a compound annual growth rate of 0.77 percent based on DRI's August, 1991 data, as opposed to a growth rate of 0.44 percent based on DRI's January, 1989 data (id.).

year over the period 1991 to 2000, as opposed to a compound annual growth rate of 1.76 percent per year under the initial forecast (id., Exh. BE-2, p. 68).

ii. Analysis and Findings

The Siting Council has reviewed the Company's long-run forecast methodology (see Section II.C.4.a.ii, above). In that review, the Siting Council found the Company's long-run forecast to be reviewable, minimally appropriate, and minimally reliable at the time it was filed.

Here, the Siting Council notes that BECo's reforecast of residential energy sales utilized more recent data as an input to the same methodologies used in its initial forecast of residential energy sales. In previous decisions, the Siting Council has required companies to update elements of their forecasts to determine the effects of changed circumstances. Eastern Energy Corporation, EFSC 90-100, pp. 8, 19-23 (1991) ("Eastern"); 1990 MMWEC Decision, 20 DOMSC at 1, 7; Fitchburg Gas and Electric Light Company, 19 DOMSC 69, 74-75 (1989) ("1989 Fitchburg Decision"). The Siting Council notes that the use of updated economic data here led to revised projections of two components of residential consumption and thereby resulted in a residential energy requirements projection that is higher than that of the Company's initial forecast filing. Nevertheless, the Siting Council notes that more current economic data and the results of the reforecast using that data offer a higher degree of reliability than the data and results of the initial forecast.

Accordingly, for purposes of this review, the Siting Council finds BECo's residential reforecast to be reviewable, minimally appropriate, and reliable at the time of the reforecast.

c. Conclusions on Residential Forecast

The Siting Council has found that BECo's initial residential forecast is reviewable, minimally appropriate, and minimally reliable

at the time it was filed. For purposes of this review, the Siting Council also has found that BECo's reforecast of residential energy demand is reviewable, minimally appropriate and reliable at the time of the reforecast.

The Siting Council notes that its current review is the first comprehensive review of BECo's residential demand forecast methodology. Here, the Siting Council has focussed on a broad range of issues which are pertinent to BECo's residential forecast and which reflect the level of review applied to electric companies in recent Siting Council decisions. In several instances, the Company's methodology has been identified as weak. Nonetheless, the Company has established a sound framework for residential demand forecasting, based largely on a disaggregated end-use model. In the future, the Company has the opportunity to strengthen its residential forecast methodology and to develop that methodology in accordance with electric companies of similar size and resource levels.

Accordingly, based on the foregoing, the Siting Council finds BECo's residential energy forecast to be reviewable, minimally appropriate, and reliable at the time of the reforecast.

5. Commercial Energy Forecast

BECo stated that its commercial sector energy demand was 7,112 GWH in 1991, or approximately 55 percent of its overall energy sales in that year (Exh. HO-D-111). BECo's unadjusted initial commercial energy demand was forecasted to increase from 7,601 GWH in 1991 to 9,031 GWH in 2000, a compound annual growth rate of 1.9 percent (Exh. BE-2, p. 102).[77] See Table 4, below. In the reforecast, BECo projected unadjusted commercial energy demand to increase from 7,112 GWH in 1991 to 7,937 GWH in 2000, a compound

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77/ The projections for energy demand do not reflect savings resulting from Company-sponsored C&LM and self-generation (Exh. BE-2, p. 102). If these savings are included, commercial energy demand is forecasted to increase from 7,413 GWH in 1991 to 8,031 GWH in 2000, a compound annual growth rate of .9 percent (id.).

annual growth rate of 1.2 percent (Exh. HO-D-111). See Table 5, below. The Company's ten-year commercial forecast is derived from a combination of its short-run commercial forecast and its long-run commercial forecast. Each of these is described below.

a. Initial Forecast

i. Short-Run Forecast

(A) Description

Dr. Cuomo stated that short-run forecasts are more appropriate than long-run forecasts for determining demand in the short term (Tr. 3, p. 154). Therefore, the Company indicated that it employed an econometric methodology to forecast short-run commercial energy demand on a monthly basis for the three-year period 1990 through 1992 (Exh. BE-2, p. 128). BECo projected that its unadjusted short-run commercial forecast would increase from 7,347 GWH in 1990 to 7,827 GWH in 1992, a compound annual growth rate of 3.2 percent (id., p. 102). BECo later indicated that actual commercial electricity demand in 1990 was 7,183 GWH and in 1991 it was 7,112 GWH (Exhs. BE-9, HO-D-111).

BECo stated that its short-run commercial model incorporated the following variables: (1) Massachusetts personal income; (2) heating degree days; (3) temperature/humidity; (4) employment by trade; (5) a dummy variable for the summer season;[78] (6) calendar use days;[79] and (7) price (Exh. BE-2, p. 134).

BECo indicated that it obtained data for the model from several sources (Exh. HO-D-104). BECo stated that it obtained

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78/ A dummy variable is used to model the increased energy consumption during the summer months of June, July, August, and September (Exh. BE-2, p. 134).

79/ Calendar use days are the actual number of calendar billing days during the month, as opposed to the meter reading schedule (Exh. BE-2, p. 132). BECo stated that the use of actual calendar use days improved the statistical performance of its equation (id.).

Massachusetts personal income data from DRI, and the heating degree day data and temperature/humidity data from another external source (id.). BECo further stated that it used Company data for the calendar use days variable and the results of the price forecast for the price variable (id.). For a discussion of the price forecast, see Section II.C.3.a, above. The Company indicated that it used the results of the employment forecast for trade employment (id.). For a discussion of the employment forecast, see Section II.C.1.a.i, above. In addition, Dr. Cuomo stated that employment is a "key driver of commercial energy sales" (Exhs. MP-1, BE-2, pp. 77-81).

BECo stated that its commercial short-run forecast is accurate and reliable (Exh. BE-2, p. 130). The Company indicated that the results of the commercial short-run model satisfied all the relevant statistical tests (id.). BECo also indicated that each individual variable was statistically significant (id.).

(B) Analysis and Findings

In the past, the Siting Council has accepted the use of short-run models as an appropriate method for forecasting energy demand in the short run. 1992 NU Decision, EFSC 90-17, p. 11; 1989 BECo Decision, 18 DOMSC at 221; 1988 NU Decision, 17 DOMSC at 6. In its previous filing, BECo used a two-year short-run forecast. 1989 BECo Decision, 18 DOMSC at 221. In this filing, however, BECo extended its short-run forecast period to three years. The Siting Council has serious concerns regarding the expansion of the short-run forecast to cover such an extended period of time. While the Siting Council recognizes the validity of using a short-run econometric methodology to determine the short-run effects on demand of certain variables, an econometric methodology applied over an extended period of time becomes both less representative of the determinants of demand and less reliable.

BECo has established that all its data, except the employment data, are derived from reasonably accurate and reliable sources.

BECo obtained the employment data for the commercial short-run forecast from its employment forecast. The Siting Council has found that BECo has failed to establish that its initial employment forecast is reliable. See Section II.C.1.c.i, above. Since, as the Company has acknowledged, employment is a "key driver of commercial energy sales," a commercial short-run forecast based on substantially inaccurate employment data is unlikely to be reliable. In fact, the record indicates that BECo's short-run forecast of 7,347 GWH of commercial energy demand in 1990 is far greater than its actual commercial energy demand of 7,183 GWH for that same year. In addition, BECo's short-run commercial forecast indicated a growth rate of 3.6 percent from 1989 to 1990, while the actual growth rate for this period was only 1.2 percent.[80]

Although the Company has failed to establish that (1) it is fully appropriate to implement a short-run forecast, (2) it is appropriate to extend its short-run forecast beyond two years, and (3) reliance on the initial employment forecast results in a reliable commercial forecast, BECo has established that its commercial short-run forecast methodology is statistically sound. Therefore the Siting Council finds that BECo's short-run commercial energy forecast is reviewable, and minimally appropriate. However, the Siting Council also finds that the Company has failed to establish that its short-run commercial forecast is reliable.

In order for the Siting Council to approve the short-run commercial forecast in BECo's next filing, the Company must furnish: (1) full justification for the use of a short-run commercial forecast and the period over which it is applied; and (2) evidence that all

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80/ The Company's projection of commercial demand in the second year of the short-run forecast did not reflect the decline in commercial energy demand which actually occurred. Specifically, BECo's short-run forecast predicted 7,827 GWH of commercial demand for 1991 while actual commercial demand amounted to 7,112 GWH for that same year (Exhs. BE-2, p. 102, HO-D-111).

variables and data inputs into the short-run forecast are appropriate and reliable.

ii. Long-Run Forecast

(A) Description

BECo indicated that its long-run commercial energy forecast extended from 1993 through 1999 (Exh. BE-2, p. 102). BECo forecasted its unadjusted long-run commercial energy demand to increase from 8,068 GWH in 1993 to 8,875 GWH in 1999, a compound annual growth rate of 1.6 percent (id.).

BECo stated that its long-run commercial forecast methodology is essentially the same as the methodology approved by the Siting Council in the 1989 BECo Decision (18 DOMSC at 219; Exh. BE-2, p. 70). BECo stated that it employs an end-use model called the Commercial Energy Demand Modeling System ("CEDMS"), developed by Jerry Jackson & Associates (id.). CEDMS forecasts energy consumption for 12 building types[81] and eight end uses[82] (id., p. 69).

CEDMS calculates energy use for each building type and end use by multiplying the quantity of equipment, the maximum energy consumption of that equipment (Energy Use Index or "EUI"), and the percentage of energy actually consumed relative to the EUI ("utilization factor") for each building type (id., p. 71). The Company stated that the base year data for the model was developed by BECo in 1985 and recalibrated in 1987 (id., p. 70).

BECo stated that it determined the quantity of equipment from the quantity of floor space (Exh. BE-2, p. 71). BECo stated that it

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81/ The 12 building types are: offices, restaurants, retail trade, grocery stores, warehouses, elementary/secondary schools, colleges/universities, hospitals, other health services, hotels/motels, public (except office buildings), and miscellaneous (Exh. BE-2, p. 69).

82/ The eight end uses are: space heating, air conditioning, ventilation, water heating, cooking, refrigeration, lighting, and others (Exh. BE-2, p. 70).

used employment as a proxy to determine the quantity of floor space (id.). The Company indicated that it obtained employment figures from the employment forecast (id.). For a discussion of the employment forecast, see Section II.C.1.a.i, above.

The Company stated that it forecasted floor space by multiplying estimates of the amount of floor space per employee by the number of employees (id.). BECo indicated that the floor space forecast included both existing floor space and new floor space additions (id.). BECo stated that it calculated new floor space additions as the difference between the floor space forecast and the amount of existing floor space (id.). The Company indicated that it calculated the amount of existing floor space over the forecast period by applying an age distribution to current floor space and using floor space removal rates (id.).

BECo stated that the EUI for each building type changes every year as new building additions are made and existing buildings are removed (id.). The Company indicated that the EUIs for existing buildings remain the same over their lifetimes once they are established (id.). BECo stated that it used several different methodologies to calculate the EUIs for new building additions (id.).

BECo stated that it can model the EUI for each individual new building addition (id., p. 73). BECo further stated that the heating, ventilation, and air conditioning end-use EUIs are determined through a random selection method which accounts for energy use requirements, system costs, fuel prices, operating costs, and payback requirements (id., pp. 72-73). BECo determined the EUI for the lighting end use through a random selection method similar to that used to select the heating, ventilation, and air conditioning end-use EUIs (id.). The Company determined the EUIs for water heating, cooking, refrigeration, and other end uses by using fuel price and efficiency elasticities (id.). BECo calculated these elasticities through a time series analysis of commercial energy demand (id.).

BECo obtained utilization factors through the use of utilization elasticities (id.). The Company calculated utilization elasticities through econometric equations which considered electricity price, price of competing fuels, and climate variables (id., p. 77).

For the initial forecast, BECo stated that it had made several revisions to its data since its last filing (id.). The Company stated that it had redefined building types, restructured floor space and employment data according to the new building types, disaggregated cooking and refrigeration from the miscellaneous end use category, developed territory-specific EUIs, estimated short-run utilization elasticities, and recalibrated CEDMS to 1987 data (id.).

BECo's overall commercial energy forecast is derived from a blending of its short-run and long-run commercial energy forecasts (Tr. 3, p. 154). In an attempt to blend the short-run and long-run forecasts, the Company stated that it compared the 1992 short-run forecast figure with the 1993 long-run forecast figure and observed an "almost negligible" growth rate (id.). BECo stated that it considered this low growth rate to be "very unrealistic," and proceeded with a comparison of the 1992 short-run figure and the 1994 long-run figure (id.). However, this comparison also did not yield satisfactory growth rates (id.). BECo stated that it continued the comparisons until the year 2000, at which point the Company determined that the growth rate was reasonable (id.).

To bridge the 1993 to 1999 blending period, the Company employed a straight line time series analysis (Exh. HO-D-43). BECo used the 1992 short-run commercial sales forecast figure as a starting point and the year 2000 long-run commercial sales forecast figure as the endpoint, and calculated a compound annual growth rate between the two points (id.). BECo applied this compound annual growth rate to the 1992 short-run figure to obtain the 1993 forecast figure (id.). The Company then applied the compound annual growth rate to the 1993 figure to obtain the 1994 figure, and continued this

process until it had obtained forecasts for the years 1993 through 1999 (id.).

BECo stated that the CEDMS model assumes an increase in commercial energy utilization as a response to efficiency improvements ("snapback effect") (Exh. MP-20). BECo stated that the snapback effect is equal to 15 percent of efficiency savings, or an average of 19 GWH per year from 1990 to 2000 (id., Exh. MP-RR-9). In support of its assumption, BECo cited several articles regarding the snapback effect in the residential sector (Exh. MP-17). The Company, however, did not provide any documentation or data in support of its assumption of a 15 percent snapback effect in the commercial sector (id., Exh. MP-18).

(B) Positions of Parties

MASSPIRG contends that the Company has overestimated commercial energy demand through the inclusion of the 15 percent snapback effect (MASSPIRG Initial Brief, p. 3). In response to MASSPIRG's contention, BECo claimed that the 15 percent snapback effect is theoretically sound and should be incorporated into the long-run commercial forecast (BECo Initial Brief, p. 48).

MASSPIRG further contended that BECo has failed to account for the effect on demand of a recently implemented five percent Massachusetts sales tax on commercial and industrial electricity sales (MASSPIRG Initial Brief, p. 3). In response, BECo stated that commercial and industrial energy demand are determined by the demand for the products and services produced by these sectors, and that commercial and industrial energy demand would be affected only by a substantial increase in the price of electricity (BECO Initial Brief, p. 48). BECo indicated that the cost of electricity comprises only approximately three to four percent of total costs to the commercial sector, and therefore a five percent increase in the price of electricity "would not have a perceptible impact on electricity demand" (id.; Tr. 4, p. 184).

(C) Analysis and Findings

Generally, BECo's modifications to its long-run commercial model and improvements to its data represent significant efforts by the Company to continually improve its forecast. The Company has demonstrated that its improvements have likely increased the reliability of the results of its long-run forecast. The Siting Council has approved this same long-run commercial forecast methodology in the past with the understanding that BECo would continue to improve its data and assumptions. 1989 BECo Decision, 18 DOMSC at 219. Here, BECo has demonstrated that it is continuing to improve its data and assumptions.

Nonetheless, several aspects of BECo' methodology raise concerns. First, with regard to BECo's blending of its short-run and long-run commercial forecasts, the Siting Council notes that pursuant to G.L. c. 164, sec. 69I, BECo is required to present a ten-year forecast of demand and supply. Here this period extends from 1990 through the year 2000. The Siting Council notes that the results of the CEDMS long-run end-use forecast are only used for the year 2000. For the blending period between the short-run and long-run forecasts from 1993 through 1999, BECo employed a straight line time series projection. Consequently, for seven of the eight statutory forecast years that BECo designated as long-run forecast years, BECo did not use its long-run end-use methodology to forecast commercial energy demand.

The Siting Council has serious concerns regarding the appropriateness of blending the short-run and long-run commercial energy forecasts. In utilizing the blending methodology to produce the commercial energy forecast for the years 1993 through 1999, the Company seems to have undermined the intent of the implementation of an end-use forecasting methodology to forecast long-run commercial energy demand. The straight line time series projection cannot capture the level of detail necessary to reflect accurately annual variations in commercial energy demand. Moreover, the Siting Council

notes that BECo did not use a similar methodology to blend the short-run and long-run residential energy forecasts. Instead, the short-run residential forecast and the long-run residential forecasts were simply combined. For a discussion of the short-run residential forecast, see Section II.C.4.a.i.(A), above.

Furthermore, the Siting Council notes that BECo failed to demonstrate that it applied a quantitative and reliable approach to determining the appropriate period over which to blend the results of the short-run and long-run commercial energy forecasts. In fact, the record indicates that the Company appears to have arbitrarily selected a blending period that would produce an expected growth rate. The Siting Council notes that this is the first time it has performed a detailed analysis of the blending of short-run and long-run forecasts in a forecasting methodology. Consequently, in spite of the detrimental effects of the blending methodology on the reliability and appropriateness of BECo's overall commercial energy forecast, the Siting Council accepts this methodology for the purposes of this review only.

Second, the Siting Council notes that BECo's long-run commercial forecast uses employment as a proxy for floor space. Therefore, employment is a key driver of the long-run commercial forecast. BECo obtained the employment data for the long-run forecast from its employment forecast. The Siting Council has found that BECo has failed to establish that its initial employment forecast is reliable. See Section II.C.1.c.i, above. As a result, a long-run commercial forecast based on unreliable data is unlikely to be reliable.

Third, the Company also has failed to document or justify its inclusion of a 15 percent snapback effect in the long-run model. In past reviews of commercial forecasts, the Siting Council has required electric companies to provide sufficient documentation in support of their assumptions. 1991 CECo/CELCo Decision, EFSC 90-4 at 27; 1989

MECo/NEPCo Decision, 18 DOMSC at 335; 1988 NU Decision, 17 DOMSC at 11.

The Siting Council, however, agrees with the Company that the five percent sales tax on commercial energy may not significantly affect total commercial energy demand. Assuming electricity costs comprised four percent of total commercial costs, a five percent increase in the price of electricity would only amount to a 0.2 percent increase in total commercial costs. This magnitude of increase in electricity price would be unlikely to alter the electricity consumption patterns in the commercial sector.

In sum, BECo's dependence on unreliable employment data as a key driver for its long-run commercial forecast, its inclusion of a 15 percent snapback effect, and its blending of the short-run and long-run commercial forecasts may seriously impact the reliability of its overall commercial forecast. In fact, BECo's use of unreliable employment forecast data and incorporation of the 15 percent snapback effect may have caused it to overestimate its long-run commercial forecast.

Accordingly, the Siting Council finds that BECo's long-run commercial energy forecast is reviewable and minimally appropriate. The Siting Council also finds that the Company has failed to establish that its long-run commercial energy forecast is reliable. In order for the Siting Council to approve the commercial forecast in BECo's next filing, the Company must furnish: (1) full justification and documentation for the inclusion of any snapback effect in its long-run commercial forecast; (2) evidence that it has incorporated reliable employment data in the calculation of its long-run commercial forecast; and (3) either full justification for or omission of the practice of blending the short-run and long-run commercial forecasts over an extended period of time.

iii. Conclusions on the Initial Forecast

The Siting Council has found that BECo's short-run commercial energy forecast is reviewable and minimally appropriate. The Siting Council, however, also has found that the Company has failed to establish that its short-run commercial energy forecast is reliable. The Siting Council has found that BECo's long-run commercial energy forecast is reviewable and minimally appropriate. The Siting Council also has found that the Company has failed to establish that its long-run commercial energy forecast is reliable. Accordingly, the Siting Council finds that BECo's initial commercial energy forecast methodology is reviewable and minimally appropriate. However, the Siting Council also finds that the Company has failed to establish that its initial commercial energy forecast is reliable.

b. Reforecast

i. Description

BECo stated that its reforecast of commercial energy demand demonstrated slower growth than its initial forecast (Exh. HO-D-111). BECo indicated that its reforecast projected unadjusted commercial energy demand to increase from 7,112 GWH in 1991 to 7,937 GWH in 2000, a compound annual growth rate of 1.2 percent (id.). By contrast, the initial forecast produced unadjusted commercial energy demand figures of 7,601 GWH in 1991 increasing to 9,031 GWH in 2000, a compound annual growth rate of 1.9 percent (Exh. BE-9).

BECo stated that it used CEDMS to produce its reforecast of long-run commercial energy demand (Exh. HO-D-111). The Company indicated that it used the revised commercial employment forecast as the input for the reforecast (id.). For a discussion of the revised commercial employment forecast, see Section II.C.1.a.ii, above. The Company indicated that the reforecast utilized employment data that are approximately 31 months more recent than the data used in the initial forecast (id.).

ii. Analysis and Findings

BECo indicated that the methodology used for the reforecast of commercial energy demand is the same as that used for the initial forecast of commercial energy demand. Nevertheless, the methodological problems of blending and snapback are still present. However, the commercial employment forecast used in the reforecast is based on data that is 31 months more recent than that used in the initial forecast. Accordingly, the Siting Council finds BECo's reforecast of commercial energy demand to be reviewable, minimally appropriate and minimally reliable at the time of the reforecast.

c. Conclusions on the Commercial Energy Forecast

The Siting Council has found that BECo's initial commercial energy forecast is reviewable and minimally appropriate. The Siting Council also has found that BECo has failed to establish that its initial commercial energy forecast is reliable. The Siting Council has found BECo's reforecast of commercial energy demand to be reviewable, minimally appropriate, and minimally reliable at the time of the reforecast. Accordingly, the Siting Council finds BECo's commercial energy forecast to be reviewable, minimally appropriate, and minimally reliable at the time of the reforecast.

6. Industrial Energy Forecast

BECo stated that its industrial sector energy demand was 1,685 GWH in 1991, or approximately 13 percent of its overall energy sales in that year (Exh. HO-D-111). BECo's unadjusted initial industrial energy demand was forecasted to increase from 1,874 GWH in 1991 to 2,009 GWH in 2000, a compound annual growth rate of 0.8 percent (Exh. BE-2, p. 112).[83] See Table 4, below. In the

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83/ The projections for energy demand do not reflect savings resulting from Company-sponsored C&LM and Time-of-Use ("TOU") rates (Exh. BE-2, p. 112). If these savings are included, BECo forecasts energy demand as 1,854 GWH in 1991 increasing to 1,952 GWH in 2000, a compound annual growth rate of 0.6 percent (id.).

reforecast, BECo projected unadjusted industrial energy demand to increase from 1,685 GWH in 1991 to 1,956 GWH in 2000, a compound annual growth rate of 1.6 percent (Exh. HO-D-111). See Table 5, below. The Company's ten-year industrial forecast is derived from a combination of its short-run industrial forecast and its long-run industrial forecast. Each of these is described below.

a. Initial Forecast

i. Short-Run Forecast

(A) Description

BECo indicated that it employed an econometric methodology to forecast short-run industrial energy demand on a monthly basis for the three-year period 1990 through 1992 (Exh. BE-2, p. 128). BECo forecasted its unadjusted short-run industrial energy demand to increase from 1,869 GWH in 1990 to 1,890 GWH in 1992, a compound annual growth rate of 0.6 percent (id., p. 112).

BECo stated that its short-run industrial forecasting model uses the following variables to determine industrial energy demand: (1) manufacturing employment; (2) U.S. industrial production index; (3) calendar use days; (4) U.S. producer price index; (5) weather;[84] (6) price; and (7) U.S. inventory/sales ratio (id., p. 137). BECo indicated that manufacturing employment is the most significant variable (id.).

BECo indicated that it obtained the data for the industrial short-run forecast from various sources (Exh. HO-D-104). BECo stated that it obtained the U.S. industrial production index, the U.S. producer price index, and the U.S. inventory/sales ratio from DRI forecasts (id.). The Company indicated that it used the manufacturing employment forecast from its employment forecast for the manufacturing employment variable (id.). For a discussion of the

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84/ The weather variable is calculated by summing temperature/humidity and the product of heating degree days and windspeed (Exh. BE-2, p. 137).

manufacturing employment forecast, see Section II.C.1.a.i, above. BECo further stated that it used Company data for the calendar use days variable, a weather study by an external source for the weather variable, and the price forecast for the price variable (id.). For a discussion of the price forecast, see Section II.C.3.a, above.

BECo stated that the industrial short-run forecast was developed based on eight and one-half years of historical monthly data (Exh. BE-2, p. 137). The Company indicated that the results of the industrial short-run equation are all statistically significant (id.).

(B) Analysis and Findings

In the past, the Siting Council has accepted the use of short-run models as an appropriate method of forecasting energy demand in the short run. 1992 NU Decision, EFSC 90-17, p. 11; 1989 BECo Decision, 18 DOMSC at 221; 1988 NU Decision, 17 DOMSC at 6. As in the commercial forecast, however, BECo has extended its short-run industrial forecast period in this filing, in this case from two years to three years. The Siting Council expresses here the same concerns it raised in our review of the commercial forecast regarding the appropriateness and reliability of using the short-run forecast over such an extended period of time. See Section II.C.5.a.i, above.

BECo has established that its data, with the exception of the employment data, are derived from reasonably accurate and reliable sources. BECo obtained the manufacturing employment data for the industrial short-run forecast from its employment forecast. For a discussion of the manufacturing employment forecast, see Section II.C.1.a.i, above. The Siting Council has found that the Company failed to establish that its initial employment forecast was reliable. The Siting Council also notes that employment is the most significant variable in the industrial short-run equation. Consequently, an industrial short-run forecast based on inaccurate employment data is not likely to be reliable.

The Siting Council has noted its concerns regarding the appropriateness and reliability of BECo's short-run industrial forecast. However, the Company has established that its industrial short-run model is statistically sound. Therefore, the Siting Council finds that BECo's short-run industrial energy forecast is reviewable and minimally appropriate. The Siting Council also finds that the Company has failed to establish that its short-run industrial energy forecast is reliable.

In order for the Siting Council to approve the short-run industrial energy forecast in BECo's next filing, the Company must furnish full justification for the incorporation of the results of a short-run industrial forecast and the period over which those results are applied.

ii. Long-Run Forecast

(A) Description

BECo indicated that its long-run industrial energy forecast extended from 1993 through 1999 (Exh. BE-2, p. 112). BECo forecasted its unadjusted long-run industrial energy demand to increase from 1,904 GWH in 1993 to 1,994 GWH in 1999, a compound annual growth rate of 0.8 percent (id.).

BECo indicated that the basic methodology used in its industrial long-run forecast has been modified from the methodology last approved by the Siting Council (Tr. 3, pp. 161-162). See 1989 BECo Decision, 18 DOMSC at 219-220. BECo stated that it previously forecasted long-run industrial energy requirements with a combination of end-use modeling and econometric equations (Tr. 3, pp. 161-162, Tr. 4, p. 6). Here, BECo's long-run industrial energy forecast methodology is based entirely on end-use modeling (Exh. BE-2, pp. 103, 104, 115). Further, BECo indicated that it has replaced the end use model used in its previous forecast with the current model (id., p. 103).

BECo forecasted long-run industrial class consumption by assuming that energy requirements were represented by the sum of 19 identified industrial SIC manufacturing groups in its service territory (id., pp. 113-119).[85] In addition, BECo assumed that the electricity requirements of its industrial customers were driven by two major factors: (1) the demand for manufactured goods (i.e., industrial output), and (2) the level of electricity use per unit of output (i.e., the intensity of manufacturers' electricity use) (id., p. 103; Tr. 3, p. 179). Thus, BECo asserted that changes in industrial energy consumption could be forecast by projecting the rates of change in output and energy intensity (Exh. BE-2, pp. 103-105). BECo indicated that the Factor Decomposition Model ("FDM") implemented by the Company was designed to incorporate those rates of change (id., p. 103).[86]

BECo stated that its FDM model is being implemented in two phases (id., p. 104). BECo indicated that it presented Phase I in this filing (id., p. 104; Exh. HO-D-55). BECo stated that Phase II would involve expansions and refinements in data inputs (id.). BECo indicated that three factors -- fuel alternatives, energy efficiency, and building stock -- would be added to the model in Phase II (Exh. BE-2, pp. 104, 114).

BECo contended that end-use data would be identified fully and developed in Phase II (id., p. 106). BECo stated that "electric

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85/ The 19 two-digit SIC groups are: food and kindred products (SIC 20); textile mills (22); apparel products (23); lumber and wood (24); furniture and fixtures (25); pulp and paper (26); printing and publishing (27); chemicals (28); petroleum products (29); rubber and plastics (30); leather products (31); stone, clay, and glass (32); primary metals (33); fabricated metals (34); non-electric machinery (35); electrical machinery (36); transportation equipment (37); instruments (38); and miscellaneous (39) (Exh. BE-2, p. 115).

86/ Dr. Cuomo indicated that because the Company's previous end-use model -- the Production Input Decision Model -- required "extensive" data without a corresponding increase in accuracy, BECo adopted the FDM (Tr. 3, p. 162).

technology development" -- defined as end-use data covering saturation and penetration rates for end-use equipment such as efficient motors, heat pumps, and lighting, as well as industrial process and mechanical equipment -- was the most important variable affecting intensity (Exhs. HO-D-49, HO-D-50). As a consequence, BECo reported that data to support that variable presently was being developed based on its 1989 commercial/industrial customer survey (Exh. HO-D-50). Finally, Dr. Cuomo indicated that the manufacturers "most important" to the service territory -- the non-electric machinery (35), electrical machinery (36), and instruments (38) SIC groups -- would be analyzed for disaggregation to the three-digit SIC level (Tr. 3, p. 164).

BECo stated that its overall industrial energy forecast was derived from a blending of its short-run and long-run industrial energy forecasts (id., p. 74). BECo indicated that it used the same methodology to select the blending period for the short-run and long-run industrial forecasts that it used to select the blending period for the commercial forecast (id., p. 156). See Section II.C.5.a.ii.(A), above. BECo stated that its short-run industrial forecast produced very low results, and a comparison of those growth rates to the long-run industrial forecast results for the years 1993 through 1995 yielded "ridiculously high growth rates" (id., p. 78). BECo indicated that the long-run forecast predicted a rebound in the industrial sector (id.). Consequently, the Company stated that it selected 1993 through 1999 as the blending period for the short-run and long-run industrial forecasts (id.). BECo stated that the year 2000 "was a much more realistic long-run point to compare to the short-run forecast," which ends in 1992 (id.).

To bridge the 1993 through 1999 blending period, the Company employed a straight line time series analysis (Exh. HO-D-44). BECo used the 1992 short-run figure as a starting point and the year 2000 long-run figure as the endpoint, and calculated a compound annual growth rate between the two points (id.). BECo applied this compound

annual growth rate to the 1992 short-run figure to obtain the 1993 forecast figure (id.). The Company then applied the compound annual growth rate to the 1993 figure to obtain the 1994 figure, and continued this process until it had obtained forecasts for the years 1993 through 1999 (id.).

MASSPIRG argued that BECo's industrial forecast was biased because effects of a recently enacted five percent energy tax were omitted (MASSPIRG Brief, p. 3). During this proceeding, Dr. Cuomo indicated that the effects on consumption attributable to such a tax would not be significant because: (1) electricity cost is a minor concern of manufacturers, since it averages about two percent of finished product cost, and (2) the energy tax included numerous exceptions and exemptions (Tr. 4, pp. 183-186).

(B) Analysis and Findings

The Siting Council notes that the Company's modifications to its industrial model relative to the model employed in its previous forecast represent an important advance toward a more comprehensive end-use methodology for the industrial sector. In fact, another electric company has begun to use similar end-use models to forecast industrial energy demand. 1992 NU Decision, EFSC 90-17, pp. 30-36.

However, the Siting Council has a number of concerns regarding the Company's long-run industrial forecast. First, although BECo has continued to modify its long-run industrial end-use forecasting methodology, the Siting Council notes that, as in the commercial methodology, the results of the long-run forecast are not utilized for the years 1993 through 1999. See Section II.C.5.a.iii. The actual forecast methodology BECo employed over this period is a straight line time series projection. Consequently, the Siting Council has significant concerns similar to those in the commercial forecast regarding the appropriateness and the reliability of using the blending methodology over such an extended period of time.

Second, in using a procedure similar to that used in the commercial forecast, BECo also has failed to demonstrate that it applied a quantitative and reliable approach in determining the blending period between the short-run and long-run industrial forecasts. In fact, the record indicates that in the industrial sector, the Company arbitrarily selected a blending period that would produce "a more realistic" compound annual growth rate. In addition, the straight line time series blending methodology fails to provide the level of detail necessary to accurately reflect annual variations in industrial energy demand.

Although the Siting Council has concerns regarding the use of a straight line time series methodology to blend the short-run and long-run industrial forecasts over a seven year period, the Siting Council notes that this is the first time it has performed a detailed analysis of the blending of short-run and long-run forecasts in a forecasting methodology. Therefore, in spite of the deficiencies of the blending methodology, the Siting Council accepts the use of this methodology for purposes of this review only.

Finally, another weakness in the Company's current industrial forecast is the use of proxies to represent the electric technology development variable. The Company, however, has stated that it intends to fully develop the effects of electric technology development during Phase II of model implementation.

Here, as in its review of the commercial forecast, the Siting Council agrees with the Company that the five percent sales tax on industrial energy is not likely to have a significant effect on total industrial energy demand. Assuming electricity costs comprised two percent of total industrial costs, as the Company maintains, a five percent increase in the price of electricity would amount to only a 0.1 percent increase in total industrial costs. This magnitude of increase would not be sufficient to substantially alter the electricity consumption patterns of the industrial sector. See Section II.C.5.a.ii.(B), above.

Still, BECo's use of the blending methodology, and its use of proxies to represent the electric technology development variable, may affect the reliability of the industrial energy forecast. Accordingly, the Siting Council finds BECo's long-run industrial energy forecast to be reviewable, minimally appropriate and minimally reliable at the time it was filed.

In order for the Siting Council to approve the industrial forecast in BECo's next filing, the Company must furnish: (1) reliable data and an appropriate methodology to model the effects of electric technology development; and (2) either full justification for or omission of the blending of the short-run and long-run industrial energy forecasts over an extended period of time.

iii. Conclusions on the Initial Forecast

The Siting Council has found that BECo's short-run industrial energy forecast is reviewable and minimally appropriate. The Siting Council also has found that the Company has failed to establish that its short-run industrial energy forecast is reliable. The Siting Council has found that BECo's long-run industrial energy forecast is reviewable, minimally appropriate and minimally reliable at the time it was filed. Accordingly, the Siting Council finds that BECo's initial industrial forecast is reviewable and minimally appropriate. However, the Siting Council also finds that the Company has failed to establish that its initial industrial energy forecast is reliable.

b. Reforecast

i. Description

BECo indicated that its reforecast produced lower energy demand figures through 2000 (Exh. HO-D-111). However, BECo stated that, over the forecast period, its reforecast of industrial energy demand demonstrated higher growth rates than its initial forecast (id.). BECo indicated that its reforecast projected unadjusted industrial energy demand to be 1,685 GWH in 1991 increasing to

1,956 GWH in 2000, a compound annual growth rate of 1.6 percent (id.). See Table 5, below. By contrast, the initial forecast produced unadjusted industrial energy demand figures of 1,874 GWH in 1991 increasing to 2,009 GWH in 2000, a compound annual growth rate of 0.8 percent (Exh. BE-2, p. 112). See Table 4, below. However, the Company indicated that its actual industrial energy demand decreased 95 GWH between 1989 and 1990, and another 65 GWH between 1990 and 1991 (Exh. HO-D-111).

BECo stated that it used the FDM to produce its reforecast of industrial energy demand (id.). BECo indicated that it used the revised industrial employment forecast as the input for the reforecast (id.). For discussion of the revised industrial employment forecast, see Section II.C.1.a.ii, above. BECo did not indicate any differences in methodology between the initial industrial forecast and the reforecast (id.).

ii. Analysis and Findings

BECo indicated that the methodology used for the reforecast of industrial energy demand is the same as that used for the initial forecast of industrial energy demand. However, the inputs to the reforecast are revised, and therefore offer a higher level of reliability than those of the initial forecast. Nonetheless, in light of the decrease in the actual industrial energy demand from 1989 to 1991, the Siting Council notes its concerns regarding the projected increased growth rate of the reforecast. Still, the results of the reforecast should be more reliable than those of the initial forecast.

Accordingly, the Siting Council finds BECo's reforecast of industrial energy demand to be reviewable, minimally appropriate and minimally reliable at the time of the reforecast.

c. Conclusions on the Industrial Energy Forecast

The Siting Council has found that BECo's initial industrial energy forecast is reviewable, and minimally appropriate. The Siting Council also has found that the Company has failed to establish that its initial industrial energy forecast is reliable. The Siting Council also has found BECo's reforecast of industrial energy demand to be reviewable, minimally appropriate and minimally reliable at the time of the reforecast. Accordingly, the Siting Council finds BECo's industrial energy forecast to be reviewable, minimally appropriate and minimally reliable at the time of the reforecast.

7. Other Energy Forecasts

In addition to forecasting electricity in the residential, commercial and industrial sectors, Boston Edison projected energy consumption for the following classes: streetlighting; municipal sales; MBTA; MWRA; and "losses and company use" (Exh. BE-2, pp. 121-123). See Tables 4 and 5 below.

a. Streetlighting Forecast

Boston Edison stated that streetlighting energy sales accounted for about one percent of total service territory sales in 1989 (id., p. 121). The Company stated that it expects sales in this category to decline from 129 GWH in 1990 to 110 GWH in 2000 (id., pp. 121, 124). BECo indicated that it expected constraints on municipal spending, particularly the provisions of "Proposition 2-1/2," and improvements in the energy efficiency of lamps used in streetlighting to reverse growth in streetlighting sales (id., p. 121). The Company stated that it assumed that through its C&LM programs 4,410 streetlights would be replaced annually for eight years, accounting for an average savings of 626 kwh per light (Exh. HO-D-81).

The Company stated that, because the streetlighting forecast is not sensitive to DRI economic projections, the initial

streetlighting forecast was not changed in the reforecast (Exh. HO-D-111, p. 23.).

In a previous decision, the Siting Council rejected an electric company's streetlighting forecast because the company failed to provide documentation or support for the assumption that streetlighting sales would remain constant. See 1990 MMWEC Decision, 20 DOMSC at 36 and 37. Here, Boston Edison has provided limited documentation regarding its assumptions relative to its streetlighting C&LM programs and to its projections of declining streetlighting energy sales.

For purposes of this review, the Siting Council finds that the Company's streetlighting forecast to be reviewable, appropriate, and reliable at the time of the reforecast. In order for the Siting Council to approve BECo's streetlighting forecast methodology in its next filing, however, Boston Edison must furnish more extensive documentation to substantiate its assumptions regarding streetlighting sales. The Company's documentation of streetlighting sales assumptions should include, but not be limited to, information regarding the number of streetlights to be replaced, and the average savings per light.

b. Municipal Sales Forecast

Boston Edison stated that it sells electricity at wholesale to the municipal light departments in the Towns of Concord and Wellesley on an as-needed basis (Exh. BE-2, p. 121). The Company indicated that those light departments also purchase a small portion of their energy requirements from the New York Power Authority (id.). Boston Edison stated that municipal sales were expected to grow from 356 GWH in 1991 to 432 GWH in 2000 (id., p. 125).

To forecast municipal sales, Boston Edison stated that it used regression equations which operated under the assumption that the Towns' energy requirements were a function of GNP, personal

income, and local employment (id.). The Company stated that Concord sales were a function of town employment and GNP, and that Wellesley sales were a function of personal income and GNP (Exh. HO-D-82). Employment forecasts were derived by applying territory employment growth rates to actual 1988 employment in Concord (Exh. BE-2, p. 125). The Company obtained GNP and personal income forecasts from DRI (id.).

The Company stated that the methodology used in the reforecast of municipal sales was the same as that used in the initial forecast. The Company indicated that, in the reforecast of municipal sales, August, 1991 DRI forecasts of employment, personal income and GNP were used (Exh. HO-D-111, p. 21). The Company stated that, in its reforecast, it expected municipal sales to grow from 333 GWH in 1991 to 421 GWH in 2000 (id., p. 22).

For the purposes of this review, the Siting Council finds Boston Edison's initial municipal sales forecast to be reviewable, appropriate and reliable at the time of filing. The Siting Council finds the Company's reforecast of municipal sales to be reviewable, appropriate and reliable at the time of the reforecast.

c. MBTA

Boston Edison stated that it had a "special contract" for energy sales with the MBTA (Exh. BE-2, p. 122). The Company stated that sales to the MBTA special account were forecasted to grow from 137 GWH in 1991 to 164 GWH in 2000 (id., p. 125). To forecast sales to the MBTA, the Company applied a projected commercial sector growth rate to 1988 MBTA consumption (id.).

BECo stated that, in the reforecast of sales to the MBTA, the Company used actual 1991 sales to the MBTA as a baseline, and applied a commercial sector growth rate from the reforecast (Exh. HO-D-111, p. 23). Otherwise, the methodology used by the Company to forecast sales to the MBTA remained unchanged in the reforecast (id.).

For the purposes of this review, the Siting Council finds Boston Edison's initial MBTA sales forecast to be reviewable, appropriate and reliable at the time of filing. The Siting Council finds the Company's reforecast of sales to the MBTA to be reviewable, appropriate and reliable at the time of the reforecast.

d. MWRA

Boston Edison stated that it had a special contract with the MWRA for sales to the MWRA's Deer Island facility (Exh. BE-2, p. 122). The Company stated that it expected energy sales for this account to grow from 163 GWH in 1991 to 322 GWH in 2014 (id., pp. 122, 125). BECo stated that the forecast was developed from information obtained from the MWRA (id., p. 122).

The Company indicated that, because the forecast of sales to the MWRA is not sensitive to DRI economic projections, the initial forecast of sales to the MWRA was not changed in the reforecast (Exh. HO-D-111, p. 23).

For the purposes of this review, the Siting Council finds Boston Edison's forecast of MWRA sales to be reviewable, appropriate and reliable at the time of the reforecast.

e. Losses and Company Use

The Company stated that transmission and distribution system losses and company use would constitute approximately 9.1 percent of service territory sales over the forecast period (Exh. BE-2, pp. 122-123). BECo stated that this projection was slightly lower than the 9.4 percent forecasted in the Company's previous filing (id., pp. 122, 123, 126, and 127). The Company stated that losses and company use were projected to grow from 1,249 GWH in 1991 to 2,047 GWH in 2014 (id., pp. 126, 127). BECo stated that it calculated the loss percentage through an analysis of the Company's recent load data (id.).

In its reforecast filing, the Company provided no documentation of changes in methodology or data relative to its forecast of losses and company use.

For the purposes of this review, the Siting Council finds Boston Edison's forecast of losses and company use forecast to be reviewable, appropriate, and reliable.

f. Conclusions on the Other Energy Forecasts

The Siting Council has found BECo's forecast of streetlighting sales to be reviewable, appropriate, and reliable at the time of the reforecast. The Siting Council has also found the Company's initial forecasts of municipal sales and sales to the MBTA to be reviewable, appropriate and reliable at the time of filing, and the Company's reforecasts of municipal sales and sales to the MBTA to be reviewable, appropriate and reliable at the time of the reforecast. In addition, the Siting Council has found the Company's forecast of sales to the MWRA to be reviewable, appropriate and reliable at time of the reforecast. The Siting Council has also found the Company's forecast of losses and company use to be reviewable, appropriate, and reliable. Therefore, the Siting Council finds BECo's other energy forecasts to be reviewable, appropriate and reliable at the time of the reforecast.

8. Conclusions on the Energy Forecast

The Siting Council has found Boston Edison's employment forecast to be reviewable, appropriate and reliable at the time of the reforecast. The Siting Council has found BECo's initial demographic forecast and demographic reforecast to be reviewable, appropriate and reliable. The Siting Council also has found Boston Edison's price forecast to be reviewable, appropriate and reliable. In addition, the Siting Council has found BECo's residential energy forecast to be reviewable, minimally appropriate and reliable at the

time of the reforecast. The Siting Council has found both BECo's commercial energy forecast and its industrial energy forecast to be reviewable, minimally appropriate and minimally reliable at the time of the reforecast. Finally, the Siting Council has found BECo's other energy forecasts to be reviewable, appropriate and reliable at the time of the reforecast.

Accordingly, the Siting Council finds BECo's forecast of energy requirements to be reviewable, minimally appropriate and reliable at the time of the reforecast.

D. Peak Load Forecast

1. Initial Forecast

a. Description

BECo stated that it is a summer peaking system and expects to remain so throughout the forecast period (Exh. BE-2, p. 145). BECo forecasted initial unadjusted summer peak load to increase from 2,809 MW in 1991 to 3,370 MW in 2000, a compound annual growth rate of 2.0 percent[87] (id., p. 11). See Table 1, below. BECo stated that it used the Electric Power Research Institute's ("EPRI") Load Management Strategy Testing Model ("LMSTM") to forecast peak load (id., p. 145). BECo indicated that LMSTM uses hourly load shapes and the energy forecast as inputs (id.). BECo stated that the data for the hourly load shapes were derived from territory-specific end-use load data obtained through load research conducted by the Company (id.).

87/ The unadjusted peak demand figures do not reflect the savings resulting from TOU rates, self-generation, and Company-sponsored C&LM (Exh. BE-2, p. 150). If these savings are included, the peak demand figures would be 2,603 MW in 1991 increasing to 2,852 MW in 2000, a compound annual growth rate of 1.0 percent (id.).

BECo stated that LMSTM disaggregates hourly load shapes by sector[88] and end use[89] for each of four day types[90] and three seasons[91] (id., p. 146). The Company stated that the energy forecast for each sector (i.e., residential, commercial, industrial, etc.) was allocated to the corresponding hourly load shape, by day type and season, for that sector to produce a peak load forecast for each sector (id.). BECo indicated that the peak load forecasts for all the sectors were summed to produce the peak load forecast for the service territory (Exh. HO-D-64).

BECo stated that it has disaggregated its peak load model adequately relative to its energy model, and that it plans to disaggregate the peak load model further in the future (Tr. 4, pp. 94-97). BECo indicated that it has disaggregated the most significant residential end uses, which represent approximately 40 percent of residential load (id., p. 94). The Company stated that it used 21 different load shapes to represent the base, heating and cooling loads in the commercial sector (Exh. HO-D-68). The Company further stated that it developed nine load shapes for the industrial class using data obtained from customers representing 75 percent of the industrial class (Exh. HO-D-69).

88/ The sectors are residential, commercial, industrial, streetlighting, MBTA, and MWRA (Exh. BE-2, pp. 151-153).

89/ The end-use categories in the residential sector are heating, room air conditioning, central air conditioning, water heating, refrigeration, and others (Exh. BE-2, p. 151). The end-use categories for the commercial sector are heating, cooling and others (id., p. 152). The other sectors were not disaggregated by end use (id., pp. 152-153).

90/ The four day types are (1) weekdays, (2) weekends, (3) high days (the 14 days of highest demand in each season, excluding the peak day), and (4) peak days (Exh. BE-2, p. 146).

91/ The three seasons are winter (January, February, March and December), summer (June through September) and spring/fall (April, May, October and November) (Exh. BE-2, p. 146).

BECo indicated that the hourly load shapes were based on 1985 data because it was a normal weather year (Tr. 4, p. 85). The Company stated that it assumed normal weather conditions through the forecast period and did not adjust the peak load forecast for any weather abnormalities (Exh. HO-D-75). Dr. Cuomo stated that the most recent load data from 1988 was not used because the summer of that year was abnormally warm (Tr. 4, p. 85). BECo stated that it had not performed an analysis of the sensitivity of the peak load forecast to abnormal weather conditions (id., p. 87).

BECo stated that it calculated the final peak load forecast by deducting the capacity savings due to TOU rates, self-generation, and Company-sponsored C&LM from the peak load forecast described above (Exh. BE-2, p. 146). BECo indicated that the impact of TOU rates would amount to 17 MW by the year 2000 (id., p. 150). BECo also indicated that the impact of self-generation would amount to 35 MW by the year 2000, and that the impact of Company-sponsored C&LM would equal 466 MW by the same year (id.).

Finally, the Company stated that its system peak of 2,652 MW which occurred on July 23, 1991, was slightly higher than the projected 1991 system peak of 2,603 MW from its initial forecast. The Company argued that this indicates that its initial forecast is more accurate than the reforecast supported by intervenors (BECo Initial Brief, p. 3). For a description of the reforecast of peak load, see Section II.D.2.a, below.

b. Analysis and Findings

BECo has demonstrated that it has implemented a peak load model that adequately captures most of the variables that significantly affect peak load. The Siting Council recognizes the Company's implementation of the LMSTM as an appropriate use of sophisticated computer modeling techniques in peak load forecasting. The Siting Council also accepts the validity of the Company's estimates of the impacts of TOU rates and self-generation. In

addition, in the past, the Siting Council has accepted similar peak load forecasting methodologies from other electric companies. 1991 CECo/CELCo Decision, EFSC 90-4 at 36; 1989 MECo/NEPCo Decision, 18 DOMSC at 329; 1988 NU Decision, 17 DOMSC at 17.

However, BECo failed to account for the effects of weather in its peak load forecasting methodology. The Company acknowledges through its choice of data that abnormal weather may have a significant impact on the Company's peak load. Consequently, any comparisons between actual peaks and forecasted peaks should be conducted under normalized weather assumptions.[92]

In addition, the Siting Council has concerns regarding BECo's inputs to the peak load model. BECo indicated that it used the output of the energy forecast as a direct input into the peak load model. The Siting Council, however, has expressed its concerns regarding the reliability of the initial energy forecast in previous sections. See Sections II.C.4.a, II.C.5.a, II.C.6.a, above. Consequently, BECo's overestimated peak load forecast may be unreliable as a result of the energy forecast inputs. BECo's failure to account for the effects of weather on peak load also may have affected the performance of its peak load forecast.

Accordingly, the Siting Council finds that BECo's initial peak load forecast is reviewable and appropriate. The Siting also finds that BECo has failed to establish that its initial peak load forecast is reliable. In order for the Siting Council to approve the peak load forecast in BECo's next filing, the Company must furnish (1) an analysis of the sensitivity of peak load to weather abnormalities for all seasons; and (2) evidence that it has

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92/ BECo claimed that the July 23, 1991, all-time peak of 2,652 MW supports the reasonableness of its peak demand forecast even in light of the current economic recession. The Company, however, did not provide evidence regarding the effects that higher temperatures during the summer of 1991 may have had on peak demand. Consequently, in light of BECo's failure to model weather in its peak demand methodology, the 1991 summer peak cannot be compared with the initial forecast under the conditions specified.

incorporated reliable energy forecast data into its peak load methodology.

2. Reforecast

a. Description

BECo's reforecast of peak load produced considerably lower figures than its initial forecast (Exh. HO-D-111). In the reforecast, BECo projected unadjusted peak loads of 2,652 MW in 1991 increasing to 3,152 MW in 2000, a compound annual growth rate of 1.94 percent (id.). See Table 2, below. By contrast, the initial forecast produced unadjusted peak load figures of 2,809 MW in 1991 increasing to 3,370 MW in 2000, a compound annual growth rate of 2.0 percent (Exh. BE-2, p. 149). See Table 1, below.

BECo stated that it used the same load factors generated by LMSTM for the initial forecast to calculate the reforecast (Exh. HO-D-111). The Company stated that it used the reforecast of energy derived from the August, 1991 DRI forecast as the input to LMSTM (id.).

b. Analysis and Findings

Because BECo indicated that its methodology for the reforecast of peak load is essentially the same as its initial forecast of peak load, we find that BECo's reforecast of peak load is reviewable and appropriate. In addition, the reforecasts of BECo's employment data and energy have been established to be more reliable than the initial forecasts of employment and energy. See Sections II.C.1.c.ii, II.C.4.b.ii, II.C.5.b.ii, II.C.6.b.ii, above. Consequently, the inputs to the reforecast of peak load have been established as more reliable than the inputs to the initial forecast of peak load. Therefore, the results of the reforecast of peak load are more reliable than the results of initial forecast of peak load. Accordingly, the Siting Council finds BECo's reforecast of peak load

to be reviewable, appropriate and reliable at the time of the reforeca

3. Conclusions on Peak Load Forecast

The Siting Council has found that BECo's initial peak load forecast is reviewable and appropriate. The Siting Council also has found that BECo has failed to establish that its initial peak load forecast is reliable. The Siting Council also has found BECo's reforecast of peak load to be reviewable, appropriate and reliable at the time of the reforecast. Accordingly, the Siting Council finds BECo's peak load forecast to be reviewable, appropriate, and reliable at the time of the reforecast.

E. Conclusions on Demand Forecast

The Siting Council has found: (1) BECo's forecast of energy requirements to be reviewable, minimally appropriate, and reliable at the time of the reforecast; and (2) BECo's peak load forecast to be reviewable, appropriate, and reliable at the time of the reforecast.

BECo presented three major arguments regarding its demand forecast.[93] BECo argued that (1) its reforecast was not a replacement for its initial demand forecast; (2) the growth rates associated with its initial forecast and its reforecast exhibited

93/ MASSPIRG argued that the Company's initial forecast of demand should be rejected due to its reliance on outdated economic data (MASSPIRG Initial Brief, p. 9; MASSPIRG Reply Brief, pp. 1, 4; MASSPIRG Letter Brief, p. 4).

considerable similarities;[94] and (3) the peak load level of summer 1991 constituted evidence that declining economic activity had not produced a clear decrease in peak load[95] (BECo Initial Brief, pp. 38, 40; BECo Letter Brief, p. 2).

In response to BECo's arguments, the Siting Council recognizes that some methodological differences exist between BECo's initial forecast filing and its reforecast. Nonetheless, the record in this proceeding indicates that the Company's reforecast was based largely on the forecasting techniques used by the Company to develop its initial forecast filing.[96] In addition, the Company has provided a reforecast of energy and peak load requirements which incorporate the effects of more recent economic input data. In this decision, the Siting Council has recognized the significance of that more

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94/ Over the period 1991-2000, the high, base, and low case projections of energy requirements in BECo's initial forecast reflected compound annual growth rates of 2.4 percent, 1.8 percent, and 1.2 percent, respectively, while its high, base, and low case projections of peak load requirements reflected compound annual growth rates of 2.7 percent, 2.0 percent, and 1.4 percent, respectively (Exh. BE-2, pp. 191, 193). Over the same time period, the high, base, and low case projections of energy requirements in BECo's reforecast reflected compound annual growth rates of 2.3 percent, 1.9 percent, and 1.0 percent, respectively, while the high, base, and low case projections of peak load requirements reflected compound annual growth rates of 2.5 percent, 1.9 percent, and 1.0 percent, respectively
(Exh. HO-D-111).

95/ BECo reported that it experienced a new historic high peak load of 2,652 MW on July 23, 1991 (BECo Initial Brief, Attachment 1).

96/ In previous decisions, the Siting Council has required companies to update elements of their forecasts to determine the effects of changed circumstances. 1991 Eastern Decision, EFSC 90-100 at 8, 19-23; 1990 MMWEC Decision, 20 DOMSC at 7; Fitchburg Gas and Electric Light Company, 19 DOMSC at 69, 74-75 (1989) ("1989 Fitchburg Decision"). In addition, the Siting Council has recognized that electric companies may be required to provide alternate forecasts of resource need as part of the reviews of the demand forecast and resource inventory under the new IRM framework. 1990 Final Decision, 21 DOMSC, 116.

recent economic data, primarily in terms of the higher level of reliability which it offers in the Company's reforecast of energy and peak load requirements. See Sections II.C.1, II.C.4.b, II.C.5.b, II.C.6.b, and II.D.2, above.[97]

The Company also argued that the initial forecast and the reforecast exhibited considerable similarities in terms of growth rates. While the Siting Council acknowledges that fact, throughout the forecast period the projected peak load levels of the reforecast are considerably lower than the peak load levels projected in the initial forecast despite similarities in growth rates. For example, 1992 peak load levels projected by the Company's reforecast are considerably lower than those projected by the Company's initial forecast, and peak load levels projected by the Company's initial forecast for 1996 would not be reached until 2000 according to the reforecast. See Tables 1 and 2, below. In every year of the forecast period the projected peak loads of the reforecast fall below the projected peak loads of the initial forecast. Clearly, the similarity in growth rates between the initial forecast and the reforecast fails to account for the sustained reduction in peak load levels reflected by the Company's reforecast.

With regard to the Company's reference to its July, 1991 summer peak load figure, the Siting Council notes that weather adjustment of that figure was not provided. See Section II.E.2.b., above. In the absence of such adjustment, the actual peak load level reported by the Company cannot be compared to other peak load data, either actual or projected, which have been adjusted for effects of weather. Weather has clear and pronounced impacts on energy consumption, and unless the peak load data in question have been recalculated in terms of a common weather reference point a

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97/ MASSPIRG raised a point regarding the use of outdated economic data in the Company's initial forecast, and the Siting Council has addressed that point in earlier sections of this decision regarding the Company's employment forecast, residential, commercial, and industrial energy forecasts, and peak load forecast.

comparison between various levels of peak load is rendered meaningless.

Accordingly, the Siting Council hereby APPROVES BECo's 1990 demand forecast based on its reforecast of energy and peak load requirements. In making this finding, the Siting Council notes that accurate projections of energy and peak load are of critical import to the determination of resource need in this proceeding. Here, we recognize that the significantly increased reliability associated with the reforecast meets this fundamental accuracy requirement.

III. ANALYSIS OF THE SUPPLY PLAN

A. Standard of Review

In keeping with its mandate in G.L. c. 164, sec. 69H, to "provide a necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost," the Siting Council reviews two dimensions of an electric utility's supply plan: adequacy and cost.

The adequacy of supply is a utility's ability to provide sufficient capacity to meet its peak loads and reserve requirements throughout the forecast period. 1991 Nantucket Decision, 21 DOMSC at 260; 1990 MMWEC Decision, 20 DOMSC at 41; 1989 MECo/NEPCo Decision, 18 DOMSC at 336; 1989 BECo Decision, 18 DOMSC at 224. The Siting Council has determined that different standards of review are appropriate and necessary to establish supply adequacy in the short run and the long run.[98] 1991 Nantucket Decision, 21 DOMSC at 260; 1990 MMWEC Decision, 20 DOMSC at 41; 1989 MECo/NEPCo Decision, 18 DOMSC at 336; 1989 BECo Decision, 18 DOMSC at 224. To establish adequacy in the short run, a company must demonstrate that it has an identified, secure, and reliable set of energy and power supplies. In essence, a company must own or have under contract sufficient resources to meet its capability responsibility under a reasonable range of contingencies. If a company cannot establish that it has adequate supplies in the short run, that company must then demonstrate that it operates pursuant to a specific action plan guiding it in being able to rely upon alternative supplies in the event of certain contingencies. 1991 Nantucket Decision, 21 DOMSC at

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98/ The Siting Council defines the short run as four years. The four year period is measured from the time in a proceeding that (1) the final discovery or record response is submitted, or (2) the final hearing is held, whichever is later. 1991 Nantucket Decision, 21 DOMSC at 260; 1990 MMWEC Decision, 20 DOMSC at 41-42; 1989 MECo/NEPCo Decision, 18 DOMSC at 336-337; 1989 BECo Decision, 18 DOMSC at 224-225.

260; 1990 MMWEC Decision, 20 DOMSC at 41; 1989 MECo/NEPCo Decision, 18 DOMSC at 336; 1989 BECo Decision, 18 DOMSC at 224.

To establish adequacy in the long-run, a company must demonstrate that its planning processes can identify and fully evaluate a reasonable range of resource options on a continuing basis while allowing sufficient time for the company to make appropriate supply decisions to ensure adequate cost-effective energy and power resources over all forecast years.[99] Generally, a supply plan that meets the least-cost standards set forth below is deemed adequate in the long-run.

The Siting Council next determines whether a supply plan minimizes the cost of power (that is, whether it ensures least-cost supply) subject to trade-offs with adequacy, diversity and the environmental impacts of construction and operation of facilities. 1991 Nantucket Decision, 21 DOMSC at 261-310, 1990 MMWEC Decision, 20 DOMSC at 42-99, 1989 MECO/NEPCo Decision, 18 DOMSC at 337-371, 1989 BECo Decision, 18 DOMSC at 225, 232-281. Recognizing that supply planning is a dynamic process undertaken under circumstances which make it difficult for a company to identify with exactitude all the power resources it plans to rely upon in the latter years of its long-range forecast (1991 Nantucket Decision, 21 DOMSC at 261-277, 1990 MMWEC Decision, 20 DOMSC at 42-99, 1989 MECo/NEPCo Decision, 18 DOMSC at 337-348, 1989 BECO Decision, 18 DOMSC at 225, 232-250), the Siting Council's review of the long-run cost of the supply plan generally focuses on a company's supply planning methodology. 1991 Nantucket Decision, 21 DOMSC at 261-310, 1990 MMWEC Decision, 20 DOMSC at 42-99, 1989 MECo/NEPCo Decision, 18 DOMSC at 337-371, 1989 BECo Decision, 18 DOMSC at 225, 232-281.

The Siting Council reviews the company's processes of identifying and evaluating a variety of supply options. In reviewing a company's resources identification process, the Siting Council

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99/ The Siting Council will evaluate the long-run adequacy of the Company's planning processes in Phase II of this Decision.

focuses on whether that company identified a reasonable range of resource options by (1) compiling a comprehensive array of available resource options, and (2) developing and applying appropriate criteria for screening its array of available resource options. In reviewing a company's resource evaluation process, the Siting Council determines whether that company (1) developed a resource evaluation process which fully evaluates all resource options, including the treatment of all resource options on an equal footing, and (2) applied its identified resource options. 1991 Nantucket Decision, 21 DOMSC at 261-310, 1990 MMWEC Decision, 20 DOMSC at 43-99, 1989 MECo/NEPCo Decision, 18 DOMSC at 337-371, 1989 BECO Decision, 18 DOMSC at 225-226, 232-281.

B. Previous Supply Plan Review

In its 1989 BECo Decision, the Siting Council ordered Boston Edison to comply with the following Orders:

(1) to include as part of its supply planning process a comprehensive analysis of the Pilgrim unit, including sensitivity analyses for, at a minimum, the different operating and cost variables that MASSPIRG has questioned in this proceeding;

(2) to consider for inclusion in its array of available resource options a wider range of generation technologies which potentially could contribute to a least-cost supply plan;

(3) to implement a methodology which includes an adequate consideration of the environmental impacts of alternative resource options;

(4) to diversify the sources consulted inside and outside of the Company for the purposes of developing the probabilities assigned to each variable forecast in the Company's risk management process ("Survey Order"). (18 DOMSC at 282)

The Survey Order is addressed below. The other Orders will be addressed in Phase II of this Decision.

The Siting Council included the Survey Order in its 1989 BECo Decision because of concerns over the Company's assignment of probabilities to forecasts of key variables (18 DOMSC at 273-275).

In response to the Survey Order, the Company included several surveys to develop probabilities for key variables that are the basis of BECo's risk management process (Exh. HO-S-100).[100] The

100/ BECo's risk management process is referred to as "reliability planning" in this decision, and is described in detail in Sections III.D.2, III.D.3, and III.E, below.

Company stated that it used "Delphi" surveys[101] to gather opinions from many of its personnel throughout five Company departments, as well as several participants from outside of the Company (id.). The Company stated that survey participants from outside the Company were selected using two criteria: (1) the agency or firm for which the individual works, and (2) "the individual's expertise in the related fields" (id.). The Company's surveys of outside participants consistently included policy analysts from the Commonwealth and a public interest group (id.). However, the Company stated that it did not know the outside participants' experience in forecasting these key variables (id.). The Company also indicated that it was aware of professional forecasters other than DRI that prepare economic and energy forecasts for Massachusetts (Tr. 45, pp. 89-92).

The Company surveyed 13 BECo personnel, three participants from outside the Company, and DRI for their opinion of the probability of various fuel price forecasts (Exh. HO-S-100). For the load growth variable, seven Company personnel and four participants from outside the Company were surveyed (id.). For capacity additions, nine Company personnel and six participants from outside the Company were surveyed, including one person employed by the New England Power Pool's Planning organization (id.). For the two variables concerning demand-side management and unit availability, the Company surveyed only BECo personnel (id., Exh. BE-1, p. E-11).

The Company's survey required that participants rate their "acquired knowledge" in energy planning, except for DRI, which was assigned a ranking equal to the total of the other participants

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101/ A Delphi survey generally allows experts to provide opinions in several iterations, after receiving the results of the prior iterations. However, BECo did not explain why its surveys were characterized as Delphi surveys when outside participants did not provide second opinions (Tr. 34, pp. 70-74).

(Exh. HO-RR-70, HO-S-101). The Company weighted the survey responses based on the expertise of the respondent (Exh. BE-1, p. E-10).[102]

CLF urged the Siting Council to reject BECo's use of "Delphi" surveys, arguing that the surveys lacked documentation, misused the Delphi methodology, and lacked reasoned explanation of its results (CLF Initial Brief, p. 21). CLF questioned the expertise of many of those who were consulted in the surveying process (id.). CLF argued that BECo may have influenced the outcome of the survey process through its selection of its employees to be polled (id.).

The Company's response to the Survey Order represents an improvement to the Company's past practice of relying exclusively on Company personnel to develop probabilities. BECo's effort to diversify its sources inside the Company through the participation of multiple departments within Boston Edison is a step towards compliance with the Survey Order. However, the Siting Council agrees with CLF that BECo's efforts to consult with sources outside of the Company were insufficient. In its last forecast, BECo indicated that it had consulted with Wharton Econometric Forecasting Associates for information on the accuracy of its load growth forecasts, and used DRI in assigning probabilities to the fuel price forecast. 1989 BECo Decision, 18 DOMSC at 240. Here, the Company did not use such supplemental information from professional forecasters beyond its use of the DRI fuel price forecast. The

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102/ To assist the outside participants in assigning probabilities to the forecasts of each variable, the Company provided a limited description of each forecast (Exh. HO-RR-70). For example, the Company informed the participants of the current level of the price of oil, and the price in the year 2014 under high, base, and low forecasts (id.). The Company also provided the average annual rate of increase in price represented by each forecast (id.). The participants received this data during telephone calls in which they were asked to assess the probability of each forecast (id.). This procedure was repeated for the peak load forecast (id.). The capacity additions survey was mailed to outside participants and contained an additional table indicating the following information for each planned unit: name, location, fuel type and BECo's MW entitlement (id.).

Siting Council's Survey Order required the Company to diversify the sources consulted inside and outside the Company. In the future, BECo should diversify the sources consulted outside of the Company, relying upon independent, professional forecasting experts. For forecasts that are Company-specific, the Siting Council encourages BECo to consult with outside professional forecasting experts that are familiar with the Company.

Nonetheless, the Siting Council finds BECo has complied with the Survey Order.

C. Reliability Planning

1. Overview

Consistent with the Siting Council's standard of review, this section addresses the reliability planning process by which Boston Edison projected its need for additional energy resources. In simplest terms, an electric company's need for additional energy resources can be assessed by comparing projected system loads to the ability of existing and planned resources to meet those loads. However, the reliability planning process is complex and ultimately requires detailed analysis of the factors that drive future load levels and those that affect contributions that may be anticipated from a company's existing and planned resources, all within the context of the uncertainties inherent in any forecasting process.

An appropriate reliability planning process has three essential components. First, a methodology must be developed that provides a theoretically sound basis for determining future resource requirements. A necessary part of this process is the development of a methodology for identifying a reliability planning target that strikes an appropriate balance between system reliability and cost. Second, appropriate input data must be selected and processed in a manner consistent with that methodology and which produces dependable projections of future resource requirements. Third, an implementation strategy reflecting least-cost objectives must be

developed for achieving the reliability objectives prescribed via the first two steps of the process.

In Section III.C.2, below, Boston Edison's reliability planning process is assessed to determine whether its planning methodology, application of that methodology, and implementation strategy are appropriate. Alternative approaches to reliability planning suggested by Intervenors are addressed in Section III.C.3, below.

2. Boston Edison's Reliability Planning Process

a. The Methodology

Boston Edison's proposed reliability planning methodology can be separated into three distinct phases. The first phase of the process consisted of the development of a series of resource need scenarios that spanned the planning horizon and attempted to capture the variability in supply forecasting by representing the full range of potential resource requirement levels (Exh. BE-1, pp. E-1 to E-2). The Company's forecasts were based on the factors, or "key variables," proposed to have the greatest influence on the levels of future resources that could be required (id., pp. E-1 to E-2, E-6).

The second phase of the process involved the development of production cost projections associated with individual forecasts, representing the costs that would be incurred if the Company were to expand its current supply-side and demand-side resource portfolio to meet future requirements prescribed by those individual forecasts (id., p. E-2).

The third phase focussed on an effort to strike an appropriate balance between system reliability and cost (id., pp. E-2 to E-3). Here, the Company employed a process that weighed the production costs that would be incurred at successive levels of system expansion against the reliability that could be achieved, as measured by the costs of unmet energy that could be avoided (id., p. E-18).

The application of these phases of Boston Edison's reliability planning methodology are addressed in Section III.C.2.b, below.

The reliability planning methodology proposed by the Company in this proceeding was largely the same as that submitted and evaluated in the 1989 BECo Decision. In that Decision, the Siting Council accepted the Company's methodology, which entailed forecasting a reasonable range of future resource requirements, developing projections of future production costs, and striking the appropriate balance between reliability and cost (18 DOMSC at 272-276). However, the Siting Council also concluded that the methodology presented there only "served as a practical starting point" for such evaluations. Id. at 276.

Here, the Siting Council finds that the Company's methodology constitutes an acceptable theoretical foundation for reliability planning. However, during the course of these proceedings, many issues were raised regarding the data and calculations utilized in the application of the reliability planning methodology. The issues pertaining to the Company's application of its reliability planning methodology are addressed next.

b. Application of the Reliability Planning Methodology

i. Developing Resource Need Scenarios

(A) Overview

The objective of the initial phase of Boston Edison's reliability planning process was to develop a series of projections of resource requirements across the planning horizon, which taken in total, represented the full range of future need scenarios to which the Company might have to respond (Exh. BE-1, pp. E-1 to E-2). Toward this end, Boston Edison first identified the key variables anticipated to most influence future resource requirements.

In the 1989 BECo Decision, Boston Edison presented four variables that it believed would most affect future resource

requirements: load; fuel prices; C&LM contributions; and capacity additions (18 DOMSC at 272). In that Decision, the Siting Council found that the Company had demonstrated that the four selected variables, in fact, significantly would affect resource requirements, but suggested that the Company also consider the forecasts of capacity factors for existing generating units, NEPOOL reserve requirements, and the timing of anticipated capacity additions. Id. at 271.

In this proceeding, the Company's forecasts of future resource requirements were based on what were initially five "key variables" (Exh. BE-1, p. E-6). These included "load growth," "fuel price," and the MW contributions from existing C&LM programs ("DSM penetration"), existing supply-side resources ("unit availabilities"), and planned supply-side resources ("capacity additions") (id.). BECo projected high, base, and low case MW levels for each variable (except for the "fuel price" variable), across the proposed 25-year planning horizon (id., pp. E-1 to E-2). Probability levels associated with the high, base, and low levels of each key variable also were developed (id., pp. E-10 to E-13).

With the high, base, and low MW and probability levels for each key variable serving as inputs, the Company used a decision tree program within its Integrated Decision Analysis System ("IDEAS") computer model to develop 81 scenarios representing different 25-year forecasts of incremental resource requirements and associated probability levels for each scenario (Exh. BE-1, pp. E-1, E-2, E-13). For each year in the forecast period, algorithms within the IDEAS decision tree model first subtracted the three "DSM penetration" MW levels from the three "load growth" MW levels to produce nine net load forecasts (Exh. BE-1, p. E-13). A reserve margin was next applied to each of the nine net load forecasts, reflecting the amount

of capacity that BECo would acquire to be consistent with NEPOOL's capability responsibility calculation (id.).[103]

BECo indicated that it reduced the five key variables to four by combining the "unit availabilities" and "capacity additions" variables into a single variable designated "effective resources" with its own high, base, and low MW and probability levels (id.).[104] The "effective resources" MW levels were subtracted from the "capability responsibility" MW levels, resulting in 27 different levels of resource need for each year of the forecast period (id.). BECo stated that these need scenarios, when combined with the three fuel price forecasts and their associated probabilities, yielded 81 forecasts of resource need (id.).

Finally, the Company indicated that it undertook a process to reduce the 81 alternative resource requirement forecasts to thirty "representative" scenarios (ten different resource requirement forecasts at each of the three high, base, and low fuel price levels) (id., pp. E-15 to E-16). These thirty scenarios were utilized in the second and third phases of Boston Edison's reliability planning process.

In the 1989 BECo Decision, the Siting Council found that the decision tree analysis constituted an appropriate method for projecting future resource requirements (18 DOMSC at 273). For the purposes of this review, we find that the Company's decision tree analysis, and in particular the algorythms within the IDEAS model,

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103/ Capability responsibility is a retroactive calculation done by NEPOOL to ensure that each NEPOOL participant provided, during a given billing period, an appropriate share of the total generating capacity (including reserves) necessary to meet NEPOOL-wide loads (Tr. 47, pp. 14-15; Exh. MP-38). The Company's capability responsibility is a function of Company loads (net of C&LM savings), the availabilities of its existing generating units over a prior four-year period, and other factors (Tr. 47, pp. 15-18; Exhs. HO-S-61, HO-S-213; MP-38).

104/ The derivation of BECo's "effective resources" key variable is presented and reviewed in Section III.C.2.b.i.(G), below.

represent an acceptable planning tool.[105] Further, the Siting Council finds that the Company's process for reducing the number of future scenarios from 81 to 30 is acceptable. A discussion and analysis of each of Boston Edison's key variables follows.[106]

(B) "Load Growth"

In Section II.D.1, above, the Siting Council has found that the Company has failed to establish that its initial peak demand forecast methodology is reliable. Accordingly, the Siting Council finds that the "load growth" projections from the initial demand forecast are not acceptable for the purpose of calculating future resource requirements.

105/ As indicated above, in calculating resource need through the IDEAS model, a reserve margin was applied to "net-of-DSM" load projections. The Siting Council notes that this method of projecting future resource requirements is consistent with generally accepted planning methods in the electric utility industry. However, we also note that, because the reserve margins utilized were based on the anticipated performance of BECo's existing generating units, resource need projections may be distorted to the extent that incremental load growth is met with resources having performance characteristics that differ from that of the Company's existing supply portfolio.

While this matter was not addressed on the record of this proceeding, it may be of consequence in future resource need assessments performed by the Company. We encourage the Company to address this issue in its next resource plan filing.

106/ As presented in Section I.B, above, during March 1992 the Company submitted updated information to the Siting Council concerning several of the variables affecting BECo's future resource requirements. However, the following sections contain an assessment of the input values for the key variables utilized in the Company's reliability planning process, which was presented in the May 1990 resource plan. Therefore, our evaluation of the key variables necessarily focusses on the record as it existed at the close of February, 1992 ("February 1992 Record").

(C) "Fuel Price"

Boston Edison stated that it selected "fuel price" as a key variable in the decision tree because, "while it does not directly impact required resources, it has a direct impact on load growth, C&LM and the amount of additional resources expected to come into service, as well as on the resources selected" (Exh. BE-1, p. E-6). BECo indicated that "fuel price" probabilities were developed through the Delphi process (id., p. E-10). BECo also stated that, although the "fuel price" variable did not directly affect the MW levels of the 81 forecasts of resource requirements, "fuel price" affected the decision tree results in terms of the probability levels attributed to individual need scenarios (id., p. E-36).

The Attorney General argued that "fuel price" should not have been treated as a key variable in the Company's decision tree analysis because it was a factor in the derivation of the Company's load growth forecasts, and because it did not affect the resource requirement levels that were the outcome of the decision tree analysis (Attorney General Initial Brief, pp. 87-88). The Attorney General maintained that the base load forecast assumes a base fuel price, the low load forecast assumes high fuel prices, and the high load forecast assumes low fuel prices (id., p. 88). Therefore, the Attorney General asserted that the Company created nonsensical scenarios in IDEAS by pairing, for example, its base case load forecast with high and low fuel prices when the Company's original base case load forecast was explicitly based on only the base case fuel forecast (id.).

The Siting Council agrees with the Attorney General that it may seem inappropriate to pair, for example, a high fuel price with a high load growth level in developing decision tree scenarios, when low fuel prices were a premise for the high "load growth" bandwidth. Nonetheless, the MW levels associated with the Company's key variable bandwidths are merely forecasts of possible future outcomes. It is possible, even if unlikely, that loads consistent with the high load

growth forecast may be realized even with high fuel prices. To the extent that the Company's Delphi process appropriately recognized the low probability of such an event (and likewise yielded appropriate probability levels for other combinations of the affected key variables), the Company's treatment of the "fuel price" variable in the decision tree analysis is acceptable. In addition, we note that the results of the Delphi process, through which the relative probability assignments for the "load growth," "DSM penetration," and "fuel price" variables were assigned, recognized the interdependencies of these variables (see Exh. BE-1, pp. E-10, E-11, E-31).

While we are not convinced that the Company's "fuel price" key variable enhanced its analysis, based on the record in this proceeding the Siting Council finds that the Company's treatment of the "fuel price" variable is acceptable for the purpose of calculating future resource requirements.

(D) "DSM Penetration"

(1) Company Proposal

BECo indicated that its existing C&LM resource plan[107] contained 12 residential programs, 20 commercial and industrial ("C&I") programs and one streetlighting conversion program (Exh. BE-1, pp. B-20 to B-22). BECo stated that the projected contributions toward peak MW reduction of these C&LM programs in the base case were derived from projections developed through the collaborative process

107/ BECo asserted that its resource plan includes no planned C&LM programs, only existing programs (Exh. BE-111, p. 6).

(id., p. E-7).[108] According to BECo, the base case "DSM penetration" projections assumed aggressive penetration into each market segment and BECo's payment of full measure cost below the Company's avoided cost (id., p. B-29). BECo stated that the high and low C&LM cases were developed using high and low penetration rates determined by Company personnel (id., p. E-7). BECo stated that the low C&LM case assumed lower penetration rates reflecting greater market barriers than were anticipated in the base case (id.). Similarly, BECo indicated that the high C&LM case assumed greater participation rates in the short-term than the base C&LM case, but the same participation rates as the base case by 2007 (id.).

BECo stated that some of the collaboratively designed C&I programs were not completed at the time of the development of the resource plan (id., p. B-27). Therefore, the Company indicated that it developed the resource plan using actual savings projections from the collaborative process for residential programs, but estimated the savings from "the yet to be designed C&I programs" in deriving base case "DSM penetration" projections (id.). The Company noted that the collaborative process did not include a review of all of the programs BECo currently offers, such as the load management programs, but stated that the load management programs were included in the resource plan (id.). The Company projected high, base and low "DSM penetration" projections for the year 2000 of 487 MW, 466 MW and 336 MW, respectively (id., p. E-32).

BECo stated that probabilities for the high, base and low C&LM cases of 36 percent, 44 percent and 20 percent, respectively, were assigned through the Delphi survey completed by BECo's C&LM

108/ The parties to the collaborative process -- CLF, MASSPIRG, the Division of Energy Resources, the Attorney General, and the Company -- collectively designed C&LM measures and strategies for BECo's customers (Exh. BE-1, p. B-7). As part of the collaborative process, the collaborative parties issued a report entitled "Phase II Collaborative Document" (id., p. B-8).

personnel, taking load growth and fuel prices into consideration (id.).

(2) Positions of Parties

CLF argued that by relying on the Phase II Collaborative Document instead of developing its own methodology for estimating base case C&LM potential, BECo produced unreasonably static and low "DSM penetration" MW projections (CLF Initial Brief, p. 5). CLF defined the Phase II Collaborative Document as a program design guide, not a resource planning projection (id.). CLF maintained that the Phase II Collaborative Document did not purport to review or estimate the size of BECo's C&LM resources; rather, the document only outlined cost-effective programs for initial implementation (id.). CLF also asserted that BECo's load-management program was not reviewed by the collaborative parties, so BECo cannot properly claim that the parties to the collaborative process took part in its estimates (id., p. 9). Further, CLF asserted that BECo incorporated estimates of its own C&I programs in the resource plan, not estimates of the collaboratively-designed C&I programs (id., p. 15; Exh. CLF-1, pp. 12-13; CLF Reply Letter, p. 2). Finally, CLF stated that "residential programs are arbitrarily assumed to terminate after five years and most C&I programs end soon after" (CLF Initial Brief, p. 15).

MASSPIRG argued that BECo did not consider all cost-effective C&LM in its resource plan (MASSPIRG Initial Brief, p. 21). MASSPIRG agreed with CLF that the Company inappropriately used the collaborative planning targets for the first five years of those programs as the maximum C&LM potential (id.). MASSPIRG further asserted that BECo made no attempt to extend certain programs, especially residential programs, throughout the full planning horizon (id.).

The Attorney General criticized the use of the collaborative C&LM estimates for planning purposes (Attorney General Initial Brief,

pp. 27-29). The Attorney General presented as a witness the technical coordinator for the non-utility parties to the collaborative, who testified that the collaborative estimates were produced for the "purpose of short-term program design" and were not intended to project C&LM potential or to be used for long-term resource planning (id.; Exh. CLF-2, p. 8).

The Attorney General also argued that the Company deliberately limited the effectiveness of existing C&LM programs (Attorney General Initial Brief, p. 25). The Attorney General noted that BECo acknowledged that its own marketing plans for certain 1991 conservation programs were "very limited" and "carefully controlled so that an excess of leads were not generated" (id.; Exh. BE-111, p. 6). According to the Attorney General, the residential high-use program achieved only four percent of its implementation goal during the first half of 1991 (Attorney General Initial Brief, p. 25; Exh. AG-RR-74). In addition, the Attorney General noted that the Company reached only 15 percent of its goal for the C&I programs (Attorney General Initial Brief, p. 26).

Finally, the Attorney General criticized the Company's assumption that new participation in residential programs would stop in 1994, because BECo had acknowledged that "additional DSM is a potential resource" and that "actual participation rates...will probably be small (but non-zero) in years after 1994" (parenthesis in original) (Attorney General Initial Brief, p. 26; Exh. BE-43, p. 2; Tr. 8, pp. 84-85).

BECo argued that it made "enhancements" to its process for forecasting C&LM resources -- a process which has been reviewed previously by the Siting Council -- to include the contribution of the comprehensive and aggressive programs developed through the collaborative process (Company Initial Brief, p. 81). The Company claimed that it had no reason to believe that there was any better source of savings projections from its existing programs than the collaborative (id., p. 108).

The Company stated that because nearly all the residential programs were developed by the collaborative to achieve reasonable penetration rates (generally around 30 percent) in five years, "no additional penetration was projected beyond 1994 because of uncertainty in the remaining market and [the] cost to penetrate that market" (Exhs. BE-43, p. 2, HO-S-183). BECo stated that C&I programs, however, were extended beyond 2000, "because of the difficulty in saturating the market" (Exh. HO-S-183). BECo added that while some additional C&LM savings were likely, it believed that the collaborative C&LM projections, taken on the whole, were "aggressive" (Tr. 8, p. 85).

The Company also stated that it is even likely that it will not be able to achieve as much C&LM savings in the early years of the forecast period as it had projected, but some incremental residential conservation will occur after 1994 (Company Initial Brief, pp. 72-73).

(3) Analysis and Findings

The Siting Council focusses on the accuracy and reasonableness of forecasting techniques in the review of the Company's projections of C&LM resource contribution (as well as our review of projections of planned capacity additions and existing generating unit availabilities). The Company's process for identifying and evaluating C&LM resources (including questions of the Company's aggressiveness in C&LM planning) is addressed in Phase II of this Decision.

CLF, MASSPIRG and the Attorney General have criticized the Company's reliance on the collaborative process to determine "DSM penetration" projections. The record indicates that the Phase II Collaborative Document is a program design guide, and the MW savings projected by the collaborative process are based on the initial implementation of an array of C&LM programs. The projection of C&LM savings at the beginning of a comprehensive new program is a

challenging task. Ultimately, some programs will exceed their projections, others will not, and programs which do not prove to be cost-effective will be discontinued. For purposes of this proceeding, the collaborative C&LM design projections constitute a reasonable, good-faith effort by the Company to estimate the contribution of C&LM.[109]

The Attorney General, CLF and MASSPIRG also criticized the Company for ending certain C&LM programs after only five years.[110] The record indeed reflects that none of the Company's existing residential C&LM programs extend beyond the five-year period identified in the Company's resource plan, while C&I programs extend 7 to 15 years (see Exh. CLF-1, p. 15). Therefore, the C&LM MW savings figures presented by the Company do not reflect any incremental savings associated with these programs after their termination dates.

The Siting Council notes that there is little likelihood that BECo will not offer residential C&LM programs after 1994. Specifically, it would be unlikely (and inappropriate) for the Company to ignore C&LM opportunities that present themselves in new residential construction beyond 1994. However, these programs, as currently planned, conclude in 1994. Therefore, no incremental MW savings would be anticipated from them beyond that date, and it would be inappropriate to assume otherwise for the purpose of determining resource need. While recognition of the planned end-dates of C&LM

109/ The Attorney General raised concerns about the low participation rates that have been experienced with certain of the Company's C&LM programs. However, issues concerning BECo's diligence in implementing its C&LM programs are properly a matter for Phase II of this Decision and in proceedings before the Department.

110/ The Siting Council notes the distinction between the duration of a C&LM program and the savings associated with that program. Although a program may end, i.e., the financial support for and installation of associated C&LM measures may terminate, the actual capacity and energy savings associated with program measures installed to that point may continue for many years.

programs (or any resource) might result in unmet need in subsequent years, it may be determined in Phase II of this Decision that reinstituting similar C&LM programs represents the most cost-effective means by which to meet that need. In this proceeding, the Company has met its burden of presenting an adequate C&LM plan. Accordingly, the Siting Council finds that BECo's "DSM penetration" projections are acceptable for the purpose of calculating future resource requirements.

(E) "Capacity Additions"

(1) Company Proposal

In the resource need calculation presented in its resource plan, the Company proposed to include the following units as planned resources: Ocean State Power ("OSP");[111] Hydro Quebec II ("HQ II");[112] Northeast Energy Associates ("NEA") 1 and 2;[113] Everett

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111/ OSP is comprised of two gas-fired combined cycle units located in Burrillville, Rhode Island. The February 1992 Record indicates that BECo's summer entitlement from OSP is 116.6 MW (Exh. HO-S-60).

112/ HQ II represents an energy-only power sales agreement ("PSA") between BECo and Hydro Quebec. The February 1992 Record indicates that BECo's summer entitlement from HQ II is 171.1 MW (Exhs. HO-S-60, HO-S-118).

113/ NEA 1 and 2, located in Bellingham, Massachusetts, are gas-fired combined cycle cogeneration units. The February 1992 Record indicates that BECo's summer entitlement from NEA 1 is 130.7 MW, while its entitlement from NEA 2 is 68 MW (Exh. HO-S-60).

Energy;[114] L'Energia;[115] Patriot Energy;[116] Wheelabrator Urban Woods;[117] AES Riverside;[118] and the winning bids from BECo's RFP #2[119,120] (Exh. BE-1, p. C-24).[121] The Company's calculations of future resource need thus reflected projected contributions from planned capacity additions, which generally increased in terms of total MW between 1991 to 1996, remained constant between 1996 and the year 2000, and then decreased through 2014 (id., p. C-13).

114/ The February 1992 Record indicates that BECo and Everett Energy signed a PSA, entitling the Company to 80 MW from the gas-fired facility in Everett, Massachusetts (Exh. HO-S-60).

115/ L'Energia is a gas-fired combined cycle qualifying facility located in Lowell, Massachusetts. The February 1992 Record indicates that the Company's summer entitlement from this unit is 48.8 MW (Exh. HO-S-60).

116/ BECo and Patriot Energy signed a PSA pursuant to BECo's RFP #1. The February 1992 Record indicates that this PSA entitles the Company to 200 MW from the coal-fired cogeneration facility (Exh. HO-S-60).

117/ BECo and Wheelabrator Urban Woods signed a PSA pursuant to BECo's RFP #1. The February 1992 Record indicates that the PSA entitles BECo to 25 MW from this waste wood facility.

118/ The February 1992 Record indicates that BECo and AES Riverside signed a PSA entitling BECo to 81 MW from this coal plant in Woonsocket, Rhode Island (Exh. HO-S-60).

119/ MASSPOWER is a member of BECo's RFP #2 award group. The PSA between BECo and MASSPOWER was approved by the Department on December 19, 1990. MASSPOWER is a gas-fired cogeneration facility, located near Springfield, Massachusetts. The February 1992 Record indicates that BECo's summer entitlement from MASSPOWER is 100 MW (Exh. HO-S-60).

120/ Cogen Technologies is a member of BECo's RFP #2 award group. The February 1992 Record indicates that BECo's summer entitlement from Cogen Technologies is 100 MW (Exh. HO-S-60). However, no PSA has been signed between BECo and Cogen Technologies.

121/ The February 1992 Record indicates that the total MW contribution of all planned facilities, if completed, is approximately 1125 MW (Exh. HO-S-60).

BECo used its Delphi survey to forecast a number of different possible capacity additions levels that might result from the group of planned units identified above (Exh. AG-59; Tr. 34, p. 70). Using these different capacity additions levels and their associated probabilities, BECo determined that the statistically expected value of capacity additions would be 637 MW (id.). The Company then calculated this expected value as a percentage of the total capacity assuming all planned units were to successfully enter service, and found it to represent roughly 57 percent of the total (Exh. HO-S-113).

To develop its base case "capacity additions" forecast, the Company first determined the total possible MW that planned units might contribute in each year of the forecast period, assuming that all projects would enter service by the dates and at the capacity levels anticipated in the signed contracts (Exh. BE-1, pp. E-8, E-34). The base case "capacity additions" projection for each year was derived by applying the 57 percent figure described above to the total possible capacity additions MW level for each year (Exh. HO-S-114).

The Company did not identify the success rates that had been attributed to specific projects in its filing. The Company indicated that revealing the probabilities of success that it assigned to specific projects could jeopardize a project developer's ability to bring a project to fruition (Exh. AG-59, p. 1).

The Company used a similar process to develop its high case "capacity additions" forecast. For the high case projections, the Company selected a 1038 MW estimate from the Delphi survey process as representative of the high end of the capacity addition range because any MW level above this estimate was anticipated to have a low likelihood of occurring (Exh. BE-1, p. E-8; Tr. 34, p. 71). The Company determined that 1038 MW represented roughly 92 percent of the total capacity level if all planned units were to successfully enter service (Exh. BE-1, p. E-34). The high case forecast for each year

was derived by applying the 92 percent figure to the total possible capacity additions MW level for each year (id.).

The Company also used this process to develop its low case "capacity additions" forecast. For the low case projections, the Company selected a 450 MW estimate from the Delphi survey process as representative of the low end of the capacity additions range, because any MW level below this was anticipated to have a low likelihood of occurring (Exh. BE-1, p. E-8; Tr. 34, p. 71). The Company determined that 450 MW represented roughly 40 percent of the total capacity level if all planned units were to successfully enter service (Exh. BE-1, p. E-34). The low case forecast for each year was derived by applying the 40 percent figure to the total possible capacity additions MW level for each year (id.).

During the proceeding, the Company updated the status of its planned resources. BECo indicated that OSP was on-line as of June 21, 1991 (Tr. 49, p. 33) and that HQ II was expected to enter full commercial operation on July 1, 1991 (Exhs. HO-S-118; Tr. 49, p. 33). BECo also stated that NEA 1 and 2 were undergoing start-up testing as of June 21, 1991, and as a result, BECo was receiving some energy from the units with full-power operation anticipated in late 1991, or early 1992 (Exh. HO-S-21; Tr. 49, p. 33). In addition, BECo indicated that L'Energia had experienced some difficulties with its construction contract, but financing was underway (Exh. HO-S-21). BECo indicated that its contracts with Everett Energy, Patriot Energy, Wheelabrator Urban Woods had been terminated, and that the AES Riverside project had been cancelled (id.). Finally, regarding the award group members from BECo's RFP #2, BECo estimated a start-up date of late 1995 for MASSPOWER (id.). BECo also indicated that it was negotiating a PSA with Cogen Technologies, the other winner in RFP #2, and that the start-up date for that project was uncertain (id.).

(2) Analysis and Findings

The Siting Council is concerned that the process by which the Company projected "capacity additions" levels introduced distortions to the resource requirements calculations. The record reflects that in developing high, base and low case forecasts, a single percentage (92 percent in the high case, 57 percent in the base case, and 40 percent in the low case) was applied across total possible capacity additions MW levels for each year. This method of forecasting capacity additions is problematic because, although it might produce reasonable projections for the planning horizon taken as a whole, it sacrifices a significant degree of accuracy by neglecting the contributions associated with specific projects that may enter service in a particular forecast year.[122,123]

The Siting Council acknowledges that there is much uncertainty involved in any planning process and that use of a standardized approach to estimate capacity additions may be warranted. However, the use of a standardized approach should not allow a company to ignore clear and definite information about certain projects. While the averaging of probabilities of success

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122/ For example, in a case where an average success rate is calculated based on anticipated contributions from a group of planned projects, one of the planned projects may have a very high likelihood of success, and would enter service during an early forecast year; the rest of the planned projects may have very low likelihoods of success and would enter service during the later years of forecast. Application of the Company's approach to forecasting capacity additions would result in understated capacity additions during early forecast years; i.e., at the relatively low averaged rate rather than at the high rate attributable to the high probability-of-success project. Similar inaccuracies also might occur in later years of a forecast depending on the individual success rates and timing of capacity additions.

123/ Even if the Company had updated its "capacity additions" variable and the need calculation within the reliability planning process to reflect the changes in the status of planned units, the "capacity additions" MW values still would not be acceptable, since the methodology that would be used to derive those values is flawed.

across all years may yield reasonable results in the long run, the averaging approach sacrifices accuracy in the short run.

This problem with the Company's methodology for projecting the MW value from capacity additions is underscored by the updated information provided by the Company, which reveals that the status of certain planned projects has changed considerably. For example, OSP and HQ II already have entered service, and NEA 1 and 2 are about to enter service. Based on this evidence, it appears that the low case "capacity additions" projections projected by the Company are substantially understated in the early forecast years. Moreover, because contracts for all other planned additions have been terminated, OSP, HQ II, NEA 1 and 2, and L'Energia now represent the only planned units that could be in service by 1994. As a consequence, the high case "capacity additions" values during early forecast years are clearly overstated.[124]

The Siting Council recognizes the Company's concern about publicly revealing the probabilities of success associated with specific planned projects. However, because "capacity additions" projections are essential to the resource need calculations, which in turn play a role in substantial investment decisions, the Siting Council finds it critical that the "capacity additions" projections be as accurate as possible. Since OSP, HQ II, and NEA 1 and 2 already are providing BECo with power, there would be little damage to these NUGs if their probabilities of success were publicly and specifically assigned. Similarly, the record reflects that several

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124/ The Siting Council notes that G.L. c. 164, sec. 69I prescribes a ten-year horizon for planning purposes. By contrast, the Company has developed key variable values and forecasts of resource requirements over a 25-year planning horizon. Given the uncertainties associated with forecasting resource need, any evaluation of need that attempts to look beyond ten years, let alone out to 25 years, bears minimal value. Even if the Company believes its long-term projections are beneficial, accuracy in the near-term is critical if the forecasts are to be used in support of investment decisions.

of the PSAs for planned projects have been terminated. For the remaining planned projects still under development, steps can be taken to bring accurate and confidential information concerning their status into the planning process.

Although the "capacity additions" projections undoubtedly were developed using the best information available to the Company at the time its filing was being prepared, the Company's methodology failed to project accurately short-term capacity additions. Because the projections of contributions from capacity additions represent a critical component in the resource need calculation, and because findings on resource need (especially in the short-term) may have significant reliability and cost consequences, the accuracy of the short-term projections is essential.

Accordingly, the Siting Council finds that the Company's "capacity additions" projections are not acceptable for the purpose of calculating future resource requirements. In future filings, the Company should develop a reasonable process for projecting the contribution from capacity additions, which accommodates and incorporates specific information regarding the contributions of individual projects in the short-term.

(F) "Unit Availabilities"

(1) Company Proposal

BECo selected the availability of its existing generation units as a key variable in its resource planning process, because unit performance significantly affects the Company's resource requirements (Exh. BE-1, p. E-8). In developing forecasts of the anticipated MW contribution from existing generating units, the Company analyzed separately the availability of its fossil fuel units and Pilgrim (id.).[125]

125/ The Company made no presentation regarding how it determined unit availabilities for non-Company-owned units in its resource plan.

BECo identified its fossil fuel units as New Boston 1 and 2, Mystic 4, 5, and 6, Mystic 7, and combustion turbine units ("Jets") (id., p. E-8). By surveying several Company personnel, BECo submitted that the base case, "most likely" equivalent availability factor ("EAF") was 81.6 percent for Mystic 4, 5 and 6; 75.8 percent for Mystic 7; 79.3 percent for New Boston 1 and 2; and 78.7 percent for the Jets (id.). In further developing its "unit availabilities" forecasts, BECo assumed performance incentive program ("PIP") targets established by NEPOOL as the high case EAF and assumed average historical EAFs as the low case EAF for its fossil fuel units (id.).

The Company indicated that it employed a different process to derive EAFs for Pilgrim (id., p. E-9). The Company maintained that because of the "significant improvements" made at Pilgrim during a recent overhaul, historical performance would not be indicative of future performance (id.). Therefore, the Company projected Pilgrim's availability by relying on a combination of historical data from similar nuclear units and data reflecting the Company's expectations of improved future performance at Pilgrim (Exh. HO-S-158). Using a statistical methodology, the Company derived a high case EAF of 76.63 percent, a base case EAF of 68.62 percent, and a low case EAF of 60.05 percent for Pilgrim (Exh. BE-1, p. E-9).[126] Corresponding probabilities assigned through the Delphi survey were 13 percent for

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126/ In order to determine high, base and low case EAFs for Pilgrim, the Company calculated three EAF distributions for Pilgrim, using the mean EAF between 1985 and 1987 for all boiling water reactors ("BWRs") (61.6 percent), the mean EAF between 1985 and 1987 for BWRs similar to Pilgrim (68 percent), and BECo's own projection of Pilgrim's EAF (68 percent) (Exh. BE-1, p. E-9). The Company indicated that the three distributions were combined using discrete probability distribution calculations to generate a single probability distribution (id.). The Company stated that the resulting distribution ranged from a 48.52 percent EAF to an 81.93 percent EAF (id.). A mathematical condensation technique transformed the curve into high, base and low case EAFs, to which corresponding Delphi-developed probabilities were assigned (id.).

the high case, 50 percent for the base case, and 37 percent for the low case (id.).

BECo indicated that in order to forecast total MW contributions from the Company's existing resources, the contributions from fossil units and Pilgrim were combined (id., p. E-9). The base case "unit availabilities" forecasts were derived through an assessment of the base case EAFs for all units, including Pilgrim (id.). Similarly, the high case "unit availabilities" forecast combined high band EAFs for all units including Pilgrim, and the low case EAF level combined low band EAFs for all units including Pilgrim (id.). The high, base and low "unit availabilities" probabilities for all units, including Pilgrim, were 26 percent, 43 percent, and 31 percent, respectively (id., p. E-13).

(2) Positions of Parties

The Attorney General asserted that the Delphi survey, which resulted in BECo's "most likely" base case EAF values, "is a combination of negotiated values that are wrongly interpreted by the Company" (Attorney General Initial Brief, p. 86). The Attorney General alleged that some responses to specific questions in the Delphi survey were internally inconsistent (Attorney General Reply Brief, p. 40).

According to the Attorney General, it is appropriate to determine the need for additional capacity under a range of scenarios that reflects consideration of historic EAFs (Attorney General Reply Brief, p. 46). However, the Attorney General contended that historic EAFs should not represent the base case EAF in the Company's analysis, because such an approach would serve to foster "continued poor performance" of the Company's existing units (id.).

CLF urged the Siting Council to reject BECo's resource plan, arguing that the Delphi survey used to establish EAFs for existing units suffers from lack of documentation, misuse of the methodology, and lack of reasoned explanation of its results (CLF Initial Brief,

p. 21; Exh. CLF-1, pp. 51-52). In addition, CLF questioned the expertise of many of those who were consulted in the surveying process (CLF Initial Brief, p. 21). CLF also criticized the fact that the Company determined how many and which of its employees were polled and the weight assigned to their responses (CLF Initial Brief, p. 21; Exh. CLF-1,
pp. 52-53).

According to MASSPIRG, the Company's expected EAFs were more appropriate than historic EAFs for use in the base case (MASSPIRG Initial Brief, p. 20). MASSPIRG agreed with the Attorney General that the use of historical plant performance presented a dilemma (id., p. 19). MASSPIRG acknowledged that it may be overly optimistic to assume that a plant that has had a long history of poor performance will improve to target levels, thereby leading to capacity shortages if the projected improvement does not occur (id.). Conversely, MASSPIRG asserted that if all units are assumed to perform at historical levels for the purposes of long-run planning, then the effect may be to encourage utility companies to invest in new plants rather than make cost-effective investments in existing plants to improve their availability (id.).

MASSPIRG also questioned the Company's assignment of a 68.62 percent EAF as the base case for Pilgrim, noting that this is "well above" its historic capacity factor (id., p. 24). According to MASSPIRG, it is impossible to forecast accurately Pilgrim's EAF in light of its history and the recent improvements (id.).

(3) Analysis and Findings

The Siting Council has substantial concerns regarding the base case EAF values which the Company applied in developing the base

"unit availabilities" forecasts within its decision tree analysis.[127] If the resource requirements calculation is to reflect a realistic assessment of the Company's future needs, it is essential that the "unit availabilities" forecasts reflect realistic estimates of the contribution that can be anticipated from existing resources.

The Siting Council notes that, in general terms, the level at which a generating unit has been performing -- the historic EAF level -- is the best indicator of future performance (especially where investment decisions in the short-term are at issue). Historic EAFs, however, may not always accurately forecast future performance. Therefore, if recent performance trends or substantial recent capital improvements can better predict future performance levels, an analysis which reflects such trends and improvements should be employed. In this regard, if substantial capital improvements, for example, are anticipated to significantly affect future performance, the estimated effect of these improvements should be quantified and presented.

The record reflects that the base case EAF projections for the Company's fossil units are based on the estimates of Company personnel as developed through the Delphi process. In the absence of reliable evidence of clearly discernible recent performance trends or substantial recent capital improvements on the Company's fossil units, the Delphi projections are largely unsubstantiated. Therefore, the Siting Council finds that the EAFs reflecting historic fossil unit performance are appropriate for the purpose of

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127/ We note that the Company did not present any MW projections associated with the "unit availabilities" variable. Consistent with the Company's presentation, this analysis focusses on unit EAFs, which were later used to calculate the MW contribution from existing fossil units and Pilgrim in the Company's derivation of "effective resources." As presented in Section III.C.2.b.i(G), below, the Company reflected the contributions from existing units and planned capacity additions through a single "effective resources" variable.

calculating the base case MW contribution from existing fossil units.[128]

Since the EAFs which reflect historic unit performance now will be used for the purpose of developing base case forecasts for fossil units, the Siting Council rejects the EAFs used to derive the low case "unit availabilities" forecasts for existing fossil units as well. Accordingly, the Siting Council finds that the EAFs used by the Company in deriving the base case and low case "unit availabilities" forecasts for fossil units are not acceptable for the purpose of calculating future resource requirements.

As noted above, the high case EAFs for fossil units set out by the Company reflect PIP standards. Although very substantial improvements in unit performance would be necessary in order to achieve the PIP standards, for purposes of this review, the Siting Council finds that the PIP standards are acceptable as the basis for calculating the high case "unit availabilities" forecast for existing fossil units. Accordingly, the Siting Council finds that the EAFs used by the Company in deriving the high case "unit availabilities" forecasts for fossil units are acceptable for the purpose of calculating future resource requirements.

Finally, in light of the substantial capital improvements to Pilgrim, we agree with the Company that it is more appropriate to consider the historic performance of comparable nuclear power plants as an indicator of future Pilgrim performance until such time as the

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128/ Although the Siting Council recognizes the legitimacy of the Intervenors' concerns regarding the possibility of fostering poor plant performance if historic EAFs are assigned to the base case, the necessary focus in this Phase I Decision is to identify the most reasonable estimates of future plant performance in order to calculate accurately the contribution from existing units and subsequently, resource need. Matters concerning what resource options (including enhancements to the performance or output of existing units) would constitute the most cost-effective additions to the Company's resource portfolio are more properly the subject of Phase II of this Decision.

historic performance of Pilgrim is deemed an acceptable indicator of future performance. We note that in a number of recent regulatory proceedings, BECo has displayed a substantial commitment to improving the performance of Pilgrim. See Boston Edison Company, D.P.U. 88-28/88-48/89-100, pp. 15-17 (1989). Accordingly, the Siting Council finds that the EAFs used by the Company in deriving the high case, base case and low case "unit availabilities" forecasts for Pilgrim are acceptable for the purpose of calculating future resource requirements.[129]

(G) "Effective Resources"

(1) Company Position

The Company indicated that before applying its key variables projections to the IDEAS decision tree, it went through a process by which it "condensed" or integrated the "unit availabilities" variable and "capacity additions" variable into a single "effective resources" variable (Exh. BE-1, pp. E-1, E-2, E-13). BECo stated that it condensed these two variables in order to simplify the calculation of future resource requirements (id., p. E-13).

The Company's explanation of its derivation of "effective resources" was abbreviated. The Company indicated that "effective resources" MW values for each forecast year were developed by combining the high, base, and low "unit availabilities" and the high, base, and low "capacity additions" projections to produce nine MW levels (Exh. AG-35, p. 1). The resulting nine MW levels for each forecast year were placed in ascending order and then, using a mathematical technique for condensing discrete probability distributions, condensed into three levels representing high, base,

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129/ Here, we make no findings concerning the acceptability of the "unit availabilities" MW projections, because the Company's filing presented none. The existing fossil unit and Pilgrim EAFs discussed in this Section were used directly in the derivation of "effective resources," as presented in Section III.C.2.b.i(G).

and low "effective resources" forecasts (Exh. AG-35, p. 1, Supplement).

The Company asserted that "capacity additions" represent more MWs than "unit availabilities," and that "capacity additions" was the "driving force" in the condensation process (Exh. BE-1, p. E-13). BECo indicated that the "effective resource" levels were therefore "developed in a manner to have similar probabilities to the 'capacity additions' levels," and were assigned probabilities of 7 percent, 52 percent, and 40 percent in the high, base, and low cases, respectively (id.).

(2) Attorney General Position

In criticizing the Company's "effective resources" variable, the Attorney General's witness, Susan Geller, presented a table which outlined the method by which "effective resources" MW values and probabilities were derived (see Exh. AG-60, Fig. 4). According to the Attorney General, the Company first determined a total MW value for its existing units at their full capabilities (id.). Second, the Company added the high, base, and low capacity additions forecast for each year to the total existing unit capability level, producing high, base, and low interim projections (id.). To each of these three levels of interim projections, the Company added a figure representing the MW effect on its capability responsibility to NEPOOL if its existing units were to perform at EAF levels implicit in each of the high, base, and low "unit availabilities" forecasts (id.). The resulting nine MW levels were placed in ascending order, and probabilities were calculated for each of the nine levels reflecting the high, base, and low "capacity additions" and "unit availabilities" probabilities from which each of the nine levels was derived (id.).

Finally, according to the Attorney General, the nine MW levels were separated into high, base, and low groups such that the total probability of each group matched that of the respective high,

base, or low "capacity additions" probability (id.). The nine levels were condensed into three by calculating a single statistically expected MW value within each high, base, and low group based on the relative probabilities of MW levels within each group (id.). These expected MW values became the high, base, and low case "effective resources" forecasts.

The Attorney General criticized the combination of the "unit availability" variable and "capacity additions" variable into one "effective resources" variable (Exh. AG-60, pp. 8-9). The Attorney General asserted that the condensation process compromised the results of the Company's decision tree analysis (id., p. 8). The Attorney General claimed that the base case EAFs were factored into calculation of the low case value of "effective resources" and the high case EAFs were factored into the calculation of the base case value of "effective resources" (id.). The Attorney General also noted that, had "capacity additions" and "unit availabilities" been considered separately, the result would have been a much larger decision tree with 243 possible scenarios (id., p. 9).

(3) Analysis and Findings

The Siting Council notes that, from a strictly theoretical standpoint, it would not be inappropriate to seek to reduce two key variables to one variable in order to simplify a decision tree analysis. Nor is it problematic that base case EAFs entered into the calculation of low case "effective resources," provided that accurate calculations within the condensation process indicate that base case EAFs indeed contribute to the low "effective resources" projections. However, the Siting Council shares the Attorney General's concern regarding the condensation of two key variables into the single "effective resources" variable for several reasons.

First, the record reflects that the final high, base, and low case "effective resources" MW values are the statistically expected values of various groupings of the nine MW levels representing the

different possible combinations of the "capacity additions" and "unit availabilities" variables. As a consequence, the MW levels that would reflect a pairing of the low case "capacity additions" projections with the low case "unit availabilities" projections are not represented in the final "effective resources" projections.

In a reliability planning study, the resource requirements scenarios that result from a decision tree analysis would be incomplete if they failed to reflect a reasonably possible, worst-case condition to which the Company might have to respond. If the low case "capacity additions" and low case "unit availabilities" MW values represent realistic contingency conditions (even if at low probabilities), then their simultaneous occurrence must be considered in any comprehensive reliability planning process. Therefore, we question the value of the Company's condensation process because it eliminated the MW values commensurate with a low case "capacity additions" and low case "unit availabilities" pairing.

Our second concern pertains to the probabilities implicit in the "effective resources" derivations. The Company asserted that "capacity additions" represent more MW than "unit availability" and were thus the "driving force" in the condensation process. However, a comparison of the range of "capacity additions" MW values that might be anticipated to those for "unit availabilities" (based on findings presented in Sections III.C.2.b.i(E)(2) and (F)(3), above,) reveals that, in the critical early years of the planning horizon, it is "unit availabilities" that has the greatest range in terms of total MW (see Sections III.C.2.b.i(E) and (F), above, and Sections III.D.2.d and e, below). The Company's approach is problematic to the extent that its results are used to support near-term investment decisions.

Finally, the Siting Council questions the general value of condensing "capacity additions" and "unit availabilities" into a single "effective resources" variable. The Company presented both unit availabilities and capacity additions as "key" factors affecting

future needs. The Siting Council agrees with the Company that both unit availabilities and capacity additions represent important and independent factors in the resource planning process. Therefore, both unit availabilities and capacity additions could better have been treated as important and independent factors in developing future need scenarios. The condensation process introduced by the Company contravened this objective, sacrificing comprehensiveness and additional accuracy for a gain in simplicity.

Accordingly, based on the foregoing, the Siting Council finds that the Company has failed to demonstrate that the "effective resources" projections are acceptable for the purpose of calculating future resource requirements.

(H) Conclusions on the Proposed Need Scenarios

The Siting Council has found the decision tree to represent an acceptable planning tool. The Siting Council also has found that the Company's process for reducing the number of future scenarios from 81 to 30 is acceptable.

With regard to the selection and application of the key variable input values used in the IDEAS decision tree analysis, the Siting Council has found that: (1) the "load growth" projections from the initial forecast are not acceptable for the purpose of calculating future resource requirements; (2) the Company's treatment of the "fuel price" variable is acceptable for the purpose of calculating future resource requirements; (3) the Company's "DSM penetration" projections are acceptable for the purpose of calculating future resource requirements; (4) the Company's "capacity additions" projections are not acceptable for purpose of calculating future resource requirements; (5) the EAFs used by the Company in deriving the base and low case "unit availabilities" forecasts for fossil units are not acceptable for the purpose of calculating future resource requirements; (6) the EAFs used by the Company in deriving

the high case "unit availabilities" forecasts for fossil units are acceptable for the purpose of calculating future resource requirements; (7) the EAFs used by the Company in deriving the high, base and low case "unit availabilities" forecasts for Pilgrim are acceptable for the purpose of calculating future resource requirements; and (8) the Company has failed to establish that its "effective resources" projections are acceptable for the purpose of calculating future resource requirements.

The Siting Council finds that the Company has not established that its decision tree methodology was applied in a manner that yields acceptable projected alternative scenarios of resource requirements. The Siting Council further finds that the 81 scenarios developed by the Company do not constitute a reliable projection of the range of future resource requirements. Accordingly, the Siting Council finds that the Company has failed to establish that its determination of resource need is acceptable.[130]

ii. Production Costs to Meet Resource Needs

After the Company developed the 30 representative forecasts of resource requirements from the original 81 scenarios (which reflected ten alternate patterns of future resource requirements across the planning horizon at the high, base, and low fuel price levels) the second phase of its reliability planning process began. BECo used its Electric Generation Expansion Analysis System ("EGEAS") computer model to evaluate the 30 representative forecast scenarios

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130/ The resource requirement scenarios that result from the first phase of the Company's reliability planning process are essential to later phases of the process. However, the fact that the Siting Council has rejected the Company's determination of resource need does not obviate the need for further review of Boston Edison's reliability planning process. Boston Edison, or other companies, may choose to use this reliability planning methodology as the basis for its filings in future proceedings before the Siting Council. Therefore, we will complete our evaluation of how the methodology was applied in this proceeding, and make findings regarding whether BECo's application of its methodology is acceptable.

(Exh. BE-1, pp. E-2, E-41).[131] The Company indicated that the objective of this effort was to assess the costs and timing of new resources associated with a series of least-cost resource portfolios that could be implemented to meet loads under each of the 30 scenarios (id., p. E-2). The Company indicated that it considered a number of resource alternatives in developing its "optimal" resource portfolios, and that the associated costs constituted the Company's production engineering department's estimates of the costs of the various resource alternatives (id., pp. C-7, E-2). BECo used a screening process and the EGEAS model to optimize resource portfolios under alternative expansion plans and to project associated production costs (id., p. E-15). The Company stated that both the "optimal" resource selections and their corresponding production cost projections were the output of the Company's EGEAS model (id., pp. E-15, E-38 to E-40).

The Attorney General criticized the Company's EGEAS calculations, arguing that they were inconsistent with the results of the IDEAS decision tree analysis (Exh. AG-60, pp. 8-11). The Attorney General reiterated a Company statement that EGEAS uses availability data on a per-unit basis rather than a system-wide basis (id., p. 11). The Attorney General indicated that the availability data used in EGEAS was understated in comparison to the data used in deriving resource requirements through the IDEAS decision tree (id.).

131/ The Company presented EGEAS as a state-of-the-art generation optimization program which was developed under a grant from the Electric Power Research Institute by the Massachusetts Institute of Technology and Stone and Webster Engineering Corporation (Exh. BE-1, p. C-8). Utilizing input assumptions on load forecasts, required reserve levels, fuel forecasts, capital and O&M costs, unit operating characteristics, carrying costs, etc., EGEAS has the capability of costing out thousands of potential resource plans (id.). The EGEAS program prioritizes potential resource plans in terms of economic preference; that is, it is able to identify an optimal resource plan by selecting among various input resource options (id.).

The Attorney General asserted that the EGEAS-based production costs thus were distorted (id.).

The Siting Council does not agree with the Attorney General that different unit availability assumptions in the IDEAS decision tree and EGEAS models undermined the system production cost calculations. As presented in Section III.C.2.b.i(A), above, the 81 decision tree scenarios were reduced to 30 representative forecasts in an acceptable manner. The nature of the need behind each of those 30 scenarios is not critical to the EGEAS production cost calculations; rather, the focus of the EGEAS analysis is necessarily on the cost of additional resources that would be incurred by the Company in responding to various need levels with appropriate levels of resource additions. While we accept that some loss of precision may result if the EAFs used in EGEAS are not absolutely consistent with those reflected in the need levels to which EGEAS is responding, based on this record, we are not convinced that any significant distortions were produced in the system production cost calculations.

However, as presented in Section III.C.2.b.i(H), above, the Siting Council has found that the 81 scenarios developed by the Company do not constitute a reliable projection of the range of future resource requirements. Because the various need levels upon which the production cost calculations were based have not been accepted, the Siting Council finds that the various production cost totals associated with different expansion plans cannot be accepted as relevant to the reliability planning process in this proceeding.

Finally, we note that the Company's production cost calculations place an important issue before the Siting Council. If the production costs associated with differing levels of system expansion are to be realistic, they must reflect portfolios containing least-cost, least-environmental-impact energy resources, as would be required under G.L. c. 164, sec. 69I. There are serious questions concerning the implications of our approving the production cost projections associated with the various expansion plans as both

least-cost and least-environmental-impact, and thus implicitly designating the new resources within those plans as least-cost and least-environmental-impact, without thorough review of the individual new resources.[132]

The Company has developed its proposal for reliability planning based on an analysis that employs production cost projections which reflect a series of expansion plans proposed as "optimal" by the Company. While it would not be possible for the Siting Council to find each expansion plan to be "optimal," i.e., least-cost and least-environmental-impact, based solely on the cursory presentation supporting the EGEAS production cost analysis, without some reasonable projections of production costs under alternative expansion plans, a system reliability evaluation that considers those production costs simply could not be developed. Reasonable production cost projections are necessary to evaluate the different reliability levels that might be achieved with different levels of investment in new resources. In past Decisions, the Siting Council has emphasized the importance of assessing the costs of planning to different reliability levels. Massachusetts Electric Company/New England Power Company, 21 DOMSC 325, 374-375 (1991) ("1991 MECo/NEPCo Decision"); 1991 Nantucket Decision, 21 DOMSC at 260-262, 268; Bay State Gas Company, 21 DOMSC 1, 11-15, 42-43 ("1990 Bay State Decision"); Berkshire Gas Company (Phase I), 19 DOMSC 247, 268 (1990) ("1990 Berkshire Decision"); 1989 BECo Decision, 18 DOMSC at 276, 277.

Many new resource options could be included in the series of future expansion plans by which a company might respond to different need levels across a long-run planning horizon. The Siting Council notes that the presentation and regulatory review necessary to

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132/ For example, the Siting Council will not address until Phase II of this proceeding whether Edgar constitutes a least-cost, least-environmental-impact addition to Boston Edison's resource portfolio.

determine whether each resource option represents a least-cost, least-environmental-impact alternative would be extremely burdensome task. Therefore, if cost considerations are to enter into the reliability planning process, some reasonable but less rigorous approach to forecasting production costs is necessary. Production cost models, such as the EGEAS model used by BECo, are a commonly used industry tool which can provide reasonable estimates of the production costs that would be incurred under alternate potential least-cost expansion plans, without necessitating specific review and findings concerning the particular resources reflected in the cost estimates. In this instance we defer our review of the EGEAS model and its application by the Company to least-cost planning to Phase II of this Decision.

iii. Risk vs. Cost Analysis

The Company implemented the final step of its reliability planning process in order to identify an appropriate planning level for system expansion that balances the costs of unserved energy and system expansion (Exh. BE-1, pp. E-2 to E-3, E-16). First, using the probabilities associated with each forecast, BECo stated that the ten alternative forecasts of resource requirements within the 30 representative scenarios were transformed into a matrix of resource requirements set out at different confidence levels (id., pp. E-17, E-43). The Company stated that those levels that did not represent major changes (in terms of incremental resource requirements) from succeeding levels were dropped from the analysis; a total of seven confidence levels -- 10, 25, 40, 60, 70, 80, and 95 percent -- remained for further analysis (id., p. E-17).

The Company next assumed implementation of a least-cost expansion plan that could meet loads implicit in each of the seven identified confidence levels (id., p. E-17). The Company used its EGEAS model to forecast the unserved energy hours that could be anticipated if needs were to materialize consistent with each of the

original 81 scenarios (id., p. E-18). Specifically, for the expansion plans corresponding to each of the seven confidence levels, the Company combined the probability and projected number of unserved energy hours for each of the 27 different need levels implicit in the original 81 scenarios to derive the statistically expected value for unserved energy hours that could be anticipated in each year of the forecast (Exh. HO-S-132).

The Company did not identify explicitly the cost of unserved energy in dollars-per-megawatthour ("MWH") terms (Exh. BE-1, p. E-18). Rather, in the final step of its risk-versus-cost analysis, Boston Edison calculated the cost of unserved energy at which it would be cost effective to accept the incremental costs of expanding the generation system to meet loads commensurate with the subsequent confidence level (id., pp. E-18, E-46). More specifically, the Company compared the system production costs and expected unserved energy costs that would be anticipated under an expansion plan commensurate with each confidence level to the system production costs and expected unserved energy costs that would be anticipated if its system were to be expanded to the next highest level (id.). The Company indicated that unserved energy hours were calculated for the Boston Edison system on an own-load basis (Exh. HO-S-132; Tr. 49, pp. 53-55). The Company asserted that, in this manner, the reliability gains associated with avoiding unserved energy hours through system expansion could be compared to the additional production costs that could be incurred in so doing (id.).

Based on this analysis, the Company stated that system expansion to a level that would meet future resource requirements commensurate with the 80 percent confidence level could be justified in the period between 1990 and the year 2000 (Exh. BE-1, pp. E-18 to E-19). The Company identified $510 per MWH as the minimum unserved energy cost value at which expansion to the 80 percent confidence level in the period ending in the year 2000 would be justified (id.).

The Attorney General opposed Boston Edison's proposal to plan to an 80 percent confidence level. The Attorney General maintained that the Company has inflated its calculation of need from 119 MW to 400 MW in the base case "by extravagantly planning to build to an 80 percent confidence level" (Attorney General Reply Brief, p. 9). The Attorney General offers the following explanation of the 80 percent confidence level: "The 80 percent confidence level means that NEPOOL's [one-day-in-ten-years reliability] criterion is not met in 20 percent of projected scenarios; it does not mean that blackouts would occur 20 percent of the time" (Attorney General Initial Brief, p. 84).[133] He continued, "to maintain compliance with the [one-day-in-ten-years] criterion, NEPOOL relies on a 50 percent confidence level, and reviews load and capacity annually, using short-term resources to provide any needed additional capacity" (id.).

MASSPIRG echoed both the Attorney General's criticism of BECo's proposed 80 percent confidence level and the suggestion that NEPOOL's 50 percent confidence level represented a better approach to reliability planning (MASSPIRG Reply Brief, pp. 9-10).

As a preliminary matter, the Siting Council first addresses the comments submitted by Intervenors concerning the Company's proposed 80 percent confidence level. Both the Attorney General and MASSPIRG expressed their dissatisfaction with the results of the risk-versus-cost analysis that supported BECo's proposal to plan to an 80 percent confidence level. However, neither the Attorney General nor MASSPIRG commented on the risk-versus-cost analysis itself, or why the 80 percent confidence level would not strike an

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133/ The "one-day-in-ten-years" standard reflects a loss-of-load probability (or, more accurately, a loss-of-energy probability projection), which is often proclaimed as an industry standard in assessing reliability (Exhs. BE-1, p. E-16, HO-S-163, p. 2). For purposes of this proceeding, the Siting Council interprets "one-day-in-ten-years" to mean that, if that standard is achieved, on average customers will experience the loss of electric service for, at most, a total of 24 hours during any ten-year period because of generating system deficiencies.

appropriate balance between system reliability and cost. The Intervenors' proposed alternative approach to reliability planning, i.e., planning to NEPOOL's 50 percent confidence level, is addressed in Section III.C.3, below.

In the 1989 BECo Decision, the Siting Council evaluated the risk-versus-cost analysis that Boston Edison used to develop a resource plan commensurate with a 70 percent confidence level (18 DOMSC at 276). In that Decision, the Siting Council generally accepted the approach taken by the Company in its risk-versus-cost analysis. Id. at 277. However, in that case, the Company provided a wide range of estimates concerning the cost of unserved energy, from $125 per MWH to "well over" $1,000 per MWH. Id. at 276. In the 1989 BECo Decision, the Siting Council stated that, while Boston Edison's risk-versus-cost methodology "serve[d] as a practical starting point for balancing resource adequacy and cost," the Company should begin researching methods to better evaluate or quantify the societal costs of an outage (18 DOMSC at 276).

In this proceeding, however, the Company has made no effort to more precisely define the cost of unserved energy. Rather than respond to the Siting Council's directive in the 1989 BECo Decision, the Company's approach was to define the cost per MWH of unserved energy at which investment in additional resources representing expansion of its system to a higher reliability level would be justified. Generally, the Company's more simple alternative approach would be appropriate if it could demonstrate that the true cost of unserved energy is greater than the identified levels at which the cost per MWH of unserved energy cost would economically justify system expansions. Here, the Company has not made this demonstration.

The record reflects that the Company's approach of planning to an 80 percent confidence level could be justified if unserved energy costs exceeded $510 per MWH. However, this figure represents roughly the midpoint of a wide range of unserved energy cost

estimates assessed in the 1989 BECo Decision. The broad extent of this range of estimates was the reason the Siting Council directed the Company to further study and define the cost of unserved energy more narrowly. Because the Company did not more precisely define the true cost of unserved energy, the record in this proceeding does not demonstrate that unserved energy costs do, in fact, exceed $510 per MWH. Therefore, the Company has not established that system expansion to an 80 percent confidence level is justified.

Other important concerns regarding BECo's risk-versus-cost analysis pertain to the Company's calculation of the quantities of unserved energy hours that were factored into the risk-versus- cost analysis. First, the record reflects that unserved energy hours were calculated for the Boston Edison system on an own-load basis. Consequently, the Company's calculation does not reflect the reliability benefits that the Company obtains for its customers simply by virtue of being a member of NEPOOL.

Therefore, the unserved energy hours that formed the basis of the risk-versus-cost analysis are not realistic.[134] The reliability benefits that accrue to utilities through NEPOOL participation represent a resource, like any other, for Boston Edison. As is the case for other resources, NEPOOL reliability benefits should be assessed in terms of the number of MW that can be expected from NEPOOL under varying circumstances. While deriving estimates of reliability contributions from NEPOOL under different scenarios may be difficult to do with precision, even a rough estimate of NEPOOL contributions would be preferable to ignoring this valuable resource

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134/ The Siting Council notes, for example, that the Company presented unserved energy hours across the entire range of the Company's forecast need scenarios, even under system expansion to very high confidence levels (Exh. HO-S-132). It is highly unlikely, under many of the low need scenarios (which generally reflect low load growth conditions), that NEPOOL would not be able to assist the Company with capacity sufficient to prevent Boston Edison customers from experiencing service disruptions.

altogether.[135] The Company should not make investments in additional supplies in order to avoid unserved energy hours that are not realistic.

The second deficiency in the quantification of unserved energy hours pertains to the time periods across which energy deficiencies were anticipated to last in the Company's calculations. The Company's calculations would suggest that, if little system expansion occurs (i.e., Boston Edison develops its system only to the 10 or 25 percent confidence level) and loads commensurate with the high need scenarios materialize in the future, then high levels of unserved energy hours could be anticipated across a 25-year horizon. This outcome is highly unlikely. If the Company were to construct its system to one confidence level, and resource requirements consistent with a higher confidence level were to materialize, Boston Edison would not refuse to act while customer needs went underserved across two decades. Rather, pursuant to an appropriate long-run supply planning process consistent with Company's statutory responsibility, the Company would take prompt and appropriate action to expand its system to a level that could deliver least-cost, environmentally acceptable energy to meet customer demands. Therefore, because the Company's calculation of unserved energy hours misstates the period across which energy deficiencies would reasonably be anticipated to persist in the event of an undersupply,

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135/ The Siting Council does not suggest that the Company should neglect its responsibility, as a member of NEPOOL, to make an appropriate level of resources available to the pool. We simply emphasize that the reliability benefits that accrue to NEPOOL members must be recognized in some manner in the reliability planning process.

the Company's projections of unserved energy hours may be greatly overstated.[136]

As we have stated in past Decisions, individual utilities should attempt to achieve an optimal balance between reliability and cost in making resource procurement decisions. 1991 MECo/NEPCo Decision, 21 DOMSC at 374-375; 1991 Nantucket Decision, 21 DOMSC at 260-262, 268; 1990 Bay State Decision, 21 DOMSC at 11-15, 42-43; 1990 Berkshire Decision, 19 DOMSC at 268; 1989 BECo Decision, 18 DOMSC at 276, 277. Generally, an electric company should consider both the positive and negative aspects of NEPOOL membership in determining what level of system reliability would be appropriate for its customers. Once NEPOOL, and all other existing and planned energy resources have been properly considered, an electric company may be able to demonstrate that system expansion to a higher reliability level is justified.

Accordingly, based on the foregoing, the Siting Council finds that the Company has failed to establish that the results of its risk-versus-cost analysis are acceptable. Therefore, for purposes of this review, the Siting Council finds that the Company has not established that its proposal to plan to an 80 percent confidence level is acceptable. In the future BECo must better evaluate and quantify the costs of unserved energy.

136/ The Siting Council notes that, to the extent that loads in fact materialize on a region-wide basis that exceed the levels to which NEPOOL members have planned generally, the fact that Boston Edison might have developed its system to a reliability level consistent with meeting those higher loads may not fully benefit its own customers. Rather, as a NEPOOL member, Boston Edison would be expected to join other utilities in implementing NEPOOL emergency procedures in the event of a region-wide capacity deficiency.

While investments in system reliability may thus only accrue in part to the Company's ratepayers, Boston Edison's pursuit of higher reliability levels would not necessarily be precluded. Only a comprehensive analysis of the costs and true benefits of investing to higher reliability levels in the context of BECo's NEPOOL membership would reveal whether investing to the higher levels would be justified.

c. Boston Edison's Reliability Implementation Strategy

The Company stated that its "decision analysis established the economic basis for planning to a target confidence level of 80 percent through the year 2000" (Exh. BE-1, pp. E-3, E-23). The Company indicated that in 1994 an additional 400 MW would be needed at the 80 percent level (id., p. E-21). Therefore, consistent with its proposed "near term" planning target, the Company indicated its intent to pursue immediate licensing and construction of a 306 MW facility for service by 1994 (id., p. E-22). BECo also indicated that it would "monitor load and resource conditions and would enter into (short term) purchases if (need commensurate with the 80 percent confidence level) materializes" (id., pp. E-22 to E-23).

The Company indicated that "[i]t is not necessary...to commit to additional resources for the 1995-2000 period at this time" (id., p. E-23). Rather, the Company proposed to assess the type and amount of resources needed as time progresses (id.). The Company stated that the resources which it proposed to rely upon in the "mid-term" included potential new C&LM programs, purchases from non-utility generators through competitive solicitations, and prelicensing existing generation sites, such as the existing combustion turbine site in Medway (id.).

The Attorney General argued that the Company failed to demonstrate that building "excess" capacity is the least-cost way to achieve reliability (Attorney General Brief, p. 85). The Attorney General claimed that the Company has presented no analysis that evaluated the costs of pursuing short-term purchases or contingency resources, such as a Medway combustion turbine, as alternative approaches to ensuring an appropriate level of reliability (id.).

The Attorney General proposed that "the most economical way to plan, and the way that NEPOOL plans, is flexibly, reviewing load and capacity annually and adjusting plans for changes with short-term resources and contingency resources, which have shortened lead times"

(Attorney General Reply Brief, p. 10). The Attorney General cited a NEPOOL report, "Assessing NEPOOL's Resource Adequacy and Potential Resources," to support his proposition (id., p. 11; Exh. AG-25, pp. 15, 18). The Attorney General asserted that the Company chose what NEPOOL recognizes as the most expensive way of meeting need -- construction to meet a single need forecast at a high confidence level -- apparently because that is the only analysis that would allow its proposed project to meet a reliability need (Attorney General Reply Brief, p. 11).

While the Attorney General criticized Boston Edison's decision to ensure system reliability to an 80 percent confidence level, there is no real disagreement between the Company and the Attorney General concerning implementation strategies. Both indicate that it may not be necessary to make immediate investments in resources to a level commensurate with future planning targets. In addition, both appear to recognize that proper planning requires flexibility such that potential resources may be held in a contingency status until ensuring an ability to achieve predetermined reliability objectives dictates implementation.

Accordingly, the Siting Council finds that the Company's stated strategy for meeting an identified reliability objective is acceptable. We note that in Phase II of this Decision, the Siting Council will determine whether the Company's proposed resource plan

effectively implements this strategy in a least-cost manner that minimizes environmental impacts.[137]

3. Intervenors' Alternative Approach to Reliability Planning

a. Introduction

The Siting Council has found that Boston Edison has failed to establish that it should plan its system to an 80 percent confidence level. During the course of these proceedings, several Intervenors proffered an alternative approach to reliability planning which they argue is superior to the Company's proposal. We address the Intervenors' suggestion below.

137/ The Siting Council notes that both the Attorney General and MASSPIRG have expressed concern over the size of the reserve margins that may result as a consequence of the Company's proposed reliability planning process (Attorney General Initial Brief, p. 84; MASSPIRG Reply Brief, p. 10). We note, however, that reserve margins are properly an outcome of the reliability planning process, not a determinant within the process. While implementation of a planning strategy that gives due consideration to achieving reliability objectives in a least-cost manner will not necessarily produce high reserve levels, it is also possible that actions taken to ensure a high level of system reliability may result in reserve levels that might appear excessive if the Company's actual future need materializes at lower levels than initially projected.

In general, implementation of a flexible implementation strategy would allow the Company to respond to unexpectedly low demand levels by postponing short-term resource options, thereby holding down the reserve margins. However, high reserve margins may occur if a company initiates implementation of additional resources commensurate with a reliability planning objective that requires it to be positioned to meet potential high growth in resource requirements in the short-term, and then that growth fails to materialize. Given the uncertainties of load forecasting, it is inevitable that planning to appropriately high reliability levels occasionally will result in reserve margins that might seem high relative to base and low load forecasts, and high relative to the load levels that actually materialize.

b. Attorney General Position

The Attorney General asserted that BECo has failed to establish that, on a company-specific basis, it has sufficient need to warrant construction of additional capacity in the short term (Attorney General Initial Brief, p. 20). Rather, the Attorney General claimed that updated economic forecasts show "sharply delayed need in the Company's service territory" and an expected capacity deficiency in 1994 of only 17 MW in the base case (id., pp. 18-19). The Attorney General maintained that the Company's next need for a resource addition would come between 1999 and 2001 (Attorney General Reply Brief, p. 5). The Attorney General opposed Boston Edison's proposal to plan to an 80 percent confidence level, suggesting instead that the 50 percent confidence level used by NEPOOL would better serve Boston Edison as a basis for planning (Attorney General Initial Brief, p. 84). The Attorney General asserted that if NEPOOL operates at the 50 percent confidence level, individual utilities should be able to operate at lower confidence levels, with pooling benefits increasing overall reliability (id.).

c. MASSPIRG Position

MASSPIRG asserted that the Company failed to demonstrate a need for additional energy resources (MASSPIRG Initial Brief, p. 3). MASSPIRG argued that, for reliability purposes, Boston Edison has no need to add 306 MW to its resource portfolio until at least 1999 (id., pp. 3, 18).[138] MASSPIRG claimed that the Company's proposal to develop its system to meet an 80 percent confidence level is unsupported (MASSPIRG Reply Brief, pp. 9-10). MASSPIRG asserted that "[t]he Company implies that a 50 percent confidence level means only

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138/ MASSPIRG, in its brief, uses "Edgar" to refer to "the Company's proposal to build a 306 MW combined cycle generating station at the proposed time, price and terms" (MASSPIRG Brief, p. 2). We interpret subsequent MASSPIRG arguments that "Edgar" is not needed as meaning that the Company has no near-term need for an additional 306 MW.

a 50 percent chance that the lights will stay on. In fact, the 50 percent confidence level means that the Company is most likely to be on target to be able to meet its customers needs for every day but one in ten years" (id., p. 10). MASSPIRG stated that "[t]his standard, which is used by NEPOOL and is virtually standard throughout the industry, already provides a very high confidence level in the reliability of electric service" (id.).

d. Business Associations Position

Business Associations presented arguments that would suggest that they would oppose adopting an alternative approach to reliability planning if such alternative resulted in reducing the targeted reliability level below that identified by Boston Edison (Business Associations Brief, pp. 1-8). Business Associations stated that ensuring adequate and reliable future electric supplies is crucial to the Commonwealth and the entire New England Region (id., p. 3). They expressed a concern that the projections of future DSM savings and the projections of new, non-utility power supplies supported by the Attorney General and CLF may not be realistic (id., p. 4).

Business Associations further asserted that "approving a plant that ultimately proves to be unneeded will mean, at worst, the waste of some money which will harm BECo's shareholders and perhaps, to a diminishing degree, its ratepayers.... On the other hand, denying approval for a plant..., will worsen the quality of life in New England and may prevent the economic growth which is the best hope for those in our society who most need additional economic opportunities" (id., p. 5).[139]

139/ NECA stated that it was taking no position with respect to Boston Edison's presentation concerning the need for additional capacity (NECA Initial Brief, p. 43).

e. Discussion and Analysis

At the outset, the Siting Council notes that the Company's proposed reliability planning process differs from a loss-of-load (or loss-of-energy) probability calculation, which the Company identifies as long having been a standard in the industry to ensure adequate generation to meet load requirements. NEPOOL's one-day-in-ten-years reliability criterion constitutes a loss-of-energy probability measure of system reliability.[140] Here, Boston Edison has proposed, as a reliability planning target, that it position itself to acquire supply-side and demand-side resources to a level that would provide sufficient capacity to meet system loads under 80 percent (i.e., to the 80th percentile in terms of probability of occurrence) of the potential future resource need scenarios that the Company projected may occur across a 25-year planning horizon.

Intervenors in this proceeding have raised the issue of whether an alternative planning approach, namely one that relies on NEPOOL's standards and approaches to reliability planning, might offer Boston Edison's customers an appropriate level of reliability at a lower cost than the Company's approach. Intervenors' comments focussed on NEPOOL's one-day-in-ten-years planning criterion and the 50 percent confidence level asserted to be the basis for NEPOOL reliability planning. In assessing whether NEPOOL's planning process might represent an alternative or superior approach to reliability planning, the Siting Council reviews the NEPOOL reliability planning process as presented in the record in this proceeding.

140/ While "one-day-in-ten-years" has been asserted by several parties to be a planning standard throughout the electric utility industry, the Siting Council has yet to be presented with a company supply plan wherein it is demonstrated that, if the company plans its system to an identified level, generation outages will be expected during, at most, 24 hours across a ten year period. As discussed below, "one-day-in-ten-years" is applied to a 50 percent probability load forecast by NEPOOL in projecting objective capability for billing purposes (Exhs. HO-S-163; HO-D-111, p. 2).

The planning standards recommended by the intervenors (i.e., one-day-in-ten-years and the 50 percent confidence level) pertain to the method by which NEPOOL calculates its objective capability. Objective capability, expressed in MW, is the minimum amount of capacity that NEPOOL members must make available on a cumulative basis if NEPOOL is to meet its reliability standards during a given year (Exh. HO-S-163, p. 2).[141] Through a separate capability responsibility calculation, the NEPOOL objective capability figure is divided into capacity assignments to individual member utilities (Exh. HO-S-50; Tr. 47, p. 15).

NEPOOL's objective capability is generated to meet the Northeast Power Coordinating Council's generation reliability criterion that "the probability of disconnecting customers due to generation deficiency will be no more than one day in ten years" (Exh. MP-38). NEPOOL's reserve margin, which is reflected in its objective capability figure, is derived in consideration of this one-day-in-ten-years reliability standard (id.; Exh. HO-S-163, pp. 2-3).

The process by which NEPOOL calculates annual objective capability figures is based on a Westinghouse Generation Planning Capacity Model ("Westinghouse Model"), which uses probabilistic mathematics to simulate the uncertainty and random nature of future peak loads and resource availability (Exh. HO-S-163, p. 3). Peak load forecasts, which NEPOOL staff develop for the New England region, are a key input to the Westinghouse Model (id.; Tr. 47, p. 4). The Westinghouse Model reflects the uncertainties associated with and inherent in the normal random variations of daily peak loads due to weather variations (Exh. HO-S-163, p. 3).

141/ The record indicates that, while estimates of future objective capability figures are routinely projected across a four- to five-year period, NEPOOL formally establishes objective capability for only a single year at a time, largely for billing purposes (Tr. 47, p. 5; Exhs. HO-S-163, HO-D-111, p. 2). Consequently, as a forecast of regional resource requirements, NEPOOL's objective capability projections represent only "unofficial" and short-term forecasts.

The Company's witness, Mr. Killgoar, testified that the Westinghouse Model performs a loss-of-energy probability calculation by which NEPOOL determines the probability of losing load for a particular year under study, given an input peak load level and capability and availability assumptions concerning existing and planned resources (Tr. 47, pp. 9-10). As a result of this calculation, NEPOOL identifies a level of resources, i.e., an "objective capability," believed necessary to ensure that the loss-of-energy probability does not exceed one-day-in- ten-years (id.).[142] NEPOOL employs a set of formulas to assign a "capability responsibility" figure to member utilities, representing the MW level that each company is expected to make available in order to ensure that NEPOOL can meet its objective capability (Tr. 47, pp. 14-15; Exh. MP-38).

A problem arises with the calculation from the standpoint of reliability planning. The peak load data that represents a key input to the Westinghouse Model that NEPOOL uses to project objective capability is derived from the load forecast of the most recent CELT report, which reflects a 50 percent probability level (Exh. AG-25, Technical Supplement p. 9; Tr. 47, p. 7, Tr. 49, p. 59). Economic and demographic parameters that might contribute to higher load forecasts are not evaluated for sensitivity in the objective capability calculation (Exh. HO-S-163, p. 3; Tr. 47, p. 10). At the 50 percent probability level, there is a 50 percent chance that future loads realized by NEPOOL will fall below the CELT forecast level, but also a 50 percent chance that future loads will exceed the CELT forecast level (Exh. AG-24; Tr. 47, p. 8; Tr. 42, p. 26).

Therefore, NEPOOL's objective capability calculation does not anticipate the upper 50 percent of potential future load levels (Exh.

142/ The record reflects a possibility that the resource requirements prescribed by the computer model may be adjusted subjectively in setting a final objective capability because of differing views among NEPOOL planners as to the appropriateness of the input assumptions to the model (Tr. 47, p. 14).

HO-D-111, p. 1).[143] Given a strictly analytical and very long term perspective, if NEPOOL participants were to plan their systems based on the 50 percent probability load levels used to project objective capability, the one-day-in-ten-years reliability level would be achieved if, and only if, future loads were at or below that 50 percent probability level. To the extent loads exceeded that level in some years (the 50 percent probability level would be exceeded to some extent in half of future years), it is likely that NEPOOL's one-day-in-ten-years planning standard would not be achieved in the long run, although it is difficult to predict the effect on system reliability and associated costs.[144]

Moreover, the record shows that NEPOOL itself questions the 50 percent level as a basis for reliability planning (Exh. HO-D-111, p. 2). In its Resource Adequacy Assessment report, NEPOOL explored the costs and reliability benefits of pursuing different reliability planning levels, such as the 80 percent confidence level (Exh. HO-S-171; Tr. 49, p. 76). While NEPOOL's evaluation of planning to an 80 percent confidence level, in and of itself, does not necessarily mean that such a level would be appropriate for Boston Edison, the NEPOOL Resource Adequacy Assessment does provide further support for the conclusion that planning to a 50 percent confidence level might not ensure sufficient levels of reliability in the long run.

Mr. Killgoar also suggested that there is a "self-correcting mechanism" in the NEPOOL planning process (Tr. 49, p. 59). The Company stated that "if NEPOOL predicted a particular load level in a

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143/ Moreover, as noted above, NEPOOL establishes final objective capability figures for only one year at a time.

144/ It is possible that NEPOOL's objective capability calculation might result in reliability somewhat above a 50 percent confidence level. For example, we note that the effects of weather variation on the input load level, as is factored into the objective capability calculation, might encompass certain load levels above the 50 percent probability level. However, the record is not clear on this particular aspect of the issue.

given year and the loads turn out to be much higher when you add up the individual participants' loads, and each participant is responsible for their own loads, then the amount of capacity that would have to be supported within NEPOOL would be much higher than that MW value that is established" (id., pp. 59-60). The Company indicated that if NEPOOL underestimated a load forecast, the capability responsibility calculation eventually would "assign a greater capacity need to all utilities in New England" (id., p. 60).

The Siting Council draws two conclusions in regard to this apparent self-correcting mechanism. First, if a correction is applied to a period after an unexpectedly high load has been realized, then it would be too late to remedy any loss of reliability during that initial period when the unexpected loads first materialized. Second, if NEPOOL's capability responsibility assignment does not predict system requirements dependably, rather than relying on any self-correcting mechanism, it may be more appropriate for the Company to employ an approach to reliability planning that begins with and accurately projects the full range of reasonably anticipated loads.

In sum, in this proceeding the Siting Council does not agree with the Attorney General and MASSPIRG that planning to a 50 percent probability level would permit the Company to be positioned to meet customers' demand for every day but one in ten years. The record in this proceeding demonstrates that, if the Company were to plan its system to a 50 percent probability level, then in 50 percent of future years the Company might well fall short of the proposed one-day-in-ten-years reliability planning target. The intervenors have proposed that the Company should plan to a 50 percent confidence level, then implement short-term resources if resource need commensurate with higher confidence levels does materialize. The intervenors' strategy presents two significant weaknesses. First, sufficient short-term resources may not be available, or even identified, unless the Company happened to have anticipated they

might be needed and planned to a higher reliability level. Second, even if sufficient short-term resources happen to be available at a later date, the resources may come at a higher cost to the Company and ratepayers.[145]

The Siting Council emphasizes this distinguishing point in reliability planning: if a company has no choice but to initiate immediately a particular resource option in order to ensure an appropriate level of reliability at some future date (i.e., other shorter lead-time options that could be implemented later to meet that level of reliability are not available in sufficient quantity), then prudent planning would dictate that that project be initiated. The essential difference in targeting one reliability level versus another pertains to the point in time at which investment decisions would have to be made by a company, given the lead times associated with various resource options. A company planning to an 80 percent confidence level would be expected to initiate larger projects sooner than one planning to a lower reliability level. As a consequence, a company that plans in an appropriate manner to a higher reliability level would be expected to be positioned to have sufficient energy resources available to respond to certain contingencies that a company planning to a lower reliability level would not be able to meet. We also reiterate that securing additional capacity needed to meet unanticipated higher load levels, on short notice, also could

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145/ There is nothing in the record that would suggest that the 50 percent confidence level identified in the Company's filing (see Exhibit BE-1, p. E-29) would match exactly a 50 percent confidence level as might be calculated in a manner consistent with the NEPOOL objective capability methodology (i.e., by applying an appropriate reserve margin to a 50 percent probability load forecast). We note, however, that both approaches to identifying a 50 percent confidence level in reliability planning would suffer from the deficiencies discussed above. Moreover, while the Attorney General and MASSPIRG have argued that Boston Edison should plan to the 50 percent confidence level used by NEPOOL, the Siting Council has yet to have a NEPOOL member present it with a reliability plan based upon a 50 percent probability load forecast and reserve margin consistent with what is suggested to be a regional planning standard.

result in costs to ratepayers that might be avoided if those higher load levels are anticipated in a company's planning process.

This discussion and analysis supports a conclusion consistent with the position of Business Associations that the assurance of adequate and reliable future electric supplies may warrant planning to above the 50 percent confidence level, where cost-effective. The limiting factor in planning to higher reliability levels would be the costs that a company would incur in purchasing resources commensurate with higher reliability. However, if system reliability can be enhanced at reasonable cost to ratepayers, a company would be expected to pursue such opportunities. As the Siting Council has emphasized in past Decisions, resource costs are the determinant factor in reliability planning decisions. 1991 MECo/NEPCo Decision, 21 DOMSC at 374-375; 1991 Nantucket Decision, 21 DOMSC at 260-262, 268; 1990 Bay State Decision, 21 DOMSC at 11-15, 42-43; 1990 Berkshire Decision, 19 DOMSC at 268; 1989 BECo Decision, 18 DOMSC at 276, 277. Therefore, in theory, to optimize system reliability a company should make investments in additional resources as long as such investments remain cost-effective for ratepayers. An analysis that properly balances cost and system reliability will define the point to which investments in additional resources would be consistent with ratepayers interests.

Accordingly, for the purpose of this review, the Siting Council finds that planning to a 50 percent confidence level has not been established as an acceptable alternative approach to reliability planning.

D. Determination of Resource Need

1. Introduction

As presented in Section III.C.2, above, the Siting Council has given careful consideration to Boston Edison's proposal to plan its system to an 80 percent confidence level. However, in that section, the Siting Council determined that the Company's

presentation contains several critical deficiencies. First, because many of the input values (i.e., key variables) used in calculating resource need were inaccurate or inappropriate, the Siting Council has found that the 81 scenarios developed by the Company do not constitute a reliable projection of the range of future resource requirements (see Section III.C.2.b.i(H)). Second, because the various need levels upon which the production cost calculations were based have not been accepted, the Siting Council has found that the various production cost totals associated with different expansion plans cannot be accepted as relevant to the reliability planning process in this proceeding (see Section III.C.2.b.ii). Finally, because the Company's presentation fails to adequately identify the cost of unserved energy and fails to adequately identify the quantity of unserved energy hours that would be anticipated under the proposed alternate planning scenarios, the Siting Council has found that the Company has failed to establish that the results of its risk-versus-cost analysis are acceptable (see Section III.C.2.iii).

Accordingly, the Siting Council has found that the Company has not established that its proposal to plan to an 80 percent confidence level is acceptable (see Section III.C.2.iii).

As presented in Section III.C.3, above, the Siting Council has given careful consideration to the Intervenors' alternative approach to reliability planning, which focussed on the process by which NEPOOL develops objective capability projections. However, the record of this proceeding reveals substantial deficiencies in this alternative approach to reliability planning. Because the Company might fall short of a "one-day-in-ten-years" reliability target in 50 percent of future years if system planning were based on 50 percent probability load inputs, and because simply targeting a 50 percent confidence level would preclude a balancing of reliability and cost in reliability planning, the Siting Council has found that planning to a 50 percent confidence level has not been established as an

acceptable alternative approach to reliability planning (see Section III.C.3).

In considering an approach to identifying Boston Edison's need for additional resources that would be supported by the record of this proceeding, the Siting Council notes that planning to a 70 percent confidence level was approved in the 1989 BECo Decision. Therefore, we consider here whether the record in this proceeding would support a finding that the Company's current need for additional resources can be based on a 70 percent confidence level calculation.[146]

A comparison of the record upon which the 1989 BECo Decision was based to that of this proceeding reflects many substantive changes to the calculations in Boston Edison's reliability planning process. Most importantly, the fact that the essential inputs (i.e., the key variables and their respective MW values and probabilities) have changed since the time of the 1989 BECo Decision dictates that the results of that earlier reliability planning study are not valid for determining resource need here. Therefore, it is necessary to evaluate the 70 percent confidence level within the context of the record in this proceeding.

146/ Although the Siting Council has not made specific findings on resource need in the past, it is appropriate for the Siting Council to do so in this proceeding. Clearly, G.L. c. 164, sec. 69I invests us with the authority to determine an electric company's resource need when that company proposes to construct a generating facility such as Edgar. Otherwise, the Siting Council could not "ensure a necessary energy supply for the Commonwealth." G.L. c. 164, sec. 69H.

Our decision to make findings in this proceeding regarding the Company's need for additional resources also is consistent with our responsibilities under the IRM regulations. 220 CMR 10.00 et. seq.; 980 CMR 12.00 et. seq. Under IRM, the Siting Council is required, in some cases, to make findings regarding the level of additional resources needed by an electric company when that company's own forecast of demand or resource inventory are found to be unacceptable. 1990 Final IRM Order, 21 DOMSC at 118; 980 CMR 12.03(5)(a).

Our review of Boston Edison's reliability planning process in this proceeding reveals that a proposal to plan to a 70 percent confidence level would suffer from the same flaws as does the Company's presentation at the 80 percent confidence level. Because the Company failed to reliably project future needs (at any level, including the 70 percent confidence level) and failed to identify the true costs and benefits of investing in new resources to meet alternate need levels (at any level, including the 70 percent confidence level), the Siting Council finds that planning to a 70 percent confidence level cannot be approved on the record of this proceeding.

The Siting Council's standard of review, as set out in Section III.A, above, defines adequacy of supply as a utility's ability to provide sufficient capacity to meet its peak loads and reserve requirements throughout the forecast period. The Siting Council has directed, and continues to direct, electric companies to balance risk and cost in long term supply planning. However, for the purpose of assessing Boston Edison's need for additional resources in the absence of an acceptable reliability presentation, we find it appropriate to apply a methodology consistent with our standard of review for determining the adequacy of supply throughout the forecast period.

Therefore, the following sections present an assessment of Boston Edison's need for additional resources in 1996 and 1997 under a scenario that considers the base case, "most likely" projections of

peak loads and the other variables relevant to a resource need calculation, in conjunction with an appropriate reserve level.[147,148]

In regard to the base case projections of the key variables affecting resource need, we note that the March 1992 Record Update included extensive information to the Siting Council, updating data which were used in the derivation of the key variables (Exh. BE-121). Problems associated with a calculation of resource need based upon this data are presented in Section III.D.3.a, below. Nonetheless, under the circumstances, it is important to evaluate whether this information would have a substantial impact on the outcome of this proceeding.

Therefore, in Section III.D.2, below, the Siting Council makes findings concerning BECo's need for additional resources based on the February 1992 Record. In Section III.D.3, below, the Siting Council presents a calculation of BECo's need for additional resources using appropriate information presented in the March 1992 Record Update. Finally, in Section III.D.4, below, the Siting

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147/ The Siting Council makes findings on the need for additional resources in 1996 and 1997 because the Company has proposed to construct Edgar, for which BECo now projects a January, 1996 in-service date (see Section I.B, above).

148/ The Siting Council's use of this approach for the purpose of determining resource need in this proceeding does not constitute an endorsement of reliability planning that focusses only on a company's "most likely" peak load, and other base case projections. This methodology accommodates neither a range of reasonably possible future need scenarios, nor a balancing of risk and cost across that range -- both of which are important components to a reliability planning process. Moreover, we note that our IRM regulations require electric companies to conduct sensitivity analyses regarding the major assumptions contained in demand forecasts, for the purpose of evaluating alternate need scenarios. 980 CMR 12.03(5)(e).

However, in the absence of a record that would adequately support a resource need calculation that incorporates a risk-versus-cost evaluation across a range of future need scenarios, we make findings using base case projections consistent with our standard of review to ensure an adequate energy supply.

Council presents its conclusions concerning BECo's need for additional resources.

2. Resource Need Based on the February 1992 Record

a. Variables Affecting the Need for Additional Resources

i. Overview

Based on the February 1992 Record in this proceeding, the Siting Council finds that four variables can be anticipated to have a direct and significant effect on the level of resources needed by the Company in the future: (1) load growth; (2) the contributions from the Company's existing C&LM programs; (3) the contributions from planned capacity additions; and (4) the contributions from existing supply-side resources. In the following sections, the Siting Council makes findings on the appropriate base case values of these variables for use in determining resource need, based on the February 1992 Record.

ii. Load Growth

In Section II.E, above, the Siting Council has found the Company's reforecast of peak load to represent a reasonable projection of peak load in the base, "most likely" case. For the year 1996, this reforecast shows a peak level of 2,919 MW. The record indicates that the demand of the town of Reading, time-of-use rates, and self-generation would combine to increase the natural peak load projection by three MW in that year (Exh. BE-1, p. E-32). Therefore, for the purpose of calculating future resource requirements, the Siting Council finds 2,922 MW to represent a reasonable projection of peak load, before C&LM reductions, for the year 1996.

The reforecast also identifies 2,970 MW as the peak load in the base, "most likely" case for the year 1997. The record indicates that the demand of the town of Reading, time-of-use rates, and self-

generation would combine to reduce the natural peak load projection by one MW in that year (Exhibit BE-1, p. E-32). Therefore, for the purpose of calculating future resource requirements, the Siting Council finds 2,969 MW to represent a reasonable projection of peak load, before C&LM reductions, for the year 1997.

iii. Contribution From Existing C&LM Resources

Based on the February 1992 record, the Siting Council has found that the Company's "DSM penetration" projections are acceptable for the purpose of calculating future resource requirements (see Section III.C.2.b.i(D), above). The base case value for the projected C&LM contribution toward peak load reduction in 1996 is 400 MW (Exh. BE-1, p. E-32). Similarly, the base case value for the projected C&LM contribution toward peak load reduction in 1997 is 425 MW (id.). Therefore, for the purpose of calculating future resource requirements, the Siting Council finds 400 MW and 425 MW to represent reasonable projections of the C&LM contribution toward peak load reduction for the years 1996 and 1997, respectively.

iv. Contribution from Planned Capacity Additions

The February 1992 Record indicates that a number of planned capacity additions that had been identified in BECo's May 1990 Resource Plan filing are no longer anticipated to enter service. In particular, BECo indicated that its contracts with Everett Energy, Patriot Energy, and Wheelabrator Urban Woods had been terminated, and that the AES Riverside project had been cancelled (Exh. HO-S-21). Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds that no capacity contribution would be anticipated from those units.

The February 1992 Record also identifies BECo's peak season entitlement in OSP as 117 MW, and indicates that OSP was on-line as of a June 21, 1991 hearing (Exhs. BE-1, p. C-13; Tr. 49, p. 33).

Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds it appropriate to recognize BECo's full 117 MW entitlement in OSP.

The February 1992 Record further identifies BECo's entitlement in HQ II as 171 MW, and indicates that HQ II was expected to enter full commercial operation by July 1, 1991 (Exhs. HO-S-118; BE-1, p. C-13; Tr. 49, p. 33). Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds it appropriate to recognize BECo's full 171 MW entitlement in HQ II.

The February 1992 Record further identifies BECo's peak season entitlement in NEA 1 and 2 as 199 MW, and indicates that NEA was undergoing startup testing as of a June 21, 1991 hearing (Exh. BE-1, p. C-13; Tr. 49, p. 33). Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds it appropriate to recognize BECo's full 199 MW entitlement in NEA 1 and 2.

The February 1992 Record further identifies BECo's peak season entitlement in L'Energia as 49 MW (Exh. BE-1, p. C-13). The record reflects that the Company applied a 57 percent success rates to planned units, in the base case (Exh. HO-S-113). In assessing BECo's need for additional resources, the Siting Council finds it appropriate to recognize BECo's entitlement in L'Energia at a 57 percent success rate. Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds that a 28 MW capability contribution would be anticipated from L'Energia.

Finally, BECo's RFP #2 and RFP #3 were issued for new supplies totalling 200 MW and 132 MW, respectively (Exh. BE-1, p. C-13; Boston Edison Company, D.P.U. 90-270-C (1992)).[149] The

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149/ The Siting Council hereby takes administrative notice of the Department's Order in Boston Edison Company, D.P.U. 90-270-C (1992), which set the RFP#3 supply block at 132 MW.

Siting Council finds it appropriate to recognize planned capacity additions from RFP #2 and RFP #3 at the same 57 percent success rate. Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds that a 189 MW capability contribution would be anticipated from RFP #2 and RFP #3, combined.

Accordingly, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds 704 MW to represent a reasonable projection of the capability contribution from planned capacity additions.

v. Contribution from Existing Supply-side Resources

The February 1992 Record indicates that the capability of the existing units in the Company's supply portfolio (including purchases) totals 2,767 MW (Exh. BE-1, p. E-34). The Siting Council finds it appropriate to reduce this existing unit total capability value by 16 MW, consistent with the fact that, in February 1992, Yankee Rowe ceased generation operations.[150] Therefore, for the purpose of calculating future resource requirements in 1996 and 1997, the Siting Council finds 2,751 MW to represent a reasonable projection of the capability contribution from existing supply-side resources.

b. Conclusions on Resource Need Based on the February 1992 Record

Based on findings presented above, Boston Edison's need for additional energy resources during 1996 is calculated as follows. A C&LM contribution of 400 MW is subtracted from the 2,922 MW peak load projection, before C&LM, yielding a 2,522 MW peak load projection,

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150/ The March 1992 Record Update indicates that no MW contribution from that unit is anticipated in future years (Exh. BE-121). No party in this proceeding disputes this fact.

after C&LM. Application of a 31.1 percent reserve margin,[151] consistent with findings in Section III.C.2.b.i(F), to the peak load projection, after C&LM, yields a target capability level of 3,306 MW.

As presented above, the anticipated capability contribution from planned capacity additions is 704 MW, and the anticipated capability contribution from existing generating units is 2,751 MW. Accordingly, the Siting Council finds that BECo can be anticipated to experience a capacity surplus totalling 149 MW in 1996 (see Table 6).

Based on findings presented above, Boston Edison's need for additional energy resources during 1997 is calculated as follows. A C&LM contribution of 425 MW is subtracted from the 2,969 MW peak load projection, before C&LM, yielding a 2,544 MW peak load projection, after C&LM. Application of the above 31.1 percent reserve margin, consistent with findings in Section III.C.2.b.i(F), to the peak load projection, after C&LM, yields a target capability level of 3,335 MW (see Table 6).

As presented above, the anticipated capability contribution from planned capacity additions is 704 MW, and the anticipated capability contribution from existing generating units is 2,751 MW. Accordingly, the Siting Council finds that BECo can be anticipated to experience a capacity surplus totalling 120 MW in 1997.

3. March 1992 Record Update

a. Introduction

As noted in Section I.B, above, a procedural conference was held on March 2, 1992 to discuss what record information, if any, should be updated as a result of the Company's decision to postpone the projected in-service date for Edgar from January 1, 1994 to

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151/ This reserve margin was taken from Exhibit HO-S-157, p. 4.

January 1, 1996.[152] The Attorney General asserted that several areas in the record required updating and that any new evidence presented should entitle all parties to "due process rights" to additional discovery, cross-examination of Company witnesses, testimony from other parties' witnesses, and additional briefing before the Phase I Decision could be issued (March 2, 1992 Procedural Conference, Tr. pp. 8-10, 26-30, 58-64, 78).[153] BECo acknowledged the need for "some additional data" consistent with an expedited review process (March 2, 1992 Procedural Conference, Tr. p. 18).

After extensive discussion regarding the scope and extent of necessary updates, the Siting Council staff directed the Company to present further information on four specific issues: (1) the status of Yankee Rowe; (2) the status and projected attrition rates for planned capacity additions from RFP #2; (3) the status and projected attrition rates for planned capacity additions from RFP #3; and (4) the projection of savings from BECo's C&LM programs, specifically its

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152/ At the outset of this procedural conference, BECo Associate General Counsel Douglas Horan stated that "the Phase I Decision and record would not be impacted directly in any event by the change of the in-service date ..." and offered no further record updates (March 2, 1992 Procedural Conference, Tr. p. 6).

153/ Both the Attorney General and MASSPIRG also suggested that the determination of resource need be deferred until IRM. BECo's IRM filing is due in November 1992. A decision in that IRM proceeding is not anticipated until 1995 -- some five years after the Company's filing in this proceeding. Such a delay clearly would be inappropriate and unwarranted if sufficient evidence exists upon which to base a decision at this time (see Section III.D.4).

C&I conservation programs (March 2, 1992 Procedural Conference, Tr. p. 26-30, 56-57, 67-74, 77, 79-80).[154]

On March 12, 1992, the Company filed the March 1992 Record Update. In addition to updating the four specific areas discussed at the March 2, 1992 Procedural Conference, BECo filed substantial additional information (Exh. BE-121).[155]

As discussed in Section I.C, above, the Attorney General and MASSPIRG filed motions asking the Siting Council to postpone consideration of the March 1992 Record Update to the IRM review or to Phase II, or in the alternative, to afford them an opportunity for additional discovery, new evidence, cross-examination of Company witnesses, and briefing in Phase I, arguing that the updated information was a matter of factual dispute among the parties.

The Siting Council agrees that the March 1992 Record Update is the subject of factual dispute which normally would entitle intervenors to discovery and comment.[156] G.L. c. 164, sec. 69J; G.L. c. 30A, sec. 11. In order for the Siting Council to rely upon the new information in determining resource need in this proceeding, the intervenors would have to be afforded their full due process rights. We note, however, that such a course of action could extend the

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154/ The Siting Council staff expressly asked whether any other issues needed updating in order to determine BECo resource need for 1996 and 1997, and none were specified by any parties (March 2, 1992 Procedural Conference, Tr. pp. 77-79). The Siting Council also directed the Company to consult with other parties before filing the updates in order to avoid any evidentiary disputes and close the record (March 2, 1992 Procedural Conference, Tr. pp. 57, 65-67). BECo agreed to consult with the other parties prior to submission of its updates (March 2, 1992 Procedural Conference, Tr. pp. 74, 84).

155/ On March 18 and 19, 1992, the Company also presented nearly 300 pages of supporting documentation in response to information requests issued by the Attorney General without authorization from the Siting Council (Exhs. AG-87 to AG-103).

156/ As noted earlier, the Company's Yankee Rowe update was not contested and, therefore, is considered in our determination of resource need. In addition, we have deferred consideration of BECo's new load management proposal to Phase II.

proceedings for several more weeks or even months. In light of the already lengthy proceedings in this case, and the fact that further delay could lead to additional, legitimate requests to update the record, the Siting Council considers it appropriate to consider the potential impact of the new evidence before determining whether further examination of and reliance upon that evidence is warranted in this proceeding. Therefore, in the following sections we examine how the variables affecting resource need as identified in Section III.D.2.a(1), above, would be impacted in the event that BECo could substantiate the numbers in its March 1992 Record Update.[157]

b. Variables Affecting the Need for Additional Resources Under the March 1992 Record Update

i. Overview

As presented in Section III.D.2.a(i), above, the Siting Council has found that four variables can be anticipated to have a direct and significant effect on the level of resources needed by the Company in the future: (1) load growth; (2) the contributions from the Company's existing C&LM programs; (3) the contributions from planned capacity additions; and (4) the contributions from existing supply-side resources. In the following sections, the Siting Council presents a calculation of BECo's need for additional resources using

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157/ In its March 1992 Record Update, the Company proposed to recalculate resource need based on new load management projections, reserve margins based on "most likely" EAF performance for existing generating units, and other information. As discussed in Section I.C, consideration of the Company's load management proposal will be deferred to Phase II. With respect to the reserve margins based on "most likely" EAFs, nothing in the March 1992 Record Update convinces us that our finding that historic fossil unit EAFs are appropriate for reliability planning in the base case is not valid (see Section III.C.2.b.i.(F), above). The remaining information presented in the March 1992 Record Update is evaluated in Sections III.D.3.b and c, below. We note that even if we had relied upon all the new data in the March 1992 Record Update (including the new load management projections and the reserve margins based upon the Company's proposed "most likely" EAFs), BECo projects a base case surplus of five MW in 1996 and a deficiency of 18 MW in 1997 (Exh. BE-121, Table 3, p. 1).

information provided in the March 12 Record Update to develop base case projections for each of these four variables.

ii. Load Growth

In Section II.E, above, the Siting Council has found the Company's reforecast of peak load to represent a reasonable projection of peak load in the base, "most likely" case. For the year 1996, this reforecast shows a peak level of 2,919 MW. The record indicates that the demand of the town of Reading, time-of-use rates, and self-generation would combine to increase the natural peak load projection by three MW in that year (Exh. BE-1, p. E-32). Therefore, for the purpose of calculating future resource requirements, the Siting Council finds 2,922 MW to represent a reasonable projection of peak load, before C&LM reductions, for the year 1996.

The reforecast also identifies 2,970 MW as the peak load in the base, "most likely" case for the year 1997. The record indicates that the demand of the town of Reading, time-of-use rates, and self-generation would combine to reduce the natural peak load projection by one MW in that year (Exhibit BE-1, p. E-32). Therefore, for the purpose of calculating future resource requirements, the Siting Council finds 2,969 MW to represent a reasonable projection of peak load, before C&LM reductions, for the year 1997.

iii. Contribution From Existing C&LM Resources

The March 1992 Record Update suggests that conservation programs would reduce loads by 166 MW in 1996, and 184 MW in 1997 (Exh. BE-121).

As is discussed in Section III.D.3.a, above, the Company's proposal to reduce its load management programs will be addressed in Phase II of this Decision. Therefore, the Siting Council finds that the load management contributions contained in the May 1990 Resource Plan would still be appropriate for the purpose of calculating future

resource requirements here. Data contained in the March 1992 Record Update concerning the May 1990 Resource Plan filed by the Company identifies contributions from load management programs that would contribute to load reductions of 251 MW in 1996, and 260 MW in 1997 (Exh. BE-121).

Therefore, for the purpose of calculating future resource requirements, information contained in the March 1992 Record Update, as adjusted above, suggests that the total MW contribution from C&LM resources would be 417 MW in 1996, and 444 MW in 1997.

iv. Contribution from Planned Capacity Additions

As presented in Section III.D.1, above, the Company has presented updated information concerning the capability contributions that might be anticipated from planned capacity additions during the years 1996 and 1997.

Based on the Company's March 1992 Record Update, for the purpose of calculating future resource requirements in the base case during 1996 and 1997, the planned capacity additions would be treated as follows: AES would be anticipated to contribute 23 MW; HQ II would be anticipated to contribute 201 MW; OSP would be anticipated to contribute 110 MW; NEA 1 and 2 would be anticipated to contribute a total of 209 MW; L'Energia would be anticipated to contribute 49 MW; the RFP #2 units would be anticipated to contribute 128 MW; and the RFP #3 units would be anticipated to contribute 37 MW. Therefore, for the purpose of calculating future resource requirements in the during 1996 and 1997, information contained in the March 1992 Record Update suggests that the capability contribution from planned capacity additions would total 757 MW.

v. Contribution from Existing Supply-side Resources

The Company's March 1992 Record Update reflects that the capability of the existing units in the Company's supply portfolio would total 2,544 MW (Exh. BE-121, Table 3). Information provided in the March 1992 Record Update indicates that it would be appropriate to add to this total the capability contributions from Canal 1 at 142 MW, MWRA at 1 MW, and from Peat Products, which is now projected to contribute six MW given application of a 28 percent success rate (Exh. BE-121, Tables 1,3). Accordingly, for the purpose of calculating future resource requirements in during 1996 and 1997, information contained in the March 1992 Record Update suggests that it would be appropriate to anticipate a capability contribution of 2,693 MW from existing supply-side resources.

c. Conclusions on Resource Need Based on the March 1992 Record Update

Based on information presented in the March 1992 Record Update, BECo's need for additional energy resources during 1996 would be calculated as follows. A C&LM contribution of 417 MW is subtracted from the 2,922 MW peak load projection, before C&LM, yielding a 2,505 MW peak load projection, after C&LM. Application of the 31.1 percent reserve margin used in Section III.D.2.b, consistent with findings in Section III.C.2.b.i(F), to the peak load projection, after C&LM, yields a target capability level of 3,284 MW.

As presented above, the anticipated capability contribution from planned capacity additions would be 757 MW, and the anticipated capability contribution from existing generating units would be 2,693 MW. Accordingly, information contained in the March 1992 Record Update suggests that BECo would be anticipated to experience a capacity surplus totalling 166 MW in 1996 (see Table 6).

Based on the March 1992 Record Update, BECo's need for additional energy resources during 1997 would be calculated as

follows. A C&LM contribution of 444 MW is subtracted from the 2,969 MW peak load projection, before C&LM, yielding a 2,525 MW peak load projection, after C&LM. Application of the 31.1 percent reserve margin, consistent with findings in Section III.C.2.b.i(F), to the peak load projection, after C&LM, yields a target capability level of 3,310 MW.

As presented above, the anticipated capability contribution from planned capacity additions would be 757 MW, and the anticipated capability contribution from existing generating units would be 2,693 MW. Accordingly, information contained in the March 1992 Record Update suggests that BECo would be anticipated to experience a capacity surplus totalling 140 MW in 1997 (Table 6).

4. Conclusions on Resource Need

As presented in Section III.D.2.b, above, based on the February 1992 Record, the Siting Council has found that BECo can be anticipated to experience capacity surpluses totalling 149 MW in 1996, and 120 MW in 1997. As presented in Section III.D.3.c, above, the Siting Council's evaluation of information contained in the March 1992 Record Update suggests that if such information were substantiated after further proceedings, BECo would be anticipated to experience capacity surpluses totalling 166 MW in 1996, and 140 MW in 1997.

The Siting Council is committed to making findings based on the most accurate information available. In fact, during the course of this lengthy proceeding, the Siting Council has repeatedly emphasized the need for all parties to update the record to ensure that our findings are based on accurate information. The Siting Council always has made findings only after giving all parties to a proceeding a full and fair opportunity to develop the record and to comment on all relevant issues. As noted in Section III.D.3.a, above, normally the presentation of new or updated evidence which is the subject of factual dispute would warrant a full opportunity for such discovery and comment. Departure from this fundamental

procedure must be limited to those extraordinary circumstances where the benefits of further discovery and comment on new or updated information are outweighed by the disadvantages of the corresponding extension of the proceedings.

Here we are presented with just such extraordinary circumstances. The calculations of BECo's need for additional resources based on BECo's March 1992 Record Update result in capacity surpluses for 1996 and 1997 that are even greater than those using the February 1992 Record. In determining resource need for reliability purposes, the size of any surplus is irrelevant.[158] Therefore, to conduct additional proceedings over several weeks in order to determine whether the larger surplus indicated by BECo's update actually would exist would unnecessarily delay this Decision. Similarly, to extend the proceedings to allow intervenors the opportunity to demonstrate that the surplus should be even larger than BECo's data indicates would serve no purpose.

The Siting Council is charged with assuring a "necessary energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost." G.L. c. 164, sec. 69H. This statutory mandate obligates us to expedite our review of filings, consistent with the development of a complete and adequate record. This proceeding has lasted nearly two years already due to the complexity of the issues and the participation of 18 intervenors. The record is now sufficiently complete and accurate to enable us to proceed with this Phase I Decision, including a determination of resource need.

Accordingly, the Siting Council finds that Boston Edison can be anticipated to experience a capacity surplus totalling 149 MW in 1996, and 120 MW in 1997.

158/ In the case of a surplus, the focus in least-cost resource planning turns to the existing resource mix. Therefore, Edgar or other resource alternatives may be found to be necessary in Phase II on economic efficiency grounds.

E. Adequacy of the Supply Plan

1. Adequacy of the Supply Plan in the Short Run

a. Definition of the Short Run

As noted in Section III.A, above, in the past the Siting Council has defined the short run for all electric companies as four years from the date of the final hearing or from the date of the response to the final record request, whichever is later. BECo's final hearing was held on June 21, 1991 and the final record request response was dated July 19, 1991. Consistent with previous Siting Council decisions, the short run in this proceeding extends from the summer of 1992 through the summer of 1995.

b. Base Case Supply Plan

The data shown in Table 6 compare BECo's projected system resource capability to its peak load capability responsibility over the years 1992 through 1995.[159] These data indicate that BECo is projecting short-run capability surpluses ranging from 388 MW (11.9 percent) in 1992 to 138 MW (4.2 percent) in 1995 (see Table 7).

Accordingly, the Siting Council finds that BECo has established that its base case plan is adequate to meet requirements in the short run.

c. Short Run Contingency Analysis

In order to establish adequacy in the short run, a company must establish that it can meet its forecasted needs under a reasonable range of contingencies. To evaluate the adequacy of BECo's short-run supply plan, the Siting Council analyzes the

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159/ The Siting Council developed the base case supply inventory by adding the summer capacity available from (1) BECo's existing units and entitlements, and (2) 57 percent of the entitlements for planned units that have contracts.

following contingencies: (1) high load growth as represented by the Company's high case demand forecast;[160] (2) the delay of supplies from RFP #2 and RFP #3 beyond the summer of 1995; (3) the double contingency of the high case demand forecast and the delay of RFP #2 and RFP #3 supplies.

i. High Case Demand Forecast

Under its high case demand forecast, BECo projected that its summer peak load would grow from 2,516 MW in 1992 to 2,569 MW in 1995 (Exh. HO-D-111). In the event that load growth occurs at this rate, and if all resources in its base case supply plan remain available, BECo would experience a resource deficiency during the summer of 1994 of 49 MW (1.4 percent) (see Table 8).

In the event of the occurrence of the high demand forecast, BECo stated that it has an action plan to address this deficiency, involving the use of C&LM, construction of a combustion turbine in Medway, and short-term utility purchases (Exhs. BE-1, pp. E-23; HO-S-170; Tr. 45, pp. 46-47, 49, 57). The Company indicated that it would review its C&LM programs for potential acceleration (Exh. BE-1, p. E-23; Tr. 45, p. 57). In addition, BECo stated that it identified an additional combustion turbine at the Medway site as a "contingency resource" (Tr. 45, p. 47). The Company stated that this combustion turbine could be available in 1994 or 1995, and that the Company has commenced environmental studies for permitting (id., Exh. HO-S-34). Finally, BECo indicated that it can purchase capacity from other utilities in NEPOOL, in New York, New Jersey, and Pennsylvania, and Canada to address short-run contingencies (Exh. HO-S-17; Tr. 45, pp. 41-42, 44). BECo explained that it has frequent contact with other utilities in order to arrange short-term purchases, economy

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160/ For the purpose of reviewing short-run adequacy under the contingency of higher than expected load growth, the Siting Council uses the high case peak demand forecast as included in the reforecast (Exh. HO-D-111).

transactions, and capacity exchanges (Tr. 45, pp. 41-42). The Company estimated that a purchase of capacity for more than one year likely would require one year to evaluate and negotiate (id., pp. 42-46).

The Siting Council initially notes that an option in BECo's action plan -- Medway turbine -- may not be available to meet a resource deficiency in the summer of 1994. At the same time, we acknowledge that a number of other options in BECo's action plan -- accelerated C&LM and power purchases from other utilities -- could be available in 1994. Therefore the Siting Council finds that BECo has an action plan consisting of sufficient resource options to meet capability responsibility, and thereby avoid deficiencies in the summer of 1994 in the event of the contingency of the high case demand forecast.

ii. Delay of RFP #2 and RFP #3

BECo stated that it expects non-utility generators from RFP #2 and RFP #3 to provide 189 MW in the summer of 1995 and to continue to provide that level of power throughout the summers of the forecast period (Exhs. HO-S-21, HO-S-169; See Boston Edison Company, D.P.U. 90-270-C). If BECo experiences a delay of RFP #2 and RFP #3 supplies, and if all other resources in its base case supply plan remain available to BECo, BECo would experience a resource deficiency of 200 MW (6.0 percent) in 1995 (see Table 9).

In the event of a delay of RFP #2 and RFP #3 supplies, BECo identified an action plan involving a combustion turbine in Medway, short-term utility purchases, and additional C&LM (Exhs. BE-1, pp. E-22, E-23, HO-S-170; Tr. 45, pp. 46-47, 49, 57). See Section III.E.4.c.i, above. Therefore the Siting Council finds that BECo has an action plan consisting of sufficient resource options to meet capability responsibility, and thereby avoid deficiencies in the summer of 1995 in the event of the contingency of a delay of RFP #2 and RFP #3 supplies.

Accordingly, the Siting Council finds that BECo has established that it has an action plan to meet requirements in the short run in the event of the delay of RFP #2 and RFP #3.

iii. Double Contingency of High Case Demand Forecast and Delay of RFP #2 and RFP #3

One possible combination of short-run contingencies would be the occurrence of the high case demand forecast and the delay of the RFP #2 and RFP #3 supplies. If all other resources in its base case supply plan remain available to BECo, and BECo faced that combination of the above contingencies, BECo would experience resource deficiencies of 49 MW (1.4 percent) during the summer of 1994, and 290 MW (8.5 percent) during the summer of 1995 (see Table 10).

In the event of the occurrence of the high demand forecast and a delay of RFP #2 and RFP #3 supplies, BECo identified an action plan involving additional C&LM, a combustion turbine in Medway, and short-term utility purchases (Exhs. BE-1, pp. E-22, E-23, HO-S-170; Tr. 45, pp. 46-47, 49, 57). See Section III.E.4.c.i, above.

The Siting Council initially notes that an option in BECo's action plan -- Medway turbine -- may not be available to meet resource deficiencies in the summer of 1994. At the same time, we acknowledge that a number of other options in BECo's action plan -- accelerated C&LM and power purchases from other utilities -- could be available in 1994. Therefore the Siting Council finds that BECo has an action plan consisting of sufficient resource options to meet capability responsibility, and thereby avoid deficiencies in the summers of 1994 and 1995 in the event of this double contingency of the occurrence of the high demand forecast and the delay of RFP #2 and RFP #3 supplies.

iv. Conclusions on the Short-Run Contingency Analysis

The Siting Council has found that BECo has established that it has: (1) an action plan to meet any resource deficiencies in the summer of 1994 in the event of the occurrence of the high demand forecast; (2) an action plan to meet any resource deficiencies in the summer of 1994 in the event of a delay of RFP #2 and RFP #3 supplies; and (3) an action plan to meet any resource deficiencies in the summers of 1994 and 1995 in the event of the double contingency of the occurrence of the high demand forecast and a delay of RFP #2 and RFP #3 supplies.

2. Conclusions on Adequacy of the Supply Plan in the Short Run

The Siting Council has found that BECo has established that its base case plan is adequate to meet requirements in the short run.

The Siting Council has also found that BECo has established that its supply plan is adequate to meet its capability responsibility in the short run under a reasonable range of contingencies.

Accordingly, the Siting Council finds that BECo has established that it has adequate resources to meet its projected requirements in the short run.

IV. DECISION

The Siting Council hereby APPROVES the 1990 demand forecast of the Boston Edison Company at the time of the reforecast.[161]

In so deciding, the Siting Council has detailed specific information that the Company must provide in its next filing in order

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161/ Findings on the Company's supply plan will be made in Phase II of this Decision. The findings in Phase I on the determination of resource need and the adequacy of the supply plan in the short run will be incorporated into our findings on the supply plan in Phase II.

for the Siting Council to approve BECo's next demand forecast. This specific information is necessary for the Siting Council to fulfill its statutory mandate, including its need to determine whether the projections of the demand for electric power and of the capacities for existing and proposed facilities are based on substantially accurate historical information and reasonable statistical projection methods and include an adequate consideration of conservation and load management.

Therefore, in order for the Siting Council to approve BECo's next demand forecast filing, the Company must furnish:

(1) full justification for the incorporation of the results of the short-run residential forecast and the period over which those results are applied;

(2) (a) a complete explanation of how appliance efficiency standards were applied to its forecast of average use per appliance along with an

average use forecast consistent with an application of those standards; and (b) full supporting documentation of its forecast of miscellaneous use inclu

ding analyses of the major factors identified as contributing to miscellaneous use, and a complete justification for its selection of a growth rate for

the miscellaneous end-use category based on those analyses;

(3) (a) full justification for the use of a short-run commercial forecast and the period over which it is applied; and (b) evidence that all variables and data inputs into the short-run forecast are appropriate and reliable;

(4) (a) full justification and documentation for the inclusion of any snapback effect in its long-run commercial forecast; (b) evidence that it has incorporated reliable employment data in the calculation of its long-run commercial forecast; and (c) either full justification for or omission of blending the short-run and long-run commercial forecasts over an extended period of time;

(5) full justification for the incorporation of the results of a short-run industrial forecast and the period over which those results are applied;

(6) (a) reliable data and an appropriate methodology to model the effects of electric technology development; and (b) either

full justification for or omission of the blending of the short-run and long-run industrial energy forecasts over an extended period of time;

(7) more extensive documentation to substantiate its assumptions regarding streetlighting sales; and

(8) (a) an analysis of the sensitivity of peak demand to weather abnormalities for all seasons; and (b) evidence that it has incorporated reliable energy forecast data into its peak load methodology.

The Siting Council further notes that the Company's next demand forecast and supply plan will be submitted in its first IRM filing which is scheduled to be submitted on November 1, 1992.

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Frank P. Pozniak
Hearing Officer

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Michael D. Ernst
Hearing Officer

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Robert D. Shapiro
Hearing Officer

Dated this 31st day of March, 1992

APPROVED by the Energy Facilities Siting Council at its meeting of April 10, 1992 by the members and designees present and eligible to vote. Voting for approval of the Tentative Decision as amended: Gloria Cordes Larson (Secretary of Consumer Affairs and Business Regulation); Andrew Greene (for Susan F. Tierney, Secretary of Environmental Affairs); Joseph Donovan (for Stephen P. Tocco, Secretary of Environmental Affairs; Stephen J. Remen (Commissioner of Energy Resources); Mindy Lubber (Public Environmental Member); Michael Ruane (Public Electric Member); and Kenneth Astill (Public Engineering Member). Voting against the Tentative Decision as amended: Joseph C. Faherty (Public Labor Member).

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Gloria Cordes Larson
Chairperson

Dated this 10th day of April, 1992

TABLE 1

BOSTON EDISON COMPANY
Base Case Initial Forecast of Annual Sales and Peak Demand*
1990-2000

Year	Annual Energy Sales (GWh)	% Growth	Summer Peak (MW)	% Growth	Winter Peak (MW)	% Growth
1990	13,355	----	2,729	----	2,585	----
1991	13,786	3.23	2,809	2.93	2,674	3.44
1992	14,127	2.47	2,886	2.74	2,743	2.58
1993	14,476	2.47	2,964	2.70	2,813	2.55
1994	14,696	1.52	3,016	1.75	2,858	1.60
1995	14,928	1.58	3,072	1.86	2,902	1.54
1996	15,221	1.96	3,138	2.15	2,960	2.00
1997	15,481	1.71	3,202	2.04	3,013	1.79
1998	15,720	1.54	3,261	1.84	3,062	1.63
1999	15,974	1.62	3,312	1.56	3,106	1.44
2000	16,214	1.50	3,370	1.75	3,156	1.61

Notes: *Unadjusted for Company-sponsored C&LM

Source: Exh. BE-2, pp. 10-12

TABLE 2

BOSTON EDISON COMPANY
Base Case Reforecast of Annual Sales and Peak Demand^
1990-2000

Year	Annual Energy Sales (GWh)	% Growth	Summer Peak (MW)	% Growth	Winter Peak (MW)	% Growth
1990*	12,975	----	2,548	----	2,283	----
1991*	12,812	-1.27	2,652	4.08	2,333	2.19
1992	13,347	4.18	2,725	2.75	2,590	11.02
1993	13,557	1.57	2,774	1.80	2,633	1.66
1994	13,758	1.48	2,822	1.73	2,674	1.56
1995	13,943	1.34	2,868	1.63	2,709	1.31
1996	14,167	1.61	2,919	1.78	2,753	1.62
1997	14,369	1.43	2,970	1.75	2,795	1.53
1998	14,593	1.56	3,025	1.85	2,840	1.61
1999	14,948	2.43	3,099	2.45	2,906	2.32
2000	15,168	1.47	3,152	1.71	2,951	1.55

Notes: ^Unadjusted for Company-sponsored C&LM *Actual figures

Source: Exh. HO-D-111

TABLE 3

DRI FORECASTS OF MASSACHUSETTS EMPLOYMENT

(x 1000)

Year	1/89 Forecast	8/90 Forecast	2/91 Forecast	8/91 Forecast	1/89-8/90	8/90-8/91	1/89-8/91
1990	3192	3063	3040	2978	129	85	214
1991	3228	3035	2943	2831	193	204	397
1992	3267	3043	2944	2809	224	234	458
1993	3282	3059	2978	2851	223	208	431
1994	3296	3093	3029	2908	204	185	389
1995	3332	3129	3077	2951	203	177	381
1996	3380	3166	3111	2998	214	168	382
1997	3422	3210	3140	3031	212	179	391
1998	3451	3252	3169	3066	198	186	384
1999	3478	3296	3202	3108	182	188	370
2000	3503	3337	3237	3141	165	196	362

Sources: Exhs. BE-9, MP-RR-10, and BE-119.

TABLE 4

BOSTON EDISON COMPANY
Base Case Initial Forecast of Energy Sales By Customer Class*
1990 - 2000
GWH

Year	Residential	Commercial	Industrial	Streetlighting	MBTA	MWRA	Municipals
1990	3453	7347	1869	132	136	73	345
1991	3523	7601	1874	132	137	163	356
1992	3608	7827	1890	132	142	163	365
1993	3671	8068	1904	132	144	186	371
1994	3709	8226	1919	132	146	186	378
1995	3756	8358	1934	132	149	211	388
1996	3864	8514	1949	132	153	211	398
1997	3940	8671	1964	132	156	211	407
1998	3995	8828	1979	132	159	211	416
1999	4065	8875	1994	132	161	322	425

2000 4124 9031 2009 132 164 322
432

Notes: *Not adjusted for Company-sponsored C&LM

Sources: Exh. BE-2, pp. 68, 102, 112, 124, 125

TABLE 5

BOSTON EDISON COMPANY
Base Case Reforecast of Energy Sales By Customer Class^
1990 - 2000
GWH

Year	Residential	Commercial	Industrial	Streetlighting	MBTA	MWRA	Municipals
1990*	3431	7183	1750	132	143	0	336
1991*	3382	7112	1685	131	149	20	333
1992	3569	7318	1672	132	150	163	343
1993	3652	7385	1695	132	155	186	352
1994	3730	7455	1732	132	160	186	363
1995	3789	7528	1747	132	164	211	372
1996	3904	7603	1766	132	169	211	382
1997	3991	7682	1789	132	173	211	391
1998	4058	7764	1851	132	176	211	401
1999	4144	7849	1909	132	180	322	412
2000	4217	7937	1956	132	183	322	421

Notes: ^Not adjusted for Company-sponsored C&LM *Actual Figures

Source: Exhs. BE-9; HO-D-111

TABLE 6
BOSTON EDISON COMPANY
RESOURCE NEED
(MW)

Variables	February 1992 Record		March 1992 Update	
Affecting Need	1996	1997	1996	1997
Peak Load	2922	2969	2922	2969
less:				
Conservation	149	165	166	184
Load Management	251	260	251	260
Reserve Margin	31.1%	31.1%	31.1%	31.1%
Capability Target	3306	3335	3284	3310
Supply Resources				
Planned Capacity Additions	704	704	757	757
Existing Units	2751	2751	2693	2693
Total	3455	3455	3450	3450
Resource Surplus	149	120	165	140

Sources:

Peak Load: Exhs. HO-D-111, BE-1, p. E-32.
C&LM: Exhs. BE-1, p. E-32, BE-121.
Reserve Margin: Exh. HO-S-157, p. 4
Planned Capacity Additions: Exhs. BE-1, p. C-13, HO-S-21, HO-S-113, HO-S-118; Boston Edison Company, D.P. U. 90-270-C (1992)
Existing Units: Exhs. BE-1, p. E-34, BE-121

TABLE 7

BOSTON EDISON COMPANY
Short Run Base Case Demand Forecast and Supply Plan
Summer Peak

Year	Capability Respons.(1) (MW)	Existing Capability(2) (MW)	Base Case Surplus (MW)	Percent Surplus
1992	3249	3637 (3)	388	11.9
1993	3201	3571 (4)	370	11.5
1994	3248	3272	24	0.7
1995	3283	3420 (5)	138	4.2

Notes:

(1) Capability Responsibility was calculated from the following factors: Peak Demand Forecast as presented in reforecast (Exh. HO-D-111); adjustments for Town of Reading Demand, TOUR, self-generation and base level C&LM reduction in peak (Exh. BE-1, p. E-32); and Reserve Requirement Forecast presented by the Company for historic EAF's (Exh. HO-S-157).

(2) Existing capability includes resources represented as"existing" in Exh. HO-S-159, Attachment A, line 1, with exception of Yankee Rowe (16 MW); "purchases" line 8; and MWRA Southboro (0.8 MW) and Peat Products (22.6 MW).

(3) 1992 and following years include entitlement to HQ II (171.1 MW); OSP (116.6 MW); NEA 1 (130.7 MW); and NEA 2 (68.0 MW).

(4) 1993 and following years include 57% of entitlement to L'Energia (34 MW).

(5) 1995 includes 57% of RFP #2 supply (114 MW) and 57% of RFP #3 supply (75 MW).

Sources: Exhs. BE-1, pp. C-13, E-32, HO-D-111, HO-S-21, HO-S-116, HO-S-157, HO-S-159.

BOSTON EDISON COMPANY
Short Run Contingency Analyses

TABLE 8

High Case Demand Forecast and Base Case Supply Plan
Summer Peak

Year	Capability Respons. (MW)	Existing Capability (MW)	Base Case Sur/(Def) (MW)	Percent Sur/(Def)
1992	3283	3637	354	10.7
1993	3256	3571	315	9.6
1994	3321	3272	(49)	(1.4)
1995	3373	3420	47	1.3

TABLE 9

Base Case Demand Forecast and Delay of RFP #2 and RFP #3
Summer Peak

Year	Capability Respons. (MW)	Existing Capability (MW)	Base Case Sur/(Def) (MW)	Percent Sur/(Def)
1992	3249	3637	388	11.9
1993	3201	3571	370	11.5
1994	3248	3272	24	0.7
1995	3283	3083	(200)	(6.0)

TABLE 10

High Case Demand Forecast and Delay of RFP #2 and RFP #3
Summer Peak

Year	Capability Respons. (MW)	Existing Capability (MW)	Base Case Sur/(Def) (MW)	Percent Sur/(Def)

1992	3283	3637	354	10.7
1993	3256	3571	315	9.6
1994	3321	3272	(49)	(1.4)
1995	3373	3083	(290)	(8.5)

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

Such petition for appeal shall be filed with the Siting Council within twenty days after the date of service of the decision, order or ruling of the Siting Council, or within such further time as the Siting Council may allow upon request filed prior to the expiration of the twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the clerk of said court. (Massachusetts General Laws, Chapter 25, Sec. 5; Chapter 164, Sec. 69P).