

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of
BOSTON EDISON COMPANY, et al.,
Pilgrim Nuclear Generating
Station, Unit No. 2

Docket No. 50-471

INTERROGATORIES PURSUANT TO 10 C.F.R.
§2.740b BY THE
COMMONWEALTH OF MASSACHUSETTS
ADDRESSED TO BOSTON EDISON COMPANY
CONCERNING THE "NEED FOR POWER" ISSUE

Pursuant to the provisions of 10 C.F.R. §2.740b the
Commonwealth of Massachusetts hereby makes the following
interrogatories upon Boston Edison Company.

1. Please supply the data listed in Ex. NP-33 for each year 1970 to 1978. Please identify the source of the data. Please supply the data and calculations on which the "weather corrected" peak is based.
2. Please supply the forecast or backcast contribution to peak of each class, and the resultant class annual load factors, for each state and for New England, for each year 1970-1990.
3. Please supply the model-generated backcasts for all the data in Ex. NP-33 for 1970 to 1978.

4. Please provide the model values of:
 - a. PENT and its explanatory variables;
 - b. LTSEX;
 - c. URBRA;
 - d. LSFH;
 - e. COSTX, and its components:
 1. El. Cost
 2. Oil Cost
 3. Annualized El. Cap. Cost
 4. Annualized Oil Cap. Cost including the data and calculations from which the variables were derived, for 1970-1990, by state.
5. Please provide NEPOOL's best estimate of residential customer number, residential electric-heating customer number, and residential household demolitions by state 1970-1978, and provide the source of such estimate. Please provide the model-generated values for these three values, by state, 1970-1990.
6. Please provide the saturation of each residential appliance type for each year 1970-1990 for each state, for:
 - a. total households;
 - b. multi-family housing; and
 - c. single-family housing.
7. Please provide the consumption for each appliance type for each year, for each state:
 - a. peak appliance (differentiated by housing type, if applicable);
 - b. peak household; and
 - c. total for the state.
8. Please explain whether the income/saturation functions are constrained to keep saturations between zero and 100 (or zero and 230) for each income group, or only for each housing type or each state. Please explain how this constraint is applied by the model code.

9. Please explain whether the statement on page G-23 of the June 1977 Report on the NEPOOL-Battelle model that the 20% reduction in range energy consumption is derived from an estimated 16% in total energy use implies that annual energy use by a microwave oven is 4% of annual energy use by a range (without microwave). If this is not the case, please explain how the 16% and 20% figures are equivalent or compatible.

Questions 10 to 13 apply to the Report of the NEPOOL Load Forecasting Task on the Force Model-Based Forecast:

10. Please provide the data (and its source) used in developing NEPOOL's estimate of the effects of wood-burning stoves (p. 15). Please explain exactly how wood stoves are recognized in the model, including the numerical impact in each year for each state in which they are recognized.
11. Please explain how the New England electricity price pattern for 1979 to 1989 was applied to each state. Please provide the forecast base price for each sector for each state, 1979 to 1989, and the actual price 1970 to 1978.
12. Please provide all studies, documents, and calculations used in deriving price cases A, C, and D.
13. Please provide the number of controlled water heaters, the number of uncontrolled water heaters, and the contribution of each type of water heater to system peak by state on the 1989-90 winter peak.
14. Please explain the assertion that miscellaneous use and space conditioning connected loads "were originally New England values". (Documentation 13) Please explain how connected loads for each of these four appliance types were estimated for each dwelling type in each state. Please provide the data and calculations from which they were estimated.

15. Please provide the model-produced energy consumption (disaggregated by each appliance type) and actual consumption for each state in 1970 which were used to develop Table 1 of Documentation 13.
16. Please provide the following parameters and data discussed in Documentation 8:
 - a. EMP/POPT for each SIC and state in the base year;
 - b. the base year used for each SIC and state;
 - c. EPTR for each SIC, each state, and each year from the base year to 1990; and
 - d. national actual or forecast values of EMP/POPT, 1978-1990.
17. Please explain why Table B-8 in Documentation 9 has no entries for the coefficients of E P 16 and/or time for seven cohorts. Please provide the results of all alternative models estimated for each cohort with other combinations of these variables, including goodness-of-fit and significance tests, and explain in each case why the specification presented was preferred to the other three possible specifications.
18. Please provide the national forecasts of LFPR (BLS, WEFA, and DRI) used in preparing the modifications to NEPOOL LFPR forecasts including the national LFPR estimated by each source for the years 1970-78. Please provide NEPOOL's estimated or forecast LFPR for each state for each year 1970-90.
19. Please provide copies of the "special industry studies" and the "examination of industrial self-generation" mentioned on page H-15 of the June 30, 1977 NEPOOL Model Report.
20. Please provide studies, reports, or other documents which describe the derivation, testing, verification, structure or assumptions of the NEPOOL model.

21. Please explain how the 10.83% cost of money was determined to be the appropriate value for Boston Edison to use in evaluating the cost of Pilgrim II.
22. Please provide BECO's estimate of the amount of money to be spent by BECO on construction in each year, 1979-2016, the amount to be raised from each source (common stock, preferred stock, bonds, etc.), the cost of each source, the manner which such cost is estimated (including data and calculations, if applicable), and the composite cost of capital. Please supply this information for 1985 Pilgrim II installation, for 1988 Pilgrim II installation, and for Pilgrim II replaced by 1150 MW of purchased base load proven (1985-2016).
23. Please provide Boston Edison's current best estimate of its cost of money, by source and as a composite.
24. Please provide Boston Edison's best estimate of the opportunity cost of capital for each of the following classes of its customers:
 - a. residential;
 - b. commercial;
 - c. industrial;
 - d. wholesale; and
 - e. composite average cost.
25. Please provide Boston Edison's best estimate of the opportunity cost of capital for the New England economy.
26. Please provide the internal BECO forecast of nuclear fuel prices, including all assumptions and calculations.
27. Please provide BECO's estimate of market-place nuclear fuel prices if these differ from the values used in the testimony. Please explain why it is appropriate for costs other than market prices to be used.
28. Please provide all load shape data utilized in the estimations provided in Ex. NP-33 through NP-43.

29. Please provide the NEPOOL documents which forecast peak load beyond 1989 and which were utilized in preparing exhibits NP-37 to NP-43. Please explain how these documents were produced and supply (as applicable) the calculations, assumptions, and computer input and output from which they are derived.
30. Please provide detailed expenditures by year for Pilgrim II for the 1985 and the 1988 installation dates. For each expenditure in the 1985 schedule, please identify the corresponding date and amount of expenditure in the 1988 schedule. If the expenditure does not occur exactly three years later, please explain why. Please explain how escalation is calculated in the comparison.
31. Please provide the AFUDC rates used for each in-service date and for each year of construction. Please explain how the rates were estimated and provide the supporting assumptions and calculations.
32. For the capital cost column common to Exs. NP-37, NP-39, and NP-41, please provide the capital-related cost for each year for each option. Please provide all data, assumptions and calculations used in developing the annual costs, so that the results can be reproduced and verified.
33. For each of the following nuclear power plants in New England:
 1. Pilgrim I;
 2. Millstone II;
 3. Vermont Yankee;
 4. Maine Yankee; and
 5. Connecticut Yankee.

Please provide the following information:

- a. the effective date of:
 1. limited work authorization (if any),
 2. construction permit,
 3. operating license,

- b. the cost history of the plant,
including for each estimate made:
 - 1. the date of the estimate,
 - 2. estimate in-service data,
 - 3. estimated plant cost, including
initial core,
 - 4. estimated AFUDC,
 - c. the final actual cost of the plant.
- 34. Please provide the following information for
Seabrook 1 and 2 and Millstone 3:
 - a. effective date of
 - 1. limited work authorization;
 - 2. construction permit;
 - b. latest cost estimate update;
 - c. the current estimates of percentage of
plant completed, of in-service date, and
of total expenditures to date.
- 35. Please supply the following information for
each existing nuclear plant in New England
for each year of its life:
 - a. total operating and maintenance expense
(O+M);
 - b. O+M per MW;
 - c. O+M per net MWH generated; and
 - d. additions to capital cost, as total
dollar amount and as % of initial
construction cost.
- 36. Please explain how Pilgrim II's O+M expense
was forecast for the calculations in Ex.
NP-37, NP-39, and NP-41.
- 37. Please provide the annual net output in MWH
for Pilgrim I for 1973 to 1978, and for the
first five months of 1979.
- 38. For each nuclear power plant in New England,
please provide the MW capacity figure which
is comparable to the 1150 MW figure used for
Pilgrim II.

39. Please provide, for Pilgrim II commercial operation of 12/85/, 12/88, 12/91, and 12/94, the capital-related costs which BECO (as opposed to its customers) would expect to incur in each year 1979 to 2020, in connection with Pilgrim II. Please list separately construction costs (as incurred), Operating and Maintenance expenses, property taxes, and nuclear fuel purchases.
40. Please provide recalculations of the "Fuel" tables of Ex. NP-37, NP-39, and NP-41, assuming Pilgrim II actually achieves the same capacity factor in each year of operation that Pilgrim I achieved in the corresponding calendar year of operation.
41. Please provide the following documentation for "the Company's production cost program" and its application:
- a. a listing of the program;
 - b. a copy of the user's manual for the language in which it is written;
 - c. a copy of any existing user's manual or instructions for the program;
 - d. a flow chart of the program; and
 - e. complete inputs and outputs for all runs of the program used in developing the Exhibits NP-33 through NP-43.
42. For each current and forecast NEPOOL plant or purchase, please provide the following assumptions used in the program runs:
- a. fuel type;
 - b. fuel price by year;
 - c. heat rate;
 - d. in-service date if this occurs after 1978;
 - e. retirement date, if this occurs before 2020;
 - f. availability factor by year;
 - g. forced outage rate by year;
 - h. MW capacity; and
 - i. fuel cost per MWH.
43. For each steam-turbine plant which is forecast to use oil rather than oil/coal slurry, please explain why NEPOOL does not expect it to use oil/coal slurry.

44. Please supply, for 1985 and for 1988 Pilgrim II in-service dates:
a. total fuel costs;
b. total energy sales; and
c. average fuel cost per KWH sold for the years 1986 to 1993.

45. Please explain why Ex. NP-38, NP-40, and NP-42 report MWH outputs for Pilgrim II which do not equal:

1150 MW x 8760 hrs. x (capacity factors from Ex. NP-43)

and which vary between growth cases and in-service dates.

46. Please explain how the production costing program simulates scheduled and unscheduled plant outages and their effect on system fuel costs.
47. Please provide the numbers of outages and the numbers and duration of deratings forecast for Pilgrim II for each year 1986-1993 (under each starting date). Please explain how these outages and reductions effect Pilgrim II's overall heat rate.
48. Please provide the number of MWH's projected to be produced by conventional (non-pumped) hydro plants in New England 1986-1993. Please provide historical hydro output for each year 1970-78.
49. Please explain how the value of energy displaced by Pilgrim II can be greater for the 3.0% growth case than for the 3.4% growth case in 1992 and 1993 if the production costing program simulates economic dispatch.

50. Please provide 1986 to 1993 Fuel costs for 1985 and 1988 Pilgrim II in-service dates for the following growth rates of peak (from the 1978/79 weather adjusted winter peak):
- a. 2.5%;
 - b. 2.0%;
 - c. 1.5%;
 - d. 1.0%;
 - e. 0.5%;
 - f. 0.0%; and
 - g. for the 3.8, 3.4, and 3.0% cases presented in Exh. NP-37 to NP-42.
51. For each hour of the first Wednesday of each month from June 1978 to May 1979, please supply the NEPEX operating cost of the most expensive 100 MWH dispatched and the load on the system.
52. Please supply all studies performed by or for NEPOOL and its members to determine the cost-effectiveness of alternative approaches to displacing foreign oil with capital.

Question 53-60 refer to the NEPOOL Industrial and Commercial Sector Power Module.

53. Please supply the data, results, and calculations from which K1, K2, and K1TR were estimated. Please explain why two time trends (K2 and K1TR) are utilized, and how they were differentiated in the derivation. (Documentation 43).
54. Please supply K1, K2, and K1TR by state and SIC.
55. Please supply actual or estimated value added and electric energy sales by state and SIC for each year 1963-78. Please identify sources.
56. Please provide the coefficients of the exponential productivity model for each SIC/state combination for which no R value is provided in Tables 5 and 6 of Documentation 43. For each case, please explain why the exponential model was not used.

57. Please provide the information in Table 5 and 6 for New England. If any of the New England equations omit the R values, please provide the information requested in the previous question. Please provide goodness-of-fit and significance tests for each equation in Tables 5 and 6, and for each equation supplied in the answer to this question, and in the answer to the preceding question.
58. Please provide the values of the following variables (for 1970-1990) which are utilized by the exogenous national forecast of national employment which drives the industrial portion of the NEPOOL model:
- a. value added per man-hour
(or growth therein); and
 - b. annual man-hours per employee.
59. Please provide the model-generated values of the ratios in Table 2, Documentation 43, for 1971-1970.
60. Please provide the following information for each of the equations in Table I-4, p. I-6, Report on the NEPOOL-Battelle Forecasting Model (June, 1977):
- a. the criteria used for selecting variables to enter or leave the equation;
 - b. the set of variables available to the regression program (or user, if selection was manual);
 - c. the intermediate equations generated by the program (or user); and
 - d. all available statistics for goodness-of-fit and significance and all equations and their coefficients.

Please take notice that pursuant to 10 C.F.R. §2.740b,
answers to these interrogatories are due 14 days after service.

COMMONWEALTH OF MASSACHUSETTS

BY: FRANCIS X. BELLOTTI
ATTORNEY GENERAL

BY: Michael B. Meyer
Michael B. Meyer
Assistant Attorney General
Utilities Division
Public Protection Bureau
One Ashburton Place, 19th Floor
Boston, Massachusetts 02108
(617) 727-9714

June 8, 1979

CERTIFICATE OF SERVICE

I, Michael B. Meyer, hereby certify that the attached Interrogatories Pursuant to 10 C.F.R. §2.740b and by the Commonwealth of Massachusetts Addressed to Boston Edison Company Concerning the "Need for Power" Issue has been served by hand delivering or by mailing postage prepaid, first class copies to the below parties at their usual business addresses:

Edward Luton, Esq., Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dr. A. Dixon Callihan
Union Carbide Corporation
P.O. Box Y
Oak Ridge, Tennessee 37830

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety and Licensing Appeal Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Office of the Secretary
Docketing and Service Section
U.S. Nuclear Regulatory Commission
Washington, DC 20555

George H. Lewald, Esq.
Ropes and Gray
225 Franklin Street
Boston, Massachusetts 02110

Dale G. Stoodley, Esq.
Boston Edison Company
800 Boylston Street
Boston, Massachusetts 02199



Barry H. Smith, Esq.
Marcia E. Mulkey, Esq.
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

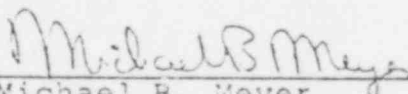
William S. Abbott, Esq.
50 Congress Street, Suite 925
Boston, Massachusetts 02109

Mr. Daniel F. Ford
1208 Massachusetts Avenue
Cambridge, Massachusetts 02138

Henry Hermann, Esq.
151 Tremont Street
Boston, Massachusetts 02111

Chief Librarian
Plymouth Public Library
North Street
Plymouth, Massachusetts 02360

Mr. and Mrs. Alan R. Cleeton
22 Mackintosh Street
Franklin, Massachusetts 02039



Michael B. Meyer
Assistant Attorney General

June 8, 1979

485 120