

NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

BOSTON EDISON COMPANY, et al.

(Pilgrim Nuclear Generating
Station, Unit 2)

Docket No. 50-471

Place - Plymouth, Mass.

Date - Monday, July 16, 1979

Pages 10,342-10,493

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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In the matter of: :

BOSTON EDISON COMPANY, et al :

(Pilgrim Nuclear Generating :

Station, Unit No. 2) :

Docket No. 50-471
----- +

Plymouth Memorial Hall,
Plymouth, Massachusetts

Monday, July 16, 1979

The hearing in the above-entitled matter was
reconvened, pursuant to adjournment, at 1:00 p.m.

BEFORE:

ANDREW C. GOODHOPE, Esq., Chairman

DR. RICHARD F. COLE, Member

DR. DIXON CALLIHAN, Member

APPEARANCES:

GEORGE H. LEWALD, Esq., Ropes & Gray,
225 Franklin Street, Boston, Massachusetts; and
DALE G. STOODLEY, Esq., Boston Edison Company,
Legal Department, 800 Boylston Street, Boston,
Massachusetts; on behalf of the Applicant

MICHAEL B. MEYER, Esq., Assistant Attorney
General, Statehouse, Boston, Massachusetts;
on behalf of the Commonwealth of Massachusetts,
Intervenor.

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1 APPEARANCES: (Continued):

2 MARCIA MULKEY, Esq., Office of the
3 Executive Legal Director, Nuclear
4 Regulatory Commission, Washington, D.C.;
on behalf of the Nuclear Regulatory
Staff

5 EDWARD L. SELGRADE, Esq., Deputy Director,
6 Governor's Office Energy Resources,
Boston, Massachusetts.

7 ALAN R. CLEETON, Pro se.
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493 003

I N D E X

WITNESSES: DIRECT: CROSS: REDIRECT: RECROSS:

F. CORT TURNER

(By Mr. Lewald) 10,427

(By Mr. Meyer) 10,430

NIGEL GODLEY

(By Mr. Lewald) 10,427

(By Mr. Meyer) 10,430

DAVID HANNA

(By Mr. Lewald) 10,427

(By Mr. Meyer) 10,430

JOHN G. BUCKLEY

(By Mr. Selgrade) 10,370

(By Mr. Meyer) 10,372

(By Mr. Cleeton) 10,385

(By Ms. Mulkey) 10,390

(By Mr. Selgrade) 10,400

EXHIBITS

<u>NO.</u>	<u>DESCRIPTION</u>	<u>I.D.</u>	<u>EVID.</u>
17A	Letter dated June 20th to Averill Laundon, Esq.	10,350	10,353
17B	Letter dated June 21, to Peter V. Lacouture, Esq.	10,350	10,353
17C	Letter dated June 22, 1978 to Lewis Segal, Esq.	10,350	10,353
17D	Letter dated June 23, 1978, to Joseph Ransmeier.	10,351	10,353
18	Package of letters	10,352	10,353
19	Applicant's Revised Supplemental Testimony on Need for Pilgrim II	10,427	10,430

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(The hearing continued at one o'clock p.m.)

MR. GOODHOPE: All right, the hearing will be in order. This is a continuation of hearings in the matter of Boston Edison Company, et al, Pilgrim Nuclear Generating Station Unit 2, Docket Number 50-471; Nuclear Power Safety and Licensing Board set for proceeding.

Is everybody here that is coming?

I'll ask all the counsel to state their appearance for the record who they represent. We'll start off with you, Mr. Lewald.

MR. LEWALD: Yes, Mr. Chairman. My name is George H. Lewald. My address is 225 Franklin Street, Ropes & Gray, Boston, Massachusetts, and together with Mr. Stoodley who is at my right. Mr. Stoodley is Assistant General Counsel of the Boston Edison Company, 800 Bolyston Street. We represent the Applicant.

MR. SELGRADE: My name is Edward Selgrade. My address is 73 Tremont Street in Boston. I represent the Massachusetts Office of Energy Resources.

MR. COLE: Would you spell your name, please?

MR. SELGRADE: S-e-l-g-r-a-d-e.

MR. MEYER: My name is Michael B. Meyer,

2 M-e-y-e-r. I am Assistant Attorney General
3 representing the Commonwealth of Massachusetts. My
4 office address is One Ashburton Place, 19th Floor,
5 Boston, Massachusetts.

6 MS. MULKEY: Marcia Mulkey. NRC staff.
7 My address is Washington, D. C. 20555. Our office
8 is in Bethesda, Maryland.

9 MR. GOODHOPE: All right. Does counsel
10 for the intervenor-- yes.

11 FATHER CLEETON: My name is Alan R. Cleeton,
12 22 Mackintosh Street, Franklin, appearing pro se.

13 MR. GOODHOPE: Are there any other appearances?

14 Thank you.

15 Well, we cancelled that hearing last week.
16 Do you want to dispose of that at this juncture?
17 We have not seen the stipulation, the members of the
18 board. Is it lengthy or short?

19 MS. MULKEY: No, it is very short. We are
20 mailing the original too. There will be a covering
21 letter with copies to all parties in it, but I did
22 bring copies for you to use here, and I don't think
23 anything would preclude us going forward and disposing
24 of the matter.

25 MR. GOODHOPE: I would like to go ahead
and get it out of the way, if we could do that.

1 MS. MULKEY: I should state that I hand
2 delivered an unsigned copy to Mr. Abbott, counsel
3 for the Cleetons at the end of last week.

4 MR. GOODHOPE: All right. We have--

5 Mr. Lewald, have you submitted the documents?
6 I know you have one for the record.

7 MR. LEWALD: We haven't submitted copies
8 of Boston Edison's letter to the counsel who
9 responded to the letter. What we have in the record
10 are the responses without the initial letter, and I
11 have copies of those which we have taken and taken
12 the liberty of premarking those, or asking that they
13 be premarked as Applicants Exhibits A through D,
14 which is referred to in the first paragraph of the
15 stipulation.

16 MR. GOODHOPE: All right. Will you get
17 this straightened out for the record? It is your
18 exhibit now.

19 MR. LEWALD: Yes. I would.

20 MR. GOODHOPE: You signed the stipulation,
21 so it is agreeable, but I just want it straightened
22 out for the record as they come in.

23 Well, the Board rules that we accept this
24 stipulation as agreed to, but what I want to do now
25 is to make sure that the record is clear to just

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exactly what exhibits are being perceived pursuant
to this stipulation.

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1 MR. GOODHOPE: Yes, Ms. Mulkey.

2 MS. MULKEY: A renewal for the Motion to admit
3 this testimony, I think the Board should rule on that.

4 MR. GOODHOPE: I have what we were served with,
5 or what was mailed to the Board.

6 I have the resumes of the four attorneys and
7 a list of the statutes, Court Decisions, and documents,
8 and a copy that we're all familiar with, I presume.

9 (Whereupon Mr. Stoodley place the documents
10 before the Board.)

11 MR. GOODHOPE: What are those four letters which
12 you have given us?

13 MR. LEWALD: These are four letters referred to
14 in the stipulations as being sent by Boston Edison Company
15 from the 20th through the 24th of June to Counsel in
16 other states requesting their views as set forth in
17 the Stipulations.

18 I would ask that the four letters be marked
19 as Applicants Exhibit 17A through D, respectively.

20 MR. GOODHOPE: So marked.

21 MR. LEWALD: The first letter under the date
22 of June 20 from Boston Edison Company to Averill Laundon,
23 Esq., Waterbury, Vermont, would actually be marked as
24 17A.

25 MR. GOODHOPE So marked.

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(A letter dated June 20th from Boston Edison Company to Averill Laundon, Esq., Waterbury, Vermont, was marked as Applicant's Exhibit No. 17A.)

MR. LEWALD: The second letter on the stationery of Boston Edison Company, under the date of June 21, 197 , and addressed to Peter V. Lacouture, Esq., Tillinghast, Collins & Graham, 2000 Hospital Trust Tower, Providence, Rhode Island, I would ask that they be marked as Applicant's Exhibit No. 17B.

MR. GOODHOPE: So marked.

(A letter dated June 21, and addressed to Peter V. Lacouture, Esq, Tillinghast, Collins & Graham, was marked as Applicant's Exhibit No. 17B.)

MR. LEWALD: The third letter on Boston Edison Company's stationery on the date of June 22, 1978, addressed to Lewis Segal, Esq., Murtha, Cullina, Richter and Pinney, Post Office Bos 3197, Hartford, Connecticut, I would ask that it be marked as Applicant's Exhibit No. 17C.

MR. GOODHOPE: So marked.

(A letter dated June 22, 1978, addressed to Lewis Segal, Esq., Murtha, Cullina, Richter and Pinney, was marked as Applicant's Exhibit No. 17C.)

MR. LEWALD: And the fourth letter on Boston Edison Company stationery on the date of June 23, 1978,

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1 addressed to Joseph Ransmeier, Sulloway, Hollis, Godfrey
2 & Soden, Post Office Box 1256, Concord, New Hampshire,
3 I would ask that it be marked as Applicant's Exhibit
4 No. 17D.

5 MR. GOODHOPE: So marked.

6 (A letter dated June 23, 1978,
7 addressed to Joseph Ransmeier,
8 Sulloway, Hollis, Godfrey &
9 Soden, were marked as
10 Applicant's Exhibit No. 17D.)

11 MR. LEWALD: Mr. Chairman, for the convenience
12 of the Board and the parties, we have separately copied
13 the answering letters of Counsel to the letters that are
14 included in Applicant's Exhibit A through D. These letters
15 are also contained in a booklet, in its entirety, which
16 was marked as Applicant's Exhibit No. 15.

17 They are attached to a letter dated August
18 2, 1978, addressed to Mr. Reagan of the NRC.

19 For the convenience of the parties, we have
20 separately copied these out of that exhibit, and we
21 are suggesting they be marked as Applicant's Exhibit
22 18, collectively.

23 MR. GOODHOPE: All right. What about 15,
24 then? Do you want to withdraw that?

25 MR. LEWALD: No, 15 contains other materials,
and along with these letters -- while there would be
some duplication -- I ----

1 MR. GOODHOPE: (Interrupting.) What I have
2 in my hand is Applicant's Exhibit No. 15, which are
3 those?

4 MR. LEWALD: Applicant's Exhibit No. 15,
5 encompasses, I think, more material than what you are
6 now showing us, Mr. Chairman.

7 MR. GOODHOPE: But the stipulation covers 15?

8 MR. LEWALD: It does cover 15.

9 I simply don't want to complicate the record
10 unnecessarily, but the stipulation only refers to the
11 record as being within Exhibit 15, and if that is
12 sufficient, then I don't want to complicate it by doing
13 anything further.

14 MR. GOODHOPE: Well, do you intend to offer
15 these and have them marked?

16 MR. LEWALD: I have intended to mark them
17 and offer them only for the convenience of the Board
18 and the parties so that we don't have to fish through
19 the entire Exhibit 15 to find these four letters.

20 MR. GOODHOPE: Well, did you ----

21 MR. LEWALD: (Interrupting.) If that is
22 no problem -- I think we better take them. They are
23 marked as Applicant's Exhibit No. 18.

24 (A package of letters were
25 marked as Applicant's Exhibit
No. 18.)

C1-1
KG/Rm

1 MR. GOODHOPE: We will receive 17 A through
2 D and 18.

3 Doesn't that make your records straight?

4 MR. LEWALD: It could be withdrawn, Mr.
5 Chairman, in light of the staff's Exhibits 51 and 52,
6 because it contains duplicate information. The same
7 information.

8 MR. GOODHOPE: I see no sense in having it
9 again.

10 MR. LEWALD: So we would---

11 MR. GOODHOPE: Has Exhibit 15 been received
12 in evidence?

13 MR. LEWALD: Fifteen have been received in
14 evidence, yes.

15 MR. GOODHOPE: We will not bother with 15
16 anymore, then.

17 So your stipulation covers 17 A through D
18 and 18. Since they are covered by stipulation, these
19 documents are received in evidence.

20 (Applicant's Exhibits 17 A,
21 17 B, 17 C, 17 D and 18
previously identified above
were received into evidence.)

22 MR. GOODHOPE: I have one other matter.
23 The Commission has recently -- the Nuclear Regulatory
24 Commission, has come out and advanced Notice of Proposed
25 Rulemaking. Copies of this will be distributed. We have

C1-2
KG/RM

1 copies, I think hopefully, enough for everybody, and
2 what this has to do is with Emergency Planning, and
3 apparently they are going to go into the generic
4 rulemaking process. We are going to distribute copies
5 of this this afternoon and you can all read them and
6 see what, if any, impact that they would have on our
7 hearing schedule next month on the Emergency Planning.

8 I want to take it up sometime this week, but
9 not right now, because I don't think you are all familiar
10 with it as to whether or not we should go ahead with our
11 hearings next month or where we end up standing on it,
12 but I want you all to see the documents first and hope-
13 fully come back to us with some suggestions as to how
14 we go ahead.

15 MR. COLE: Especially with respect to any
16 Appeal Board proceeding , on the licensing board
17 conducting the hearings, on rulemaking subjects.
18 The Douglas Point decision on that should be all looked
19 at.

20 MS. MULKEY: Mr. Chairman, I also have ten
21 copies of that document, so if you---

22 MR. COLE: (Interrupting.)

23 You have brought them all the way?

24 MS. MULKEY: So in the advent there is a
25 shortage or some limited amount, the members of the public

C1-3
KG/RM

1 might get a copy.

2 MR. GOODHOPE: We will distribute them at the
3 end of the hearing today. We are not going to try to
4 take it up today because Dr. Callihan hasn't read it
5 yet. I am sure that he will have some comment.

6 Where do we go from here?

7 DR. CLEETON: Mr. Chairman?

8 MR. GOODHOPE: Yes?

9 DR. CLEETON: May I make an inquiry?

10 MR. GOODHOPE: Yes.

11 DR. CLEETON: Both Boston Edison and a number
12 of other applicants on June 13th and again on July 10th
13 in Washington or Bethesda, and normally we get some
14 kind of report from those meetings. Will we be receiving
15 reports from those two meetings which were held in
16 Washington on very short notice, and at which we were
17 not able to be present?

18 MR. GOODHOPE: Well, I am not sure. I assume
19 that the purpose of those meetings was a stipulation
20 that we just discussed. Is this correct, Ms. Mulkey?

21 DR. CLEETON: No.

22 MS. MULKEY: No.

23 MR. GOODHOPE: All right.

24 MS. MULKEY: I think that the meeting that
25 Dr. Cleeton is referring to is the meeting which Mr.

Cl-4
KG/RM

1 Denton, Director of Nuclear Reactor Regulations, held
2 with a number of applicants for various licensing
3 actions to discuss with them the effect of the staff's
4 investigation into the Three Mile Island accident upon
5 scheduling of the various license applications attended
6 with the staff. I do not know whether meeting minutes
7 in the individual dockets have been prepared.

8 I suspect not. As it is those meetings that
9 Mr. Cleeton is accustomed to getting, the minutes that
10 are prepared of individual dockets when meetings are
11 held between NRC Staff and Applicant; I think we can
12 probably arrange to get a copy of the minutes of that
13 meeting if they have been, and I assume that there
14 have been minutes, but I doubt if they have been served
15 upon the parties to the proceedings involved.

16 MR. GOODHOPE: All right. See what you can
17 do to make Mr. Cleeton's request?

18 MR. MEYER: Mr. Chairman?

19 MR. GOODHOPE: Yes?

20 MR. MEYER: I have one procedural matter
21 before we proceed with the witnesses.

22 We have filed a motion with the other parties
23 today to postpone the hearing of two of the six panels
24 of witnesses or individual witnesses that are scheduled
25 for hearing this week due to a problem that we encountered

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KG/RM

1 with the Applicant's responses to our interrogatories.

2 As recited in this motion, although properly
3 served interrogatories were served upon the Applicant
4 back in the beginning of June, June 8th or June 9th to
5 be exact, and although we did extend the Applicant the
6 courtesy of approximately a two and a half week extension
7 in the answers to those interrogatories past the deadline
8 that would have originally existed of about June 22nd
9 or June 23rd.

10 Up to July 9th, the Applicant did not serve
11 the answers to those interrogatories on July 9th, as
12 we had assumed that they would, but instead served them
13 on us on July 12th. In light of that extremely short
14 time that we had, approximately one and a half working
15 days from last Thursday to this morning, we would request
16 that two of the panels of witnesses, specifically the
17 Company's Panel No. 1, and the Commonwealth's Panel,
18 be postponed until the beginning of next week and we
19 proceed with the remainder of this case as originally
20 scheduled.

21 MR. GOODHOPE: Well, now, these interrogatories,
22 did you answer them all? You objected to certain
23 interrogatories?

24 MR. LEWALD: Yes, we did, Mr. Chairman. We
25 responded to the others and these were served by depositing

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KG/RM

1 in the United States Mails on Monday, the 9th. Why
2 they haven't been received by the Commonwealth, I don't
3 know.

4 MR. GOODHOPE: Well, they had been received,
5 actually.

6 MR. LEWALD: Well, the first call that we had
7 from the Commonwealth was on Thursday when Mrs. Burke
8 of the Commonwealth called to tell me that she couldn't
9 find them in the Commonwealth's premises and that Mr.
10 Meyer who is coming home from San Francisco, having
11 been there earlier in the week, would be there in the
12 afternoon and asked if we could kindly get copies over
13 to her. So we shipped immediately a second set to the
14 Attorney General, and I am at a loss to explain why the
15 mails haven't delivered the interrogatories, because they
16 were deposited in the United States Mails and, indeed,
17 Mr. Stoodley has a Certificate of Service to that effect.

18 MR. MEYER: I don't challenge that statement.
19 It is correct that the original mailed copies were
20 delivered to us on Friday, the 13th; but the date that
21 I recited in my motion is the date that we got our first
22 set. That was the hand-delivered copy that Mr. Lewald
23 referred to on Thursday afternoon.

24 MR. GOODHOPE: Well, then what Panel do you
25 want? Panel No. 1?

Cl-7
KG/Rm

1 MR. MEYER: Panel No. 1 of the Applicant's,
2 which is Messrs. Weiner, Legrow, Bourcier, and Garstow,
3 and the Commonwealth's Panel of Mr. Chernick and Ms.
4 Geller, be postponed until next Monday to give the
5 Commonwealth an opportunity to review the materials
6 that the Company has presented to us.

7 MR. CALLIHAN: Mr. Meyer, I agree we are going
8 to have to be a little more definitive now that we have
9 an additional party. When you refer to the Commonwealth
10 of Massachusetts, is it the Attorney General or is it
11 the Governor?

12 May we all of us try to make that distinction?

13 MR. MEYER: Yes, sir. I believe this
14 distinction was made the last time we met in June.
15 The Attorney General represents the Commonwealth of
16 Massachusetts as a state. That matter is not contested
17 by any party here.

18 Mr. Selgrade, sitting on my left, represents
19 the Governor's Office of Energy Resources as an
20 interested state agency which was the grounds upon which
21 they were allowed to intervene back in June of 1979, an
22 intervention that I believe we did not oppose, but we
23 represent the Commonwealth of Massachusetts as a state.
24 Mr. Selgrade represents the state agency of the Office
25 of Energy Resources as an interested state agency.

1 MR. CALLIHAN: Well, returning to your
2 piece of paper, is the Commonwealth of Massachusetts
3 here the Attorney General's office?

4 MR. MEYER: No, sir, it is not. The Attorney
5 General's office represents the Commonwealth of
6 Massachusetts as a Commonwealth is one of the states
7 of the United States.
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1 MR. CALLIHAN: Are Mr. Chernick and
2 Ms. Geller witnesses of your organization, witnesses
3 that you have presented?

4 MR. MEYER: Yes, sir.

5 MR. CALLIHAN: That was my point.

6 MR. GOODHOPE: Well, Mr. Lewald, how are we
7 going to proceed? Are we going to proceed with you
8 first today, or is that one of the questions what we
9 do now? What are our plans of procedure?

10 MR. LEWALD: I think that by agreement of
11 counsel the Massachusetts Energy Resource Office was
12 going to present Mr. Buckley first, somewhat out of
13 order. Mr. Buckley, if I understand, has scheduling
14 problems and had a prior assignment for the rest of
15 the week, so that it was with our agreement that
16 he would be the first witness.

17 Our order of witnesses would then be to
18 follow Mr. Buckley with the second part of the
19 Applicant's need for power testimony, second half,
20 which would be comprised of Messrs. Chernick, Turner
21 Godley and Hanna.

22 MR. GOODHOPE: Is that Panel 1?

23 MR. LEWALD: That is Panel 2.

24 MR. GOODHOPE: Very well.

25 MR. LEWALD: This is what we had planned

1 to do before Mr. Myer's motion, then proceed with the
2 second panel, which is identified in the testimony
3 as Panel 1, Messrs. Weiner, Legrow and Bourcier.

4 MR. GOODHOPE: Would that complete your
5 presentation?

6 MR. LEWALD: That would complete our
7 presentation, with the exception of Mr. Barstow,
8 which is one of the NEPOOL members of the panel who
9 is unable to be here for that panel's presentation,
10 and we would ask to have his appearance had at a
11 later date at the next session which would complete
12 the need for power testimony.

13 MR. GOODHOPE: Would he be available next
14 week?

15 MR. LEWALD: He will not be available next
16 week. He would be available if we had it the week
17 after, but not next week.

18 MR. GOODHOPE: So we are going to have to
19 come back for him, in any event.

20 MR. LEWALD: It was assumed that we would
21 be coming back on the remaining issues in the case;
22 the population issue, the alternate sites question,
23 and also on the Emergency Planning issue.

24 We had testimony that was deferred, again
25 it was scheduling problems of the witness, on the

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1 population aspect of alternates and the alternate site
2 issue.

3 We have two of the staff panel members, or
4 at least one, who had military assignments.

5 MR. GOODHOPE: That was the NRC-- was that
6 an NRC panel member?

7 MS. MULKEY: Yes.

8 MR. LEWALD: Yes, I believe it was.

9 MR. GOODHOPE: Was that the military?

10 mr. LEWALD: Our position on the motion to
11 delay the proceeding is one of opposition to the motion.
12 All this material, practically all this material
13 that has been asked for in interrogatory, has already
14 been supplied to the Commonwealth in other proceedings.
15 There are proceedings now underway and currently
16 being held by the Massachusetts Department of Public
17 Utilities, and in the course of Mr. Bourcier, and
18 Mr. Barstow's testimony, and Mr. Weiner's testimony,
19 the majority of the information sought here was
20 produced during the course of that proceeding.

21 The only difference in this proceeding is
22 that there has been a new study that is being produced
23 by the Applicant which was not produced on the state's
24 side before the Department of Public Utilities study
25 confined themselves to the Boston Edison Company

1 and didn't involve NEPOOL.

2 I would say by and large the information
3 provided in these interrogatories has already been
4 provided some time ago to the Attorney General.

5 MR. GOODHOPE: Is that accurate, Mr. Meyer?

6 MR. MEYER: It depends upon what you
7 consider to be "by and large." Some of this information
8 given the company's responses appears to be the same
9 responses we have seen earlier. A great deal of it
10 is not. Now, if you measure it by pages, I don't
11 know if it is more than 50 percent or less than 50
12 percent.

13 All these questions were specifically directed
14 to the company's presentation.. in its supplemental
15 direct testimony of Panel Number 1, and as such all
16 of it is irrelevant to the company's explanation of
17 how Panel Number 1 achieved the results that are
18 displayed. Indent supplemental testimony.

19 I would point out first that a substantial
20 part of this we have never seen before Thursday
21 afternoon. And secondly, I would point out that
22 the Company's Panel Number 1's testimony is
23 absolutely not understandable in terms of explaining
24 how the numbers contained therein were calculated
25 without this background material.

1 Without meaning to characterize the
2 testimony, I think it is fair to say that the
3 calculations therein could not be reproduced without
4 access to this material, and you simply, the Board
5 or any other party, could not understand how the
6 Applicant's Panel Number 1 produced the result that
7 they did, without this backup.

8 I reiterate that a substantial amount of
9 this was never in our hands before Thursday after-
10 noon.

11 MR. GOODHOPE: Could you be prepared later
12 on in the week to go ahead?

13 MR. MEYER: Yes, sir, we would.
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1 MR. MEYER: I think that we may be able
2 to proceed with Mr. Buckley and we may be able to finish
3 with him today. I would think it unlikely that we
4 would be able to proceed tomorrow with the company's
5 Panel No. 1, which was the original plan that all parties
6 agreed to among themselves.

7 So, possibly, the way to do it is to see
8 where we get this day and by the end of tomorrow, but
9 I would doubt it.

10 MR. GOODHOPE: All right.

11 Now, those -- We have talked about Mr. Buckley,
12 and we'll go ahead with the company if that's all right.

13 DR. COLE: It had been originally estimated
14 that we would be one week, and is that estimate still
15 reasonable in the view of the parties?

16 MR. MEYER: Yes, I believe it is, sir.

17 DR. COLE: Would it be a hardship on the
18 parties and you, Mr. Meyer, if it were to take the
19 Panel another part of a week?

20 MR. MEYER: I don't know whether our experts
21 will be able to review the material by then. I certainly
22 am agreeing with you that we should proceed on our
23 original schedule to see if we can do that.

24 As of right now, I'm not sure that I can
25 represent to the Board that we will be ready by Thursday

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1 or Friday of this week, but certainly it makes sense
2 to go forth with all that we can do.

3 MR. GOODHOPE: All right. We can have Panel
4 No. 2, and they are ready to go on, is that true?

5 MR. LEWALD: Yes.

6 MR. GOODHOPE: And Panel 1 isn't here?

7 MR. LEWALD: Panel 1 is not here, no. It
8 is not here in its entirety.

9 MR. GOODHOPE: What other witness do we have,
10 does the Commonwealth have?

11 MR. SEGER: The Office of Energy has a witness
12 but he won't be testifying until Wednesday. The fact
13 is that he is out of town and he won't be in until
14 Wednesday and it's Mr. Fitzpatrick.

15 MR. GOODHOPE: Are there any other witnesses
16 from the NRC?

17 MS. MULKEY: The staff has witnesses, but I
18 would like to be heard on this matter of scheduling.
19 We have operated under a proposed schedule put forward
20 by the Commonwealth, and have planned our week accordingly,
21 and especially since I am here alone, but in general
22 this works, just the changing of the schedule works
23 some hardships on us.

24 We are clearly opposed to a delay in the
25 scheduling and if there is to be a change we would

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D1-3
po/em

1 like very much to have something sorted out now
2 so that we can adjust to it.

3 For example, the Consultant to the
4 Staff's witness won't be arriving until late tonight
5 and the Staff's witness on their forecasting, after
6 inquiry from the Staff to the Commonwealth and other
7 parties, is planning to arrive at the end of the
8 week.

9 MR. GOODHOPE: When do you plan to put
10 them on on Thursday?

11 MS. MULKEY: We had planned to put
12 Mr. Falrig on. I think that is somewhat adjustable,
13 he is not arriving until late tonight, and he and
14 I both thought it would be a matter of a couple
15 of days before he would go on.

16 Dr. Tern will not be here until Wednesday
17 night, and he expected to go on the stand on Thursday.
18 Again, this was with the agreement of the parties
19 and I don't mean to ----

20 MR. GOODHOPE: (Interrupting.) I mean
21 he may be able to make that. He may be here, it
22 may be late in the afternoon and he may stay over
23 for the morning.

24 MS. MULKEY: But he is coming from Oak
25 Ridge and it is particularly difficult for him and

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D1-4
po/em

1 that is why we had tended toward afternoon.

2 MR. GOODHOPE: That's what I was trying
3 to find out, and does that complete all the witnesses?

4 MS. MULKEY: I think that this is correct.
5 We have the two witnesses, and they can be separated.

6 MR. GOODHOPE: All right.

7 Well, I just wanted to get some ideas
8 of what was going to happen.

9 Now, do you have any, Mr. Lewald, do you
10 have any witnesses on this?

11 MR. LEWALD: Only a very few questions.

12 MR. GOODHOPE: All right.

13 We will talk more about this in the morning
14 and then I think we can have a rough idea of what
15 we're going to go ahead with.

16 Now, Mr. Buckley, we can go ahead with
17 you and then we can go with the Applicant's second
18 Panel. We will call it the second Panel, and then
19 we'll see where we go.

20 Now, how long with the second Panel take,
21 do you have any idea?

22 MR. LEWALD: I think, I respectfully suggest
23 that Mr. Meyer would be a better respondent to that
24 question than I would be, Mr. Chairman.

25 MR. GOODHOPE: Well, we will try to work

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D2-1

1 out something and we can do it in the morning.

2 Now, is Mr. Buckley here?

3 MR. SELGRADE: Yes.

4 As an initial matter, I have two errors
5 that have to be noted. This is in Mr. Buckley's
6 testimony.

7 On page three, line sixteen, of the testimony,
8 did ----

9 MR. GOODHOPE: (Interrupting.) One moment,
10 we will have to swear the witness.

11 First of all, do you swear that the
12 testimony you are about to give will be the truth,
13 the whole truth, and nothing but the truth? .

14 THE WITNESS: Yes, I do.

15 JOHN G. BUCKLEY, Sworn

16 DIRECT EXAMINATION

17 Q (By Mr. Selgrade.) On page three, line sixteen of
18 your testimony, is there a questions?

19 A Yes. The Office of Energy, the Office of Emergency
20 Preparedness should be changed to the Department of
21 Energy. It was a forerunner organization.

22 Q And, on page five, line five, is there a correction,
23 Mr. Buckley?

24 A Yes. We should take the word "not" out. OPEC countries
25 as a group will manage their production.

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MR. LEWALD: What line?

MR. SELGRADE: That is line five.

That concludes the examination.

MR. GOODHOPE: These are all the questions
you're going to put?

MR. SELGRADE: Yes.

MR. GOODHOPE: Let us proceed.

Now, are you going to offer the testimony,
this testimony?

MR. SELGRADE: Yes. I formally offer the
testimony of Mr. John G. Buckley, on behalf of the
Massachusetts Office of Energy Resources.

MR. GOODHOPE: Is he appearing as an
expert witness?

MR. SELGRADE: Yes, he is.

MR. GOODHOPE: Do we have his qualifications?

MR. SELGRADE: The qualifications are in the
statement.

MR. GOODHOPE: All right.

Is that all?

MR. SELGRADE: Yes.

MR. GOODHOPE: Well, do you accept this
testimony as being , r testimony, Mr. Buckley?

THE WITNESS: Yes, I certainly do.

MR. SELGRADE: No further questions.

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MR. GOODHOPE: All right, let's go on.

MS. MULKEY: Can we have copies for the Board?

MR. GOODHOPE: I hope we can get some.

Now, are there any objections to the testimony being incorporated into the record?

MR. MEYER: No.

MR. GOODHOPE: All right, the testimony of Mr. John G. Buckley will be incorporated into the record, as though he appeared to testify under oath in the statements contained in the Pre-Trial testimony.

Now, does that complete your questioning?

MR. SELGRADE: Yes, it does.

Mr. Buckley is available for cross-examination.

MR. GOODHOPE: Who wishes to proceed first?

MR. LEWALD: The Applicant has no cross-examination for Mr. Buckley.

MR. GOODHOPE: Mr. Meyer?

MR. MEYER: Thank you, Mr. Chairman.

CROSS EXAMINATION

Q (By Mr. Meyer.) Mr. Buckley, am I correct in saying that your actual projections for future increases in the price of oil are contained in page seven and page eight of your testimony, where you state

D2-4
po/em

- 1 specific escalation rates?
- 2 A That is correct.
- 3 Q And specifically, sir, on page ten of your testimony,
4 line eleven, is it your best estimate that oil prices
5 will rise in the eight to ten per cent rate?
- 6 A That is right.
- 7 Q For the years 1981 through 1985?
- 8 A That is correct.
- 9 Q And on line four, page seven, you project this same
10 eight to ten per cent inflation rate from now until
11 1981; is that correct?
- 12 A On line seven?
- 13 Q No, line four of page seven?
- 14 A That is correct.
- 15 Q And, finally, on page eight, line sixteen, you
16 project approximately six per cent increase in oil
17 prices for the years 1985 and the years thereafter;
18 is that right?
- 19 A That is correct.
- 20 Q Now, are those price increases the inflation rates
21 that you are projecting for the industrial nations
22 for those respective three time periods; is that
23 correct?
- 24 A That is correct.
- 25 Q And, so, in constant dollars, you are saying that

D2-5

po/em

1 the price of oil will remain constant from 1979
2 through the end of the period that you project?
3 A That is the case that I have made, yes. It is the
4 case that I hope for.

5 Q And did you -- And does your testimony include a
6 statement that you believe that the Arthur D. Little
7 Panel of witnesses, that their projections of
8 future oil prices were too low?

9 A Yes; that is correct.

10 Q Did you have made available to you the original
11 copy of the Arthur D. Little testimony that is
12 Panel 2 to the Applicant's supplemental testimony?

13 A Yes, I did.

14 Q And did you have the revised version of that testimony
15 filed in June 29, available to you?

16 A Was that filed as part of Boston Edison's revised
17 file?

18 Q Yes.

19 A Yes, I saw that. I didn't see that before I did the
20 statement, but I have seen it subsequently, yes.

21 Q Now, is it your testimony, sir, that the Arthur D.
22 Little Panel witnesses, in their original supplemental
23 testimony filed previous to June 29, that they did
24 not project that the price of oil will keep up with
25 inflation?

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D2-6
po/em

1 A They, basically, did not foresee the events that
2 grew out of the file of the Shah of Iran and the
3 very rapid rise and increase in the price of oil that
4 occurred in the last six months or subsequent to that
5 event?

6 Q Sir, my question to you was, is it your understanding
7 of the Arthur D. Little witnesses testimony, as
8 filed in the original supplemental version, that they
9 did not project real oil prices?

10 A Could you, can you refresh my memory on the date of
11 the initial submission?

12 Q Certainly, sir. On May 18, 1979?

13 A Obviously, May occurred after December of 1978, and
14 the Iranian production was shut down, but I'm not
15 sure whether the initial study of that time frame,
16 what period, what month, 1979, they stopped with.

17 The most rapid price escalation that
18 occurred, occurred by independent OPEC nations
19 decisions in May, with respect to surcharges and then
20 the formal OPEC agreement on the new price structure
21 which occurred in June.

22 Now, the question is that the initial
23 submission did not reflect either of the two
24 currencies.

25 I guess, therefore, my answer in that

D2-7
/em

- 1 context will be that they did not reflect the real
2 prices that have occurred in May and June of 1979.
- 3 Q Sir, my question to you is, did your reading of that
4 Panel's witnesses indicate to you that they were
5 projecting price increases in real dollar terms,
6 whether they were projecting constant oil prices?
- 7 A By real dollar terms, do you mean simple dollars
8 for barrels, or constant dollars? How do you find
9 the difference between the two?
- 10 Q Do you believe the Arthur D. Little witnesses, sir,
11 will project the increases in oil prices in real
12 dollar terms, and by real dollar terms, I mean, if
13 you deflate oil prices for inflation, were they
14 projecting increases in oil prices in real dollar
15 terms?
- 16 A Well, I'm not sure whether they were projecting them
17 in real dollar terms or in constant dollar terms.
18 All I know is that they were not projecting
19 sufficiently high prices to take account of what
20 had occurred this year.
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KG/RM

1 Q And we have established, sir, that your projections
2 contained within your testimony is that oil prices
3 will remain constant in real dollar terms; is that
4 a direct testimony?

5 A That is my hope. That is what I think represents a
6 conservative estimate of what will happen to foreign
7 oil prices. I think it is the best case that we can
8 expect. I do not say for sure that it will happen.
9 I can think of many, many circumstances under which
10 the prices will rise by more than I have indicated, but
11 I think as a minimum the sovereign governments of OPEC
12 oil expect to get back in the marketplace any increase
13 in inflation that occurs in the major industrial countries
14 from which they buy most of their goods. They will
15 want to retain the increases that they had just had in
16 real constant terms.

17 Q I take it, sir, that your written testimony is your
18 best estimate of what is going to happen with oil prices
19 in the future, is that correct?

20 A That is correct.

21 Q Do you know whether oil prices rose in real dollar terms
22 from 1974 to 1979?

23 A No, they declined through 1978. In 1979 they more than
24 compensated, but they certainly declined in dollars.

25 If you look at marks and yen, and some of the

E1 2
KG/AM

1 other stronger currencies, the real cost of importing
2 to those countries who simply bought dollars to pay for
3 the oil, they actually had lower prices in 1978 than
4 they had in 1974.

5 Q Sir, how much time did you have to prepare your testimony
6 in this case?

7 A How much time did I take in preparing it?

8 Q Yes, sir.

9 A Two or three hours.

10 Q And how much time were you given total to prepare, and
11 by that I mean, how long before this testimony
12 were you approached by the Office of Energy Resources?

13 A To the best of my recollection a week or two.

14 Q Sir, on page 3 of your testimony, you referred to some
15 1969 testimony on a Maine Refinery before the Senate
16 Banking Committee, is that correct?

17 A That is correct.

18 Q What was your testimony; what was the gist of your
19 testimony on the availability of crude oil in 1969?

20 A That testimony had to do more precisely with the
21 availability of refined products in New England, but
22 since the hearing on availability of distillate supply
23 in New England did embrace the question of whether certain
24 action should be taken by Federal government to cause
25 a refinery to be built in Machiasport, Maine, there may

E1-3
KG/RM

1 have been questions about where that refinery was going
2 to get its crude oil, so that there may have been a
3 contingent question where the crude was coming for that
4 refinery, but the hearings, chaired by Senator McIntyre
5 of New Hampshire, were keyed more to the availability
6 of distillate supply, home heating oil supply, in the
7 New England region.

8 Q Well, line 1 of page 3 indicates that you testified on
9 the availability of crude supplies, is that correct?

10 A One of the queries dealt with whether this refinery
11 could get crude and what kind of crude it would be.
12 We didn't have to outline, since I was a project manager
13 for that particular project, where we planned to get
14 the crude oil to run that plant.

15 Q And that was your testimony in that case that the crude
16 oil would be available, is that correct?

17 A That is correct.

18 Q On page 5, sir, at the bottom of the page you made
19 some reference to Saudi Arabia's curtailing, if I
20 could summarize it, their policy of expanding production;
21 is that correct?

22 A That is correct.

23 Q Is this testimony starting, say on line 15 of page 5,
24 going on over to line 7 on page 6, is the testimony
25 still correct, sir?

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E1-4
KG/RM

1 A Yes, it is correct. Primary thrust of it. It
2 is true that in the interim the Saudis have agreed
3 temporarily to raise production by a million barrels
4 a day. Of that new amount is still a million barrels
5 a day lower than they were producing last December,
6 and I don't think it represents any fundamental shift
7 in their attitude towards the future.

8 Q Would you agree with me, sir, that the Saudi Arabian
9 decision to increase their production of a million
10 barrels a day in the last month or so indicates in the
11 light of the testimony on page 5 and page 6 that it is
12 somewhat risky to predict what OPEC will do?

13 A It is always risky to predict what OPEC will do. The
14 Arab group of sovereign countries each has its own
15 narrow interest as well as the general interest of
16 OPEC to look at each time they meet.

17 Q Page 6, line 14, lines 13 and 14, you state that due
18 to a persistent tightness in supply the normal decline
19 in world demand in the second and third quarters has not
20 occurred this year. Will you explain to me how tightness
21 in supply can affect demand?

22 A Well, ordinarily in the second and third quarters of
23 each year there is a decline in demand for products
24 and a corresponding increase in the building of
25 inventories, particularly crude oil and home heating oil

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E1-5
KG/RM

1 and refined products. It perhaps is not clear from
2 the testimony, but what I intended to indicate was
3 that because there was insufficient crude oil being
4 produced in the world that the normal stockpiling and
5 inventory building that occurs in the second and third
6 quarter has not occurred this year.

7 Q I take it you aren't testifying, sir, that supply affects
8 demand directly, is that right?

9 A Well, it can affect demand. Obviously it has with the
10 gasoline consumption. If it is not available, demand
11 drops, as the summer. You know, it's not really a
12 decrease in demand; it's a forced decrease in demand
13 if you don't have the supply available, but obviously
14 if the supply isn't there, then no matter what the demand
15 may be pent up, the actual demand has to drop to the
16 supply.

17 Q Is it your testimony, sir, that shortness in supply
18 causes demand to decrease?

19 A I am testifying that shortness in supply directly causes
20 demand to decrease.

21 Q Do you mean that the demand decreases or that consumption
22 decreases?

23 A Consumption, but most economists look at the demand if
24 you are looking at actual demand as consumption. Demand
25 for gasoline dropped probably ten percent on the East

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E1-6
KG/RM

1 Coast of the United States. It was nothing that anybody
2 wanted to and not because people really wanted to use less,
3 but because in most cases they were forced to use less
4 but they just couldn't get it.

5 Q Then your testimony here on lines 13 and 14, sir, is
6 that because of a persistent tightness in supply this
7 year demand did not decrease?

8 A Well, that is not clear. I agree with you it is not
9 clear. Okay let me restate the point I intended to
10 make in that sentence.

11 Because of the persistent shortage of supply,
12 the decline in world demand which normally leads to and
13 results in an increase in inventory during the second
14 and third quarter, a buildup for the following winter
15 has not occurred.

16 MR. GOODHOPE: This all goes back to tightness
17 of supply?

18 THE WITNESS: That is correct. But I admit
19 to you that it is not crystal clear what that sentence
20 means without some amplification.

21 Q Sir, as a general matter, do you believe that OPEC
22 nations act to maximize the present value with total
23 revenues over a particular planning horizon?

24 A I think some OPEC members operate that way. Others
25 operate not to optimize or maximize, but rather to

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E1-7
KG/RM

1 see some increase in value but without attempting or
2 with an attempt to moderate that optimum result to
3 prevent recession from occurring in major industrial
4 countries.

5 Q Which group of OPEC countries would you put in the
6 first category; that is, those that act to maximize
7 present values in total revenues over the planning
8 horizon?

9 A Well, I would certainly put Libya and Algeria, Nigeria,
10 in that category.

11 I would put the British and Norwegian and
12 the North Sea in that category.

13 I would put Iraq in that category, although
14 Iraq can sometimes let political objectives obscure
15 economic projection.

16 Q Which countries would you put in the second category,
17 that is, those that are already concerned with inflation
18 in the industrialized nations?

19 A Well, the leader of that group is certainly Saudi
20 Arabia, the United Arab Emirates, Abu Dhabi, tend
21 to follow the Saudi lead in that connection. I would
22 place countries like Kuwait between the two camps,
23 responding to pressures of both.

24 I would have put Iran in the Saudi camp
25 earlier prior to the Shah's departure. I would now put

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E1-8
KG/RM

1 Iran more closely allied to the price hawks.

2 Q And by "price hawks" you mean maximizing the present
3 total value of total revenues?

4 A That is correct.

5 Q On page 2 of your testimony, line 20, you mentioned the
6 New England Council. Would you identify it for the
7 record what the New England Council is?

8 A The New England Council is a group of some 11 or 12
9 hundred businesses, primarily businesses small and large
10 from the six New England States, who gather together
11 in this particular business association to try to
12 maximize economic growth in the six state region.
13 There are some fairly healthy representations from,
14 trade and tourism type activities, some academic, a
15 good deal of banking, a good deal of manufacturing within
16 the makeup, as well as energy oriented companies.

17 Q Would you identify for the record the Associated
18 Industries of Massachusetts that appears on line 21 and
19 22?

20 A Associated Industries of Massachusetts is an organization
21 made up of several hundred companies largely manufacturing
22 companies, small and large, apart from other kinds of
23 industrial enterprises, who belong to the Associated
24 Industries of Massachusetts in order to try to improve
25 the business climate for their kind of operation within

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E1-9
KG/RM

1 the Commonwealth.

2 Q In your opinion, sir, your oil price projections are
3 superior to those of the Arthur D. Little witnesses
4 that are part of the Company's Panel No. 2, is that
5 correct?

6 A Well, they are certainly more up to date, I think.
7 Obviously if they had accesses to the same kinds of
8 data in as late a time frame as I did, they might have
9 come up with the same answers.

10 I was merely projecting what I thought OPEC
11 would do at the end of June when I prepared this
12 statement. OPEC has now acted, and we know what happened.

13 I had projected 22.50 weighted average group
14 cost to this country. I may have been 15 to 20 cents
15 too low.

16 Q And, with respect to the prices past 1979, do you
17 consider your price forecast to be superior to that
18 of the other witnesses presented by the Commonwealth
19 on this subject, is that correct?

20 A Yes. I have talked to a number of OPEC people, people
21 who work with OPEC countries, and I just have a very
22 strong feeling that they are now going to have to try
23 to obtain back each year, regardless of the crude oil,
24 enough of a price increase to cover their cost of
25 importing goods from major industrial countries.

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KG/RM

1 MR. MEYER: I have no further questions.

2 MR. GOODHOPE: Ms. Mulkey?

3 MS. MULKEY: I wonder if Mr. Cleeton could
4 ask his questions?

5 MR. GOODHOPE: Yes.

6 MR. CLEETON: Could I be heard?

7 CROSS-EXAMINATION

8 Q (By Mr. Cleeton.) Mr. Buckley, does your report here
9 in its essence assume that there will be a constant
10 inflation?

11 A In the industrial countries of the world? Yes.
12 I would say that it will assume that. There are
13 individual countries that may be able to avoid that,
14 but looking at the total mix of where OPEC's crude is
15 sold, there will always be enough industrial countries
16 in inflationary trouble so that there will be a weighted
17 average inflation insofar as each OPEC country is
18 concerned as they look at each year.

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1 Q The Office of the Governor's Energy Resources
2 made recent recommendations that homeowners
3 convert to gas for heating from '79 up to '80?

4 A I do not know of it per se, but I've heard of it,
5 yes. I've heard it on radio and newspapers and
6 television, yes.

7 Q This is because of shift in supply of and circulation
8 of gas?

9 A It is not so much, I think, as the result of the shift
10 in supplies so much as it is an increase in supplies
11 so much as a redefinition of intrastate gas that
12 occurred as part of the national debate and final
13 implementing of legislation last year which suddenly
14 saw intrastate gas that up until that time had been
15 used really only in the states in which it was
16 produced, Texas, Louisiana and others suddenly put
17 into the pot with all of the intrastate natural gas,
18 and this created a spare capacity, if you will, at
19 least spare supply of the natural gas in excess of
20 that had been available in the intrastate the year
21 before.

22 Q Did you think the deregulation of oil, which had
23 been recommended by the President and which is being
24 considered by the Congress would have the same effect
25 on the supply of domestic oil?

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em/pf

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1 A If I might respond to that by saying that the President
2 has already done that. He decontrolled domestic crude
3 oil on June 1. It is a phased decontrol and to be
4 honest with you I think that on the rules under which
5 it is phased, those rules could lead to some producers
6 having less than maximum incentive to produce oil
7 this year rather than next year when the prices would
8 be higher, but, in any event, we have been on a
9 seven or eight year declining trend with the sole
10 exception of Alaskan North Slope crude and our
11 production this year is down another half a million
12 gallons a day from last year's level.

13 Q Do you think that the transcontinental pipeline for
14 shipping the Alaskan oil to Texas or the midwest
15 would be in place before Pilgrim is on line in '85
16 or '86?

17 A I would doubt it.

18 Q Was not that one of the President's primary statements
19 last night that we'll have a pipeline?

20 A Yes, that certainly was, but meanwhile the company that
21 applied to build long since lost their enthusiasm
22 and has given up the project. So, you are starting
23 from scratch on that one, I am afraid.

24 Q As an energy consultant, do you know anything about
25 spot market prices of enriched uranium?

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em/pf
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1 A No, I don't.

2 Q Do you know anything about the United States Navy oil
3 shale project in Rico, Colorado?

4 A I know that it exists, but I don't know too much
5 about the economics of it.

6 Q Are you acquainted with the use in the 1950's of
7 the Denver Rio Grande Western Railroad of shale oil
8 as a demonstration of cost effectiveness comparable
9 to crude petroleum in the United States?

10 A No, but I am not surprised by it. I do believe it
11 is comparable myself. It is at least getting very
12 close to it.

13 MR. MEYER: That is all I have.

14 MR. GOODHOPE: All right. Ms. Mulkey.

15 MS. MULKEY: Maybe I am being too much of
16 a mother hen about this, but I am concerned that
17 there isn't an exhibit number nor a binding into the
18 record of his testimony.

19 MR. GOODHOPE: All right. Let's go off
20 the record.

21 (Discussion off the record.)

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1 MR. GOODHOPE: The question has been asked, that
2 the testimony of Mr. John G. Buckley, on behalf of
3 the Massachusetts Governor's Office of Energy
4 Resources on the need for a program to be officially
5 appended to the record at the end of today's hearing
6 and also will be noticed in the record where
7 Mr. Buckley testified.

8 Now, I don't think we need an exhibit
9 number, but we will identify it as the testimony
10 of Mr. Buckley.

11 MS. MULKEY: Thank you, Mr. Chairman.

12 CROSS EXAMINATION

13 Q (By Ms. Mulkey.) Mr. Buckley, did you listen to
14 the President's speech last night, or have you read
15 it or seen it?

16 A Yes, I did.

17 Q Assuming that his expression becomes national
18 policy, can you tell us what, if any, affect it
19 has on the conclusions you have reached in your
20 testimony?

21 MR. GOODHOPE: What was the last part of
22 the question?

23 MS. MULKEY: What affect, if any, it
24 has on the particulars of the testimony?

25 THE WITNESS: If I take the President's

493 050

1 speech last night, together with the news reports
2 today, or what he said today, the news reports indicate
3 a \$140 billion program. I would have to assume that
4 \$125 billion or \$130 billion of that \$140 billion is
5 going to be in the development of synthetic fuels
6 from shale, from coal, and all I can say about it is
7 that the numbers I have seen in the development of
8 synthetic fuels comes up with the cost per barrel
9 in the \$28 to \$35 barrel range, depending on how
10 the project goes, whether it is on stream, on time,
11 or whether they run into technical problems.

12 You can't be too precise, but I have
13 talked to companies that have looked at and are
14 planning two, three and five million dollar projects
15 to develop synthetic fuels if the right rules are
16 in place.

17 I know that they are looking at that
18 \$28 to \$35 barrel or dollar barrel window, and
19 wondering will that oil be commenced when we bring
20 it on with the marginal barrel or OPEC barrel which
21 it will be replacing.

22 I think if the right regulation is in place
23 that many of those credit checks would go forward
24 under the President's program with the passive
25 assumption, of course, that one way or another, that's

1 what the market will be at by the time they get
2 upstream.

3 Q Do you know whether these estimates of \$28 to \$35
4 a barrel for substitute fuels, do you know what
5 assumption is made in calculating that dollar cost
6 about costs, or conforming to environmental regu-
7 lations?

8 A I don't precisely know what part of the total
9 capital investment and subsequently what part of
10 the cost of the barrel of synthetic crude oil are
11 directly attributable to either existing or changes
12 in the Environmental Regulations.

13 Q On page nine of the testimony, you referred to
14 a conclusion that you believe that the petroleum
15 users in the future will, insofar as possible, limit
16 their petroleum use and turn, instead, to other
17 energy sources; is that a fair statement of your
18 conclusions?

19 A This is the last section of page nine?

20 Q That is correct. This is line 17.

21 A Yes. I should say that that conclusion does not
22 include liquid hydro-carbon made from any of the
23 alternate or synthetic studies.

24 I guess what I'm saying is that looking
25 at oil today, and the marginal value or the OPEC

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1 valve, that increasingly oil users will try to
2 satisfy their liquid petroleum needs from synthetic
3 fuels of domestic or Western Hemisphere sources,
4 rather than from the OPEC barrel.

5 Q Do you also mean to say that they will try to
6 minimize their liquid petroleum use?

7 A Well, I'm talking about oil needs there, and I do
8 have a sentence in there saying that a combination
9 of escalating oil costs and on certain supplies is
10 already convincing developers to seek these alternative
11 energy sources.

12 Smong those alternate energy sources, just
13 so you understand my point, there will be a lot of
14 liquid hydro-carbon which you might call petroleum
15 but it is going to be petroleum made from something
16 else.

17 Q I don't understand.

18 A And that is secure. It is domestic or Northern
19 Hemisphere. That could still grow. We could still
20 use a lot more oil twenty years from now than we
21 do today, but an increase in the large share of that
22 will be synthetic rather than convention produced
23 from the ground petroleum.

24 Q Do you believe, then, that there is likely to be
25 an attempt to reduce use of liquid petroleum products,

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1 whatever their sources?

2 A Yes. I do also believe that simply because the
3 synthetic fuels are going to be very high-cost energy
4 and when you have high-cost energy, you tend to minimize
5 its use and we have already done a lot of that in this
6 country.

7 Q With respect to those attempts to minimize liquid
8 petroleum use, using the phases in the general sense,
9 does your experience lead you to believe that any such
10 uses in New England are likely to shift to electricity?

11 A I suppose that would depend on the price of electricity.

12 I mean, right now, it is, as you indicated,
13 there is a very aggressive program going on to convert
14 from heating homes with oil to heating with gas. There
15 are probably '25,000 conversions this year. There will
16 be another 25,000 or 40,000 next year because the
17 price differential is so large that it is 35¢. It
18 is 30¢ to 35¢ a gallon.

19 Therefore, obviously, as national gas prices
20 go up, then that incentive will be less, but,
21 similarly, electricity, electric heat has been very
22 dear, it has been very costly, and we have not seen a
23 shift to electric heat from oil heat in the home, but
24 depending on the future equation of whether electric
25 heat is less costly or more costly than oil, you will

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1 see a shift, or you won't, depending on the sort of
2 economic practice at the time. People are very
3 price conscious now, with the high cost of energy.

4 New home builders will certainly be looking
5 at it and it really will depend on the future
6 availability and the price of electric heat.

7 Q Is one credible scenario that new home builders in
8 northern New England might shift to a combination of
9 wood and electric space or baseboard heating?

10 A I cannot speak for the northern use of electricity.
11 I can tell you already that there has been a dramatic
12 move towards wood.

13 The average home in those three Northern
14 states in New England, the average oil use is possibly
15 down in the range of 30 to 35 per cent and since the
16 embargo in 1973 and '74. Some of that is due to
17 lower thermostats; some of it is due to retrofit and
18 insulation, but by far the largest single component
19 is due to wood stoves.

20 People buying them, installing them, and
21 using them in one room, and basically living in that
22 one room.

23 Q Do you know whether electricity is used as a backup
24 heating system for wood?

25 A I don't know that. I'm sure that it has a piece of the

FS-1
p. 1

1 market. I know my numbers because we supply a great
2 number of independent oil dealers in those three
3 areas, those three states, and they have seen a decline
4 in their per home sales. They have seen a fifteen
5 per cent decline in the first year and a few percentage
6 last winter when the price moved up this last winter
7 another big slice of another big ten to 12 per cent
8 reduction in use.

9 So, the average home, particularly in the
10 northern part of those three states, even though there
11 still are on oil, are using about a third less than
12 they did at the time of the embargo.

13 If electricity is as costly as all of them,
14 then I would think you would see the same trend in
15 electricity, but I don't know that for a fact.

16 Q Among industrial users, is there a move to the capturing
17 of waste heat?

18 A What?

19 Q Is there a mood to capture of waste heat?

20 A Yes. I think a number of companies have looked at that.
21 This is so-called cogeneration because industrial
22 companies have looked at that. This is so-called
23 cogeneration because the industrial companies with the
24 largest amount of either processed steam generated
25 by firing an oil burner or heat or both, have seen

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1 their energy costs go up. This is oil energy costs
2 and they have seen it go up roughly 1,000 per cent
3 since the embargo. This is ten times, and when you
4 see that kind of a dramatic increase in the year
5 manufacturing costs, particularly if you are the least
6 bit energy intensive in your manufacturing operation,
7 you will get, you will look at any way you can to
8 reduce that cost.

9 And I think, if I could single out any one
10 single sector that has conserved more than any one
11 sector in the country, is that one sector; the northeast
12 company between the New England companies that use
13 a large volume of oil to run their plants, to provide
14 the processed steam to generate power to run the plant
15 and heating it.

16 There has been a very dramatic increase in
17 conservation.

18 Q Do you know whether the technology to capture waste
19 heat relies, in part, on electricity?

20 A No, I don't. I'm not an expert in cogeneration.

21 Q Okay. On page six of your testimony, there is a phrase
22 that I, frankly, I had difficulty understanding the
23 significance of it.

24 Now, you referred to unfamiliarity of new
25 buyers, particularly the Japanese and Europeans with
the spot market?

A Yes.

1 Q (By Ms. Mulkey) Could you explain to us what the
2 kind of unfamiliarity with the spot market is?

3 A Well, what has happened here is a very sharply
4 accelerating trend under which the major international
5 oil companies; the familiar names of, Royal, Dutch,
6 Shell, British Petroleum, Exxon, Chevron, Mobil and
7 others; have decided, mostly, that since their margin
8 on the barrel is what they now have to buy from the
9 OPEC country or buy on the spot market, either one,
10 that they are no longer in a position to supply
11 smaller independent refiners, that they used to
12 either go out and seek that business and were
13 anxious to supply an independent Japanese supplier
14 of crude oil, particularly when they owned the
15 production around the world because the more pro-
16 duction that they could sell, the more profit that
17 they made; what has happened here is a gradual
18 reduction in oil available to those international
19 companies as country after country, OPEC and non-
20 OPEC, have nationalized and taken over their
21 own production.

22 Then this last disruption, starting with
23 the fall of the Shah of Iran, has just led many
24 of them to believe, and some to state publicly,
25 that they are phasing out of that business entirely

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1 and that when current contracts are up, they will
2 write no more, and that even those contracts that
3 they presently have under forceman de jure provisions,
4 will be supplied only partially during the remaining
5 years or months of each contract.

6 Now, as a result a great number of refinery
7 companies around the world, here, Europe, and
8 Japan, are going out on their own and talking to
9 producer governments, brokers, anyone they can talk
10 to to try to get back into their system the crude
11 oil that used to be supplied by the major inter-
12 nationals.

13 These companies, many of them, are not
14 sophisticated in the market. They have not had to
15 take care of themselves before. They look at the
16 prospect of lower refinery runs, and that is the
17 last thing that they want to happen, so they will
18 go to any length to pay any price, almost, in
19 order to get an extra cargo of oil or two cargoes
20 of oil. You have that kind of pressure put on a
21 relatively thin volume of oil that is on the
22 spot market. You see those spot prices sharply
23 outrunning the official prices established by
24 OPEC, for the great volume of oil that they do move
25 at official levels. That has exacerbated the

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1 current spot price situation for crude to go up
2 as high as \$40 a barrel, and even for conventional
3 Middle East type, Saudi Arabian light, or Iranian
4 light crude, the price is well into the third,
5 middle thirties per barrel.

6 There has some drop since the Saudies came
7 back in with this extra million barrels a day.
8 Prices have fallen off a bit, but they still, in
9 the case of Saudi Arabian light crude, still are
10 ten dollars, twelve dollars a barrel higher than
11 the official price. That is just part of the
12 explanation why that pressure was built.

13 MS. MULKEY: I have no more questions.

14 MR. SELGRADE: I have a few more questions
15 on redirect.

16 MR. GOODHOPE: Go ahead. Proceed.

17 REDIRECT EXAMINATION

18 Q (By Mr. Selgrade) Mr. Buckley, in response to a
19 question by Mr. Meyer, you said that your forecast
20 of your projection does not operate a component
21 for real price increase. Is this because you believe
22 that there will be no real price increases in the
23 future or is it rather because you want it to
24 provide a minimum or a floor type of forecast?

25 A It is because I thought you ought to look at the

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1 best case, the floor case. That case I think will
2 prevail if there are no international interruptions
3 in supply, no more problems that will generate
4 embargo type activity or other decisions to reduce
5 production as a result of pressure from the Middle
6 East. It is I think, the best case that you can
7 look at.

8 There are many, many things that could
9 happen to disrupt the production. The fall of
10 the Shah of Iran has disrupted the current market
11 and driven up official prices of every country that
12 produces oil in the world 60 to 70 percent. The
13 only country that hasn't gone up by that percent
14 is Saudi Arabia. They have only gone up 45 percent.

15 Every other major producing country
16 inside and outside of OPEC is now up for the year
17 60 and 70 percent, and in some cases even a little
18 higher than that.

19 That kind of rapid increase resulted from
20 a disruption. Now I am saying let's assume no
21 disruption. If there are no disruptions, then I
22 think that OPEC will have to be satisfied, and
23 will be satisfied, with just trying to offset the
24 inflationary costs that they perceive are being
25 passed back to them in the cost of importing goods

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1 that they need, and they will try to counter that
2 by raising their prices modestly, eight, nine, ten
3 percent a year, if we are lucky. If we are going
4 to run at 12 and 15 percent inflation, then
5 obviously they are not going to be satisfied with
6 eight or nine percent.

7 But if we can get a grip, which won't
8 be easy in the short run because these very OPEC
9 prices, coupled with our own government's decision
10 to decontrol are proof that are putting enormous
11 pressure on our economy all by themselves. I
12 would estimate if you look at the President's
13 decision to decontrol domestic crude, let it go
14 to the OPEC level, coupled with the OPEC decisions
15 that have already been made in the first six months
16 of this year, you are going to be adding two per-
17 cent to our inflation rate; that is, if it was
18 seven and a half, it is now going to be ten this
19 year and next year. Next year because we get more
20 of the domestic.

21 So, if you are going to look at a ripple
22 effect, because you just don't have a direct cause,
23 you always have a ripple, the truck driver that
24 pays the extra diesel cost just doesn't pass it on;
25 he adds something because it usually costs more

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1 in interest, so you have a ripple effect in fact
2 which adds another percent.

3 So, I think you are looking at three and
4 a half percent inflation in this country just from
5 oil prices alone. This year and next year. That
6 means that to get down to eight we would really
7 have to get down to four and a half. I think that
8 is going to be very difficult.

9 I am still amazed that the president took
10 that course, but he did. I think we are looking
11 at very difficult times short of a massive recession,
12 short of a depression, of getting inflation down
13 to more reasonable levels over the next few years.

14 Q Mr. Buckley, can you identify currently a country
15 in the Middle East that might present the possibility
16 of another supply disruption?

17 A Oh, I can name a lot. All you have to do is read
18 the daily paper and you know that the Ayatollah
19 Khoumani has problems. He is continuing to kill
20 people and some of his trusted lieutenants are
21 continuing to be killed. The most unstable area
22 in Iran, outside of the northern border area where
23 the Kurds live, is in the oil fields. That is the
24 area that is dominated more by labor, a leftist
25 leaning, now that's filled by the Ayatollah Khoumani

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1 and the changes that he is making. You will notice
2 that when they were sabotaged last week in Iran, it
3 occurred in blowing up a pipeline from the oil
4 fields to Iran's big refinery, the Abudan Refinery,
5 the second largest refinery in the world. That was
6 obviously an effort by those dissident groups I
7 am talking about to shut off the flow of products
8 within the country, embarrass the government.

9 Between the civilian government and the
10 religious government there is constant clash. I
11 have to say that Iran is still a very unstable
12 place and that even the three and a half billion
13 barrels a day that they are now producing and
14 exporting is very vulnerable.

15 There are also problems in Omar, a smaller
16 producer, but nonetheless one that produces very
17 high quality crude. That is a very iffy situation.

18 There are difficulties in Nigeria. The
19 Nigerians have ordered the European companies
20 operating there, particular Royal Dutch Shell and
21 British Petroleum, to engage in a secondary boycott,
22 to state and sign legally that each vessel that
23 comes into that company to load crude oil has not
24 called on a port within the prior six months, a
25 port that would be Rhodesian oil or that would

1 feed crude oil to Israel or feed crude oil to South
2 Africa.

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1 A (Continuing) As a result, continued petroleum
2 availability of Nigerian crude has dropped because
3 they can't sign these statements in some cases,
4 and if American companies in Nigeria were ever asked
5 to sign that document, and given the emotionalism
6 that exists in Black Africa, vis-a-vis Rhodesia
7 and South Africa, American companies in Nigeria
8 would be asked to sign that kind of a statement,
9 it would be a clear violation of U. S. law. A
10 clear secondary boycott which they aren't
11 allowed to participate in, and we could lose all
12 of our Nigerian crude which is currently our second
13 largest source, about 14 percent of all our crude,
14 a million, two hundred thousand barrels a day,
15 comes from that country. That one is simmering
16 along.

17 Mexico is in technical difficulties in
18 delivering only 60 percent of their crude now that
19 they have contracted for. Mexico, which is not
20 a member of CPEC, has also now raised their price
21 up to \$22.60, which lays it in the United States
22 at over \$23.

23 I think when you look at the list of
24 all the countries that produce oil around the world,
25 Colonel Khadafi, of leader of Libya, announced two

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1 weeks ago that he was going to stop production for
2 two years, and then he said I didn't mean it, we
3 are just studying it.

4 But, any move like that, in looking at
5 the political instability, beyond the ongoing
6 negotiations on the Palestinian state, beyond the
7 ongoing Egyptian negotiations which we are a party
8 of with Ambassador Strauss,---

9 DR. CLEETON: Mr. Chairman, some of this
10 testimony is entering into the area of conjecture,
11 and I wonder if this is expert testimony that the
12 witness is capable of testifying.

13 MR. GOODHOPE: Well, finish your answer.
14 Go ahead.

15 A (Continuing.) Well, that last point is an area
16 where obviously a number of the states that I
17 identified earlier from the Commonwealth's question,
18 have very strong emotional feelings about, and
19 they often, as they did in 1973, will invoke an
20 embargo against this country which they did then,
21 simply because of the role they see us playing
22 in that area.

23 In short, the availability of crude oil
24 to this country from all the major producing
25 countries in the world is subject of much

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1 uncertainty. That is one of the reasons why the
2 President wants to change and make us less vulnerable.
3 I don't think we have ever been as vulnerable as
4 we are today to this kind of disruption. There is
5 no spare capacity anywhere. These disruptions could
6 happen. I am not counting on them happening. I
7 hope they don't happen. But if any one of them
8 did happen, and we have plenty of precedent for
9 them in the last decade, then obviously my projection
10 would be far to low. You would have another leapfrog
11 like we just had in the last six months.

12 MR. GOODHOPE: And do you have any further
13 questions?

14 MR. SELGRADE: Just one more.

15 Q Mr. Buckley, you testified that after 1985 or 1986
16 the average inflation rate of importing countries
17 would come down to six percent. I think you per-
18 haps answered this before. Is there a possibility
19 that it would remain above six percent?

20 A Yes, there is a possibility that would remain
21 above. I am counting on the President's initiative
22 last night and today not to solve all the problems
23 of the world, but to get the country headed in the
24 kind of direction where it will be by mid-1980 by
25 solving a lot of its problems itself here at home,

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1 and I think that once we get that technology in
2 place, we will then have a much larger say about how
3 much we are willing to pay for OPEC oil because
4 we will have some alternatives available to us
5 here. They will be high cost, but I think once
6 they are in place and coming on in large volume,
7 they will act as a cap both on inflation here at
8 home and OPEC's aspirations for higher price
9 increases.

10 MR. GOODHOPE: Any further questions?

11 MR. SELGRADE: No further questions.

12 MR. GOODHOPE: Thank you, Mr. Buckley.

13 Did you have some questions? All right.

14 I am sorry.

15 MR. COLE: Just a couple of questions,
16 Mr. Buckley. In response to a question by
17 Ms. Mulkey concerning the implications of President
18 Carter's address last night and how that would
19 impact on your testimony or your conclusions,
20 your testimony deals principally with the supply
21 and price of oil?

22 THE WITNESS: That is correct.

23 MR. COLE: Could you first for the record
24 describe how the supply and price of oil would
25 impact upon the subject of this particular hearing.

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1 which is the need for Pigrim 2?

2 THE WITNESS: I am not an expert in the
3 economics of nuclear power, and it is difficult for
4 me to assess, to put my testimony against that
5 equation you are looking at.

6 My testimony is designed only to give
7 you a framework of where I think oil prices are
8 going to be, and since oil is a large component
9 in a generation of electric power if you have fossil
10 fuel, like running on oil, of the alternate economics
11 of doing it that way would be if it is decided to
12 go that way rather than nuclear.

13 I guess what I am saying is that I can't
14 take what I have said and in a meaningful way
15 compare it with the economics of nuclear, because
16 I am just not an expert in that area and I would
17 hope that perhaps other people can do that for
18 you, but I can't.

19 MR. COLE: Okay. Well, is it fair, then,
20 to say that all of the things being equal, an
21 increase in the price of oil would make other
22 alternatives--

23 THE WITNESS: (Interrupting.) More viable?

24 MR. COLE: More viable.

25 THE WITNESS: No question about it.

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1 MR. COLE: Is that the substance of your
2 testimony?

3 THE WITNESS: That is correct.

4 MR. COLE: Now, you made a comparison or an
5 evaluation of the price of one of the Applicant's
6 panels and your conclusion from that is that from
7 the supply and price viewpoint their estimate was
8 conservative; is that correct, sir?

9 THE WITNESS: That is correct. Too low.

10 MR. COLE: Too low a price?

11 THE WITNESS: That is correct.

12 MR. COLE: For oil. Do you or have you
13 made any estimate of what would happen to the supply
14 and price of oil if the points that were raised by
15 President Carter in his address are in fact fulfilled
16 and we stick to this program, what would happen
17 to supply and price of oil as compared to what your
18 present estimates are, sir?

19 THE WITNESS: I think my estimates through
20 the short term, which would be up through the next
21 five to seven years, we would still have to face that
22 as possibly the best case. I would hope that if
23 enough of this program is implemented, there would
24 be a moderating trend because there would be more
25 and more control of the total number of hydrocarbons

g-2-8

1 MR. COLE: But is that a change because
2 of the President's policies, or is that the way you
3 predicted?

4 THE WITNESS: It is a confirmation of
5 what I earlier predicted.

6 MR. COLE: I have no other questions.
7 Thank you, very much.

8 MR. CALLIHAN: One small question. A small
9 housekeeping matter. Would you give to me please
10 a conversion factor between gallons and barrels in
11 the context of your testimony?

12 THE WITNESS: Yes.

13 MR. CALLIHAN: And in the context of the
14 way the terms are bandied around these days?

15 THE WITNESS: A gallon-- there are 42
16 gallons, United States gallons, not imperial gallons,
17 U. S. gallons, to a barrel of oil; so that if a
18 barrel of oil is sold at \$21 a barrel, that is 50
19 cents a gallon.

20 MR. CALLIHAN: Thank you.

21 In these rapidly changing times, it is
22 difficult to affix conditions to statements such
23 as your testimony, and this is no criticism of you,
24 so when you make comments such as those on page four
25 about recent OPEC actions and so forth, may I ask

g-2-7

1 that we are using here at home or within the hemis-
2 phere.

3 That is why I project lower price increases
4 out beyond 1985. Between now and then we are
5 vulnerable. We are going to stay vulnerable. There
6 is nothing much we can do to change that. We are
7 going to conserve in order to stay within his
8 numbers-- eight and a half million barrels a day in
9 1977, and I suspect when the final details of his
10 quota system comes on you will see some reductions.
11 I don't think he really wants to shut down plants,
12 or hospitals, or schools, or homes; if we don't
13 have enough oil or there is only one place we can
14 get it and that is to import it. But we will have
15 to wait and see what those details are.

16 MR. COLE: You, sir, you indicated just
17 a moment ago that you thought past 1985 the price
18 would not increase as fast, providing President
19 Carter's program is fulfilled. Do you think that
20 is realistic?

21 THE WITNESS: No, what I meant is I would
22 look for more moderate a price increase towards
23 the end of the eighties and I am looking at the
24 beginning of the eighties. But I think I have
25 already indicated that in my testimony.

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1 for a time frame, and I am sorry, I have got to
2 define a new calendar here to base this on, and I
3 want to define a calendar that has a zero point of
4 which is somewhat between the SALT talk in Vienna
5 and the Tokyo summit. I think a little bit of a
6 small positive quantity in that scale dates on my
7 calendar an OPEC action.

8 THE WITNESS: Okay.

9 MR. CALLIHAN: Now, do you see values on
10 page four where I repeat you spoke of recent OPEC
11 actions, recognize that OPEC price increase which
12 I just described on my calendar?

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1 THE WITNESS: What you are talking about
2 was the one that went in place on July 1?

3 MR. CALLIHAN: If I knew that I wouldn't
4 have had to invert a calendar. I am sorry.

5 THE WITNESS: The one that was announced
6 a week before the Tokyo summit?

7 MR. CALLIHAN: I thought it was about the
8 time of the Tokyo summit.

9 THE WITNESS: It may have been announced
10 a day or two before the Tokyo summit.

11 MR. CALLIHAN: Okay. That is the one I
12 am talking about.

13 THE WITNESS: That had not taken place when
14 I wrote this testimony. The time frame here is a
15 very simple five percent increase across the board
16 January 1. That is what OPEC agreed to in December.
17 They had planned to go fourteen and a half percent
18 for the year, five percent in the first quarter
19 and another percent in the second quarter and so
20 forth to get up to fourteen and a half. By the
21 time April first came, the beginning of the second
22 quarter they decided rather than to go X percent
23 per quarter, they would do the whole fourteen and
24 a half percent then. so they take the five percent
25 ahead in January 1 and bring it up to fourteen and

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1 half percent by April first.

2 They also decided that each individual
3 country if it wished, could add a surcharge over and
4 above the normal quality which is two and a half
5 dollars a barrel. Now, during April, a little bit
6 of that occurred but not much.

7 During May, everybody added a permissible
8 surcharge and then some went above the permissible
9 surcharge, and so when they met in June there was
10 enormous pressure to get the Saudi Arabians who had
11 only moved fourteen and a half percent up near the
12 level and to reunify crude pricing, because in the
13 past the Saudi's market crude was a group where all
14 other prices, official prices were denominated.
15 There would be some a little higher, some a little
16 lower, depending upon the freight, the quality
17 differentials, each individual OPEC country would
18 group around that so-called marker price. That
19 objective failed.

20 Saudis did agree to go from 14.54 to
21 \$18 a barrel. That was a new floor, but they are
22 the only ones at \$18. They each then kept the right
23 to add quality differentials, freight differentials,
24 and surcharges up to a ceiling.

25 Now, they have for the first time a

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1 ceiling imposed of \$23.50 a barrel, so you today
2 have Saudi Arabia at \$18, FOB. Libya, Algeria,
3 and Indonesia and Nigeria at \$23.50, or within a
4 few pennies, depending upon the quality of the
5 crude, and then the others group in the 20 to 22
6 dollar range. So there is no unity. All there is
7 is a new floor and a new ceiling, both of them
8 much higher, and an increase in the weighted
9 average cost to us which, as I say, is coming out
10 at around \$22.60 on an average of all the crude that
11 we bring in.

12 I had projected in here \$22.50 but that
13 was before they took their action. It is coming
14 out, if you look at where we buy our crude from and
15 what the new prices are, it is coming out at about
16 \$22.60, plus a little increment for spot crude which
17 is coming in at a little higher price.

18 So, I now think that they will sit back
19 and they won't increase prices any more this year
20 short of some interruption in supply, some distortion
21 or disruption or other event of that kind. But I
22 do expect that next January they will begin increase,
23 hopefully, modestly, but at least in keeping with
24 what these parameters that I have talked about,
25 namely, the rate of inflation of the countries that

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1 they are selling. So, the time frame of most of
2 this action that I have described here is really
3 from the first of May to the two days before the
4 Tokyo summit. The third week in June.

g-3-4

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1 MR. CALLAHAN: At the moment, then, the
2 value you gave is low because of that?

3 THE WITNESS: No. I'm only low about ten
4 cents.

5 I came up with the price of \$22.50, and I
6 think if you take the actual crude that will bring it
7 in, and a lot of it won't get here until August,
8 but when all of the crude reflects what I have done on
9 July 1, it is going to come out in the range of \$22.50
10 to \$22.75 a barrel, average. This is not counting
11 the spot market.

12 With this extra Saudi increase of 1 million
13 barrels a day, I don't expect the spot market to be
14 as wild as it was during that second quarter of the
15 year, and I would hope that that Saudi action,
16 particularly if it is continued to the rest of the
17 year, instead of just the quarter, will operate to
18 hold the line on current prices, and not permit them
19 to jump above the ceiling the way they did in May or
20 June.

21 MR. CALLAHAN: You led into my next question
22 which was to have been, and really is, how does the
23 spot market influence the figures that you gave, or
24 to put it differently, or do your estimates recognize
25 the spot market?

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1 THE WITNESS: I have referred to it only
2 as a pressure mechanism which tends, if the price is
3 in the spot market very high, to kind of force the
4 OPEC countries to get their official prices up higher,
5 too.

6 The spot market, as I have indicated,
7 particularly since the Saudi position ten days ago
8 to increase production, has fallen somewhat. It has
9 fallen ten to fifteen per cent of what it was a month
10 ago.

11 The spot market is a very small volume of
12 oil. It ranges from two to five per cent. It tends
13 to be larger today than it used to be because some
14 of the producing countries like to sell on the spot
15 market. Iran is a good example of that.

16 Now, this spot market, basically tells you
17 what the market will be, and in times of shortages,
18 the amount for that extra cargo will be very high.
19 If it stays high, as it did during the first half of
20 this year, it puts enormous pressure on countries with
21 limited production like Ontario. They produce
22 about 1 million barrels a day for export. They see
23 their crude being sold. They see price graph service
24 from McGraw-Hill Publications, and they see that their
25 oil is being sold at \$38 and \$40 a barrel and they are

1 down to \$21, and they say, hey, if anyone is going to
2 make that kind of money, it is going to be us and not
3 some oil company or some middleman or some broker.
4 Why should we let them have all that profit?

5 So, it tends to support their analysis that
6 there is a short supply of a very tight market and
7 that they can seek that optimum price, official optimum
8 price that we talked about earlier.

9 So, it does have a very pronounced impact
10 on the psychology of the OPEC countries, looking at
11 what their price ought to be; their official price
12 for all the barrels.

13 And the fact that it was as high as it was
14 during the full first half of this year, let them.
15 it was one of the reasons that they moved that high
16 and fast as they did in the official price.

17 MR. CALLAHAN: And did you ----

18 THE WITNESS: (Interrupting.) No, I did
19 not count it in my U.S. computations. We did not
20 bring in any spot oil during most of the second quarter.
21 It was against the rule.

22 We are now bringing it in, and it will mean
23 our awaited average crude cost is not going to be
24 \$22.50 or \$22.60, but it is going to be more like
25 \$23.00 or \$25.00, even if we just bring five per cent

1 in from the spot market because each of the spot cargoes
2 is going to be five to twelve dollars higher than the
3 official.

4 MR. CALLAHAN: As you are aware, these
5 proceedings addressed this subject earlier, and on
6 those occasions I have taken the opportunity to ask
7 a particular question and I can't resist taking that
8 opportunity again.

9 The question is, essentially as follows,
10 and it also has to do with conservation and if we
11 will set aside, for a moment, your earlier remarks
12 about supply for seeing a decrease in demand and
13 looking purely at conservation, will you comment,
14 please, on your observations and your opinion of how
15 the public in this country is reacting or can react
16 or perhaps will react to true conservation of our
17 own supplies and the context of that, of course, if
18 just feeding the present situation. It is more and
19 more strongly into the vicious inflationary pattern
20 that we have experienced and may continue to experience.

21 Among the arsenal of weapons we have to
22 address the current situation, the most potent single
23 weapon, short-range, is conservation. There is not
24 much you can do on the supply side, short-range, to alter
25 the situation.

H2-1

1 When you look at conservation, you have
2 to look at total conservation and energy use and
3 total conservation in oil use.

4 Total conservation in energy use has taken
5 place, but most of it has taken place as a result of
6 conservation in oil use because oil prices have been
7 sharply increased.

8 The most conservation has occurred where the
9 price increases have been the most rapid, and the
10 use of industrial fuels, as I indicated, in the
11 New England area, which uses a large amount of
12 industrial residual fuel, imported from abroad.

13 You have seen a better than twenty per cent
14 conservation by industrial users since 1973. They
15 get the same output today, using 78 or 79 barrels
16 instead of 100 barrels we got five years ago.

17 Home owners have conserved, particularly
18 those on home heating oil. There has been a thirty-five
19 to fifty per cent price increase in five, six years.

20 You have seen the conservation in natural
21 gas, residential use, because that price has been
22 much lower. You have seen some of it here, but you
23 haven't seen much of it down closer to the source of
24 production from where the price is substantially lower.

25 You have seen, on new plants, on capital

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1 expansion, on economic growth, in that area, you have
2 seen a long tradition of energy use, which were
3 almost fifty years, grew on a one-to-one basis with
4 economic growth.

5 If you had an extra unit of GNP growth,
6 you had an extra unit of energy growth.

7 In the last six years, we have gotten that
8 down to .66. So, for each unit of economic growth,
9 it is now only .66 units of energy, overall energy
10 and not just oil.

11 I think that this will continue. I think
12 we will get up to .5, maybe even below that. We
13 have done better than any industrial country in that
14 regard. Our conservation, since the embargo, has
15 been more dramatic and our new rate of using energy
16 for new GNP growth is better today than a year ago,
17 though we are, they often complain about it.

18 We have, of course, used gasoline more
19 efficiently because of mandated standards of
20 automotive efficiency. The average car today is
21 fifty per cent more efficient than six years ago,
22 and that is going to keep up to twenty-seven and a
23 half a gallon and then it is going to go up from there.

24 We are going to top out on gasoline use
25 next year or the year after, at the latest, and then

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1 we will stabilize and start using less of it because
2 we have more efficient automobiles.

3 Now, beyond that, the biggest discretion
4 we have in use of petroleum product is gas.

5 As certain amounts of gas used for business,
6 that's non-discretionary for the most part, but there
7 is still a good deal of discretion in private
8 automobile driving. Some of it is required and some
9 is discretionary.

10 To the extent that we can, that people will
11 use that discretion, both because they are forced to
12 because of lines or because they genuinely believe
13 we have an energy problem -- and I think more and
14 more people are believing it and they are not
15 believing who is responsible for it or they are
16 sometimes blaming their own people, I think -- but
17 nonetheless, they do believe that we have a problem
18 and the President, and I hope that Congress will
19 continue to get that message out.

20 Because when you call upon the people of
21 this country to do something and you convince them
22 it needs to be done, and it is now in the national
23 interest to do it, they all respond.

24 So, I would be hopeful we could get some
25 additional conservation in the discretionary use

1 of gasoline that would help, that would have
2 continuing and growing efficiency in the use of
3 energy related to industrial and economic development
4 and it will continue to see and extend it to other
5 energy forms of conservation that is already taking
6 place in use of industrial fuels and home heating fuels.

7 MR. CALLAHAN: That's all.

8 MR. GOODHOPE: Thank you, Mr. Buckley,
9 that is all.

10 THE WITNESS: Thank you.

11 MR. GOODHOPE: We will now have a ten-minute
12 recess before we go ahead.

13 (Whereupon a recess was taken.)
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(The hearing continued at 3:25 p.m.)

MR. GOODHOPE: The hearing will be in order.

Mr. Lewald?

MR. LEWALD: Your Honor, I am going to call Mr. Turner, Mr. Godley, and Mr. Hanna to the witness stand.

DAVID HANNA, CLARENCE TURNER, NIGEL GODLEY, Sworn

MR. LEWALD: Your Honor, I would like to have marked for identification a multi-page document entitled "Applicant's Revised Supplemental Testimony on Need for Pilgrim 2," which document bears the caption of this proceeding.

(A multi-page document Applicant's Revised Supplemental Testimony on Need for Pilgrim 2 was received and marked as Applicant's Exhibit Number 19 for Identification.)

DIRECT EXAMINATION

Q (By Mr. Lewald.) Gentlemen, if you would state your names and addresses for the record so the reporter may get started with that?

A (By Mr. Hanna) My name is David Hanna, employed by Arthur D. Little, Inc., and my address is Acorn Park, Cambridge, Massachusetts.

A (By Mr. Turner) My name is Turner, and I am employed by Arthur D. Little Company. My address is

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1 also Acorn Park in Cambridge.

2 A (By Mr. Godley.) My name is Nigel Godley. I am
3 employed by Arthur D. Little. My address is Acorn
4 Park, Cambridge, Mass.

5 Q Gentleman, I show you a copy of a document entitled
6 "Applicant's Revised Supplemental Testimony on Need
7 for Pilgrim 2," which has been previously marked as
8 Applicant's Exhibit No. 19 for identification. I
9 would ask you to turn to that portion of the document
10 which begins "Panel 2," and is thereafter followed
11 by some fifteen pages and ask you if you can identify
12 that exhibit as being the prefiled written testimony
13 which you submitted in this proceeding?

14 A (By Mr. Hanna.) It is.

15 A (By Mr. Turner.) It is.

16 Q Now, are there any changes or corrections that should
17 be made in this copy which has been marked Applicant's
18 Exhibit 19 for Identification?

19 A (By Mr. Turner.) No changes.

20 A (By Mr. Godley.) On page 9. On page 9 we would like
21 to amend the title of the figure to add the words
22 "type crude" after "light". So that the title should
23 read "Price Forecast for Saudi Arabian Light Type
24 Crude FOB Ras Tanura."

25 Q With that correction, gentlemen, is the testimony

1 which is contained in the exhibit following the cover
2 sheet "Panel 1" true and correct to the best of your
3 knowledge and belief?

4 A (By Mr. Turner.) It is.

5 A (By Mr. Hanna.) It is.

6 A (By Mr. Godley.) It is.

7 MR. LEWALD: Mr. Chairman, there is some
8 rather awkward motion, but we would like to move the
9 admission of that part of the document, Exhibit 19,
10 which follows the sheet marked "Panel 2" within
11 exhibit. Ordinarily we would ask that the entire
12 testimony be incorporated in the record as if read,
13 but because we are dealing with it piecemeal, it is
14 somewhat of an awkward canonical problem.

15 MR. GOODHOPE: What do you want to do,
16 type it write into the record, or just attach this
17 as an exhibit?

18 MR. LEWALD: We could, with the permission
19 and acquiescence of the parties, have all of the
20 document incorporated into the record as if read,
21 subject to a motion to strike,

22 MR. GOODHOPE: All right, as of this time
23 we will bind the entire exhibit as given, but it is
24 understood that only the part pertaining to Panel 2
25 that commences back in a little over halfway through

1 the volume is admitted into evidence and bound into
2 the record. We will worry about the other front
3 half when we get to it.

4 MR. LEWALD: Thank you.

5 (Exhibit Number 19 for
6 Identification was received in
Evidence.)

7 MR. LEWALD: I have no further questions of
8 the witnesses and they stand ready for cross-examination.

9 MR. GOODHOPE: We will start with the
10 Attorney General.

11 MR. MEYER: Certainly.

12 CROSS-EXAMINATION

13 Q (By Mr. Meyer.) Mr. Turner, do I take it that you are
14 the senior member of this panel with respect to the
15 Arthur D. Little length of employment?

16 A (By Mr. Turner.) Yes.

17 Q All right, I will address my questions to you, and if
18 other witnesses feel that they wish to supplement
19 your answers, please do so, but I will ask all of my
20 questions of you directly.

21 First, would you agree with me, Mr. Turner
22 that in order to forecast the price of crude oil,
23 one needs to make estimates of demand/price elasticity?

24 A Not as a specific input; I would say not.

25 Q Next one, in order to make a forecast of the price

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Document follows.)

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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 2)

) Docket No. 50-471
)
)
)
)

APPLICANTS' REVISED SUPPLEMENTAL TESTIMONY
ON NEED FOR PILGRIM 2

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APPLICANTS' SUPPLEMENTAL TESTIMONY
ON NEED FOR PILGRIM 2*

PANEL 1

PANELISTS: Benjamin H. Weiner, Vice President-Power Supply
Administration, Boston Edison Company

Philip A. Legrow, Generation Planning Engineer,
Boston Edison Company

Donald V. Bourcier, Chief of Load Forecasting,
New England Power Planning

Arthur W. Barstow, Manager of Generation Planning,
New England Power Planning

PANEL 2

PANELISTS: F. Cort Turner, Vice President, Arthur D. Little,
Inc.

Nigel Godley, Manager-Energy Economics Section,
Arthur D. Little, Inc.

David Hanna, Energy Economics Section, Arthur D.
Little, Inc.

* Intervenor's Commonwealth of Massachusetts Contention 6,
Cleaton Contention H, Ford Contention M

P A N E L 1

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1 Q. Mr. Weiner, please state your name and business address.
2 A. Benjamin H. Weiner, Boston Edison Company, 800 Boylston
3 Street, Boston, Massachusetts.
4 Q. What is your present position?
5 A. I am Vice President - Power Supply Administration.
6 Q. What positions have you held with Boston Edison Company?
7 A. I began my employment with Edison in 1953 as an Electrical
8 Engineer. In 1957, I was assigned to the President's staff
9 and, in 1969, I was promoted to the position of Assistant
10 to the President. In April 1973, I was appointed Vice
11 President - Power Supply Administration.
12 Q. Please describe the responsibilities and duties of these
13 positions.
14 A. Since joining the President's staff, my duties have included
15 the negotiation and preparation of bulk power purchase and
16 sale agreements, including system and unit sale contracts
17 and joint ownership arrangements covering various types of
18 generation - hydroelectric, fossil and nuclear. I have also
19 negotiated and prepared contracts dealing with transmission
20 rights and charges. Since becoming Vice President, I have
21 also assumed general responsibility for all of Edison's
22 bulk power supply purchases and sales and rates for
23 wholesale and resale sales. Additionally, I am Edison's

1 representative on the New England Power Pool (NEPOOL)
2 Working Committee as well as an Alternate member of the
3 Executive Committee. These positions require me to keep
4 closely informed on the various activities of NEPOOL
5 including the operation of the New England Power Exchange
6 (NEPEX) and the New England Planning Staff (NEPLAN), as
7 well as new generation scheduled by other New England
8 companies and other matters relating to bulk power supply
9 in New England.

10 I am a member of the Company's Rate Committee which examines
11 all proposals relative to rate schedules. The Company's
12 NEPEX Billing Group and its Coordinating and Expediting
13 Division, which has the responsibility for scheduling all
14 the Company's major construction programs, except for
15 nuclear, report to me.

16 Q. Would you briefly describe your educational and professional
17 background?

18 A. I received a Bachelor of Science degree in Electrical
19 Engineering from the University of Massachusetts in 1953.
20 I have completed the Harvard Business School Program for
21 Management Development. I am a Registered Professional
22 Engineer in the Commonwealth of Massachusetts.

23 Q. Mr. Weiner, what is the purpose of your testimony?

- 1 A. My testimony is to demonstrate that bringing Pilgrim 2 on
2 line at its currently scheduled in-service date of 12/85
3 is necessary in order to assure adequate reliability levels
4 in New England. I will also demonstrate that even at
5 lower growth rates than those projected by NEPOOL, there
6 are benefits to installing Pilgrim 2 in 12/85 as scheduled.
7 These benefits include cost savings to New England electricity
8 consumers, reduction in dependency on an expensive and
9 potentially unreliable supply of oil, and the further-
10 ance of national and regional energy policies and goals.
- 11 Q. Mr. Legrow, please state your full name and business
12 address.
- 13 A. My name is Philip A. Legrow of Boston Edison Company, 800
14 Boylston Street, Boston, Massachusetts 02199.
- 15 Q. What is your present position and responsibilities with
16 Boston Edison Company?
- 17 A. I am a Generation Planning Engineer in Boston Edison's
18 Engineering, Planning and Research Department. My res-
19 sponsibilities include the analysis of any of the Company's
20 generation costs, both short and long term, and the
21 conduct of long range generation planning studies.
- 22 Q. Please describe your educational background and experience.

1 A. I received a Bachelor of Science degree in Electrical
2 Engineering from Northeastern University in 1972, where
3 I held memberships in Eta Kappa Nu, Tau Beta Pi, and
4 Phi Kappa Phi, scholastic honor societies. I received
5 a Master of Science degree in Electrical Engineering from
6 Northeastern University in 1973. I have been employed in
7 Boston Edison's Generation Expansion Group since completion
8 of my studies in 1973.

9 Q. Mr. Legrow, what is the purpose of your testimony?

10 A. I performed the production costing and economic analyses
11 underlying Mr. Weiner's testimony regarding the life-of-
12 unit oil and dollar savings associated with a 12/85 Pilgrim
13 2 in-service date as compared with a 12/88 in-service date.

14 Q. Mr. Bourcier, please state your full name and business
15 address.

16 A. Donald V. Bourcier, New England Power Planning (NEPLAN),
17 West Springfield, Massachusetts.

18 Q. What position do you hold at NEPLAN?

19 A. I am Chief of Load Forecasting, responsible for forecasting
20 long-range electric energy and peak demands for the six
21 state New England region; I also participate in the develop-
22 ment of the annual New England Load and Capacity Report.

23 Q. Would you describe briefly your educational and professional
24 background?

1 A. From 1960 to 1962, I attended the American International
2 College in Springfield, Massachusetts, and I graduated
3 in 1964 from the University of Connecticut in Storrs,
4 Connecticut, with a Bachelor of Science degree in
5 Economics. From 1964 to 1966, I studied at the University
6 of New Hampshire in Durham, New Hampshire, and received
7 a Master of Science degree in Resource Economics. I then
8 worked for the United Illuminating Company in New Haven,
9 Connecticut, as a statistical economist with responsibility
10 for developing the long-range forecast of electric energy
11 sales and revenue. From 1970 to 1972, I worked for the
12 Remington Electric Shaver Division of Sperry-Rand Corporation
13 in Bridgeport, Connecticut, as a Senior Marketing Research
14 Analyst. At Remington, I developed sales forecasting models
15 and conducted consumer market research studies. Since
16 October 1972, I have worked for New England Power Planning
17 developing and applying methodology for forecasting New
18 England's electric energy and peak demands. I am a past
19 member of the American Marketing Association and the
20 American Statistical Association. I am the current chairman
21 of the Load Forecasting Task Force of the NEPOOL Planning
22 Committee.

23 Q. Have you written any articles or books in the field of
24 economic analysis?

1 A. I am co-author of a United States Department of Interior
2 Publication entitled "An Economic Analysis of Public Water
3 Supply."

4 Q. Have you previously testified in this proceeding?
5 Yes. In Applicants Direct Testimony on Need for Power
6 following Transcript page 2647.

7 Q. Mr. Bourcier, what is the purpose of your testimony?

8 A. The purpose of my testimony is to identify and present
9 the current NEPOOL load forecast. The forecast is
10 presented and explained in three documents:

- 11 1) NEPOOL Forecast for New England, 1979-1989,
12 NEPLAN, March 1, 1979.
- 13 2) Report of the NEPOOL Load Forecasting Task Force
14 on the NEPOOL Model-Based Forecast of New England
15 Electric Energy and Peak Load, 1979-1989, NEPLAN,
16 March 1, 1979.
- 17 3) New England Load and Capacity Report, 1978-1989,
18 NEPLAN, April 1, 1979.

19 Q. Mr. Barstow, please state your name and business address.

20 A. Arthur W. Barstow, New England Power Planning (NEPLAN),
21 174 Brush Hill Avenue, West Springfield, Massachusetts.

22 Q. What position do you hold there?

23 A. I am Manager of Generation Planning.

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1 Q. What is your educational background?

2 A. I received a Bachelor of Science degree in Electrical
3 Engineering from the University of Massachusetts in 1951
4 and a Masters degree in Business Administration from
5 American International College in 1964. I have also taken
6 several courses including Power System Engineering from
7 the General Electric Company while an employee there. I
8 am a Registered Professional Engineer in the State of New
9 York and a member of the Power System Engineering Committee,
10 System Planning Subcommittee and several working groups and
11 task forces of the Power Engineering Society of the Institute
12 of Electrical and Electronic Engineers.

13 Q. Would you please describe your work experience?

14 A. In 1951, I went to work as an electrical engineer in the
15 electric design department of the Kellex Corporation in
16 New York City. From 1953 until 1958, I worked for the
17 General Electric Company as a test engineer in various
18 utility related equipment departments for two years, then
19 as a design engineer in the Large Motor and Generator
20 Department in Schenectady, New York for two years and then
21 as a Utility Application Engineer for a year in Schenectady.
22 In 1958, I went to work in the electrical planning department
23 of Western Massachusetts Electric Company in Springfield,
24 Massachusetts. I worked in distribution and transmission

1 planning until 1960. In 1960, the Connecticut utilities
2 and Western Mass. Electric Company (the same companies
3 now served by the CONVEX Satellite of NEPOOL) started
4 generation planning as a group using Westinghouse Electric
5 Company's computer programs entitled Power-Casting. I
6 was appointed to be the Western Mass. Electric Company
7 (WMECO) representative in that endeavor. In 1961, while
8 serving in that capacity, I was transferred to the
9 Connecticut Valley Power Exchange (the dispatch center
10 for Western Mass. Electric Company and the Hartford Electric
11 Light Company) in North Bloomfield, Connecticut and became
12 Systems Operations Engineer. In 1963, while still serving
13 in the generation planning effort for WMECO with Westinghouse,
14 I was transferred back to Western Mass. Electric Company
15 and became Electrical Planning Engineer. In 1964, New
16 England wide generation planning was initiated and I was
17 asked to head it up as Chairman of the Generation Task
18 Force. At the same time, I was made Interconnection
19 Planning Engineer for Western Mass. Electric Company.
20 In 1968, when NEPLAN was formed, I was one of the three
21 engineers assigned to its startup and to be responsible
22 for generation planning. I am currently Chairman of the
23 Generation Task Force. In addition, I have assisted in
24 the initiation of the load forecasting effort at Pool

1 level. I have co-authored IEEE papers and a number of
2 New England Generation planning reports on the subject of
3 generation planning and related subjects.

4 Q. Mr. Barstow, what is the purpose of your testimony?

5 A. The purpose of my testimony is to present (a) the capacity
6 aspects of the most recent NEPOOL Load and Capacity Report,
7 (b) NEPOOL's generation reliability criterion as it is
8 reflected in the determination of NEPOOL's required reserves,
9 and (c) NEPOOL's studies relating to cost vs. reliability,
10 and planning for load growth uncertainty.

11 Q. Mr. Weiner, would you describe the current New England load
12 and capacity projections?

13 A. The results of the most recent NEPOOL load forecast
14 are presented in Exhibit NP-33. The NEPOOL forecast
15 projects a 3.8% compound annual growth rate in peak load
16 from 1979/80-1989/90. Exhibit NP-34 presents the April 1979
17 schedule for major generating capacity additions planned
18 for the next decade. Exhibit NP-35 presents the total
19 capability, peak load, and reserve percentages, assuming
20 all of the in-service dates in Exhibit NP-34 are realized
21 (with Pilgrim 2 in 12/85) and alternately, with the assump-
22 tion that Pilgrim 2 is delayed until 12/88. With Pilgrim
23 2 in-service in 12/85, NP-35 shows that by 1984/85 the New
24 England reserve margin will be at or below the minimum
25 desired level. If Pilgrim 2 is delayed to 12/88, reserve

1 margins will be inadequate and reliability impaired through 1987.
2 Exhibit NP-36 graphically illustrates the loads and capacities
3 planned for the next decade. If these planned units in
4 New England are delayed, New England will not have sufficient
5 generating capacity to maintain system reliability. The
6 Sears Island unit has encountered opposition, particularly
7 from the Maine Public Utilities Commission Staff, on the
8 basis of economics and environmental considerations. The
9 NEPCO units have been postponed and will not be built on
10 the schedule indicated in Exhibits NP-33 - 36. Signifi-
11 cant delays in each of these units must be considered a
12 distinct possibility. With such potential delays it would
13 not be prudent to delay Pilgrim 2 beyond 12/85.

14 Q. Mr. Barstow, please explain how NEPOOL determines how much
15 reserve capacity is required.

16 A. The NEPOOL Management Committee establishes a generation
17 reliability criterion. Given this criterion, as well as
18 a knowledge of the pool's operating procedures, the
19 characteristics of the units in the existing system, and a
20 knowledge of the plans for expanding the system, it is
21 possible, using reliability computer programs, to determine
22 the total generating capacity reserves required.

23 Q. What is the NEPOOL generation reliability criterion?

1 A. NEPOOL has adopted a criterion which calls for the
2 installation or purchase of sufficient capacity to assure
3 that it will be unnecessary to physically disconnect
4 customers (i.e., disconnect supply feeders) more frequently
5 than once in ten years.

6 Q. On what basis did NEPOOL select the one day in ten years
7 disconnecting customers' criterion?

8 A. In a study completed in 1974, we were able to develop risk
9 profiles for different reliability levels by relating
10 various criteria to the way the system is actually operated.
11 These profiles were checked against operating experience.
12 Specifically, in the period from January 1971 through
13 October, 1973 there were 19 voltage reduction incidents
14 in the pool created by insufficient available capacity
15 whereas the reliability program estimated 13.48 to 21.84
16 incidents. Similarly, there were four radio and TV appeal
17 incidents compared to a projected 1.99 to 3.19 incidents.
18 And there were zero disconnection incidents whereas the
19 program estimated 0.32 to 0.58 or in the zero to one
20 incident range. Had the actual, valid pool experience been
21 longer, there would undoubtedly have been actual disconnec-
22 tion incidents. The sample was terminated with October, 1973
23 because of the subsequent excess reserve situation brought
24 about by the oil embargo.

1 With the criterion selected, the following frequency of
2 occurrence is expected:

3	Voltage Reductions	- 7-8/yr.
4	Radio-TV appeals	- Approx. 1/yr.
5	Disconnect Customers	- 0.1/yr. (or 1 every 10 years)

6 Lower reliability levels resulted in a greater number of
7 expected occurrences in each category with only limited
8 savings in cost of electricity to the customer. (Costs of
9 outages to the customer were not considered). Accordingly,
10 the one day in ten years customer disconnection was con-
11 sidered to be a reasonable pool generation planning criterion
12 which effectively balance system cost in the form of reserve
13 requirements with reliability expressed in terms of the
14 expected need for voltage reductions, radio and TV appeals
15 and actual customer disconnection by rotation of feeders.
16 Thus, the NEPOOL Executive Committee decided that this was
17 the reliability criterion to which the system should be
18 designed.

19 Q. Having established the reliability criterion, would you
20 please describe the procedure used to determine the NEPOOL
21 capacity requirements?

22 A. Required reserve margins are based on calculations of the
23 probability of occurrence of insufficient generating

1 capacity to meet the anticipated loads. These calculations
2 are performed by NEPLAN for the pool. Once the reliability
3 calculations have been completed and the results reviewed
4 by the NEPOOL Planning and Executive Committees, the
5 NEPOOL Objective Capability is established. The Objective
6 Capability is the amount of capacity (load plus required
7 reserves) deemed necessary by the Executive Committee to
8 meet the Pool's reliability criterion.

9 Q. Has the Executive Committee established the NEPOOL Objective
10 Capabilities for the power years 85/86, 86/87, 87/88, 88/89
11 and beyond?

12 A. No, but this is expected to occur this year. However,
13 reasonable preliminary estimates are available for the
14 reserve level required to meet the pool reliability criterion
15 in that period.

16 Q. What is your estimate of the reserve level required to meet
17 the reliability criterion in the period 85/86 to 88/89
18 and beyond?

19 A. On the basis of expanding under the Pool's generation mix
20 guidelines, recent reliability studies indicate, at this point
21 in time, that required reserves in the order of 23% to 28%
22 of peak load will be recommended to the Planning and
23 Management Committees. These reserves vary from

1 year to year depending on unit commitment and their
2 maturity trends.

3 Q. Mr. Barstow, what are the economic implications of
4 installation of nuclear capacity before it is required
5 to meet the NEPOOL reliability criterion?

6 A. The NEPOOL Generation Task Force and the NEPLAN Staff
7 report "Cost Versus Reliability Study For The Years
8 1983/84-2000/01," November, 1978, (an update of the 1974
9 reliability study) concludes that when the system is far
10 from its economic generation mix, such as is the present
11 case for New England, capacity installed to improve the
12 mix which results in more than the minimum required to
13 meet the reliability criterion can be economically justified.
14 The higher the reliability level, the lower the overall
15 costs due to the early installation of nuclear capacity.
16 Considerable amounts of oil are saved in the higher
17 reliability cases as nuclear units are installed earlier
18 than in the other cases. For example, a 10 years/day LOLP
19 reliability level saves 207 million barrels of oil compared
20 to 1.0 year/day LOLP level (which approximates the present
21 NEPOOL criterion) resulting in a reduction of 13.5% of the
22 oil used in the 1.0 year/day LOLP case.

23 In addition, the February 1978 NEPOOL Generation Task Force
24 and the NEPLAN Staff report "Planning for Load Growth

1 Uncertainty (Recognizing Unit Lead Times)" demonstrated
2 that there is a considerable economic penalty associated
3 with planning to a particular load growth rate and having
4 to install short lead-time capacity if the system experiences
5 a higher load growth rate than that on which the expansion
6 was based. In addition, there is an economic benefit
7 associated with planning to a high load growth rate and
8 actually experiencing a lower growth rate. Those savings
9 are attributable to the early installation of nuclear
10 capacity which enables the substitution of nuclear supplied
11 energy for the more costly fossil supplied energy. The
12 early installation of these nuclear units also results in
13 considerable oil savings when compared to the generation
14 expansion pattern designed just to meet the actual load
15 growth rate.

16 Q. Mr. Weiner, what are the economics of delaying Pilgrim 2's
17 in-service date?

18 A. The present worth of the cost differences due to delay in
19 the in-service date for Pilgrim 2 favor installation at the
20 earliest possible time independent of reliability require-
21 ments. For example, for a 3 year delay, assuming that all
22 other planned units are brought in on schedule, 12/85
23 installation results in net present worth savings of
24 \$1387 million (in 1986 dollars) to New England consumers
25 over the life of the project. In spite of higher costs

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1 in the first several years, the oil dollars saved
2 rapidly turn the deficiency into a savings. The break-
3 even year for net present worth savings is 1987, only
4 one year after installation.

5 In addition to the loss of savings, the delay of Pilgrim
6 2 will increase our dependence on oil as a source of
7 electricity. New England will burn an additional 12
8 million barrels of oil for each year of delay. The outlook
9 for future oil supply is not encouraging, and such increased
10 oil consumption clearly contradicts national energy policy
11 and the regional interest.

12 Q. Have you evaluated the sensitivity of this economic analysis
13 to different peak-load growth rates?

14 A. At the request of the NRC Staff we analyzed the impact of
15 a 12/85 installation date versus 12/88 assuming a 3.4%
16 peak load growth. The 3.4% growth case yielded present
17 worth savings of \$1087 million (in 1986 dollars) over the life
18 of the project. The breakeven year was 1989. We have also
19 analyzed a 3.0% growth rate for New England, comparing
20 a 12/85 and 12/88 in-service date. The 3.0% growth case
21 yielded present worth savings of \$1051 million (in 1986
22 dollars) over the life of the project. The breakeven year
23 was also 1989. We have not explicitly analyzed the impact
24 of a 12/85 installation date versus a 12/88 installation
25 date assuming a peak load growth rate higher than 3.8%.

1 It is not unreasonable to expect that a strong economic
2 recovery in New England might lead to load growth that
3 would exceed our current projections. At a higher load
4 growth rate the present worth savings accruing to the
5 earlier in-service date would be even greater due to the
6 increased necessity of relying on increasingly expensive
7 oil-fired generation.

8 Q. Mr. Legrow, would you please describe the analyses that
9 resulted in the savings presented by Mr. Weiner?

10 A. The results presented by Mr. Weiner flow from year by
11 year comparisons of the capital costs of Pilgrim 2 and
12 New England-wide fuel costs for Pilgrim 2 in-service dates
13 of 12/31/85 and 12/31/88, and for New England forecasted
14 load growth rates of 3.8% (the current NEPOOL forecast),
15 3.4% and 3.0%. These annual differences in capital charges
16 and fuel costs were summed, and the accumulative present
17 worth at Boston Edison's projected marginal cost of
18 money was taken to yield the life-of-unit savings
19 associated with the 1985 in-service date. These annual
20 differences, totals, and accumulative present worths are
21 set out in Exhibits NP-37, NP-39, and NP-41 for the 3.8%,
22 3.4% and 3.0% growth rates, respectively. Also estimated
23 were the barrels of fuel oil displaced due to 1985 as

1 opposed to 1988 installation of Pilgrim 2; these
2 estimates are shown as Exhibits NP-38, NP-40 and
3 NP-42 for the 3.8%, 3.4% and 3.0% growth rates,
4 respectively. The major assumptions inherent in
5 the development of Exhibits NP-37 through NP-42 are
6 listed in Exhibit NP-43.

7 Q. Would you describe in more detail the derivation of
8 your "Capital" and "Fuel" cost columns of Exhibits
9 NP-37, NP-39 and NP-41?

10 A. To generate the "Capital" column, which is common to
11 all three exhibits, annual capital recovery, income tax,
12 and investment tax credit charges were added to annual
13 projections of property taxes and nuclear fuel carrying
14 charges for the 28-year book life of the unit for each
15 in-service date, and the differences taken. The
16 negative entries for years 1986-1988 reflect the
17 absence of capital charges for the 1988 in-service case,
18 while the 1989-2013 entries reflect the higher capital
19 costs of the delayed (1988) unit. It is assumed that,
20 under current Massachusetts law, property taxes end with
21 the end of book life (2013 and 2016 for the respective
22 in-service dates).

23 The "Fuel" savings for the various load growths were
24 calculated by modeling the NEPEX system on the Company's
25 production costing program over the years 1986-1993.

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1 The program was run twice for each load growth - once
2 with a 1/1/86 Pilgrim 2 in-service date, and once with a
3 1/1/89 in-service date. The in-service dates of all
4 other NEPOOL units were fixed at those published in the
5 New England Load and Capacity Report of April 1, 1979.

6 The entries in the "Fuel" column are the annual differences
7 in the fuel costs of the entire New England system: for
8 1986 through 1988, with and without Pilgrim 2; from 1989
9 to 1993 reflecting the differential in maturity of Pilgrim
10 2. The absence of entries after 1993 reflects the fact that,
11 given either in-service date, Pilgrim 2 will have reached
12 a mature capacity factor by 1994, and no basis exists for
13 the projection of production cost differences from that
14 point on.

15 Q. Mr. Weiner, you made earlier reference to the outlook for
16 future oil supply. Could you elaborate further on this
17 point?

18 A. Recent international events have had dramatic repercussions
19 on the world oil markets. Consequently supplies of imported
20 oil, upon which New England must depend, cannot be
21 regarded as secure. The lesson of the 1973-74 Arab oil
22 embargo was reinforced dramatically this winter by the

1 total cutoff of Iranian oil from the world market for
2 several months. The degree of overall U.S. dependence
3 on petroleum imports has increased to over 40%, and
4 the source of most of these imports has shifted geo-
5 graphically, from the Western Hemisphere to the Arab
6 Middle East and Africa, so that the security of oil
7 supplies is considerably lower than it was 5 years ago.
8 Since 1970, the world price of crude oil has risen from
9 approximately \$1 per barrel to about \$15 currently,
10 and the continuing ability of OPEC to impose its will
11 on the market has produced an increase of approximately
12 25% in the past few months alone. As a consequence of
13 the tightness of the market brought about by the
14 temporary Iranian cutoff, the March 1979 New York
15 Harbor contract price for residual fuel oil was about
16 45% higher than the March 1978 price. While such
17 variations in spot prices may magnify the effect of
18 temporary shortages, the actual OPEC floor price for
19 Saudi Arabian marker crude now stands at \$14.55, while
20 other OPEC nations have generally set their prices
21 significantly higher. Oil burned in May by Boston Edison
22 had an average price of \$17.56/barrel, \$5/barrel or 40%
23 higher than the 1978 average cost of \$12.60/barrel. In

1 addition, our principal suppliers, Asiatic Petroleum Company
2 and Texaco have formally put us on notice that fuel
3 shortages are possible in the future. While we
4 have not as yet been denied delivery, we are on notice
5 that supply problems exist. Uncertainty over the longer
6 term is compounded, both as to price and assurance of
7 supply. While it is impossible for an electric utility
8 to significantly displace its reliance on oil in the
9 near term, we believe that the public interest demands that
10 we take all steps possible to reduce our oil dependency
11 over the longer term. Bringing Pilgrim 2 in service on
12 the earliest possible schedule will make a significant
13 contribution to that goal.

14 Q. You also mentioned consistency with National energy policy.
15 What specific policies were you referring to?

16 A. When President Carter announced the first comprehensive
17 National Energy Plan in 1977, he articulated Administration
18 policy that dependence on fossil fuel imports be reduced
19 through a large-scale conservation effort that would check
20 the trend of increasing reliance on petroleum and natural
21 gas while providing time for the nation to develop alternative
22 energy supplies.

1 In response, Congress passed a series of Acts [referred
2 to as the National Energy Act (NEA)] aimed at addressing
3 our nation's energy problems. One of these was the
4 Powerplant and Industrial Fuel Use Act of 1978 (FUA).

5 In passing the FUA, the Congress made the following Findings:

6 (1) the protection of public health and welfare,
7 the preservation of national security, and the
8 regulation of interstate commerce require the
9 establishment of a program for the expanded use,
consistent with applicable environmental require-
ments, of coal and other alternate fuels as primary
energy sources for existing and new electric power-
plants and major fuel-burning installations; and

10 (2) the purposes of this Act are furthered in cases in
11 which coal or other alternate fuels are used by
12 electric powerplants and major fuel-burning installa-
tions, consistent with applicable environmental require-
ments, as primary energy sources in lieu of natural
gas or petroleum.

13 In the definitions, Congress included uranium as an alter-
14 nate fuel. Congress included in the Statement of Purposes
15 of the Act:

16 (1) to reduce the importation of petroleum and increase
17 the Nation's capability to use indigenous energy
18 resources of the United States to the extent such reduction
and use further the goal of national energy self-
sufficiency and otherwise are in the best interests of
the United States;

19 (2) to conserve natural gas and petroleum for uses,
20 other than electric utility or other industrial or
commercial generation of steam or electricity, for
which there are no feasible alternative fuels or raw
material substitutes;

1 (3) to encourage and foster the greater use of
2 coal and other alternate fuels, in lieu of natural
gas and petroleum, as a primary energy source; ...

3 (6) to prohibit or, as appropriate, minimize the use
4 of natural gas and petroleum as a primary energy
source and to conserve such gas and petroleum for
the benefit of present and future generations;

5 (7) to encourage the modernization or replacement
6 of existing and new electric powerplants and major
fuel-burning installations which utilize natural gas
or petroleum as a primary energy source and which
7 cannot utilize coal or other alternate fuels where to do
so furthers the conservation of natural gas and
petroleum; ...

8 (11) to reduce the vulnerability of the United States
to energy supply interruptions;

9 Bringing Pilgrim 2 on-line at the earliest possible date
10 (i.e., December, 1985) would be consistent with the intent
11 and purposes of FUA, and the National Energy Plan.

12 The early installation of Pilgrim 2 is also most important
13 from the standpoint of reducing our regional dependence on
14 imported residual fuel oil. Of the five contiguous DOE
15 Petroleum Administration for Defense (PAD) districts, the
16 most vulnerable to interruption of imported oil supply is
17 District I, which is comprised of all of New England, New
18 York, Pennsylvania, New Jersey, Maryland, Delaware, West
19 Virginia, Virginia, North and South Carolina, Georgia and
20 Florida. In 1977, the total imports of all petroleum
21 products to this East Coast region was equal to more than

1 15 times the total amount of imported petroleum products
2 of the next largest importing PAD district. When
3 considering only residual oil, PAD District I imports
4 were almost thirty times the amount imported by the next
5 highest district.⁽¹⁾ Because District I receives over
6 79% of its residual oil from foreign sources, it is
7 critical that this region's dependency on residual fuel
8 imports be reduced, if the goals of FUA/NEA are to be
9 met.

10 As discussed, these goals are to reduce our nation's
11 dependency on foreign petroleum imports for non-essential
12 uses, while continuing to ensure an adequate reliability
13 of service for electric generation. If Pilgrim 2 is
14 delayed, not only are we needlessly consuming millions
15 of additional barrels of oil, at higher and higher prices,
16 but we are also exposing ourselves to extreme political
17 economic and social risks. Bringing Pilgrim 2 on-line
18 as scheduled in 1985 will contribute to the resolution
19 of problems associated with our regional vulnerability,
20 and ensure reliability of service to the consumer while
21 contributing to our national goal of energy independence.

(1) Energy Information Administration, Department of
Energy, Energy Data Reports, Year 1977.

**NEW ENGLAND
FORECAST SUMMARY 1979-1989**

	Actual		Forecast											1979-89 Compound Annual Growth Rate (%)
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	
Coincident Peak Load (MW)														
Recorded . Winter (Dec./Jan.)	14846	15100P												
. Summer	14234	14458												
Weather (a)														
Corrected . Winter (Dec./Jan.)	15363	15500P	16595	17266	18036	18822	19755	20668	21502	22267	22774	23574	24120	3.81
. Summer	13712	14954	15569	16108	16714	17409	18113	18958	19784	20552	21277	21933	22495	3.75
Energy Sales to Ultimate Customers (GWh)														
. Total	72751	n/a	84276	87590	91249	95241	99318	104148	108843	113217	117285	120980	124144	3.95
. Residential	28222	n/a	31631	32248	33260	34543	35721	37113	38450	39577	40572	41371	42007	2.88
. Industrial	n/a	n/a	22786	24143	25446	26397	27433	28670	29841	31035	32120	33220	34123	4.12
. Commercial	n/a	n/a	28655	30006	31341	33072	34904	37066	39217	41234	43191	44962	46569	4.98
. Miscellaneous	n/a	n/a	1205	1194	1203	1228	1259	1299	1336	1371	1403	1427	1445	1.84
Net Energy for Load (GWh) (b)	79781	82800P	91861	95473	99462	103812	108256	113521	118639	123407	127840	131868	135317	3.95
Annual Load Factor (%)	61.3	62.6P	63.2	63.1	63.0	63.0	62.6	62.7	63.0	63.3	63.5	63.8	64.0	
Economic/Demographic														
. Population (000's)	12238	12256P	12337	12404	12491	12569	12654	12745	12839	12937	13029	13117	13206	0.68
. Households (000's)	4141	n/a	4301	4379	4467	4552	4637	4723	4810	4892	4972	5050	5129	1.78
. Employment (000's) (c)	5377	n/a	5692	5844	5923	5988	6066	6150	6230	6300	6361	6423	6475	1.30
. Manufacturing (000's)	n/a	n/a	1469	1499	1513	1514	1525	1539	1548	1559	1563	1569	1565	0.64
. Nonmanufacturing (000's)	n/a	n/a	4202	4323	4389	4453	4520	4590	4661	4720	4777	4833	4889	1.53
. Unemployment Rate (%)	7.5	n/a	6.4	5.8	5.9	5.8	5.6	5.4	5.3	5.3	5.4	5.4	5.4	-
. Net Migration (000's)	n/a	n/a	27	41	31	35	38	37	38	32	29	30	30	-
. Personal Income (mil\$69)	53195	n/a	56514	58947	61058	63010	65109	67299	69497	71754	73961	76196	78364	3.32

n/a - not available

P - Preliminary

(a) Correction based on long-term historical peak weather conditions.

(b) Based on energy sales to ultimate customers and nine percent transmission and distribution line losses.

(c) Total employment includes approximately 21 thousand jobs outside New England (i.e., New York and Canada).

MAJOR NEW ENGLAND GENERATING
CAPACITY ADDITIONS
(THROUGH DECEMBER 1989)

<u>COMPANY</u>	<u>STATION</u>	<u>FUEL</u>	<u>CAPACITY MW</u>	<u>SCHEDULED IN-SERVICE AS OF 4/79</u>
MASS. MUNICIPALS	STONY BROOK	OIL	340	NOV 1981
MASS. MUNICIPALS	STONY BROOK	OIL	170	NOV 1982
PUBLIC SERVICE CO. OF N. H.	SEABROOK 1	NUC	1150	APR 1983
PUBLIC SERVICE CO. OF N. H.	SEABROOK 2	NUC	1150	FEB 1985
BOSTON EDISON	PILGRIM 2	NUC	1150	DEC 1985
NORTHEAST UTILITIES	MILLSTONE 3	NUC	1150	MAY 1986
CENTRAL MAINE POWER	SEARS ISLAND	COAL	568	NOV 1987
NEW ENGLAND ELECTRIC SYSTEM	NEPCO 1	NUC	1150	NOV 1987
NEW ENGLAND ELECTRIC SYSTEM	NEPCO 2	NUC	1150	NOV 1989

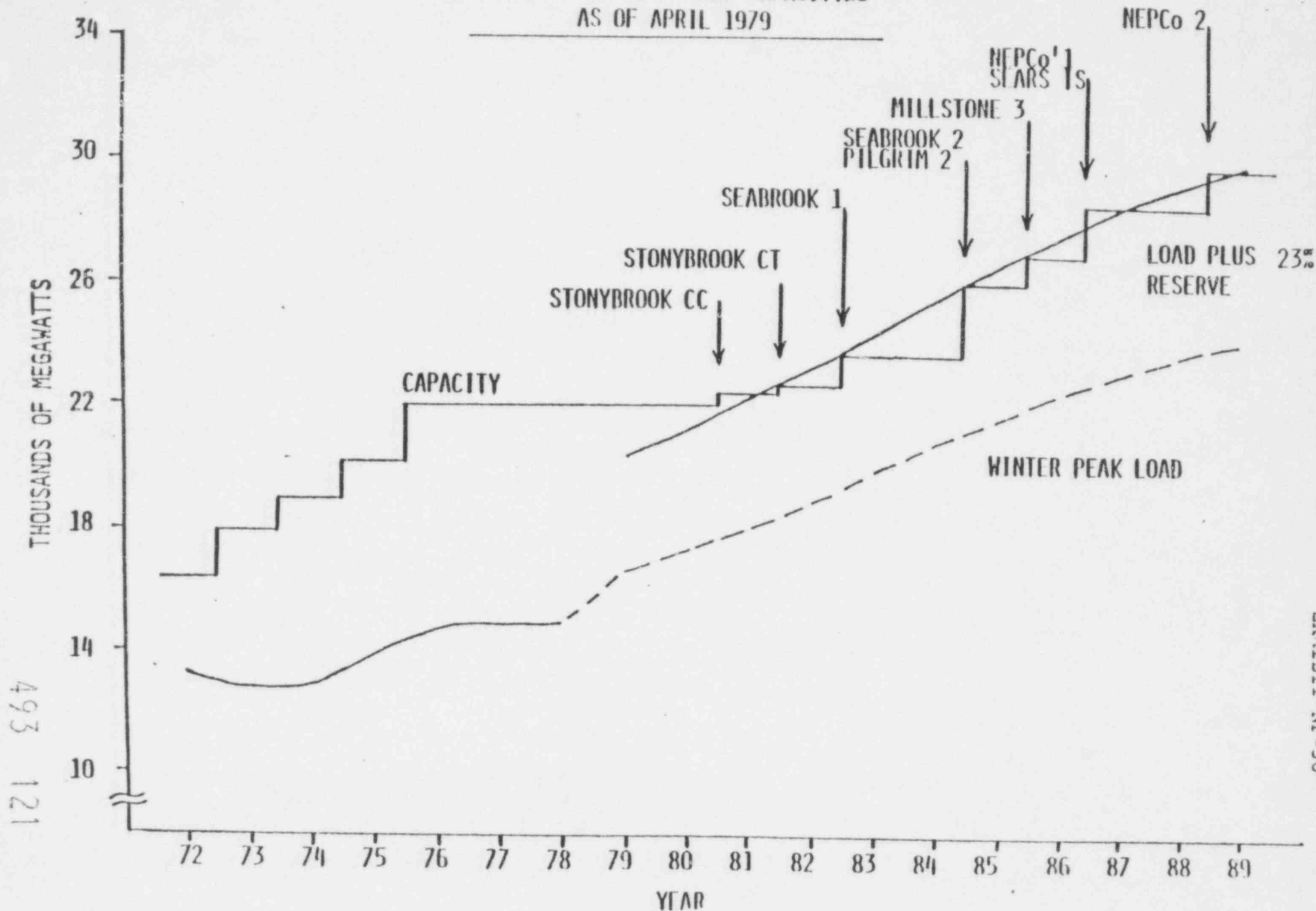
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EXHIBIT NP-34

NEW ENGLAND SYSTEM CAPABILITIES
AND
ESTIMATED PEAK LOADS
1979-1989

<u>POWER YEAR</u>	<u>TOTAL CAPABILITY</u>	<u>PEAK LOAD</u>	<u>% RESERVE AFTER MAINTENANCE</u>	<u>% RESERVE AFTER MAINTENANCE WITH PILGRIM 2 INSTALLED IN 12/88</u>
1979/80	21,980	16,595	30.0	-
1980/81	21,982	17,266	26.8	-
1981/82	22,301	18,036	20.0	-
1982/83	22,626	18,822	19.5	-
1983/84	23,773	19,755	20.3	-
1984/85	23,768	20,668	15.0	-
1985/86	25,869	21,502	20.3	15.0
1986/87	26,804	22,267	20.4	15.2
1987/88	28,421	22,989	23.6	18.6
1988/89	28,422	23,595	20.5	-
1989/90	29,574	24,120	22.6	-

NEW ENGLAND LOADS AND CAPACITIES AS OF APRIL 1979



3.8% GROWTH CASE
SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988
(\$000)

<u>Year</u>	<u>Capital Savings</u>	<u>Fuel Savings</u>	<u>Total Savings</u>	<u>Acc. P.W. Savings At 10.83%</u>
1986	(403,754)	403,363	(5,391)	(5,391)
1987	(397,061)	492,479	95,418	80,703
1988	(381,362)	501,458	120,096	178,474
1989	176,428	81,297	257,725	367,789
1990	179,332	48,342	227,674	518,686
1991	172,870	60,419	233,289	658,198
1992	168,609	11,354	179,963	755,302
1993	161,256	43,742	204,998	855,106
1994	154,631	-	154,631	923,032
1995	149,317	-	149,317	982,214
1996	145,196	-	145,196	1,034,139
1997	143,046	-	143,046	1,080,297
1998	140,720	-	140,720	1,121,267
1999	138,002	-	138,002	1,157,520
2000	135,192	-	135,192	1,189,565
2001	133,399	-	133,399	1,218,095
2002	130,678	-	130,678	1,243,312
2003	123,591	-	123,591	1,264,830
2004	116,972	-	116,972	1,283,207
2005	108,938	-	108,938	1,298,649
2006	107,159	-	107,159	1,312,353
2007	103,829	-	103,829	1,324,335
2008	100,826	-	100,826	1,334,833
2009	97,163	-	97,163	1,343,962
2010	93,733	-	93,733	1,351,907
2011	90,500	-	90,500	1,358,829
2012	86,505	-	86,505	1,364,799
2013	82,638	-	82,638	1,369,944
2014	126,981	-	126,981	1,377,078
2015	109,209	-	109,209	1,382,614
2016	92,377	-	92,377	1,386,839

3.8% GROWTH CASE
FUEL SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988

<u>Year</u>	<u>12/85 Pilg. 2 MWHR</u>	<u>12/88 Pilg. 2 MWHR</u>	<u>MWHR</u>	<u>Bbl. Oil Equiv.*</u>
1986	5,943,521	-	5,943,521	9,905,868
1987	5,940,818	-	5,940,818	9,901,363
1988	6,263,348	-	6,263,348	10,438,913
1989	6,749,019	5,942,067	806,952	1,344,920
1990	6,738,399	5,935,820	802,579	1,337,632
1991	7,047,508	6,240,489	807,019	1,345,032
1992	7,068,628	6,771,058	297,570	495,950
1993	7,047,412	6,748,850	298,562	497,603
Total Oil Savings				<u>35,267,281</u>

*Assumes 10,000 Btu/kWh, 6 MMBtu/bbl.

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3.4% GROWTH CASE
SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988
((\$000))

<u>Year</u>	<u>Capital Savings</u>	<u>Fuel Savings</u>	<u>Total Savings</u>	<u>Acc. P.W. Savings At 10.83%</u>
1986	(408,754)	328,891	(79,863)	(79,863)
1987	(397,061)	363,171	(33,890)	(110,441)
1988	(381,362)	390,758	9,396	(102,792)
1989	176,428	65,029	241,457	74,573
1990	179,332	51,597	230,929	227,628
1991	172,870	55,881	228,751	364,426
1992	168,609	13,755	182,364	462,826
1993	161,256	28,616	189,872	555,265
1994	154,631	-	154,631	623,191
1995	149,317	-	149,317	682,373
1996	145,196	-	145,196	734,298
1997	143,046	-	143,046	780,456
1998	140,720	-	140,720	821,427
1999	138,002	-	138,002	857,680
2000	135,192	-	135,192	889,724
2001	133,399	-	133,399	918,254
2002	130,678	-	130,678	943,471
2003	123,591	-	123,591	964,990
2004	116,972	-	116,972	983,366
2005	108,938	-	108,938	998,808
2006	107,159	-	107,159	1,012,512
2007	103,829	-	103,829	1,024,494
2008	100,826	-	100,826	1,034,992
2009	97,163	-	97,163	1,044,121
2010	93,733	-	93,733	1,052,067
2011	90,500	-	90,500	1,058,988
2012	86,505	-	86,505	1,064,958
2013	82,638	-	82,638	1,070,104
2014	76,981	-	76,981	1,077,237
2015	109,209	-	109,209	1,082,773
2016	92,377	-	92,377	1,086,998

3.4% GROWTH CASE
FUEL SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988

<u>Year</u>	<u>12/85 Pilg. 2 MWHR</u>	<u>12/88 Pilg. 2 MWHR</u>	<u>MWHR</u>	<u>Bbl. Oil Equiv.*</u>
1986	5,941,742	-	5,941,742	9,902,903
1987	5,941,815	-	5,941,815	9,903,025
1988	6,258,429	-	6,258,429	10,430,715
1989	8,747,160	5,941,510	805,650	1,342,750
1990	6,743,522	5,935,851	807,671	1,346,118
1991	7,043,027	6,236,696	806,331	1,343,885
1992	7,067,911	6,768,166	299,745	499,575
1993	7,047,027	6,746,673	300,354	500,590
Total Oil Savings				<u>35,269,561</u>

*Assumes 10,000 Btu/kWh, 6 MMBtu/bbl.

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3.0% GROWTH CASE
SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988
((\$000))

<u>Year</u>	<u>Capital Savings</u>	<u>Fuel Savings</u>	<u>Total Savings</u>	<u>Acc. I.W. Savings At 10.83%</u>
1986	(408,754)	317,323	(91,431)	(91,431)
1987	(397,061)	345,210	(51,851)	(138,215)
1988	(381,362)	380,114	(1,248)	(139,231)
1989	176,428	59,224	235,652	33,869
1990	179,332	58,974	238,306	191,814
1991	172,870	47,749	220,619	323,748
1992	168,609	21,494	190,103	426,324
1993	161,256	30,116	191,372	519,494
1994	154,631	-	154,631	587,420
1995	149,317	-	149,317	646,602
1996	145,196	-	145,196	698,527
1997	143,046	-	143,046	744,635
1998	140,720	-	140,720	785,635
1999	138,002	-	138,002	821,909
2000	135,192	-	135,192	853,953
2001	133,399	-	133,399	882,483
2002	130,678	-	130,678	907,700
2003	123,591	-	123,591	929,219
2004	116,972	-	116,972	947,595
2005	108,938	-	108,938	963,037
2006	107,159	-	107,159	976,741
2007	103,829	-	103,829	988,723
2008	100,826	-	100,826	999,221
2009	97,163	-	97,163	1,008,350
2010	93,733	-	93,733	1,016,295
2011	90,500	-	90,500	1,023,217
2012	86,505	-	86,505	1,029,187
2013	82,638	-	82,638	1,034,332
2014	126,981	-	126,981	1,041,466
2015	109,209	-	109,209	1,047,002
2016	92,377	-	92,377	1,051,227

3.0% GROWTH CASE
FUEL SAVINGS ASSOCIATED WITH INSTALLING PILGRIM 2 IN 1985 VS. 1988

<u>Year</u>	<u>12/85 Pilg. 2 MWHR</u>	<u>12/88 Pilg. 2 MWHR</u>	<u>MWHR</u>	<u>Bbl. Oil Equiv.*</u>
1986	5,941,743	-	5,941,743	9,902,905
1987	5,939,321	-	5,939,321	9,898,868
1988	6,257,807	-	6,257,807	10,429,678
1989	6,745,243	5,938,763	806,480	1,344,133
1990	6,743,888	5,935,851	808,037	1,346,728
1991	7,041,351	6,235,473	805,878	1,343,130
1992	7,065,725	6,765,560	300,165	500,275
1993	7,042,522	6,743,376	299,146	498,577
Total Oil Savings				35,264,294

*Assumes 10,000 Btu/kWh, 6 MMBtu/bbl.

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MAJOR ASSUMPTIONS EMPLOYED IN ECONOMIC
ANALYSIS OF DELAYED INSTALLATION

General rate of inflation: 6%/year

Boston Edison cost of money: 10.83%

Fossil Fuel price forecast: July 1978 A.D. Little report, except inflation assumed to remain constant at 6% rather than dipping to 4% after 1989.

Nuclear fuel price forecast: Internal Boston Edison forecast, consistent as to input assumptions with the July 1978 A.D. Little report.

Sample current dollar fuel prices: (\$/MMBtu)

	<u>1986</u>	<u>1988</u>	<u>1990</u>	<u>1992</u>	<u>1994</u>
No. 6 oil, 1% S	6.659	7.974	9.548	11.169	13.064
No. 6 oil, 2.2%	6.126	7.322	8.751	10.234	11.968
No. 2 oil	7.597	9.074	10.839	12.649	14.761
Coal	-	-	-	-	-
Pilgrim 2, 12/85 C.O.	.779	.862	1.152	1.374	1.615
Pilgrim 2, 12/88 C.O.	-	-	1.057	1.291	1.606

Load Model: 59% load factor all cases; peak loads:

1. as published in the April 1, 1979 New England Load and Capacity Report and other NEPOOL documents;
2. 1985/86 winter peak of 19,510 extrapolated at 3.4%/year as specified by the NRC's Oak Ridge Model;
3. 1978/79 weather-adjusted winter peak, extrapolated at 3.0%/year.

Pilgrim 2 capital costs: \$1,895 million in 1985, \$2.550 billion in 1988

Pilgrim 2 book life: 28 years

Pilgrim 2 tax life: 16 years

Pilgrim 2 depreciation method: double declining balance, switching to straight line

Effective income tax rate: 49.51%

Pilgrim 2 property tax assumptions: Plymouth annual budget growth: 10%

Income tax credit: 10% for all years

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Plymouth valuation growth: 10%/year

Classification implemented in FY 1980

Nuclear capacity factor maturation:

1st year capacity factor:	59%
2nd year:	59%
3rd year:	62%
4th year:	67%
5th year:	67%
6th and following years:	70%

Future capacity additions to meet load plus 23% required reserves through 1993: nuclear, similar to Pilgrim 2. All planned units listed in the April 1, 1979 New England Load and Capacity Report installed on the schedules indicated therein.

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P A N E L 2

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1 Q. Mr. Turner, will you please state your name and place of residence?
2 A. My name is F. Cort Turner and I reside in Cambridge, Massachusetts.
3 Q. By whom are you employed?
4 A. I am employed by Arthur D. Little, Inc., Cambridge, Massachusetts.
5 Q. What is your educational background?
6 A. I received undergraduate and graduate degrees in chemical engineering
7 and in management from the Massachusetts Institute of Technology.
8 Q. Please describe your experience with Arthur D. Little, Inc.
9 A. I have been employed by Arthur D. Little, Inc. since 1952. My current
10 position is Vice President responsible for the overall coordination
11 of the company's international energy consulting work. Prior to this,
12 I was manager of Arthur D. Little's Energy Economics Section in
13 Cambridge. Throughout my career at Arthur D. Little I have specialized
14 in oil and gas consulting on behalf of such diverse clients as large
15 energy users (utilities and chemical companies), oil companies (major
16 and independent), governments of producing and consuming countries,
17 the U.S. Environmental Protection Agency, etc. This work has included
18 strategic planning, crude oil and product marketing, refinery feasibility
19 studies, energy forecasting, design of taxation terms for oil and gas
20 exploration, and the development of a linear programming refinery
21 model to test the impact of change on the cost of producing individual
22 crudes.
23 Q. Mr. Godley, will you please state your name and place of residence?
24 A. My name is Nigel Godley and I reside in Acton, Massachusetts.
25 Q. By whom are you employed?
26 A. I am employed by Arthur D. Little, Inc., Cambridge, Massachusetts.
27 Q. What is your educational background?

1 A. I hold a diploma in Business Administration from the Portsmouth
2 College of Technology and I attended a special course dealing with
3 decision-making in the marine industries at the Massachusetts
4 Institute of Technology.

5 Q. Please describe your experience with Arthur D. Little, Inc.

6 A. I have been employed by Arthur D. Little, Inc. since 1969. I
7 am currently manager of the Company's Energy Economics Section.
8 My areas of specialization include crude oil and petroleum product
9 pricing, oil taxation, concession analysis, petroleum transportation,
10 energy forecasting and the financial analysis of the hydrocarbon
11 industry including exploration production, refining, and marketing
12 activities.

13 Q. Mr. Hanna, will you please state your name and place of residence?

14 A. My name is David Hanna, and I reside in Arlington, Massachusetts.

15 Q. By whom are you employed?

16 A. I am employed by Arthur D. Little, Inc., Cambridge, Massachusetts.

17 Q. What is your educational background?

18 A. I received an undergraduate degree in physical sciences from
19 Oxford University and a graduate degree in business management from
20 the London Business School.

21 Q. Please describe your experience with Arthur D. Little, Inc.

22 A. I have been employed by Arthur D. Little, Inc., since 1972. I
23 am a member of the Energy Economics Section in Cambridge and specialize
24 in oil and gas consulting for U.S. and international clients. My
25 work has included strategic planning, oil supply/demand forecasting
26 and crude oil and petroleum products pricing.

27 Q. What work has Arthur D. Little, Inc., recently performed for
28 Boston Edison related to fuel oil price forecasts?

1 Q. What work has Arthur D. Little, Inc. recently performed for Boston
2 Edison related to fuel oil price forecasts?

3 A. Arthur D. Little, Inc. (ADL) was commissioned by Boston Edison in July,
4 1977 to prepare a report on the outlook for coal and residual fuel
5 oil prices for Boston Edison. Our final report on this assignment
6 was submitted in July, 1978. In August, 1978 we prepared written
7 testimony for the hearings in Massachusetts DPU 19494 which was pre-
8 sented by us in April, 1979. In May, 1979 Boston Edison commissioned
9 Arthur D. Little, Inc., to update our oil price forecasts, the results of which
10 are incorporated in this testimony.

11 Q. What cost elements enter into the price of petroleum products?

12 A. The chain of costs starts with the acquisition of crude oil and includes
13 the transportation of crude oil to refineries by pipelines and tankers,
14 the refining of crude oil into the different petroleum products, and
15 the delivery and distribution of these products to the ultimate consumer.
16 In addition, governments (including state and local) may impose taxes
17 and/or fees/duties on individual products. The weighting of these
18 different elements (crude oil, transportation, refining) varies with the
19 source and type of crude processed, the complexity of refining operations,
20 and the refinery location. Very approximately, when processing a
21 Middle East crude oil, the crude oil itself now accounts for about 85%, ocean
22 transportation for 5%, and refining for 10% of the cost of all the products at
23 the wholesale level (before distribution costs, taxes, or entitlements
24 benefits).

25 Internationally, crude oil prices are set by the principal producers
26 belonging to the Organization of Petroleum Exporting Countries (OPEC).
27 Generally, in the past, these producers set the price of the Arabian
28 Light "marker crude oil" with all other crudes being related to the
29 marker crude oil through differentials reflecting quality (sulfur content,

1 specific gravity, etc.) and location (distance from markets). More
2 recently, since the Iranian crisis, many producers have added surcharges
3 related to market conditions, over and above their parity price with
4 Arabian Light. The actual production cost of the marker crude is a
5 small fraction (less than 5%) of the selling price and the same is true
6 of most other OPEC crudes as well. Historic production costs are thus
7 irrelevant as a factor in determining international crude oil prices.

8 U.S. crude oil prices are fixed by the U.S. Government under a complex
9 set of regulations designed to stimulate the search for oil by allowing
10 a higher price for "new oil" while preventing excess profits by holding
11 down the price of "old oil". The average refiner acquisition cost of
12 domestic crude oil was \$12.06 per barrel in March, 1979 or about
13 \$5.50 per barrel less than the average acquisition cost of foreign
14 crude oil. The composite refiner acquisition cost of all crude oil
15 (domestic and foreign) was \$14.52 per barrel or about \$3.00 less than
16 foreign oil. The Carter Administration has now implemented a phased
17 program of crude oil price deregulation and has proposed a windfall profits
18 tax which has yet to be approved by Congress. Under the Carter program
19 U.S. domestic crude oil prices will reach international parity levels
20 in fall 1981.

21 The other key elements in the cost build-up—transportation and refining—
22 to a large extent reflect market conditions. Currently there is a large
23 surplus of foreign flag tankers and freight rates, (particularly for
24 "very large crude carriers" (VLCC's) of over 150,000 tons deadweight)
25 have been driven down towards variable costs (i.e., rates which cover
26 bunker fuel and port charges only). In the Caribbean, the source of
27 most of New England's fuel oil, there is a large surplus of refining
28 capacity. In recent years, refiners in this area have generally recovered

1 little more than variable costs (i.e., refinery fuel and power,
2 additives. etc., which vary directly with output). Distribution
3 costs which are important for retail sales of gasoline or home
4 heating oil can be ignored for utilities which purchase fuel oil
5 in cargo quantities.

6 Q. How did you forecast the price of utility fuels?

7 A. Much of the fuel oil used in New England comes from Caribbean
8 refineries which process crude oil imported from the major OPEC
9 countries in the Middle East, Africa, and South America. The Caribbean
10 will continue to be a major source of products for the U.S. East Coast
11 and so we chose this area as the basing point for our economic cal-
12 culations. Arabian Light was selected as the crude type on the pre-
13 sumption (which in fact, is OPEC policy) that in normal times other
14 crudes will be priced in equilibrium with this marker crude oil. Thus, the
15 results would have been comparable had we chosen a different crude. Furthermor
16 the results would not differ significantly had we chosen a different
17 refining location (say, an East Coast refinery). Next, we forecast
18 the future price evolution of the Arabian Light marker crude and added
19 the projected refining and transportation cost elements to arrive at the
20 landed price of products in New England. These prices were then adjusted
21 to reflect the impact of U.S. regulations (fees, duties, and entitlements).

22 Q. Since the price of crude oil accounts for such a major proportion of
23 the cost of fuel, please describe what significant events have recently
24 affected international oil supply and how oil prices have evolved in
25 recent months.

26 A. In the late fall of 1978 a revolution took place in Iran, one of the
27 major Middle East oil producing countries. Consequent to the revolution
28 the Shah departed from Iran and the Bakhtiar Government, appointed
29 by him prior to his departure, fell. A new Islamic regime was established
30 by the Ayatollah Khomeini. The revolution in Iran caused a cessation

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1 of oil exports between late December 1978 and early March 1979.
2 Exports are reported to be limited by the Government to about 3 million
3 barrels per day, compared to an average export level of the order of
4 5 million barrels per day prior to the revolution. In response to the
5 Iranian crisis, Saudi Arabia at first allowed production to increase
6 in late 1978 to 10.4 million B/d. Subsequently, Saudi production was
7 reduced such that it averaged 9.5 MMB/d in the first quarter of 1979
8 and is currently at a level of 8.5 MMB/d. Thus, it is clear that
9 there have been significant crude oil supply difficulties and rearrange-
10 ments in recent months.
11 Concerning prices, OPEC member states met in Abu Dhabi in December, 1978
12 and decided on a schedule of quarterly price increases for 1979. Under
13 this schedule, the contract price for the Saudi marker crude was to have
14 increased in steps during each quarter reaching \$14.55/Bbl for the 4th quarter
15 (an average of 10% over the year assuming level production). The original
16 schedule was:

<u>December 1978</u>	<u>\$12.70/Bbl</u>
1st quarter 1979	13.34
2nd quarter 1979	13.84
3rd quarter 1979	14.16
4th quarter 1979	14.55

22 However, in early February 1979, Saudi Arabia announced a retroactive
23 (to January 1, 1979) price increase for all barrels sold in excess
24 of the official allowable production of 8.5 million barrels per day.
25 These excess barrels were to be sold at the scheduled 4th quarter price.
26 In mid-February, certain countries (Libya, Abu Dhabi, Qatar, Iraq, and
27 Kuwait) added surcharges to all volumes which in effect immediately
28 implemented the prices scheduled for the 4th quarter. At the end of
29 March, 1979 OPEC members met again for a "consultative" meeting in Geneva,
30 at which it was decided to increase the official marker price of Saudi

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1 Arabian Light crude oil such that the scheduled 4th quarter price of
2 \$14.55/Bbl would be effective from April 1, 1979. It was also decided
3 that member countries should be free to add those market premia which
4 they deemed justifiable in the light of circumstances. As a result,
5 member countries have introduced premia which are currently
6 in the range of \$2.50 to \$5.50 per barrel over the previously
7 scheduled 4th quarter prices. It is noted that all OPEC
8 member countries have added these price premia except Saudi Arabia.
9 At the time of writing, OPEC members are meeting in Geneva to discuss
10 official prices for the third quarter 1979.

11 Spot market crude oil prices have risen much more rapidly and have
12 now reached unprecedented levels. Spot premia over official prices
13 (already including the "official" premia mentioned above) were being
14 quoted at \$15 to \$20/Bbl and although the volume of real transactions is
15 small, some prices were recently reported to be in the range of \$35 to
16 \$40/Bbl for various crudes in early June 1979.

17 Q. Please explain how you forecast the future price of crude
18 oil given the many factors involved and the highly uncertain environment.

19 A. The price of crude oil is to a large extent politically determined:
20 by OPEC deliberations and by individual producing governments in the
21 case of foreign oil and by Presidential/Congressional action in the
22 case of domestic oil. Thus, there is a high degree of uncertainty in
23 any crude oil price projection. In this context, it is worth noting
24 that the timing and magnitude of the OPEC 1973/4 and 1979 price hikes
25 were largely unpredictable. Following the 1973 price hike, it was widely
26 believed that the cartel would collapse as all previous cartels had.
27 It is now generally believed that OPEC will continue to be able

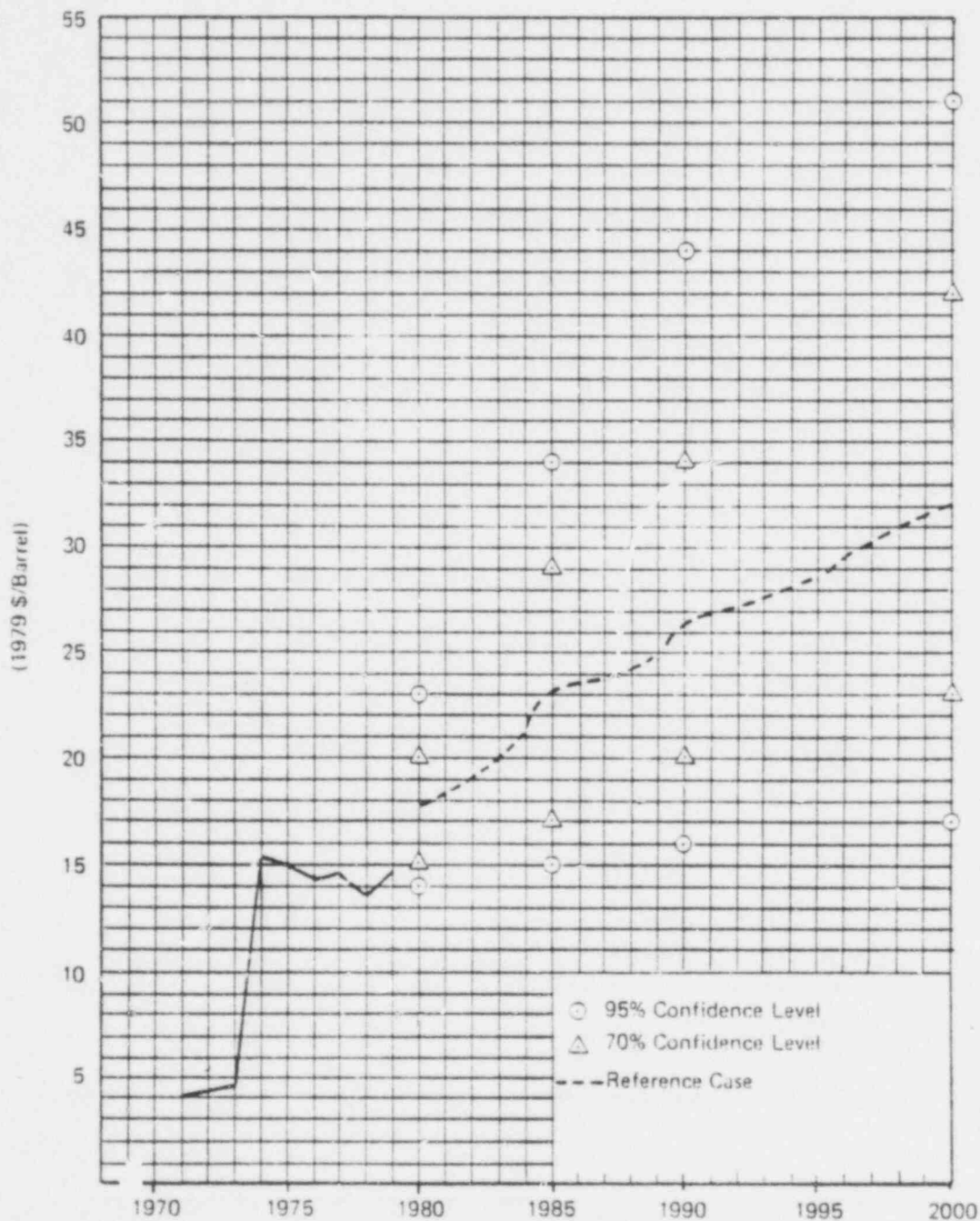
1 to set prices. An optimistic view of the future has the
2 cartel acting in a responsible manner while a more
3 pessimistic view holds that the cartel will act in an opportunistic
4 manner, taking advantage of current economic circumstances much as it
5 did in the 1973 crisis and as it is currently doing.

6 To better structure our views on these issues Arthur D. Little has
7 made use of a Delphi technique. Basically, a panel of experts, in
8 this case Arthur D. Little staff members located throughout the world,
9 were asked to record their views on the future oil price levels and the
10 paths by which these price levels would be reached. In addition, a
11 series of consistency questions related to supply/demand conditions,
12 resource availability, economic growth, cost of oil substitutes, etc.
13 were asked. The oil price projection in constant 1979 dollars resulting
14 from the most recent Delphi survey conducted in June 1979 is shown in
15 Figure I.

16 Q. What was the consensus view, or reference case, arrived at through
17 this process?

18 A. The events in Iran, the consequent disruptions to world oil supplies
19 and the impact of those disruptions on crude oil prices have re-inforced
20 our view that supply/demand pressures will trigger-off substantial up-
21 ward revisions in crude oil prices as shown in Figure I. These recent
22 events and the supply constraints introduced by Saudi Arabia have brought
23 into sharp focus the underlying tightness of world crude oil supply and
24 demand and the inherent instability of the supply situation. The impact
25 of supply tightness on price has again been demonstrated. There was
26 a general belief among the respondents that OPEC will continue to maintain
27 its price setting capability in the absence of unexpected events such as
28 military intervention or the discovery of significant new reserves of oil
29 in non-OPEC countries.

PRICE FORECAST FOR SAUDI ARABIAN LIGHT
FOB RAS TANURA



POOR ORIGINAL

1 We anticipate that the surcharges levied by most OPEC producers will be
2 consolidated into the official price for Saudi Arabian Light (currently
3 \$14.55 per barrel) such that the median price in 1980 is expected to
4 be \$17.8/Bbl in 1979 \$. A slowdown in demand growth rates due to the
5 combined effects of conservation, oil substitutes, and depressed economic
6 growth rates, coupled with the addition of new supplies from Alaska, the
7 North Sea and Mexico, will lead to a potential easing of the tight supply
8 position during the early 1980's. Price increases in this period are there-
9 fore likely to be modest and limited to inflation type adjustments.

10 Moving into the mid-1980's, the situation begins to change. New non-OPEC
11 supplies will have largely been absorbed and increases in OPEC production
12 will be needed to meet demand. During the mid-1980's there will be a
13 strong likelihood of another significant upward revision of crude price
14 to levels which would be targeted to make high cost hydrocarbon resources
15 such as shale oil, tar sands, or remote natural gas cost
16 competitive.

17 The timing of such an increase would depend on economic conditions but
18 would most likely occur when a bottleneck (in production, refining,
19 and/or transportation) develops within the oil supply system. This
20 increase would be followed by a further period of consolidation and
21 digestion, during which the crude oil prices would stabilize in real
22 terms. Later, in the mid-1990's, it was felt that further price increases
23 would take place as physical oil resource constraints were strongly
24 perceived. There was a general perception among respondents that the major
25 instabilities occurring during the 1980's as the crude oil price is
26 ratcheted upwards will give way during the 1990's to a period of
27 greater stability once the transition to greater use of alternative
28 energy forms is well under way, a higher degree of conservation has taken
29 effect and oil prices are more in line with the cost of the alternates.

1 There was, however, considerable uncertainty in future oil prices as
2 evidenced by the confidence limits shown in Figure I and Tables 1 to 5.
3 There is also considerable uncertainty surrounding the timing of price
4 increases since shortages in supply could develop at any time as a
5 consequence of accidental or deliberate cutbacks by individual OPEC
6 countries.

7 Q. How were the other elements of cost projected?

8 A. The projection of refining cost poses particular problems since joint
9 costs must be allocated to individual products. In the simplest type
10 of refinery, crude oil is separated into individual fractions by
11 boiling off the lighter fractions in a process called distillation.
12 A portion of the crude oil does not boil off and is called residual
13 fuel oil. This is the product typically used by utilities in oil fired
14 electric plants. The raw fractions obtained by this primary distillation,
15 however, may not satisfy the product demand patterns or the product
16 quality characteristics required. For example, the residual fuel oil
17 may have to be treated to remove sulfur and this desulfurization cost
18 causes a price difference between high sulfur and low sulfur fuel oils.
19 In some markets, the yield of residual fuel oil is larger than can be
20 absorbed at economic fuel oil prices. Refining processes are available
21 (catalytic cracking, hydrocracking, etc.) to convert fuel oil into gasoline
22 and No. 2 fuel oil. The cost of these conversion processes is reflected
23 in the price differential between fuel oil and these lighter products.
24 To further complicate matters, individual crude oils vary widely in their
25 properties ranging from crude oils with a very high natural proportion
26 of residual fuel oil (heavy crudes) to those with a low proportion
27 (light crudes) and ranging from crude oils with a high sulfur content
28 to crudes with very little sulfur. Refiners continually balance crude

1 oils, processing, and markets to achieve optimal results and this complex
2 interaction is reflected in individual product prices. At the present
3 time in the Caribbean there is both a surplus of distillation capacity
4 and a surplus of fuel oil desulfurization capacity. This situation
5 causes a low allocation of refining cost to residual fuel oil on the
6 one hand and price differentials between high sulfur and low sulfur
7 fuel oils below the full cost of desulfurization on the other hand.

8 At the same time, there is a shortage of processing capacity to convert
9 fuel oil to light products (gasoline and No. 2 fuel oil) and prices for
10 these products reflect margins higher than the full cost of conversion
11 processing. Our forecast of the refining element in the fuel prices
12 projected in this study reflects a gradually increasing trend to full
13 cost recovery during the period to the year 2000.

14 Foreign flag tankers are in much the same position as offshore refineries.
15 The surplus tanker capacity has driven freight rates below cash costs
16 for large tankers. For smaller product tankers, freight rates are currently
17 higher than fully allocated costs. As in the case of refineries we expect
18 rates for larger tankers to change gradually as tanker supply and demand
19 come into balance such that freight rates will reflect full costs including
20 a return on investment by the early 1990's. Both the tanker cost forecast
21 and the refinery cost forecast reflect projected crude price increases
22 which influence bunker costs in the case of tankers and refinery fuel in
23 the case of refining.

24 Current U.S. regulations reduce the cost of fuel oil below import parity
25 by granting importers an "entitlement credit" of about \$1.00 per barrel
26 (50% of the entitlement credit for imported crude oil). In addition,
27 import fees are theoretically payable on certain import volumes, but have
28 currently been suspended. The administration has recently implemented
29 a special \$5.00/Bbl entitlement credit for distillate imports. In

1 preparing the price projections, it has been assumed that only a fee
2 of 42¢ per barrel will apply to imported products as protection for
3 U.S. refiners.

4 Q. What are the results of your analysis?

5 A. Applying the procedures just outlined, we have obtained the results
6 shown below in Table 1 which are expressed in 1979 dollars per
7 million Btu, for the reference case:

TABLE 1
DELIVERED FUEL OIL PRICE FORECAST
Reference Case
(1979 \$ per Million Btu)

	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
No. 2 Fuel Oil	3.75	4.90	5.71	6.90
0.5% Sulfur Resid	3.17	4.45	5.24	6.40
1.0% Sulfur Resid	3.06	4.29	5.03	6.15
2.2% Sulfur Resid	2.83	3.95	4.61	5.63
2.7% Sulfur Resid	2.74	3.83	4.46	5.44

Tables 2 and 3 show the +70% and -70% confidence limit cases and
Tables 4 and 5 the +95% and -95% confidence limit cases.

TABLE 2
DELIVERED FUEL OIL PRICE FORECAST
Plus 70% Case
(1979 \$ per Million Btu)

	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
No. 2 Fuel Oil	4.18	6.01	7.16	8.85
0.5% Sulfur Resid	3.53	5.53	6.65	8.29
1.0% Sulfur Resid	3.41	5.33	6.40	7.98
2.2% Sulfur Resid	3.15	4.93	5.90	7.35
2.7% Sulfur Resid	3.06	4.79	5.71	7.12

TABLE 3
DELIVERED FUEL OIL PRICE FORECAST
Minus 70% Case
(1979 \$ per Million Btu)

	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
No. 2 Fuel Oil	3.21	3.67	4.41	5.12
0.5% Sulfur Resid	2.72	3.26	3.98	4.66
1.0% Sulfur Resid	2.61	3.13	3.81	4.46
2.2% Sulfur Resid	2.42	2.87	3.47	4.06
2.7% Sulfur Resid	2.34	2.77	3.35	3.91

TABLE 4
DELIVERED FUEL OIL PRICE FORECAST

+95% Case
(1979 \$ per Million Btu)

	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
No. 2 Fuel Oil	4.77	6.99	9.11	10.61
0.5% Sulfur Resid	4.02	6.48	8.55	10.01
1.0% Sulfur Resid	3.88	6.25	8.24	9.65
2.2% Sulfur Resid	3.59	5.79	7.62	8.91
2.7% Sulfur Resid	3.49	5.63	7.40	8.64

TABLE 5
DELIVERED FUEL OIL PRICE FORECAST

-95% Case
(1979 \$ per Million Btu)

	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>
No. 2 Fuel Oil	3.02	3.28	3.63	3.94
0.5% Sulfur Resid	2.55	2.88	3.21	3.52
1.0% Sulfur Resid	2.45	2.76	3.07	3.35
2.2% Sulfur Resid	2.27	2.52	2.78	3.02
2.7% Sulfur Resid	2.20	2.44	2.67	2.89

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1 of crude oil, have to take into account the problem
2 of demand/price elasticity?

3 A It's an element, but as we have indicated here, the
4 establishment of the international crude oil price
5 is largely a decision made by a relatively small
6 group of producers, whom we call OPEC.

7 Q Would you agree with me that the demand/price
8 elasticity is one of the factors that should be
9 considered when one is projecting petroleum prices
10 into the future?

11 A Well, I already mentioned that. I think it is a
12 factor, but a relatively small factor.

13 Q Do you know what your answer was to that question the
14 first time I asked you that question, sir?

15 A No.

16 MS. MULKEY: Mr. Chairman, could Mr. Meyer
17 explain what he means by the "first time?"

18 MR. GOODHOPE: Apparently Mr. Turner has
19 testified before. He will make it clear.

20 THE WITNESS: Not at this hearing.

21 Q Sir, did you and Mr. Godley and Mr. Hanna testify
22 in DPU 19494 before the Massachusetts Department of
23 Public Utilities and the Boston Edison Company?

24 A Yes, we did.

25 Q And did you testify on Friday, April 13, 1979?

1 A If you say so.

2 Q I show you Volume 50, Page 6329 of that transcript,
3 sir, and ask you if you could read into the record
4 lines 12 through 17 showing the question and answer
5 that I am referring to?

6 A "Do you agree with me that demand elasticity is one
7 of the factors that should be considered when one
8 is projecting oil prices in the future?

9 "A. If one could have a good handle on
10 it, yes."

11 Q Thank you, sir, and was that the answer that you gave
12 when I asked you that question on April 13, 1979?

13 A Could I take that back, that document?

14 Q Yes.

15 A Is that the date on the document? I guess it is.

16 Q Thank you, sir. Would you agree with me that
17 supply elasticity is one of the factors that should
18 be considered when one is projecting petroleum prices?

19 A Well, I would like to sort of set the record straight
20 here. I mean, you are talking in economic para-
21 meters, and there is no doubt that the impact of
22 price on supply and the impact of price on demand
23 has a bearing on this issue, but not the interpreta-
24 tion that I have. You are saying that there is a known
25 supply function and a known price elasticity that

1 can be used in the projection of oil prices, and I
2 guess that is the thing that I am concerned about.

3 Q And your point here, sir, is that supply and demand
4 functions are not known?

5 A They are not known in the classical economic sense
6 of being able to write a formula.

7 Q Would you agree with me that to the extent that
8 they are known the supply elasticity is one of
9 the factors that should be considered when one is
10 projecting petroleum prices?

11 A All of those are factors; the higher the price the
12 greater the tendency, or the greater the incentive,
13 to produce not only oil but other forms of energy,
14 but there are a lot of other constraints operating
15 of which that is but one.

16 Q Would you give the same answer for refinery capacity
17 elasticity?

18 A It responds to the same kinds of incentives to the
19 extent that it is permitted to be built. When
20 refinery margins are large, then they will be
21 encouragement to build a refinery.

22 Q And this refinery capacity elasticity is one of the
23 factors that should be kept in mind when one is
24 projecting petroleum prices in the future?

25 A Yes, but again not one of the key factors. Currently

rm/pf

1 there is a surplus of refining capacity and additional
2 refinery capacity will not be needed for some time.
3 But if we ran out of refinery capacity worldwide,
4 then you would see a price explosion because it
5 would create a shortage of products.

6 Q Would you agree with me that the availability of
7 tanker capacity between the Mideast and the Caribbean
8 and Caribbean and the eastern coast of the United
9 States should be one of the factors that should be
10 considered in projecting petroleum prices in the
11 future?

12 A Yes. Again for the same reason, if one needs to have
13 enough capacity of all elements leading from crude
14 oil production through to the ultimate consumer so
15 that shortages of one kind or another do not occur
16 anywhere along the chain.

17 Q Would you agree with me that in addition to total
18 world productions of crudes such as possible
19 Mexican production in the next ten years should be
20 considered in projecting future petroleum prices?

21 A Yes.

22 Q Would you agree with me that the state of inventories,
23 that is current inventories, of both crude petroleum
24 and refined products should be considered in
25 projecting petroleum prices?

A Short term.

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J1-1

1 Q Would you agree with me that liquid
2 petroleum should be considered as a long term factor?

3 A Yes.

4 Q Now, would you agree with me that import quotas for
5 the United States imports of total amounts of crude
6 imported from abroad should be one factor to be
7 considered in projecting crude petroleum prices?

8 A Yes.

9 Q Now, the testimony you have offered into evidence here
10 today, sir, concerns a second or third stage of
11 Adelphi techniques?

12 A That is correct.

13 Q And you have testified to an earlier stage of the
14 results in the DPU proceeding that we discussed
15 already?

16 A Yes.

17 MR. GOODHOPE: What was that proceeding?

18 MR. MEYER: No, sir. For the record, I
19 referred to DPU 19494, which has been referred to
20 earlier in the case. There has been testimony in
21 this case there is an investigation by the State
22 Department of Public Utilities into Boston Edison
23 Company's current construction program, specifically
24 Pilgrim II.

25 MR. GOODHOPE: Is that a state proceeding?

1 MR. MEYER: Yes, sir.

2 Q (By Mr. Meyer.) Could you explain, sir, what an
3 exercise, a Delphi Technique is?

4 A I think I will let Mr. Hanna speak to that.

5 Q Please do so.

6 A (By Mr. Hanna.) A Delphi Technique is, essentially,
7 one which sounds out the judgment and opinions of
8 a group of experts in their particular topic under
9 investigation.

10 The Delphi process is, essentially, one of
11 constructing and submitting a question to a number of
12 respondents who then exercise their judgment on the
13 questions posed, and then return the responses. These
14 are then coordinated and assembled into a consensus
15 outlook on crude oil prices.

16 Q And am I correct in saying, then, that in subsequent
17 rounds of Delphi exercises, that the opinions of
18 the participants are summarized so that in subsequent
19 rounds the participants may know what the other people
20 had in mind?

21 A That is correct. One of the features of this
22 technique is that those responses are then fed back
23 in aggregate terms to the respondents, who are then
24 allowed to change the response if they so wish and
25 this is part of the process of assembling a consensus

1 outlook.

2 Q Now, for example, if I look on page nine of your
3 testimony, Mr. Hanna, the price forecast for Saudi
4 Arabian light type crude of the ras tanura, I take it,
5 that, therefore, that projection was not necessarily
6 precisely your opinion as you were one of the participants
7 in this Delphi exercise; is that right?

8 A That is correct. This is the aggregate opinion of
9 the group of respondents.

10 Q And how many respondents were there?

11 A There were twenty-three respondents on that particular
12 occasion.

13 Q How many responses were to the previous round of the
14 Delphi exercise, sir?

15 A I believe it was 17.

16 Q Is it usual in Delphi forecasting techniques to
17 change the size of the group sample, sir?

18 A I'm not aware that it is a requirement that the sample
19 itself should not change.

20 Q Sir, so you had some participants who responded at that
21 time?

22 A Yes. In fact, on this occasion we had a better level
23 of response than we have had in previous years. I would
24 say that, generally, the population for this survey was
25 basically the same on each occasion.

Q In other words, the people of whom the question was asked

J2-2
em

1 remained the same, but those who responded differed;
2 is that correct?

3 A Give or take one or two people, I would say that the
4 population in each case was approximately the same.
5 On this occasion, we had six additional responses
6 from people who, on the previous occasion, had not
7 responded.

8 Q Did you have people on the previous occasion who
9 responded previously and did not respond this time?

10 A I believe I can think of one. There may be more.

11 Q And, similarly, Mr. Turner, I take it the price
12 forecast on page nine is not precisely your individual
13 opinion, as a respondent, but is it the assembling
14 of all opinions; is that correct?

15 A (By Mr. Turner.) That is correct.

16 Q And the same with you, Mr. Buel ?

17 A That is correct.

18 A (By Mr. Turner.) Although all three of us were
19 participants.

20 Q I understand.

21 Now, Mr. Hanna, I take it you are the
22 person most familiar with the methodology of this
23 exercise; is that correct?

24 A (By Mr. Hanna.) That is correct. I took responsibility
25 for coordinating this survey.

1 Q And as such, you are familiar with the letters that
2 were sent to the various participants in each of the
3 rounds for the exercises?

4 A Yes.

5 Q Did the letters ever mention the concepts of
6 demand price elasticity?

7 A The questionnaire certainly mentioned that concept,
8 yes.

9 Q And how did it mention that concept, sir?

10 A One of the questions set out a number of possible
11 factors influencing the price of crude oil and it
12 is my recollection that there were about fifteen
13 specific factors that were mentioned and one of these,
14 was, indeed, the potential response of supply and
15 demand price.

16 Q Do you have that letter with you?

17 A I do not have that with me, no.

18 Q Do you know whether that questionnaire mentioned
19 cross price elasticity as between oil use and other
20 end uses?

21 A It did not have the phraseology you have just used, no.

22 Q Did it have the phraseology "demand price elasticity"?

23 A I have to come back to regenerate here what Mr. Turner
24 explained earlier in that we did not view elasticity
25 in the classical sense.

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J2-4

/em

1 The classical sense being the specific
2 response of demand or supply to an increasing price.
3 Rather, we recognize the potential of such a response
4 but also recognize the fact that it is something which
5 is virtually impossible to measure and, therefore,
6 we did indicate it and reserve it as a fact that
7 we ask people to consider and we ask people to
8 assign some rating to it.

9 Q I understand your answer, sir, but my question is
10 somewhat more narrow.

11 My question is, did the questionnaire
12 that was sent to the participant mention demand
13 price elasticity?

14 A Once again, it is my recollection it did mention
15 demand elasticity.

16 Q Did it mention cross price elasticity?

17 A No.

18 Q Did it mention supply elasticity?

19 A Probably not specifically.

20 Q Did it mention refinery or tanker capacity elasticity?

21 A No. I'm not sure what you mean by either of those
22 two phrases.

23 It is certainly not a term which is in
24 common use in the oil industry.

25 Q Did it mention the possibility of additional sources

J2-5
.em

- 1 of supply of crude, such as Mexican production?
- 2 A It did not specifically mention Mexico by name, but
- 3 one of the questions did request respondents to indicate
- 4 any other sources of production that they thought
- 5 might have a bearing on this issue of price.
- 6 Indeed, many of the respondents did, in fact, select
- 7 Mexico as a country, as a producer, which might
- 8 indeed have some affect.
- 9 Q Did the questionnaire mention inventory levels?
- 10 A No.
- 11 Q Did the questionnaire mention strategic petroleum
- 12 reserves?
- 13 A No.
- 14 Q Did the questionnaire mention import quotas?
- 15 A Not specifically, no.
- 16 Q Now, I take it that the people who are participants
- 17 in this questionnaire were all employees of Arthur D.
- 18 Little; is that correct?
- 19 A That is correct.
- 20 Q And they are located in different places, geographically,
- 21 than all in Cambridge; is that correct?
- 22 A That is correct.
- 23 Q And the survey was being conducted in writing with
- 24 responses in writing through the mail; is that right?
- 25 A Yes. Not exclusively by mail, but we did use Telex

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J2-6
am

1 where it was essential to do so, to reach one
2 respondent.

3 Q How many rounds of the Delphi exercise have been
4 conducted to date?

5 A Well, this is the third year that we have conducted
6 this particular exercise and so this is the third
7 round?

8 A If it is like this, then this can be referred to
9 as the third round.

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493 157

J3-1
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1 Q Now, from the responses that appear on the standard
2 form, in answer to the questionnaires, am I right in
3 saying that you cannot tell from the responses
4 exactly how the participants came to the conclusion
5 they came to?

6 A That is correct. That is not the purpose of the
7 Delphi exercise.

8 Q Is it fair to say that one of the purposes of the
9 Delphi exercise is to achieve a consensus?

10 A That is certainly one of the objectives. It is by
11 no means certain, but the consensus can be achieved
12 by this process.

13 Q Now, the ninety-five per cent confidence level and
14 the seventy per cent confidence level that is played
15 on page nine, Mr. Hanna, I take it that those are
16 not confidence levels that are calculated in the way
17 that statisticians calculate confidence levels from
18 random samples; is that right?

19 A No. I would not say that. The confidence levels
20 which have been identified by inspection of the
21 probability distributions indicated by respondents
22 for each of those years and to that extent thirty
23 per cent, if you like, mathematical procedures of
24 achieving those confidence levels.

25 Q And the ninety-five confidence level refers to what

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J3-2

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specifically?

A Well, within the ranges indicated by the upper and lower ninety per cent quantity levels, the respondents, in aggregate, basically indicated that there is a ninety-five per cent chance of future prices lying outside those two points.

Q In other words, sir, these points that are labeled ninety-five per cent in a seventy per cent confidence levels on page nine of your testimony are the aggregate of the participant's estimates of their ninety-five and seventy per cent confidence levels; is that right?

A That, in essence, is correct.

Q And, of course, you did not know how the participants calculated their own ninety-five to seventy per cent confidence levels; is that right?

A Well, the participants themselves did not calculate confidence levels. The participants each express the price of crude in the future years indicated in terms of a probability histogram.

DR. COLE: So that the ninety-five per cent confidence level as shown on page nine, if you had twenty participants, then the nineteen of those twenty would provide a price estimate that would fall between the upper and lower bounds of the

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J3-3
em

1 ninety-five per cent? You did not conduct any
2 statistical test, other than to do that; is that
3 correct?

4 THE WITNESS: No, that is not a correct
5 interpretation of what we have done here. Perhaps
6 I could just explain this.

7 DR. COLE: Yes.

8 THE WITNESS: Each of the respondents
9 expressed the prices in the future years in terms of
10 the probability histogram.

11 In other words, they were requested to
12 express the probability that the crude oil price would
13 lie within certain ranges.

14 Now, the total figures expressed in each
15 year had right up to 100.

16 To obtain the aggregate response, we
17 summed the total response in each of the ranges for
18 the total sample and used that total, if you like,
19 the compensated probability distribution, as a basis
20 for plotting the histogram and establishing the
21 ninety-five per cent and seventy per cent confidence
22 level.

23 MR. TURNER: Just to use an exact
24 illustration, each person was asked what do you think
25 the chance of the price being between \$20 and \$22

1 is in 1985, let's say, and between \$24 and \$26, and
2 so on, and each person put down, within these brackets,
3 the probability that he, judgmentally, saw the price
4 falling between those ranges.

5 DR. COLE: I understand that. They were
6 asked for their best estimate as to what their price
7 would be in 1990?

8 MR. TURNER: Not best estimate, but just a
9 chance that it would be between 20 and 22; between
10 22 and 24; and 26 and 28.

11 DR. COLE: I understand that.

12 MR. HANNA: That will also come as a separate
13 question, ask for their best estimate price progression.

14 DR. COLE: Which should coincide with their
15 other estimates?

16 MR. HANNA: Exactly. On one or two occasions
17 when it didn't coincide, I returned the questionnaire.

18 (Laughter.)

19 DR. COLE: I understand that.
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J4-1
po/em

1 MR. GOODHOPE: Since all these correspondents
2 were employees of Arthur D. Little, I assume they
3 were economists?

4 MR. HANNA: They were all what?

5 MR. GOODHOPE: Economists.

6 MR. TURNER: No. I think they were
7 participants of what I would call the general oil
8 scene in business, economic context. There were
9 people that -- we had people located throughout the
10 world. There are some in Saudi Arabia, some in
11 Abu Dhabi, some in Algiers, and some in London.

12 MR. GOODHOPE: They are not necessarily
13 economists?

14 MR. TURNER: Very few. Not necessarily.
15 They have become economists to some extent, but,
16 essentially, they did not start out that way.

17 MR. GOODHOPE: All right.

18 Q (By Mr. Meyer.) Now Mr. Turner, if I can just refer
19 to page nine, again, do I interpret this graph on
20 page nine as being in 1979 dollars?

21 A That is correct.

22 Q And, therefore, that means that all figures on this
23 graph are net of inflation?

24 A That is also correct.

25 Q And this shows that from 1974 to at least the beginning

J4-2
po/em

1 of 1979, real oil prices dropped?

2 A That is correct. I would like to make a statement
3 here with respect to the previous testimony, if I
4 might, just to clarify a point.

5 One is that these are, in fact, in constant
6 1979 dollars and they are F.O.B. prices of a particular
7 crude oil.

8 I think that Mr. Buckley was talking about
9 a mix of crude oils delivered to the U.S. So, his
10 price of \$22.50 projected includes some higher valued
11 crude oils than this particular crude oil and it
12 also includes the transportation component.

13 So, the prices are on a, the two prices are
14 not particularly on the same basis.

15 Q I take it, sir, that you were present when Mr. Buckley
16 testified; is that right?

17 A Yes.

18 Q And from your last answer, I take it that you feel
19 you have an understanding of what he was saying and
20 what his testimony might have been?

21 A Yes.

22 Q Did he misread your testimony, sir?

23 A I believe he did.

24 Q He misread it badly, sir, didn't he?

25 A Badly, I wouldn't go as far as saying that, but I

1 think he misread it.

2 I think he assumed or had the impression
3 that he, the impression I thought was that the dollar
4 forecast, both the old one that he had, and the other
5 one, was in current dollars, and I think he did not
6 correctly interpret it.

7 In fact, our old forecast is higher than
8 his forecast.

9 Q Both your old and your new forecasts are higher than
10 Mr. Buckley's forecast; isn't that right?

11 A Yes.

12 Q And he criticized you for not being high enough; isn't
13 that right?

14 A He seemed to be, yes.

15 Q All right, if I could ask you, Mr. Turner, to turn,
16 again, to page nine?

17 A Yes.

18 Q The dotted line, which is the reference case, the
19 best estimate case, if you will, appears to have
20 two errors in which the slope was slightly steeper;
21 I would say 1984 to '85 and '89 to '90; is that
22 generally correct?

23 A Yes.

24 Q Now, could you tell me why the slope is somewhat
25 steeper in two places?

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POOR ORIGINAL

1 A Yes, I think I can, but I may have to refer to my
2 colleague.

3 A number of people felt that there would be
4 another set of events of the type you have just
5 gone through. Again, this would be sometime in 1985.

6 Now, as we approach 1985, we will begin to be
7 capacity constrained again. That would set the stage
8 for some upward ratchet in the price. The market
9 conditions would be appropriately reflected, and the
10 same thing gets repeated again in 1990 because
11 upward increase will shake out some demand and demand
12 will, perhaps, follow or stabilize and, again, will
13 begin to pick up and once again it will happen.

14 Now, this forecast also has the optimistic
15 view that after 1990 some form of international
16 cooperation takes place so that we don't have this
17 bidding system that, in fact, Dr. Buckley referred to
18 of the innocence of growing up and bidding up the
19 price of oil. Some of them are not as innocent as
20 all that.

21 Q The two upward or steeper slopes, upward that we've
22 talked about in '84 and '85 and '89 and '90, were
23 these possible used as supply constraints suggested
24 to the participant in the written questionnaires?

25 A To some extent, yes.

493 165

POOR ORIGINAL

1 A (By Mr. Hanna.) To the extent that some of the
2 questions specifically asked whether they believed,
3 and what probability would assign, to upward movements
4 in price of the type that we saw in 1973 and 1974, and
5 of the type that we have just seen early this year.

6 So, implicit in the questionnaire was the
7 suggestion of the possibility of what we call a
8 quantum jump in price.

9 Q And the question specifically asked him to consider
10 the possibility of a quantum jump and to put a date on
11 it; is that correct?

12 A It asked several things. It asked the possibility
13 of such a jump; the likely timing of such a jump;
14 the likely magnitude of such a jump.

15 Q Mr. Hanna, I think you are trained in statistical
16 techniques. Is that correct?

17 A I think it is fair to say that. My undergraduate is
18 in mathematics.

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493 166

K1-1
KG/RM

1 Q Do you agree with me, sir, that it would be extremely
2 unlikely to have a reference case of 20 or more
3 individuals average out to having bumps in this like
4 this does if the possibility of quantum jumps have not
5 been suggested in the questionnaire?

6 A I don't fully understand your question, but if we had
7 not suggested the possibility of bumps in the questionnaire
8 I am sure that the possibility would have been
9 suggested and indicated by the respondents.
10 In fact the reason that those upward movements,
11 distinct upward movements, occurred in the mid-1980s
12 and in '90, and also to a smaller extent in 1995, is
13 simply that a number of respondents, a significant
14 number of respondents, did show a progression which
15 included a number of quantum jumps. This line simply
16 represents the arithmetic average of the best estimate
17 progressions of the 23 respondents.

18 Q And I think, I guess I didn't ask it right, my only
19 questioning here is if you sample 20 or 25 individuals
20 on a general matter and asked them for a price projection
21 over time, the average of those individual responses
22 generally would not contain this level of information
23 of specific perturbations in the line as this one; is
24 that a generally correct statement?

25 A Yes, to the extent that when you average a number of

493 167

K1-2
KG/RM

1 readings, you clearly aggregate information. I think
2 that the fact that the aggregate in this case continues
3 to show fairly significant upwards movement in this
4 period, that is an indication of the fact that a
5 significant number of people believed and indicated
6 jumps occurring at that sort of time.

7 A (By Mr. Turner.) Just to add something to that, I
8 think that this average curve takes out a lot of the
9 bumps that were in some of the people's responses but
10 a lot of the people had a bump then a decline following,
11 you know, the earlier pattern. I say people, I don't
12 really know that, I think that we know that. But I am
13 sure that it would have a tendency to decrease the level
14 of bumpiness by averaging this.

15 Q Could I ask you, Mr. Turner, to turn to page 10 of your
16 testimony, lines 8 and 9. The sentence starting "price
17 increases in this period." What period is that sentence
18 referring to?

19 A We have not gotten through the current prices yet,
20 so there is still an element of doubt as to what the
21 price will finally settle out at. But once we have
22 gotten through the bump, then I think the general
23 feeling was that further increases between now and the
24 next bump, so to speak, were likely to be modest and
25 inflationary in nature.

493 168

K1-3
KG/AM

1 Q In what years is that period referring to?

2 A Well, 1980 to 1985. Let's say.

3 Q Could you turn back to page 9, sir, and tell me if that
4 is what the referenced case shows?

5 A No, it doesn't.

6 Q 1980 to 1985?

7 A No, it doesn't, but for the same reason that we explained,
8 that given the people's expectations when the next bump
9 might be varied. There is a tendency to damp out these
10 facts. But it sort of shows, but it doesn't show it quite
11 the same way, partly because people thought that there
12 might be, you know, a bump upward in 1982. That had a
13 tendency to increase '82 over and above what it might
14 otherwise have been.

15 Q If as you say you average a large enough responses, you
16 will damp out these bumps because people's ideas of when
17 the bump is going to take place is there.

18 Would you agree with me, sir, that a majority
19 of participants thought that for the 1980 to 1984 period,
20 say, that price increases would be likely to be modest
21 and likely inflationary type adjustments?

22 A I think the evidence discloses that. People thought that
23 there might be another bump in 1983, but I think that
24 everybody that went through the hump theory saw it go
25 up and level out in constant dollar terms.

493 169

K1-1
KG/R.

1 A (By Mr. Hanna.) Yes, but not every one subscribed to
2 the bump theory. Some people believed that we would
3 see continued real increases in price with no letup
4 in the next two or three years.

5 A (By Mr. Turner.) There is in fact an OPEC strategy
6 committee which is trying to grapple with some of these
7 issues, and they, a number of members of OPEC, have
8 set forth views of having prices that will relate to
9 something that will have a regularly increasing function.
10 That is a possibility.

11 Q My only question here, sir, and I guess I directed it
12 to Mr. Turner, is if you have to choose between the
13 testimony on page 10, lines 8 and 9, and the line joined
14 to the referenced case, which would be the best
15 estimate?

16 A Well, we have to go with the best estimate that I think
17 you are implying that these are in conflict but I don't
18 agree that they are in conflict. I mean, because if
19 somebody believes that price increase is going to take
20 place in 1983 as opposed to 1984, it will tend to
21 damp out, you know, it will show a rising trend.

22 Q So, the answer to my question, essentially, is there is
23 no conflict between the two things and you stand by
24 both of them, is that correct?

25 A That is essentially correct.

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K1-5
KG/RM

1 MR. MEYER: I have no further questions of
2 these witnesses.

3 MR. GOODHOPE: Mr. Selgrade?

4 CROSS-EXAMINATION

5 Q (By Mr. Selgrade.) Mr. Turner, trying to clear up some
6 of what I consider to be a misunderstanding about what
7 Mr. Buckley presented. Do you understand now that Mr.
8 Buckley projected any real price increases in the figures
9 that he gave?

10 A The understanding that I had was that he took the latest
11 price and held it constant in constant dollars. That
12 seems to be what he did.

13 Now, I think he said that he believed that that is
14 a very optimistic view of the future, because he went on
15 to say that there are a lot of things that could happen
16 and we have tried to reflect in this judgmental forecast.
17 It means that it is very unlikely to be realized.

18 Q So, in other words, you don't understand that he
19 projected no real price increases because he didn't
20 believe they weren't going to occur?

21 MR. MEYER: Objection.

22 MR. SELGRADE: I will rephrase the question.

23 Q Do you understand, Mr. Buckley, to believe that there
24 is a possibility of real price increases in the future?

25 A Yes, he said that.

493 171

K1-6
KG/RM

1 Q Can you tell me -- I am referring now to your previously
2 filed testimony that was withdrawn and I don't want to
3 focus on it too much because it has been withdrawn --
4 but do you recall when the first price increase first
5 hit \$18.00 in that projection?

6 A Yes. I think it was '85 or thereabouts. This is 1977
7 dollars, so we need that old one has to be increased
8 by 15% or so. All the figures in that, to get them to
9 '79 dollars, need to be increased by 15%.

10 Q What do you understand to be the price of oil for this
11 year?

12 A Where?

13 Q Being continued to be consistent with what you presented
14 F.O.B. Ras Turanu?

15 A Well, it is \$18.00, and that is below what the other
16 producers of comparable oil have set their price at.
17 The floor price is \$18.00.

18 If we are lucky, we will get it back down
19 to \$18.00 by the end of the year. If the Saudis continue
20 this production level, they can, that is a basically
21 support price, if you want to look at it that way --
22 however, other oils of comparable quality are at \$22.00,
23 so there is a chance that we will get out of the year
24 ending with somewhat higher prices than say the market
25 crude price is right now, depending upon what happens.

493 172

K1-7
KG/RM

1 I mean, there is no way of knowing this
2 easily. There is no way. You have people at \$22.00
3 with essentially identical oil that you are looking at
4 for \$18.00.

5 Q I refer you now to page 10 of your revised testimony,
6 and you indicated that in the mid-80's the price of oil
7 departed to make the high cost of hydrocarbon resources
8 such as shale oil and tar sands competitive?

9 A Yes.

10 Q Can you define what you mean or give a range of what
11 high cost would be in real dollars?

12 A In current dollars?

13 Q Current dollars.

14 A Say between -- most people feel between -- \$20.00 and
15 \$25.00 a barrel would be. That again has to be inflated
16 to get back again to the numbers that people are talking
17 about when they talk about synthetics. They are talking
18 about what it will cost at the time that the plant will
19 come on stream, so once again you have to be very
20 careful about what your basis is when you make these
21 projections or estimates.

22 Q Do I understand you correctly then that you're
23 anticipating another real increase before these
24 alternatives sources of hydrocarbon resources will
25 become cost competitive?

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K1-8
KG/RM

1 A Yes.

2 MR. SELGRADE: You are. Thank you. I have
3 no further questions.

4 MR. GOODHOPE: Mr. Cleeton?

5 DR. CLEETON: Yes.

6 CROSS-EXAMINATION

7 Q (By Dr. Cleeton.) Yes, I have some questions. I would
8 ask Mr. Godley, are you familiar with the United States
9 Government's experimental oil shale project in Rifle,
10 Colorado?

11 A I thought that had been dismantled, but -- I am not
12 familiar with it in any detail. There had been Bureau
13 of Mines experiments in Rifle, but I didn't think there
14 was anything particularly active there, but I don't
15 know.

16 MR. COLE: Would you talk over here to the
17 reporter?

18 THE WITNESS: Not in any detail.

19 Q Would you be surprised to learn that in 1950's that oil
20 shale distillate which was produced by that experimental
21 project was priced competitive with distillates from
22 domestic, and there wasn't too much foreign crude oil,
23 but domestic crude oil distillates?

24 A I would be surprised. Union Oil had made a number of
25 experiments there and they were never able to get the

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K1-9
KG/RM

1 cost down at that time to the level of United States
2 oil production. Otherwise people in those days would
3 have gone ahead because there were far fewer constraints
4 than there are now, and somebody has said that the
5 economics of synthetics are always about \$4.00 higher
6 than the OPEC price.

7 Q Would you clarify that "somebody" said?

8 A Oh, that is a jest, but that will never be.

9 Q Is this a jesting matter?

10 A No.

11 Q Okay. Now, except for the construction costs in
12 starting up oil shale and distillate synthetic production
13 of distillate, is the technology available?

14 A The technology is available.

15 Q So that is a matter of priorities rather than research?

16 A It is a matter of priorities rather than research.

17 Q Do you believe that an oil pipeline to Canada or
18 Southwest United States would permit us to use our
19 crude oil from the Alaskan oil fields?

20 A Well, we are using it now. It will enable us to use it
21 cheaper because currently we are hauling them around
22 by tankers.

23 Q And would this, supposing the United States under the
24 24-hour mandate of becoming energy self-sufficient were
25 able to do that, would it affect the projected prices

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K1-10
KG/RM

1 for oil from Saudi Arabia and anywhere else?

2 A Well, the judgments went into this imply a substantial
3 amount of enforced conservation because the oil simply
4 will not be there, and, therefore, one way or another
5 demand for oil is going to have to be shaken out on a
6 worldwide basis. To the extent that we are able to
7 produce a conservation and alternative energy forms,
8 we may be able to do that without the price implications
9 that would occur if OPEC does it for us, because
10 they will do it by the price method.

11 Q But if we could build a base of independence which
12 might affect the world oil market prices ---?

13 A It might affect the -- it would affect the world oil
14 price, yes.

15 DR. CLEETON: No other questions.

16 MR. GOODHOPE: Ms. Mulkey?

17 CROSS-EXAMINATION

18 Q (By Ms. Mulkey.) I am confused a little bit about the
19 three rounds, if you will, of exercise. Could you
20 sort of locate for me in time when the exercise began
21 in 1979 and what followed thereafter until its completion?

22 A All right, the first round of the exercise took place
23 in 1978 -- 1977 and 1978, and in fact, I guess, the
24 final results were published in the so-called oil glut
25 that we had in the early part of 1978, so it was

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K1-11
KG/RM

1 regarded, I think, by a number of people as a rather
2 old and high-priced forecast at the time that it was
3 made. So, it was made well before the current events,
4 and what I would like to say about that is that it
5 anticipated the sort of shape of the curve, but not the
6 timing of it. In other words, the events created the
7 supply crunch were upon us much earlier than the first
8 two rounds of the Delphi exercise implied. Most of
9 the people saw in that round, and fortunately it is not
10 intentional, you know, a bump upward. The bump, as
11 has been pointed out, took place in the mid-80's rather
12 than, you know, yesterday and it took, of course, in
13 Iran, which is the second largest OPEC producer to go
14 down. It triggered this effect off.

15 But, the general shape was there. Then I
16 might further add that that forecast was not done for
17 Boston Edison; it was done for a set of other clients
18 that have more or less the same interest in it. It was
19 made available to those particular hearings.

20 This latest round was in fact commissioned
21 by Boston Edison because it was recognized at the time
22 of those hearings that events had overtaken the previous
23 forecast and, therefore, it would be desirable to recycle
24 it yet again.

25 So, these results reflect a further recycling,

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K1-12

1 but interestingly enough, if you compare it with the
2 earlier forecast, it is more or less the same except
3 displaced about five years in time. In other words,
4 the shape of it is pretty similar and the levels of
5 price are fairly similar, but the timing has shifted
6 forward four or five years.

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1 A I would like to make the point that this is only a
2 particular forecast. This particular forecast
3 we have used in our general prime work which
4 embraces a lot of participants in the energy scene.

5 Q Okay. This is in response to a commission of
6 Boston Edison 1979. I guess at what date was the
7 questionnaires mailed, roughly?

8 A (Mr. Hanna) The questionnaires were sent out around
9 about the middle of May. I believe it was May the
10 fifteenth.

11 MR. GOODHOPE: '79?

12 THE WITNESS: Yes.

13 Q (By Ms. Mulkey) And were these questions identical
14 to the ones that had been sent in 1978?

15 A No, they were not. We felt they were obviously
16 improvements on the ones that we used in the early
17 years. However, the issue they explored was,
18 essentially, the same.

19 Q Are you, individually, the author of the '79 question-
20 naire?

21 A No. It was very much a collective effort on the
22 part of the three of us present plus at least one
23 other senior member of our group.

24 Q And I think that the four of you who authored the
25 questionnaire was four of the respondents?

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1 A That is correct.

2 Q Now, what I don't understand now is what follows
3 thereafter?

4 You then get in one run of responses; is
5 that it?

6 A No. This is pretty much an ongoing exercise. After
7 distributing the questionnaires the individuals complete
8 these and return them to me and I then tabulate the
9 response

10 And following that, the responses are
11 assembled in aggregate form and returned to the
12 individuals. The individuals are then given an
13 opportunity of changing their responses, if they
14 wish.

15 Q And the table on page 9, the figure on page 9
16 represents the tabulation after an opportunity for
17 changes?

18 A No. This represents a tabulation before they have
19 taken this opportunity for change.

20 Q Have you since tabulated the responses after an
21 opportunity for change?

22 A No, because we are still in the process of getting
23 those responses.

24 A (By Mr. Turner.) But I think the responses, I think,
25 should be, we should add, had the results of the

1 latest rounds of the previous Delphi, '78 Delphi.
2 So, they had that as well, and to some extent it
3 was a bases that they could look at.

4 Q So that we can have the same language, if it is too
5 simplistic to refer to these as '77 one and two,
6 '78 one and two and '79 one and two?

7 A No. We have not had five.

8 A (Mr. Hanna) No. We have had three rounds.

9 Q Which?

10 A One round in '77; one round in '78 and we have had
11 one round in '79.

12 Now, if you would like, we have had
13 initiated a second round during this year, which
14 will allow respondents to feedback after they have
15 seen the results of the first round in 1979 or what
16 we call the third round.

17 Q So '77 and '78 did not involve this feedback
18 mechanism?

19 A Oh, yes. The responses for both '77 and '78 rounds
20 were fed back to all of the respondents.

21 A (Mr. Turner) You can look at it that way in that
22 there was a delay of all of the responses. Normally,
23 you would take it and do it immediately thereafter,
24 but there has been, let's say, significant time
25 lapse between the time you recycle this.

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1 Q So they had feedback on the previous year samples?

2 A (Mr. Hanna) That is correct.

3 Q However, you will remember that in 1977 and 1978
4 there was not much action in the world oil market.
5 It was somewhat stable, and we felt that from those
6 responses we could assemble an adequate projection
7 which represented a form of consensus.

8 Now, given the events that have taken place
9 or are taking place at the moment and giving the
10 facts that this response was completed and assembled,
11 let's say, about three or four weeks ago, we are
12 giving the respondents further opportunity of taking
13 into account not only the aggregated responses in
14 this questionnaire but also the events that have
15 happened in the last month, let's say.

16 A (Mr. Turner) In fact, this was from before the June
17 OPEC pronouncement.

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-1-4
/pf

493 182

em/pf
L-2-1

1 Q Now, I take it that for each of you gentlemen the
2 answers to your questionnaires the individual
3 responses could have been plotted on a figure
4 similar to this?

5 A (Mr. Hanna) That is correct.

6 A (Mr. Turner) Yes.

7 A (Mr. Godley) Yes.

8 Q Would each of you, individually, answer for me what
9 changes there would be between your individual plot
10 at the time it was made in response to the question-
11 naire and a plot you would support today, individually,
12 in qualitative terms?

13 A (Mr. Hanna) I would not change my projection. I
14 might change it just a little. In particular, in
15 1980, I do feel I may have underestimated, personally,
16 the price level that will prevail for this type of
17 crude in 1980, but I don't see any reason, having
18 reviewed carefully the responses to really change my
19 own projection in the future.

20 A (Mr. Turner) I would be somewhat high in 1980, not
21 much, and then I would fall off. I would go down and
22 have another jump in 1985 and a similar jump in 1990.

23 In other words, I would have the more
24 seesaw type effect as balanced events of one kind
25 or another take place that will trigger off a

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1 response of the type you have just seen.

2 I think that the likelihood of that is
3 extremely high, and I think Mr. Buckley recited a
4 whole string of potential events. One of them is
5 bound to happen, I think, plus we have far less
6 slack capacity going into the mid-eighties than we
7 historically had. Even Libya could force our
8 hand now, and I mean could trigger off a price hike
9 of significant importance. It took Iran to do
10 that now, this time, which was six million barrels
11 a day, but the next, in the mid-eighties, it could
12 take a Nigeria of one million barrels a day. We
13 could get that type.

14 Q Thank you.

15 A (By Mr. Godley) I would not change the projection
16 I made before, but I would like to note that my
17 projection, my individual projection, is, in fact,
18 higher than the aggregate response shown on page 9
19 of the testimony.

20 The increases, the quantitative increases,
21 which I projected, are more pronounced in their
22 shape than they are shown on those aggregate responses,
23 and there are also very slightly higher levels including
24 my projection for 1980.

25 Q Now, I understood your answer, Mr. Hanna, your

L-2-3

1 answer to say that you would change the shape of
2 your individual plot. Now, would you change the,
3 say, the 1995 price estimate in \$79?

4 A (Mr. Hanna) No. The tenure of my response was that
5 I really would not make any significant changes. I
6 would, as I just said, I would increase my estimate
7 in 1980. I would need to look at the responses in
8 some more detail before actually going through that
9 exercise.

10 A (Mr. Turner) I think it is probably fair to say
11 that all of us would go along with this. I mean
12 we don't feel that it distorts our individual point
13 of view and we would consider the collective
14 judgment to be as good as any of our individual
15 judgments.

16 Q The question you described, was, is what we're calling
17 the Pop Series, on line 17, you focus on the time
18 of such increase?

19 A (By Mr. Turner) Yes.

20 Q And you say that the time is most likely to be
21 linked to some sort of bottleneck in the supply
22 system?

23 A (Mr. Turner) Yes.

24 Q Now, I understood your most recent answer to say
25 that you did not anticipate this year's bump because

L-2-4

1 there was not an expectable bottleneck in the supply
2 system; is that correct?

3 A Yes. That is correct. This year's bottleneck was
4 the Iranian revolution, which very few people predicted.

5 Q I take it that there are some expectable bottlenecks
6 in the supply system, presently expected? There
7 are some presently expected bottlenecks in the supply
8 system?

9 A Well, let's put it this way, had we continued on our
10 past projectory of use we would have hit the bottle-
11 neck, the production allowable bottleneck by 1985
12 and at that point it would take a very small country
13 a very, relatively small event to trigger the
14 supply shortage whereas this year it took an Iran.
15 In 1985 it might take, you know, a Libya or an
16 Algeria.

17 Q I am having trouble asking that question and let's
18 just put it bluntly and see if you can translate for
19 me, please?

20 Am I to accurately understand what
21 you are saying to lead to this conclusion?

22 The supply interruption of this year was
23 in addition to and not a substitute for expected
24 price increases that result from supply bottlenecks?

25 A Let us define bottlenecks. I mean, this is some

1 constraint in the facilities to get oil from under
2 the ground into the hands of the consumers.

3 Now, if you don't have enough capacity to
4 produce the oil, that is, you physically can't get
5 it out of the ground fast enough, then the constraint
6 is a production bottleneck.

7 If you don't have enough ships to transport
8 the oil from wherever it is to the consuming countries
9 then that would be a transportation bottleneck.

10 That, by the way, was the trigger in 1973.
11 The first trigger was unavailability of tanker
12 capacity, which triggered off an increase in product
13 prices. Then, finally, if you didn't have a
14 refinery capacity to refine the oil that, in turn,
15 would trigger off a price response because to use
16 Mr. Meyer's phrase, it is price elasticity in a
17 relatively small shortfall in supply and is magnified
18 in terms of price for the marginal barrel and once
19 you have that kind of a rapid spot price increase
20 in the produce of crude which later gets consolidated
21 or history has shown that it has later been
22 consolidated by the producing countries in the form
23 of higher basic crude oil prices.

24 So, to the extent that one can avoid these
25 bottlenecks from developing one can have a smoother

L-2-6

1 transition than what we have experienced in the last
2 six or seven years.

3 Q I guess my question is, if in the year of 1979 one
4 had expected a hypothetical refining capacity shortfall
5 in 1984?

6 A Yes.

7 Q But no bottleneck in either production, refining or
8 transportation prior to that?

9 A Yes.

10 Q One would have pictured the curve in a certain way?

11 A That is right.

12 Q Now, the Iranian crisis intervened?

13 A That is right.

14 Q And prices responded to it?

15 A That is right.

16 Q My question is, I guess, does that do anything to
17 damp the price jump which would have occurred in
18 1985 as a result of refining limitation or is it
19 added into the price jump?

20 A No. The price jump, I don't think,-- we said before,
21 it advanced the jump is the way we tend to look at it,
22 but the amplitude has not materially been affected.

23 Q I have some trouble understanding why that is true?

24 A I think we have to consider what the-- there is--
25 it is a question of how the internal negotiations

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1 are within OPEC and what they internally feel is
2 reasonably justifiable and accepted.

3 So, one of the things to look at is, in
4 fact alternative energy forms. This is not because they
5 think of it as a trap but because it has a ring
6 of plausibility. The plausibility seems reasonable
7 and another is local market conditions. I mean,
8 they, like most other people, don't like to see
9 their product sold at a higher price by other
10 people. They would like to get the benefit of it.
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M1-1
KG/RM

1 Q (By Ms. Mulkey.) Okay, I think that is very good.

2 Could one have plotted a meeting in response rather
3 than an arithmetic average?

4 A (By Mr. Hanna.) Yes.

5 Q Do you know whether that would have been higher or
6 lower in, say, 1990 price than the arithmetic average?

7 A I, without trying to do it and looking at it, I don't
8 know. We did it on a previous occasion. We did that,
9 but the difference between the mean and median were
10 relatively close together.

11 Q You did that for 1979, you mean?

12 A No.

13 MR. COLE: So you don't think it would make
14 much difference?

15 THE WITNESS: Well, we would have to do it
16 to check that, but on a previous occasion it made very
17 little difference. Of course with a symmetrical
18 distribution the two would be the same, although these
19 two are not perfectly symmetrical. In fact, they are
20 skewed toward the higher side, therefore, we would not
21 expect much difference between the mean and median.

22 MR. COLE: Excuse me.

23 MS. MULKEY: Sure.

24 Q Are the prices here, do they reflect end of the year or
25 average of the year prices?

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M1-2

1 A Neither. They reflect midyear prices. In fact, mid-
2 July prices.

3 A (By Mr. Turner.) That is a very good question because
4 that is very important because they changed the price
5 as of the first of July. I would not read a degree of
6 accuracy in these when you can see from this that there
7 is a great deal of uncertainty associated with this.

8 A (By Mr. Hanna.) The whole objective of this survey
9 is not to specify the price to that sort of high degree
10 of accuracy. The objective really is to sort of explore
11 all of the factors which are involved and to try to
12 explore these factors and the various uncertainties
13 involved in doing -- in the future of crude oil prices
14 and attempting to, therefore, shed some light on the
15 future of any future crisis.

16 Q Now, you have reported all of your estimates in 1979
17 dollars, and have you in your work chosen an escalation
18 rate to use if one wishes to have it imported in current
19 dollars?

20 A (By Mr. Turner.) Current dollars.

21 Q Current dollars?

22 A Not really. Whatever view of inflation there is, just
23 multiply it by that. It comes to some pretty high
24 numbers.

25 Q You also in your response, Mr. Turner, to a question

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M1-3
KG/RM

1 about synthetic fuels, meaning, I take it, oil shale
2 and some of these?

3 A Yes.

4 Q Reported a 1979 dollar cost estimate of \$20.00 to
5 \$25.00 per barrel. Do you know whether that cost
6 estimate would include -- what it would assume about
7 the cost of conforming to the environmental requirements?

8 A Not in specifics. We have made some estimates. There
9 are a lot of factors involved in coming up with that
10 particular kind of estimated price, or the required
11 price, which had to do with tax regime and a rate of
12 return requirement, and so on, and so on.

13 The environmental side of it impacts on both
14 the time and rate that you can build a plant, plus the
15 features that you have to put in to adhere to the
16 environmental regulations. We have done that, but I
17 can't comment on that, how much it would be, how much
18 is due to environment; that is hard. What does that
19 mean? If you took a reckless abandon of the environment
20 and just dug it up and just dumped the shale all over.

21 Q I will tell you what my question is focusing on; could
22 you maybe tell us what the general phrase that we hear
23 that these are "dirty fuels" implies?

24 A I think shale oil has some severe environmental implica-
25 tions. It creates emissions; it uses water. It requires

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M1-4
KG?RM

1 in the above ground retorting process disposition
2 of substantial expanded quantities of spent shale
3 that has to be put somewhere. More volume is produced
4 than is taken out of the ground. So it has the emission
5 problems that are associated with any kind of mining
6 operation or refining operation, so it has an impact
7 upon the environment. The same is true of coal mining
8 and coal conversion processes with the same for tar
9 sand in Canada.

10 Q Setting aside all those extractions and refining
11 engineering, are these fuels, say shale oil, are they
12 clean or dirty burning?

13 A I would say by the time you get it it would be
14 indistinguishable from heating oil or gasoline. The
15 same would be true of any synthetic liquid, liquid fuel.

16 Q So the environmental costs that you refer to are usually
17 the extraction or refinery?

18 A But the refining would most likely be done, you know,
19 on site, so these estimates, you know, imply fairly
20 high degree of environmental, or lack of environmental,
21 innovation. I think there is some. I don't know the
22 criteria to use. I mean, there is some deterioration.

23 MS. MULKEY: I have no further questions.

24 MR. GOODHOPE: Mr. Lewald, do you have any
25 questions?

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ML-5
KG/RM

1 MR. LEWALD: I have nothing more.

2 MR. GOODHOPF: Anyone else have any questions?

3 MR. COLE: I just wanted to make sure I
4 understand what you mean when you say real dollars and
5 '79 dollars. With respect to the chart on page 9 of your
6 testimony, of course, it is all in 1979 dollars. In
7 your questionnaire, your 23 respondents, did you ask
8 them to give you the estimates in '79 dollars, or did
9 you ask them in some other terms?

10 MR. TURNER: We asked for that in '79. We
11 also showed them what the implication of that would be
12 in current dollars, assuming a certain level of inflation,
13 so that they had a sense of what the 1979 would translate
14 to in current dollars if we had a nominal inflation rate
15 of 7%.

16 MR. COLE: That was my worry.

17 MR. TURNER: So that these numbers could be
18 multiplied, you know, whatever your perception of the
19 inflation rate of '79 is.

20 MR. COLE: Now, you used and Mr. Meyer used
21 the term "real dollars". What did you understand him
22 to mean when he said "real dollars"?

23 MR. TURNER: I didn't pick that up. I don't
24 know what those are. They could be -- I would have to
25 defer to Mr. Meyer on that. I mean, we use constant

M1-6
KG/RM

1 dollars or current dollars. Current dollars mean
2 inflated dollars. Constant dollars mean 1979 dollars.

3 I don't know what he means. I mean, I am
4 not saying that there is anything wrong with the real
5 dollars but I just don't know what they are.

6 MR. COLE: Well, we will check the transcript
7 and see the context on that in which it was used.

8 MR. TURNER: He is right here.

9 MR. COLE: I forget the exact question, but
10 I assume that what he meant was '79 dollars and it was
11 used in describing it as real dollars, and I assumed
12 that that is what you understood him to mean when you
13 answered your particular question.

14 MR. TURNER: Well, he is right there.

15 MR. COLE: Mr. Meyer?

16 MR. MEYER: Yes, separate. the record
17 it is my understanding, and I would let anyone contradict
18 me if I am wrong, but I believe that I used this term
19 with Mr. Buckley. I am not sure I used it with these
20 witnesses. It is my memory that both Mr. Buckley and
21 I used it real and constant i.e. '77 or '78 dollars,
22 interchangeably on the one hand, as opposed to current,
23 that is, each year's dollars, on the other hand. I
24 believe that is what transpired here. I think the
25 record will bear that out.

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1 MR. COLE: I have no further questions to ask.

2 MR. GOODHOPE: Being no further questions,
3 the panel is excused. Thank you, Mr. Hanna, Mr. Turner,
4 and Mr. Godley.

5 Is there anything further today, gentlemen.

6 MR. MEYER: There is the matter of scheduling
7 of further witnesses, Mr. Chairman.

8 MR. GOODHOPE: Tomorrow?

9 MR. MEYER: Yes.

10 MR. GOODHOPE: What are your plans?
11 How do we start in the morning?

12 MR. MEYER: At this point the Commonwealth
13 would press its motion not to go forward with the
14 Company's Panel No. 1 or with the Commonwealth's
15 witnesses.

16 MR. GOODHOPE: The Board will not do that
17 tomorrow. I thought we were going to see if we could
18 catch up on that later on in the week.

19 MR. MEYER: I am only speaking now as to
20 tomorrow, sir.

21 MR. GOODHOPE: That is all I am speaking about.
22 What do we have tomorrow; what witnesses do we have?

23 MR. SELGRADE: I am afraid, Mr. Chairman, that
24 that is the essence of the problem that we won't really
25 have anybody scheduled for tomorrow because prior to the

ML-9
KC/FM

1 Attorney General's motion it was my anticipation that
2 Panel 1 of the Applicant would be heard. Because of
3 that the Energy Office's second witness, Mr. Fitzpatrick,
4 will not be available Wednesday. He is out of town
5 and I don't think I could reach him at this late hour,
6 so he couldn't be reached until tomorrow.

7 MR. GOODHOPE: You have no witnesses to
8 present?

9 DR. CLEETON: Not on power. We have a switch
10 to turn it on and off.

11 MR. GOODHOPE: Well, could we go ahead with
12 the NRC people?

13 MS. MULKEY: Dr. Chernick will not be here
14 until Thursday.

15 Dr. Geller is coming in late tonight.
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1 MS. MULKEY: Perhaps I can offer a suggestion.
2 You may not like this, but if you are now ruling that
3 the Commonwealth may defer, and I am not-- I mean,
4 we are open to suggestions I would object to it
5 strenuously, but if you don't want to shoot at me then
6 I would suggest an alternative schedule. I don't
7 think I am prepared to offer that until you rule on
8 this.

9 MR. GOODHOPE: I believe in giving everybody
10 as much time as they need in all fairness. I would
11 like to finish it as fast as I can.

12 Now, we have no witnesses for tomorrow and
13 this will give you to work with your people to see
14 if you can bring them on later on this week.

15 MS. MULKEY: We will be prepared. In fact,
16 if you are going to allow the Commonwealth to defer
17 its questioning of Applicant Panel No. 1 I believe
18 that at one point we have discussed the prospect of
19 some evening sessions during this week.

20 Now, I don't know if anything else has been
21 done about the availability of this building or
22 something, but there is some prospect that the staff's
23 witness could go on tomorrow evening, I suppose.

24 MR. GOODHOPE: What about tomorrow afternoon,
25 at one o'clock?

1 MS. MULKEY: I don't think that this is at
2 all possible either. That is not out of the realm of
3 possibly either.

4 Then, I would reiterate my feeling that
5 for any number of reasons, not the least of which
6 is the eleventh hour nature of this request for a
7 change in the schedule and others mentioned by
8 Mr. Lewald, that the Commonwealth ought to defer
9 with its questioning of the Applicant's Panel No. 1.

10 Now, to the extent that there are some
11 questions which might be, not necessarily, deferred
12 as a result of the delay until the receipt of those
13 interrogatories perhaps the questioning could
14 resume.

15 Similarly, I don't also see whether the
16 Commonwealth's panel cannot go forward at some
17 relatively expeditious time as the schedule had
18 anticipated.

19 DR. COLE: Why can't you put your
20 witnesses on, Mr. Meyer?

21 MR. MEYER: The reason is very simple.
22 The Commonwealth's witnesses are currently attempting
23 to digest the responses the Company gave us on
24 Thursday afternoon.

25 I am a little upset by that counsel for

1 NRC staff stating here that the implication seems
2 to be that the Commonwealth is the one who is
3 attempting to slow down the hearings.

4 We, as a courtesy, gave the Company two
5 and a half weeks to answer these interrogatories
6 after they have already had two weeks under the
7 NRC rules. Four and a half weeks didn't prove enough.
8 They gave them to us one and a half working days
9 before this hearing was going to start.

10 Now, I don't think the Commonwealth should
11 bear the burden of the Company taking that extra
12 time, and I am surprised that the NRC staff doesn't
13 want to analyze these responses themselves.
14 Apparently the NRC staff feels that this type of
15 analysis is not necessary. It would seem to me that
16 instead of criticizing the Commonwealth for attempting
17 to have the hearings proceed in an orderly fashion
18 after the Applicant has taken far more time than
19 is necessary and after the Applicant has taken, has
20 caused the delay, I would think that the NRC staff
21 is more interested in doing its job in the review
22 of this discovery also instead of blaming the
23 Commonwealth for something the Applicants did.

24 The Commonwealth's witnesses are currently
25 reading that discovery and they will be until they

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1 understand what is contained therein.

2 MR. GOODHOPE: What is the volume of that
3 discovery?

4 MR. MEYERS: It is a foot high, colloquially
5 speaking.

6 MR. GOODHOPE: It's that tall?

7 MR. MEYERS: Yes, it is.

8 MR. GOODHOPE: They have had all day today?

9 MR. MEYERS: Yes, sir.

10 MR. GOODHOPE: You have plenty of time to
11 read it.

12 Now, can you have your panel here tomorrow
13 afternoon?

14 MR. LEWALD: We can have the panel with
15 the absence of Mr. Barstow tomorrow at one o'clock.
16 Mr. Barstow, who we had earlier advised, would not
17 be available.

18 MR. GOODHOPE: Can you put Mr. Phelps on
19 tomorrow at one 'clock?

20 MS. MULKEY: Yes, sir.

21 MR. GOODHOPE: All right.

22 MR. LEWALD: I might just add that Mr.
23 Bourcier, who is the sponsor in the need for forecast,
24 has also responded to interrogatories, but I have
25 given, he gave the same testimony before the DPU 19494,

1 and it was extensive interrogations for five days,
2 I believe. Five days were spent, I believe, by the
3 various intervenors examining Mr. Bourcier, and all
4 of the, so far as I can tell, all of the materials
5 that came forward in that area to which the Common-
6 wealth was a part, were resubmitted here as inter-
7 rogatories.

8 MR. GOODHOPE: He is a member of Panel 1?

9 MR. LEWALD: Yes. He is distinctly needed.
10 He is not connected with the new study at Boston
11 Edison, and he would, essentially, be giving the same
12 testimony that he gave before the DPU.

13 MR. GOODHOPE: Can you have him here
14 Wednesday morning?

15 MR. LEWALD: He can be here tomorrow.

16 MR. GOODHOPE: What?

17 MR. LEWALD: Tomorrow.

18 MR. GOODHOPE: Well, then, you said that
19 someone from the panel would be missing tomorrow?

20 MR. LEWALD: Mr. Barstow would be missing.

21 MR. GOODHOPE: What is the problem there?

22 MR. LEWALD: Mr. Barstow-- we moved around
23 the scheduled time for beginning this need for his
24 testimony and when we went back to Mr. Barstow with
25 the new schedule we found out that he had prior

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1 commitments and at that time it was too late to change
2 it and so we had asked to have, have it deferred in
3 his individual case.

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1 DR. COLE: When did you say Mr. Buckley
2 would be available?

3 MR. LEWALD: He would be available two
4 weeks from today.

5 DR. COLE: All right.

6 MR. GOODHOPE: All right. Well, what we
7 will do is go ahead with the NRC witnesses tomorrow
8 at 1:00 o'clock, unless something comes up, unexpected
9 comes up, and we will not be able to go ahead.

10 We will all reconvene here, if nothing
11 goes awry, at 1 o'clock tomorrow, and if something
12 does, try to get a hold of us on Wednesday morning,
13 we will go ahead with your Panel No. 1; right?

14 MR. LEWALD: All right.

15 MR. GOODHOPE: When we finish with the
16 Panel No. 1, we will go ahead with the Massachusetts
17 witnesses.

18 MR. SELGRADE: There is the Office of
19 Energy Resource with their single witness on Wednesday.

20 MR. GOODHOPE: You will have him here?

21 MR. SELGRADE: We will.

22 MR. GOODHOPE: On Wednesday. Well, the
23 question is, we will try to work him in on
24 Wednesday. It may not be possible, and can he give
25 you Thursday too?

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1 MR. SELGRADE: Well, under our original
2 understanding, he would have preceeded the
3 Commonwealth's witnesses and now I wonder if the
4 Commonwealth would go ahead with that.

5 MR. GOODHOPE: So, we'll end up Wednesday.
6 Have him here Wednesday and we will try to dispose
7 of him Wednesday and we will try to break up the
8 Commonwealth's witnesses on Thursday and possibly
9 get to him Wednesday afternoon.

10 We may have to continue late until Thursday
11 if we cannot get to him on Wednesday.

12 MR. SELGRADE: He could be available
13 Wednesday or Thursday, but I'm just trying to -- he
14 has a problem by coming and specifying one of the two
15 days.

16 MR. GOODHOPE: Well, let's try to dispose
17 of him Wednesday.

18 MS. MULKEY: One further question.

19 MR. GOODHOPE: Yes.

20 MS. MULKEY: In the event that Dr. Phelp
21 has not completed the cross examination -- the cross
22 examination of Dr. Phelp is not completed tomorrow,
23 do you anticipate that he will be interrupted and
24 then completed at the end of the week?

25 MR. GOODHOPE: Well, since we're not going

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1 to start until 1:00 o'clock tomorrow, we'll probably
2 go on late tomorrow if we have to. I would like to
3 complete his testimony.

4 I am not for going late, but I will run
5 over an hour if we can complete a witness and have
6 him done.

7 MS. MULKEY: At least I should clarify,
8 briefly, that one statement is that while we do have
9 some sympathy with the Commonwealth's problem
10 regarding response to interrogatories, I would
11 stress, came from being in front this morning, of
12 the desire on the part of the Commonwealth to
13 interrupt what has been a schedule suggested by the
14 Commonwealth.

15 MR. GOODHOPE: I agree. He has had a
16 short time. I think he has got people working on it.
17 They have had today and tonight, and they will have
18 tomorrow. I expect them to be in on Wednesday of this
19 week.

20 Now, is there anything further this
21 afternoon?

22 MR. MEYER: Yes. There is one matter
23 relevant to another issue.

24 We have copies of Commonwealth Exhibit No. 9,
25 which comes from the earlier portion of the Hearing,

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1 and I would offer these copies of 109 for the record.

2 Now, I believe it is already in the record,
3 but the copies simply were not supplied.

4 MR. GOODHOPE: Yes, that was on the issue
5 of alternate sites and we had some problems with that.

6 What is the Exhibit number?

7 MR. MEYER: It is Commonwealth 109, and
8 for the purpose of the record, it is a topographical
9 map entitled, "Onset Quadrangle Massachusetts 7.5
10 Minutes Series Topographic," and is published by
11 the United States Department of Geological Survey.

12 MR. GOODHOPE: All right, that was the exhibit
13 number -- What was it?

14 MR. MEYER: It is Commonwealth Exhibit
15 No. 109.

16 MR. GOODHOPE: And this was received into
17 evidence?

18 MR. MEYER: That is my understanding, yes,
19 and these are merely record copies.

20 MR. GOODHOPE: What?

21 MR. MEYER: These are merely record copies.

22 MR. GOODHOPE: Let the record show that
23 the exhibit that Mr. Meyer would be substituted into
24 the official record as the record copies.

25 MR. MEYER: Thank you.

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1 MR. GOODHOPE: Is there anything else?

2 (No response.)

3 MR. GOODHOPE: All right, we will then
4 adjourn until tomorrow afternoon at 1:00 o'clock.

5 (Whereupon the hearing was adjourned.)
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