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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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GENERAL PUBLIC UTILITIES CORPORATION, :
JERSEY CENTRAL POWER & LIGHT COMPANY, :
METROPOLITAN EDISON COMPANY and :
PENNSYLVANIA ELECTRIC COMPANY, :

Plaintiffs, : 80 CIV. 1683
: (R.O.)

-against-

THE BABCOCK & WILCOX COMPANY and :
J. RAY McDERMOTT & CO., INC., :

Defendants. :

- - - - -x

Deposition of General Public Utilities
Corporation by ROBERT W. KEATEN, taken by
Defendants, pursuant to notice, at the offices
of Davis Polk & Wardwell, Esqs., One Chase
Manhattan Plaza, New York, New York, on Monday,
January 4, 1982 at 1:30 o'clock in the afternoon,
before Joseph R. Danyo, a Shorthand Reporter and
Notary Public within and for the State of New
York.

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PDR ADOCK 05000289
T PDR

WALTER SHAPIRO, C.S.R.
CHARLES SHAPIRO, C.S.R.

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of Counsel

Also Present:

NINA RUFFINI

-oOo-

IT IS HEREBY STIPULATED AND AGREED by and
between the attorneys for the respective parties
hereto that the sealing, filing and certification
of the transcript of the within deposition be,
and the same hereby are, waived; that the
transcript may be signed before any Notary
Public with the same force and effect as if

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signed before the Court.

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R O B E R T W. K E A T E N, having

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been first duly sworn by the Notary Public

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(Joseph R. Danyo), was examined and testified

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as follows:

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EXAMINATION BY MR. WISE:

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Q If you would for the record, state your

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full name and current business address.

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A My name is Robert W. Keaten. Business

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address is GPU, 100 Interpace Parkway, Parsippany,

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New Jersey.

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Q What is your residence address?

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A 45 Long Ridge Road, Dover, New Jersey.

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Q Do you have any idea about how far that

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is from New York City? Is it more or less than a

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hundred miles?

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A Less than a hundred miles.

25

Q I take it you are currently employed by

General Public Utilities or one of its affiliates?

A That's correct.

Q Which corporate entity are you employed by?

A I believe it is now true that I am employed by GPU Nuclear Corporation.

Q Do you know when GPU Nuclear Corporation was formed?

A Very recently. I don't know the exact date.

Q Prior to GPU Nuclear Corporation, do you know what other entities within the GPU system you have been employed by?

A I was employed by the GPU Service Corporation.

Q When did your employment with them commence?

A In the spring of 1978.

Q Was that the first GPU-related company for which you worked?

A Yes, it is.

Q And you worked at GPU Service until that, through whatever corporate reorganization, became GPU Nuclear, is that correct?

A It is not quite correct that GPU Service Corporation became GPU Nuclear. It is rather true that GPU Nuclear was a new corporation which some of the

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2 previous GPU Service Company employees became employed
3 by.

4 Q In any event, your affiliation with GPU
5 has been either through GPU Service Corporation or GPU
6 Nuclear?

7 A That's correct.

8 Q Who now is the head of GPU Nuclear?

9 A Robert C. Arnold.

10 Q To whom do you report at GPU Nuclear?

11 A I report to Richard F. Wilson.

12 Q To whom does Mr. Wilson report?

13 A He reports to the Office of the President,
14 which includes Mr. Arnold.

15 Q Who else is in that office?

16 A Mr. Philip R. Clark, who is the executive
17 vice President.

18 Q Is this the first time that you have given
19 sworn testimony?

20 A No.

21 Q When before have you testified?

22 MR. GLASSMAN: In this case or in relation--

23 MR. WISE: I know this is the first time
24 he's given it in this case.

25 Q How many times have you testified? If they

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2 are irrelevant, we won't go into them.

3 A Most recently, sworn testimony at the TMI-1
4 restart hearings. Prior to that, a sworn deposition in
5 the GPU lawsuit with Exxon Corporation. That is all
6 since I have been with GPU.

7 Q Did you give testimony to the President's
8 Commission investigating the accident at Three Mile
9 Island?

10 A Thank you. Allow me to correct my answer.
11 I did not give sworn testimony. Let me
12 correct that. I have lost track. I don't remember
13 whether I gav sworn testimony to the President's
14 Commission, but I certainly did give sworn testimony
15 to the Nuclear Regulatory Commission as part of their
16 investigation of the accident.

17 Q Are you speaking now of the so-called
18 Special Inquiry Group?

19 A No, I am referring to the NRC I&E
20 investigation.

21 Q Do you recall also whether you gave
22 testimony, whether sworn or unsworn, to the NRC
23 Special Inquiry Group, the so-called Rogovin Commission?

24 A I don't recall. I gave two sworn pieces of
25 testimony.

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Q Let me ask you if you remember giving a deposition in October 197- -- I can't read the last figure on this. October 10, 1979. I say that, although the copy of the transcript I have has the last digit cut off, but the 7 is there -- before three fellows from the NRC Special Inquiry Group, Mr. Harnett, Mr. Schierling, Dennis Allison, and Barry Horvick?

A I remember giving a deposition at about that time. Those names sound vaguely familiar.

Q We may a little bit later in the deposition have occasion to show you some parts of that transcript.

I also have a transcript which indicates that you were interviewed on June 1, 1979 by a Mr. Marsh and a Mr. Fasano of the Nuclear Regulatory Commission, who appear from the transcript of the session to be members of the NRC's I&E staff. Does that help refresh your recollection as to that interview?

A Yes, I recall the interview in question. It was the one I had earlier referred to.

Q Do you recall one way or the other as to whether or not you were given an oath before that interview?

A I don't recall.

Q Did you give any testimony before any

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2 Congressional Committee with respect to the Three Mile
3 Island accident?

4 A No, I did not.

5 Q Let me go back to the GPU/Exxon suit. What
6 was the subject of your testimony in that lawsuit
7 generally?

8 A Generally, having to do with documents
9 related to the question of whether or not there was a
10 valid contract in existence between Jersey Central and
11 Exxon with respect to the supply of nuclear fuel for the
12 Oyster Creek station.

13 Q Have you personally participated in any
14 of the negotiations of the contract that was in issue?

15 A No.

16 Q Generally, what was your relationship to
17 the contract dispute that you have just described?

18 A Practically nonexistent. My deposition was
19 taken I believe because I had received copies of
20 certain documents that were of interest in the case.

21 Q Had you participated in any conversations,
22 either internally at GPU or with outsiders such as
23 Exxon, concerning contract terms for the purchase of
24 nuclear fuel?

25 A Not that I recall, other than some

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2 conversations with respect to the lawsuit itself.

3 Q Did you have any participation in connection
4 with that lawsuit in conversations concerning any
5 clauses in the purported Exxon/GPU, or whichever
6 subsidiary it was, contract relating to limitation or
7 exculpation of damages?

8 MR. GLASSMAN: You are talking about other
9 than conversations with counsel, if any?

10 MR. WISE: Yes.

11 A Not that I recall.

12 Q We have a resume which your counsel has
13 provided us with this afternoon, and I would like to
14 have that marked as B&W Exhibit 335.

15 (Resume was marked B&W Exhibit 335 for
16 identification, as of this date.)

17 Q If you would take a look at B&W Exhibit
18 335, which appears to be a resume for you, and tell us
19 if that generally accurately reflects your educational
20 background and work experience.

21 A Yes, I believe it generally does.

22 Q I also have a resume which I believe was
23 submitted by you or on your behalf in connection with
24 your testimony before the ASLB in the matter of TMI-1
25 restart which I would like to have marked as B&W

Exhibit 336.

(Resume was marked B&W Exhibit 336 for identification, as of this date.)

Q Have you seen B&W 336 before?

A Yes, I believe I have.

Q Do you know who prepared it?

A Yes, I did.

Q You did?

A Yes.

Q Was this in fact submitted on your behalf in connection with the TMI-1 restart hearings before the ASLB?

A I believe it was, yes.

Q Is it accurate, to the best of your knowledge and information?

A I believe that it is, except that my current title is different than shown here.

Q When did you assume your current title, which I note from B&W 335 is listed as Director, Systems Engineering (1981-present)?

A At the beginning of 1981.

Q How did that position differ from your earlier position as Manager, Systems Engineering, which you held from 1978 to 1980, according to B&W 335?

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A My present position includes a somewhat expanded organization compared to the earlier one.

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Q How does it differ?

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A It has additional organizational units and some additional responsibilities.

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Q We may want to come back to that and define that more fully.

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Let me first go back, if you will, in time to your educational experience. Both resumes, 335 and 336, indicated that you graduated with a BS in physics from Yale University in 1957. I also understand from B&W 336 that you had postgraduate and professional courses in mathematics, engineering and business taken at UCLA between 1960 and 1972.

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I assume you were not at UCLA full time during those 12 years?

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A That's correct.

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Q Could you tell us what courses you took, if any, were in the degree program, if you received any degrees, and if so, the approximate time periods associated with that work?

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A I did not receive additional degrees.

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Q Perhaps you could tell us then what specifically these courses that you took were in

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A These were largely evening courses taken to further my professional development. They included courses in mathematics, electronics, control systems theory, engineering materials, and then some business and management courses.

Q Approximately how many courses overall did you take during this period 1960 to 1972? Are we talking something of one or two or a dozen or maybe 20?

A To the best of my memory, I would say about a dozen.

Q These were all taught at UCLA, I take it.

A At one of the campuses of UCLA, yes.

Q Your resumes show that you worked from 1957 to 1959 at Du Pont with the Savannah River plant. What was the Savannah River Plant?

A Savannah River plant is an installation which produces nuclear materials for the military.

Q Is that located in Georgia?

A No, it is in South Carolina.

Q What was your title during that time, if you can recall?

A I believe it was Reactor Physicist.

MR. GLASSMAN: Off the record.

(Discussion off the record)

Q During the time you were with Du Pont, did you have any connection with the use of nuclear power to produce electricity, generate electricity?

A No.

Q Your next employment listed on the resume is with Atomics International between 1959 and 1965. What business was Atomics International in?

A Atomics International was involved in a variety of nuclear and nonnuclear programs, many of which were related to the use of nuclear power to produce electricity.

Q Atomics International is a division of Rockwell?

A At that time, it was a division of North American Aviation.

Q Did it at some later time become a division of Rockwell?

A As a result of the merger between Rockwell and North American Aviation, it became a division of originally North American Rockwell and subsequently Rockwell International.

Q Did that reactor ever actually produce or generate electricity?

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A Yes.

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Q Where was it located?

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A In the Santa Susana Mountains just outside

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Los Angeles, California.

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Q The next item on your resume is an

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employment with the Halden Reactor Project. Who or what

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company ran that program?

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A The program was run by the Norwegian

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Atomic Energy Agency, but the project was an

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international project and was funded by the various

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participants.

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Q What exactly did you do in connection with

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that?

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A I was the American representative to the

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project and so I both participated in the research

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activities that were being carried out in the project

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and also served as the liaison for information flow

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between the project and interested people in the United

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States.

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I should also clarify that during this

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period of time I continued to be an employee of Atomics

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International.

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Q What exactly was the Halden Reactor Project?

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Was that actually a plant or experimental work or

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perhaps you can describe for us just what it is we are talking about.

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A The project centered around a boiling heavy water reactor which was located in Halden, and the project emphasized the use of the reactor in performing experiments on various items of interest to nuclear power such as the irradiation of test fuel assemblies, development of in-core instrumentation, and so forth.

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Q Who had constructed the reactor, if you know? Perhaps "constructed" is the wrong word. "Designed" might be the better terminology.

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A It was done under the auspices of the Norwegian Atomic Energy Agency, and I don't know the details.

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Q In other words, it would not be as simple as saying it was a GE-designed piece of equipment or B&W-designed piece of equipment or some other company that we may be familiar with in this country?

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MR. GLASSMAN: If you know.

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A I certainly know it was not a standard product line of one of the U.S. nuclear vendors.

Q But you are not familiar with exactly who the nuclear vendor was and what design it may have used or employed?

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A I am not sure.

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Q Do you know whether that project was ever intended to be commercial?

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MR. GLASSMAN: Objection insofar as it seeks his knowledge of the intent of somebody else. He can answer.

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A I don't know what the original intent was. It was commercial in the sense that it supplied steam generated from the nuclear reactor for use in a paper factory across the road.

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Q While you were there, it did not actually generate electricity for electrical power needs of Norway or anywhere else?

A That's correct.

Q You said that you were involved in or the project included some work on in-core instrumentation. Did that include in-core thermocouples?

A I frankly don't remember. Certainly the emphasis on the type of instruments being developed and used was not on development of thermocouples.

Q What kind of in-core instruments were being studied?

A There were flow meters for individual fuel assemblies which were used as part of the irradiation

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2 of test fuel assemblies. There were small in-core
3 neutron detectors. Those are the principal ones I
4 remember.

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Q What purpose would the flow meters serve?

What would they tell the operator that the operator
would want to know?

MR. GLASSMAN: What did they tell them?

MR. WISE: What were they designed to tell
them or from the standpoint of how the experiments
worked out, if they worked, what did they tell
them?

MR. GLASSMAN: As long as we get his
testimony as to what he recalls, not what he
speculates.

A The flow meters were directed primarily
for use by the experimenters rather than by the reactor
operators. They were used to study phenomena such as
flow instabilities in the boiling heavy water reactor.

Q With respect to the in-core neutron
detectors that you mentioned, what purpose would that
instrumentation serve?

A Again, it was directed toward the
experiments rather than toward the operators, and as I
remember, they were used to characterize the amount of

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irradiation that a test fuel assembly would receive.

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Q Was any of that instrumentation used to help the operators determine the condition of the core?

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A I don't know.

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Q During your time at the Halden Reactor Project, did you at any point take up the study of in-core instrumentation as it related to operator control of the reactor?

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A To the best of my memory, I did not.

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Q Do you know whether anyone in that project was concentrating on that issue?

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A I believe there was some work of that type, but I don't remember any of the details.

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Q Do you recall, for instance, who within the project was interested in that?

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A No.

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Q Do you recall whether any interest that there may have been resulted in any papers or information that was provided to you?

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A I mentioned earlier that one of the research projects at Halden involved the application of digital computers to nuclear reactors. It may be that some of the signals that were used in that research were from in-core detectors, and I did receive some

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information on that subject.

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Q Do you have any recollection of the specifics at this point?

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A No, I do not.

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Q The next item on your resume indicates that you went back to Atomics International, where you held two positions between the years 1969 and 1978. The first is listed as Manager, Safety Analysis for Fast Breeder Reactor Program. What years did you hold that work responsibility?

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A Let me first clarify that I don't remember the exact title, and in fact, during the time frame being discussed here, the title changed at least once. In your Exhibit 336, the title is listed as Manager of Systems Engineering, which is also possible. I just don't remember. In any event, that position or series of positions was held from 1968 until I believe sometime in 1974.

Q From what sources, as best you recall, was Exhibit 336 prepared?

A I believe it was prepared from earlier resumes that I had.

Q Do you recall about when 336 was prepared?
A year ago, two years ago?

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2 A I believe it was about a year and a half
3 ago.

4 Q Did you have available to you at the time
5 that you prepared 336 other resumes and information
6 which you believed at the time accurately reflected
7 the various positions that you had held with previous
8 employers?

9 A As I said, I had available at least one
10 earlier resume, but I don't remember whether that
11 earlier resume had this title.

12 Q I am just trying to establish whether we
13 can rely upon the accuracy of Exhibit 336 and to what
14 extent we can.

15 To the extent it was prepared from
16 information that you had available to you then which
17 may either not be available here or may be more than
18 when 335 was prepared, can we rely on in effect 336
19 as being more accurate?

20 MR. GLASSMAN: You would like Mr. Keaten's
21 current understanding?

22 MR. WISE: Yes.

23 A I believe that 336 in general accurately
24 reflects my resume except as I mentioned, I have
25 reservations about that specific title, and I do

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remember it changed at least once.

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Q On Exhibit 336, the entry for 1968 to 1974 which we have been discussing indicates that you were responsible for the performance of safety analyses, the development of safety criteria and the development of instrumentation control and safety systems design.

Did you have a staff assisting you in carrying out those responsibilities?

MR. GLASSMAN: The particular paragraph counsel is reading from relates to work in the Light Metal Fast Breeder Reactor Program.

MR. WISE: That's correct.

A Before I answer your question, I noted a typographical error on that, and instead of "Light Metal," it should say "Liquid Metal."

Q Would you like the question reread?

A I remember the question.

The answer is yes.

Q How many people did you have working for you at that time?

A Reporting to me, there were a variable number that went, as best I can remember, from a half dozen to maybe 15 to 20.

Q What was the Liquid Metal Fast Breeder

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Reactor Program?

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A This entry in my resume is really a shorthand entry for what happened during that period.

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When I returned from Norway, the Atomics International Liquid Metal Fast Breeder Reactor Program consisted of in part a joint effort with General Public Utilities, looking at the design of a possible commercial fast breeder, in part was a company-funded program directed at the same goal, and in part was certain programs that were being performed for then it was the Atomic Energy Commission.

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Then I believe it was about 1971 or 1972, the contract for the Clinch River breeder reactor was awarded to Westinghouse with Atomics International as one of the principal subcontractors, and this program at that point in time shifted over to work on those portions of the Clinch River project that were within the Atomics International scope.

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Q Who at GPU was working on this project during the period of time that GPU was interested in that?

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A The program as I understand it fell under the general responsibility of Bill Hirst of GPU, but we had interactions with other GPU employees as well.

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Q Did you work at all with any of the operating subsidiaries of the GPU system?

A We had a GPU representative at Atomics International who was from Jersey Central.

Q Did you have anyone from Met Ed, as best you can recall?

A Not stationed at Atomics International, no.

Q Do you recall whether anyone from Met Ed participated in the work that you were doing?

A I do not recall any such participation, with one possible exception. The site which was being discussed for the reactor was I believe within the Met Ed territory. I went to the town close to that site on one occasion to give a general talk on fast breeder reactors to the local people who were interested, and I believe I may have met someone from Metropolitan Edison as part of that trip.

Q Was that anywhere near the Three Mile Island site?

A Not particularly. It was up above Scranton, Pennsylvania.

Q Let me ask a question, going to the next item on your resume, just to see whether for convenience sake we should combine our discussion of the Liquid

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2 Metal Fast Breeder Reactor Program with your next
3 position.

4 The resume that has been marked as Exhibit
5 336 indicates that from 1974 to 1978 you were the
6 Program Manager for, it reads "Light" but I believe it
7 should be Liquid Metal Fast Breeder Reactor Technology
8 at Atomics International, and your responsibilities
9 included research and development programs, performed
10 for the U. S. Department of Energy, including programs
11 in reactor physics, safety, and component development.

12 Was that a continuation of the work that
13 you have just described done on the Liquid Metal Fast
14 Breeder Reactor Program that was developing into the
15 Clinch River Reactor, or was that something new or
16 different?

17 A It was something new for me, although
18 obviously there was a close relationship. These
19 programs, the technology programs, were those which
20 for the most part were not specifically associated
21 with the Clinch River project, but for the most part
22 were more general technology programs.

23 Q Let me go back then to the Clinch River
24 project and its predecessor, the work you were doing
25 at Atomics International in part for GPU. I take it

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2 that the idea there was the development of a commercial
3 plant?

4 A That's correct.

5 Q That would require licensing by the NRC
6 or as it may have then been called, the Atomic Energy
7 Commission?

8 A That's correct.

9 Q Were you in any way involved in the
10 consideration of the licensing of such a plant?

11 A Yes, I was.

12 Q That last question may have been inartfully
13 phrased. Perhaps you can describe how your job
14 related to the licensing process for the Clinch River
15 plant as it came to be known.

16 A For the Clinch River plant, Westinghouse
17 had the lead with respect to the licensing activities,
18 and the Atomics International role was really
19 restricted to providing certain types of information
20 needed to support the licensing. I was involved, as
21 I remember, in coordinating the Atomics International
22 activity in this regard, but I would not say that that
23 was a very substantial part of the total licensing
24 process for Clinch River.

25 Q Perhaps let me get at it this way.

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During your work, 1968 to 1974, on the Liquid Metal Fast Breeder Reactor Program, would it have been part of your responsibilities to become familiar with the NRC's licensing criteria or general design criteria such as they were at the time?

A Yes.

Q And you would have been familiar with those?

A Yes.

Q During the performance of your duties in that time period, would you have occasion to use those design criteria on your work?

A Yes.

Q The resume says "Responsible for performance of safety analyses." Could you describe in more detail what specifically was your responsibility for the performance of safety analyses?

(Recess taken)

(Record read)

A The work on safety analyses during this period really occurred as part of the earlier AI program in which GPU participated rather than the later work on the Clinch River project. I was manager of the group which was responsible for all of the safety work, but the work was performed in two different fashions.

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2 Certain of the work was performed by those
3 people who worked directly for me. This work tended
4 to be the development of safety criteria, performing
5 scoping type analyses, whereas the more involved type
6 of safety analyses using elaborate computer codes, for
7 example, was done for me or engineers reporting to
8 me, but was performed by a different portion of the
9 organization, so in that sense, we were functioning as
10 a matrix organization, and some of the work we did
11 ourselves and some of the work we went to other portions
12 of the organization to get done for us.

13 Q Would I be correct that you and your staff
14 were not the ones who within the Atomics International
15 organization would be familiar with computer modeling
16 and performance of analyses on the computer for safety
17 purposes? If I haven't put that quite right, please
18 feel free to put it in your own words.

19 A What you said is partially correct. There
20 were certain types of computer modeling and computer
21 analyses related to plant transient behavior which were
22 done by people reporting directly to me, and there
23 were other types which were done by other parts of the
24 organization.

25 Q What was the distinction, as best you can

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2 put it without getting too technical, between those
3 sorts of things which your organization would handle
4 and those which you would go outside for?

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A In summary fashion, people working for me
6 worked with computer models of what I might describe
7 as anticipated transients, whereas in fast breeder
8 reactors, a great deal of the safety analyses consider
9 situations which are more damaging to the system than
10 has classically been treated in water reactor safety
11 analyses, and these kinds of calculations and models
12 which are very complicated were done by a different
13 part of the organization.

14

Q You mentioned earlier something called
15 scoping analysis. What is meant by a scoping analysis?

16

A I used the term to mean a very simple type
17 of analysis or calculation that is used to get some
18 idea of the magnitude of a problem or some idea of the
19 possible result.

20

Q Was there at this time we have been talking
21 about a generally understood definition of the term
22 "anticipated transients"?

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MR. GLASSMAN: Understood by whom?

24

Q Was that in effect a term of art which had
25 a technical meaning within the industry that you were

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2 aware of?

3 MR. GLASSMAN: I am not sure I understand
4 the question. Are you asking whether Mr. Keaten
5 understands an industry meaning or are you asking
6 for his own understanding?

7 MR. WISE: I am asking whether he understood
8 the term "anticipated transients" to be a term
9 of art used in the industry, and in particular
10 with respect to safety analyses and any licensing
11 criteria that might be relevant to those analyses.

12 A I am not sure that that term was generally
13 used in the industry.

14 Q Let me ask if you are familiar with the term
15 "anticipated operating occurrence."

16 A Yes, I am.

17 Q Do you understand that to be a term that
18 has significance within the industry?

19 A Yes, I do.

20 Q Isn't it correct that that is used in
21 connection with the licensing criteria for plants?

22 MR. GLASSMAN: You are talking about today?

23 MR. WISE: Today and throughout the 1970's
24 as plants were being designed.

25 A Yes, it is used as part of the licensing

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2 process.

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Q With respect to the safety analysis work that you were doing at Atomics International during the period 1968 to whenever it was that it went into the Clinch River program, did you understand the term "anticipated operating occurrences" to have that significance in connection with the licensing criteria?

A At some point in that time, yes.

Q What was your understanding of the definition of "anticipated operating occurrence"?

MR. GLASSMAN: If you recall.

MR. WISE: All of my questions may be premised with the general instruction that we are looking only for your recollection such as it may be today.

A To the best of my memory, during the time frame in question, there was considerable discussion as to just exactly what that term meant.

Q Did you form any judgment or opinion for the performance of your work as to what the term "anticipated operating occurrence" meant?

MR. GLASSMAN: Objection. You are asking for his judgment or opinion if you ask him if he had a personal understanding which he

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2 communicated to anyone, that is a more
3 appropriate line of questioning.

4 MR. WISE: I think it is a fair question.
5 If the witness wants to put his answer in his own
6 words, he is free to do so.

7 A During the time frame that we are
8 discussing, my best recollection is that we defined
9 for the reactor concepts we were studying categories of
10 transients which were based upon the probability of
11 their occurrence. My recollection is that these did
12 not bear a one-to-one correspondence with anticipated
13 operational occurrences, although the general concept
14 was the same.

15 Q In other words, there might be occurrences
16 with a high probability of happening that would be
17 anticipated operating occurrences, and there might be
18 ones that would not? I am just trying to understand
19 your previous answer as to what you meant by a
20 one-to-one correspondence. I guess I was thinking you
21 meant that the probability of an occurrence, while it
22 bore some relationship as to whether it was an
23 anticipated operating occurrence, would not necessarily
24 always dictate that particular event would be classified
25 one way or the other.

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2 A You are testing my recollection, but the
3 best of my memory is that as we at Atomics
4 International were working on our breeder concepts. In
5 this time frame we are discussing, we had three
6 categories which taken together covered the two
7 categories as they are in the water reactor criteria
8 of anticipated operational occurrences and postulated
9 accidents, so that our highest probability category
10 encompassed some but not necessarily all of the
11 anticipated operational occurrences. Some of the
12 anticipated operational occurrences might have fallen
13 in our second category.

14 Q What was your second category?

15 A I don't remember the names we used. In
16 fact, I am not even sure they had names. But they
17 were grouped according to the probability of occurrence,
18 as are the names that are used in water reactor
19 criteria.

20 Q With respect to the safety analysis work
21 that you did during this 1968, early 1970's time
22 period, did any of that result, to your knowledge, in
23 the submission of a preliminary or final safety
24 analysis report?

25 A Submission to?

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Q To the NRC or its predecessor agency.

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A We submitted a report to the NRC, but it was not a preliminary safety analysis report or final safety analysis report.

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Q That is because there was no specific plant involved, I take it.

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A It was rather because it was too early in the design phase to have all the information that would be needed even for a preliminary safety analysis report, so this was sort of a prepreliminary safety analysis report.

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Q To your knowledge, what happened to GPU's interest in the Liquid Metal Fast Breeder Reactor Program?

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A It is my understanding that GPU concluded that that program was too developmental in nature for GPU to be interested in constructing a commercial liquid metal fast breeder reactor.

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Q Do you know about when they dropped it?

A I believe it was about 1972.

Q Do you know whether any work had been done

within GPU towards obtaining a construction permit?

I am just trying to get a sense of how far they went with the program before they stopped.

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A There was, as I indicated, a site that was tentatively selected, although it is my understanding that that was selected to be usable either for a fast breeder or for a light water reactor. GPU cooperated with us in providing some preliminary site data to the Nuclear Regulatory Commission, or I guess it would be the AEC in that time frame, as part of the report I referred to, but again not the level of information that would be needed for a construction permit.

Q The next item on your resume is Program Manager as we discussed for the liquid metal fast breeder reactor technology, which included research and development programs performed for the U. S. Department of Energy in reactor physics, safety, and component development.

How did this differ from your earlier work on liquid metal fast breeder reactors?

A The work I was involved in from 1968 to 1974 was work related to a specific project, earlier, the work on the AI concept of a fast breeder reactor and then later on the Clinch River project, whereas the technology programs for the most part were not directed toward a specific project, but were rather general development type of research work.

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Q Were you still doing safety analyses?

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A There was still safety work, but it was of a different type and was mostly research rather than analytical.

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Q Your resume shows, and you earlier testified today that you joined GPU Service Corporation in 1978, which would be the next employment following your work in liquid metal fast breeder reactor technology for Atomics International.

11

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What was your reason for leaving Atomics International and joining GPU?

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A I was offered what I felt was an attractive position at GPU and, frankly, I was concerned about the future of the Liquid Metal Fast Breeder Reactor Program.

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Q Your resume states that your initial position at GPU Service Corporation was Manager, Systems Engineering Department. It also says that you were responsible for the development and application of specialized analytical skills in such areas as nuclear core reloads and fuel management, plant dynamic and safety analysis, system generating plant process computers, control and safety systems analysis and analysis of plant operating performance for nuclear

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2 and fossil plants. Perhaps we could begin by asking
3 what your responsibilities, initial responsibilities
4 were, upon your arrival at GPU and the assumption of
5 the position of Manager, Systems Engineering Department.

6 A Again, this resume was intended as a broad
7 picture and does not give every detail. When I first
8 arrived at GPU, my position as I recall it was called
9 Manager of Engineering Projects with responsibilities
10 quite different from what is shown on the resume. As
11 Manager of Engineering Projects, I was responsible
12 for the project activities related to the Forked River
13 Nuclear Station Seward-7, which is a large fossil-fired
14 station.

15 In addition, I was responsible for
16 developing a new section called Preliminary Engineering,
17 which was intended to perform some of the conceptual
18 engineering in house for the next coal-fired station.

19 Q Do you remember about when in 1978 you
20 joined GPU?

21 A It was March or April.

22 Q Your resume indicates April 1978. Is that
23 basically consistent with your recollection?

24 A Either late March or April.

25 Q How long did you continue as Manager of

1
2 Engineering Projects performing the responsibilities
3 you just outlined?

4 A Officially until October 1st, 1978.

5 Q Was there something unofficial?

6 A Yes. There was a reorganization pending,
7 and I started assuming some of the duties associated
8 with my new position prior to October 1st.

9 Q What was the next position?

10 A The next position was as listed here,
11 Manager of Systems Engineering, although the
12 responsibilities listed here are as they were about the
13 summer of 1980.

14 Q We'll take them in order. Why don't we go
15 back to the time that you began performing as Manager
16 of Systems Engineering. First let me ask when that
17 was, approximately.

18 A The position became effective October 1st.
19 I would say I was doing some activities which were
20 relevant to the new position for maybe a couple of
21 months prior to that time.

22 Q Sometime during the summer of 1978?

23 A Yes.

24 Q Let me go back before we go forward with
25 that to your initial period, managing project

1
2 activities, particularly for Forked River. That was
3 to be a nuclear plant, was it not?

4 A That's correct.

5 Q Is it correct that GPU had sought bids from
6 nuclear vendors with respect to that plant?

7 A I don't know.

8 Q Were you in any way involved with the
9 preparation of specifications for the proposed Forked
10 River plant?

11 A No.

12 Q Do you know whether it had already been put
13 out for bid at the time you arrived?

14 A Yes, I do know, and it not only had been
15 put out for bid, but an NSS vendor and architect-
16 engineer had been selected prior to the time I arrived.

17 Q Who was the selected NSS vendor?

18 A Combustion Engineering.

19 Q And who was the architect-engineer?

20 A Burns & Roe.

21 Q Seward-7 as you mentioned was to be a
22 fossil plant. Are you aware of who the vendor for the
23 steam supply equipment was to be for that unit? Was
24 that the one that B&W had been selected for?

25 A I think so.

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Q I think there were a number of them, and my recollection is hazy as to whether it was Seward-7 or one of the others. I was just curious if that was the one B&W had been selected for.

A It has been too long. I think so.

Q Other than project activities related to Forked River, Seward-7, and the new section to perform in-house work for the next coal-fired station, did you have any involvement with the operating nuclear plants in the GPU system during the period April 1978 when you arrived up through the time that you began performing the functions of Manager, Systems Engineering?

A Yes.

Q Let's establish what nuclear stations were in the GPU system at that time. This is April through the summer of 1978. My understanding is that there was Oyster Creek owned by JCP&L. That was a GE nuclear steam supply system. There was TMI-1 and TMI-2, both of which employed a B&W nuclear steam supply system. Those two units were operated as I understand it by Met Ed.

First let me ask you, does that comport with your understanding?

A Yes, with one exception. Oyster Creek was

1
2 operated by Jersey Central. I am not sure just how
3 the ownership is.

4 Q Are you aware of any other nuclear plants
5 owned or operated within the GPU system in the spring
6 or early summer of 1978?

7 A Not active nuclear plants, no.

8 Q Were there inactive plants?

9 A Yes, the Saxton facility.

10 Q What knowledge or involvement did you have
11 concerning Saxton?

12 A None.

13 Q Have you ever had occasion to do any work
14 concerning or involving the Saxton reactor?

15 A No.

16 Q Did you ever hear from anyone what the
17 purpose of the Saxton reactor had been?

18 A Yes, I believe so.

19 Q What did you hear or learn?

20 A I believe I was told that its purpose or
21 one of its purposes was to gain experience which would
22 be useful for future, larger commercial nuclear plants.

23 Q Was Saxton a pressurized water reactor,
24 to the best of your knowledge?

25 A I believe that it was.

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Q Are you aware that it employed a Westinghouse design?

A I believe I have been told that, yes.

Q Have you ever heard or learned what use, if any, has been made within the GPU system of knowledge gained from the Saxton reactor?

A Not to the best of my recollection.

Q In particular, do you know whether anything learned at the Saxton reactor was ever used in training of operators within the GPU system?

A I don't know.

Q Do you know whether any analyses were performed of transients that had occurred at Saxton?

A I don't know.

Q Do you know whether any use was made of operating experience generally that had taken place at Saxton?

A Generally, I don't know. I do know that the representative from GPU who was stationed at Atomics International had previously been at Saxton, and I believe some of his experiences there were factored into comments that he made on the fast breeder program.

Q Have you ever become aware of any system or program within the GPU system to get information and

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experience learned at the Saxton facility to the operators of the commercial plants within the GPU system?

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A I have not become aware of any such program.

6

Q Do you know whether the information and

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records concerning the Saxton reactor were kept and

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located in any particular place within the GPU system?

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A I don't know.

10

Q For instance, if you were interested in

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finding out what transients had occurred at Saxton

12

during the time of its operation, do you have any

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knowledge as to where you might go to find that type

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of material?

15

A I do not personally have such knowledge.

16

Q Do you know whether those records have

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been kept?

18

A I don't know.

19

Q I take it you wouldn't know where they were

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kept, if they had?

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A That's correct.

22

Q Do you know who operated the Saxton reactor,

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whether it was one of the operating utilities or

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whether it was done through GPU Service?

25

A I don't know.

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2 Q We were discussing work that you performed
3 after your arrival in April '78 for the operating
4 commercial plants, TMI-1 and 2 and Oyster Creek, and
5 we had come to the point where you were going to tell
6 us what your work for those plants involved during
7 that initial period.

8 A Shortly after I came, there was a transient
9 which occurred at TMI-2. GPU personnel participated
10 in an evaluation of that transient, and I was one of
11 the people who participated in that.

12 Q I take it this is the April 24, 1978
13 transient at TMI-2 involving an overcooling incident?

14 MR. GLASSMAN: I don't know that there was
15 a transient on April 24.

16 MR. WISE: I may have the date wrong.

17 MR. GLASSMAN: The 23rd.

18 MR. WISE: Is it the 23rd?

19 Q On or about April 23, 1978.

20 A Yes, I believe that's correct.

21 Q We'll come back to that.

22 A The other involvement with operating plants
23 which I presently recall is that I was made a member
24 of the General Office Review Board for Oyster Creek,
25 and I participated in those meetings.

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Q During this initial period, what steps did you take to familiarize yourself with the existing operating plants in the GPU system? I am speaking specifically of the nuclear plants.

A I participated in tours of the principal GPU plants, including TMI-2 and Oyster Creek, and I did some general reading about those plants to a degree, but I should clarify that my role and in general the role of the Service Corporation at that time was directed primarily towards its new plants and with only a few exceptions, we really became involved in the existing plants primarily upon request of the operating utility.

Q Before April 1978, had you in your work experience been involved with any commercial pressurized water reactors?

A To the best of my memory, no.

Q Would it be fair to say that there are major differences between the liquid metal fast breeder reactor and a commercial pressurized water reactor such as TMI-1 or 2?

A There are significant differences, yes.

Q You mentioned that the Halden project was a boiling water reactor. Other than that project, had

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2 you had any experience with boiling water reactors in
3 commercial power plants?

4 A In commercial power plants, no.

5 Q When you first joined GPU Service in April
6 1978, to whom did you report at that time?

7 A To Mr. R. F. Wilson.

8 Q What was his title then, if you can recall?

9 A I believe his title was Director of
10 Technical Functions.

11 Q Did you have anyone working for you at that
12 time?

13 A Yes.

14 Q How many people?

15 A The Project Engineering Manager of the
16 Forked River project reported to me, and he had about
17 eight or ten engineers under him. Then there was one
18 GPU employee and one engineer on loan who were working
19 on the Seward-7 project who were reporting to me.

20 Q The Combustion Engineering design is a
21 pressurized water reactor, am I correct?

22 A Yes.

23 Q You wanted to add something to your last
24 answer?

25 A Yes.

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Q Please go ahead and do so.

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A In addition, during the time frame in question, I promoted a GPU employee to Preliminary Engineering Manager. At least I believe it was during this time frame. Either during this time frame or shortly thereafter, I hired two or three people for the Preliminary Engineering Section.

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Q Concentrating just for a moment on the Forked River project, because that is the only one of these initial projects that was a proposed nuclear plant, what aside from the plant tours that you had at TMI-2 and at Oyster Creek did you do to familiarize yourself with the technology of a pressurized water reactor such as would be built at the proposed Forked River plant? Did you attend any seminars, take any evening courses, talk with people within the GPU system, read any specific literature or documents that were available?

If you could give us some flavor of how you went about getting up to speed, if you will, on pressurized water reactor technology in or about April '78.

A I did some general reading about pressurized water reactors, and I had conversations with

GPU employees about pressurized water reactor technology.

Q Who within GPU did you talk with about that?

A Different people, depending upon the specific topic.

Q Regarding the basic technology of the nuclear steam supply system, and particularly the operation of the primary system, who did you regard as most knowledgeable at that time within the GPU system?

MR. GLASSMAN: You are talking about Forked River?

MR. WISE: No, about learning the technology behind the pressurized water reactor in general.

A I don't remember that there was any one individual that I regarded as the most knowledgeable. There were a variety of people within the Service Company that had knowledge in one or more aspects of pressurized water reactor technology.

Q For instance, with respect to thermohydraulics or thermodynamics within the primary system, is there anyone within the GPU system to whom you looked at that time as being knowledgeable?

A Yes, there was more than one person that I

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looked at as being knowledgeable in that area.

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Q Who would you consider knowledgeable on those types of questions?

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A At that point in time, Mr. Gary Broughton, Mr. Ed Wallace, and Mr. Nick Trikouros.

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Q Is Mr. Wallace still with GPU?

A Yes, he is.

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Q Is Mr. Trikouros still with GPU?

A Yes, he is.

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Q Who within the system, if anyone, did you look to as being most knowledgeable concerning safety analyses for pressurized water reactors?

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MR. GLASSMAN: You are still talking about the same time frame?

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MR. WISE: Yes, during this time period when he was joining the company and learning about the types of commercial plants within the GPU system.

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A To the best of my memory, I would say Mr. Broughton, Mr. Wallace, and perhaps Mr. Ron Williams. Perhaps others. I can't remember that clearly.

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Q Did you become familiar during this time period with the system which on the B&W plants was known as the high-pressure injection system? It may have been

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known by other terms on this Combustion Engineering plant. Did you become familiar generally with that safety system as part of a pressurized water reactor design?

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A To the best of my recollection, I became generally familiar with the functions of such a system, probably not with the details of the design.

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Q Who within GPU would you look to with respect to any questions you may have had at that time regarding emergency core cooling systems?

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Who would you have regarded as knowledgeable in that area?

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A With regard to the functions and requirements of such systems, it would be some of the same individuals that I listed previously.

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Q What was Mr. Broughton's position at that time?

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A He was Licensing Manager for the Service Company.

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Q To whom did he report?

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A He reported to Mr. J. R. Thorpe.

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Q Was that part of the same chain of command that eventually got to Mr. Wilson, or was that in some other unit?

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A It was independent of Mr. Wilson at that point in time.

Q What unit was Mr. Wallace in?

A At this point in time, he was part of the Forked River project engineering group under me.

Q So he was working for you?

A Yes.

Q And Ron Williams?

A He was Manager of Engineering.

Q Was that a position above or equivalent to where you were?

A It was parallel to my position, also reporting to Mr. Wilson.

Q And Mr. Trikouros?

A Worked for Mr. Broughton in the Licensing.

Q Now let's move forward to the time when you became Manager of Systems Engineering in the summer of 1978 unofficially, and I take it officially October 1st. How did your duties and responsibilities change at that time?

A The two project engineering groups which I described earlier, namely, the Forked River and the Seward-7, were removed from underneath my responsibility and returned to reporting directly to

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Mr. Wilson, as they had been prior to my arrival at GPU, and two sections which had previously been part of the Engineering Department under Mr. Williams were transferred under me, those two sections being the Nuclear Fuel Section and the Process Computer Section, and then a new section was formed, also under me, with the title Control and Safety Analysis, which assumed the responsibilities for the analytical activities that had previously been performed as part of the Licensing Section.

Q What analytic activities were those?

A Activities associated with any of the safety analyses for the nuclear stations.

Q Did this include both the existing stations as well as planned additions?

A At this point in time, the activities as I recall in this section were primarily directed toward the future nuclear plant, namely, Forked River, but were really concentrated on developing the capability to perform such calculations within GPU rather than relying on outside vendors.

Q Why was that?

A This was a part of the general change in philosophy of the GPU Service Company to build up the

1
2 in-house capability for doing at least some engineering
3 work in all different areas of engineering that were
4 important to GPU.

5 Q If a problem arose at one of the operating
6 plants that required further safety analysis, would
7 it be true as a result of this reorganization that that
8 work would come to your shop as opposed to some other
9 unit within the GPU organization?

10 A Not necessarily.

11 Q I am interested now in trying to understand
12 what responsibility you had for safety analysis at
13 the operating plants as opposed to any other units
14 within the GPU system.

15 MR. GLASSMAN: Just so I understand the
16 question, I thought counsel was seeking
17 clarification of an earlier answer in which Mr.
18 Keaten distinguished between the work of his
19 group and the work of GPU vendors, rather than
20 make a distinction between his group and
21 operating plants, so that I am not sure that I
22 understand the connection between this question
23 and the earlier one on which you sought
24 clarification.

25 MR. WISE: Perhaps now I am confused. Let

me restate it.

BY MR. WISE:

Q My understanding was that when you took over as Manager of Systems Engineering, two sections from Mr. Williams' group were transferred to yourself as well as a third section which was newly transferred from the Licensing area involving control and safety analysis.

A Yes, that's right. With respect to this third section, Control and Safety Analysis, it assumed the responsibilities for some analytical work that had previously been done in the Licensing Section. The Licensing Section remained, but without responsibility for those analytical activities, but this was done within the confines of the general philosophy of the Service Company which was, with a few exceptions, that we were primarily looking at the new plants, so the Licensing Section and the Service Company and the analytical activities that subsequently came out of that were really directed toward in this case Forked River.

However, in order to build up the analytical capability, we were in fact starting to develop a pressurized water reactor transient analysis

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2 code, and we developed this using a model of Three
3 Mile Island because we felt we needed to be able to
4 bench mark our model against actual available data, and
5 there was of course no available data for Forked River,
6 so while our philosophy was directed toward the future
7 plants, in fact the computer model that occupied a
8 certain fraction of the time was in fact a model of
9 Three Mile Island Unit 2.

10 Q Why did you choose Unit 2 rather than
11 Unit 1?

12 A It was a matter primarily of the April
13 transient. At that time, the activities were not
14 under my management, but as I understand it, the model
15 was to the point that it seemed like ready to start
16 using it and here was a transient we were asked to
17 participate in evaluating, so it made a natural first
18 application. In fact, the model has been used for both
19 Unit 1 and Unit 2.

20 Q Did that model have any name?

21 A The model is based upon a computer code
22 called RETRAN, and so this became known as the TMI
23 RETRAN model.

24 Q Who developed RETRAN?

25 A It was developed by Energy, Incorporated.

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2 Q Did they sell that program to GPU?

3 A The program development was paid for by
4 the Electric Power Research Institute, and we were able
5 to obtain it through EPRI.

6 Q Let me go back now for a second to the
7 Control and Safety Analysis Unit and see if I got it
8 right now. I understand what you have said, but I am
9 looking now at it from a slightly different angle
10 and that is, trying to determine who within the GPU
11 system would be performing safety analyses such as
12 they may have been required with respect to the
13 operating plants.

14 Let me put the question to you this way.
15 Besides the Control and Safety Analysis Unit that came
16 under your management at this time, what other units
17 are you aware of that were also performing safety
18 analysis work for the operating plants within the GPU
19 system?

20 A As part of the operating utility, there was
21 a licensing section both for Three Mile Island and for
22 Oyster Creek. Safety analyses which were required
23 for the operating plants, according to my understanding
24 of the organization as it then existed, would have been
25 the responsibility of those organizations, but I should

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also point out that in general very little of the safety analyses that were required either for the existing plants or for the new plants were performed by GPU. In general, we would go to the nuclear vendor to do such analyses for us.

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Q What about with respect to secondary system matters or balance of plant matters where the nuclear vendor had not been involved?

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A In those cases, the general approach would have been I believe to go to the architect-engineer, although it is the nature of nuclear plants that most of the safety analyses per se are associated with the nuclear side of the plant.

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Q You began your work as Manager of Systems Engineering, as you said, unofficially in the summer of '78 and officially in October, and you described the setup of that unit initially.

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Could you detail what changes, if any, took place between that initial organization and the time of the Three Mile Island accident, which was of course at the end of March 1979?

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A Organizationally, it remained the same during that period, although we were attempting to increase the staff size, so we were hiring, but the

2 organizational structure stayed the same.

3 Q Did the functions of the unit change
4 during that time period?

5 A No, I don't believe they did.

6 Q Did your unit perform any safety analyses
7 with respect to TMI-1 or TMI-2 during that period?

8 A I am not sure.

9 Q Do you recall whether your unit was involved
10 in investigating any transients at TMI-1 or TMI-2
11 other than the April 23, 1978 event you mentioned
12 earlier?

13 A I don't recall that we were, as you say,
14 investigating any transients during that period,
15 although I mentioned earlier as an ongoing development
16 activity we were trying to bench mark our computer
17 code, and so during some time frame, we have gone
18 back and taken data from other transients and used it
19 to compare against the computer code.

20 Q Just to be sure that I have got it straight,
21 you have no recollection of any assistance that your
22 unit may have provided from the time of its existence
23 up through the time of the accident to the operating
24 utilities with respect to any transients that they
25 may have had at TMI-1 or TMI-2?

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A That's correct, I have no such recollection.

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Q Following the accident, could you briefly describe how your responsibilities changed and the approximate time periods that are relevant to those changes?

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A Immediately following the accident, I and many of the people in my department spent extended periods of time at Three Mile Island in support of Unit 2. After we returned from those assignments, the emphasis of the organization shifted substantially. As I recall, our activities were primarily directed toward a review of the TMI-2 accident and related factors and in starting preparation for a restart of TMI-1 and some work which we did relative to an Oyster Creek event which happened in May 1979.

Consistent with the changed state of the GPU system, the Preliminary Engineering Section, which had been under me, was dissolved and activities related to future projects, future coal-fired projects, were either terminated or were transferred outside of the Service Company. A new section was formed under me, and I don't remember exactly when this occurred, called Plant Analysis.

Q What was the function of Plant Analysis?

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A Plant Analysis as originally conceived was intended to monitor the performance of the equipment at the nuclear stations on a continuing basis in order to give feedback to the operators about probable problems that might develop.

Q Which unit of GPU had performed that function before the Plant Analysis Unit was put under your management?

A I don't know in general. There was a section within the GPU Service Company which was intended to monitor plant availability and system and component availability for all of the GPU plants, but that does not encompass all of the intended functions of the Plant Analysis Section.

Q Do you remember the unit, the name of the unit that did that or who it was under?

A I believe it was a department, and it was under Dr. R. L. Long, and I don't remember its name.

Q Do you know what general department Dr. Long was in? Was he someone who reported to Mr. Wilson or some other general organizational unit?

A He did not report to Mr. Wilson. I believe -- I am not sure where he reported.

Q Dr. Long is still with GPU, I take it.

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A That's correct.

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Q Your resume that counsel provided us with today, B&W Exhibit 335, shows a change in title which I think you testified earlier today occurred in January 1981 to Director of Systems Engineering. We touched on this briefly before and said we would come back to it. I am afraid now is the time.

Could you tell us what changed in January 1981 in connection with this change in title?

A Generally, the department organization structure was expanded. Do you want the details of the expansion?

Q Yes, please, in general. I don't want to know person by person, but what functions and responsibilities were added or subtracted from the unit?

A There were two new sections established, Radiological Engineering and Risk Analysis. In addition, there was a new Assistant Department Head position established with the Plant Safety Analysis and Plant Control Section, which was simply a renaming of the previous Control and Safety Analysis Section. Those two sections reported to the Assistant Department Head.

Q Who was that?

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A Mr. Broughton.

3

Q Who now has Licensing?

4

A The Director of Licensing is Mr. J. R.

5

Thorpe. The Manager of Licensing for TMI is Mr. Ed

6

Wallace, and there are comparable sections for Oyster

7

Creek, for Environmental Licensing, and for Generic

8

Licensing.

9

Q Mr. Wallace reports to Mr. Thorpe?

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A That's correct.

11

Q In effect, Mr. Thorpe has Mr. Broughton's

12

old job?

13

A No. Back where we started, Mr. Thorpe was

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Mr. Broughton's superior, but also under Mr. Thorpe

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were an Environmental Licensing Section which Mr.

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Broughton did not have, and I believe one other

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section, but the other difference now is that the

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Licensing Sections which supported the operating plants

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are now part of this organization which I am

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describing, so that for example, personnel located at

21

Three Mile Island who were previously Met Ed employees

22

are now part of Mr. Thorpe's Licensing organization.

23

Q And they work for GPU Nuclear?

24

A That's correct.

25

Q The Risk Analysis Unit that you mentioned

1
2 that was created in January 1981, how many people does
3 that have in it?

4 A At present, it has two.

5 Q Are you familiar with a Risk Analysis
6 Report for the Oyster Creek plant that has been done
7 in the last year or two?

8 A I am generally familiar with it, yes.

9 Q Was that done by this unit within your
10 organization?

11 A No. It was done by an outside contractor
12 and was managed internally by a team that consisted of
13 people from Jersey Central and one or two people in the
14 Service Company.

15 Q Were you in any way involved in the review
16 of that report?

17 A I was an attendee at the meeting at which
18 the vendor made the presentation to GPU management on
19 the initial results of the study. In that time frame,
20 that is the only involvement I remember having.

21 Q Have you read the study?

22 A I have read parts of it.

23 Q Who within GPU was primarily responsible
24 for this project?

25 A The primary involvement within GPU on that

1
2 project was Mr. Broughton and Mr. Trikouros. Excuse
3 me. I answered your question within the context of
4 who within the GPU Service Company was primarily
5 involved.

6 Q I take it that there may have been some
7 people from JCP&L who were also involved?

8 A Yes, and they played a very strong role in
9 the study.

10 Q What was the reason, as best you know it,
11 for the study?

12 A As it was described to me, there were two
13 basic reasons. One, recognizing that Oyster Creek is
14 a relatively old station for a commercial station,
15 there was a desire to attempt to answer the question of
16 whether the risk associated with operating Oyster
17 Creek was substantially different than for a more
18 typical nuclear station, and secondly, there was a
19 desire to provide information that could be used in
20 making decisions such as, for example, what type of
21 plant improvements would make the most contribution to
22 overall safety.

23 Q That study considered a range of accidents,
24 as I understand it, some of which might result in
25 serious core damage, is that correct?

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A Yes.

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Q Do you know whether as a result of that study any reports were made to the NRC pursuant to 10 CFR 21?

6

A I am not aware of any such.

7

Q You are familiar with 10 CFR 21 in general?

8

A I have a general familiarity with it, yes.

9

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Q Did you believe after your review of this study that any parts of it required reporting under 10 CFR 21?

12

MR. GLASSMAN: You are asking for Mr.

13

Keaten's belief?

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MR. WISE: I am just asking whether he formed an opinion that it was necessary for him to take action to make a report.

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MR. GLASSMAN: Objection. I am not going to let you probe his mental processes. If he expressed an opinion, if he took any action, I will let you ask that.

21

MR. WISE: I think I can live with that.

22

23

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25

Q Did you in fact take any action to initiate a preliminary safety concern within the GPU system concerning the results of that study? I may have used terminology you are not familiar with.

1 Preliminary safety concern is one term I have heard.
2
3 Different systems or different operations may have
4 different internal procedures for reporting concerns
5 that may result in a requirement to notify the NRC under
6 10 CFR 21. There may be a different terminology for it
7 within the GPU system. Whatever that terminology may
8 be, did you in fact initiate whatever process there is
9 within GPU which would lead to consideration of whether
10 or not a 10 CFR 21 report was required?

11 MR. GLASSMAN: Objection as to form.

12 A I took no such action.

13 Q Do you know of anyone else who did?

14 A I do not know of anyone else who did.

15 Q What is Radiological Engineering?

16 A As intended in this organizational function,
17 it is personnel who are specialists in various aspects
18 of radiation effects, both source terms, release of
19 radiation, shielding, and the so-called ALARA concept.

20 Q Could you explain for the record what that
21 is?

22 A ALARA stands for as low as reasonably
23 achievable and refers to the concept that in designing
24 to cope with radiation as it exists in a normal
25 operating nuclear plant, that the regulations require

1
2 section Plant Analysis is still a separate section,
3 each with a section manager. There is just an
4 additional layer of management above them.

5 I neglected to mention in describing the
6 organization that was formed at the beginning of 1981
7 that there is an additional function called Human
8 Factors Engineering which reports as a staff function
9 to Mr. Broughton. In terms of changes, the changes
10 which have occurred since the beginning of 1981 are
11 structural rather than functional in nature. There is
12 now an additional Assistant Department Head, and under
13 him are two section managers. The Assistant Department
14 Head is Nuclear Analysis and Fuels and under him now
15 there are a TMI Fuel Section and an Oyster Creek Fuel
16 Section and the radiological engineering function.

17 Q When was the Human Factors Engineering
18 function added?

19 A It was at the beginning of 1981.

20 Q What is its purpose?

21 A Its purpose is to bring to bear the
22 discipline of human factors engineering into the design
23 or layout of particularly the control rooms and also to
24 other control sections.

25 Q Who presently is head or responsible for

1
2 that shielding and other forms of radiation protection
3 not only meet certain specific numerical criteria,
4 but must go beyond those criteria and result in dose
5 rates as low as reasonably achievable.

6 Q Altogether today, how many employees do
7 you have that report to you, roughly?

8 A About 70. Of course, not all of those report
9 directly to me.

10 Q I understand. You may have departmental
11 heads underneath you.

12 A Yes.

13 MR. GLASSMAN: This question is directed
14 to 1982?

15 MR. WISE: Yes, today.

16 A Yes, I interpreted it as today.

17 Q Is the department today basically the
18 same functions and responsibilities as you have have
19 described beginning in January of 1981, that is,
20 Radiological Engineering, Risk Analysis, and a combined
21 section that has Plant Analysis and Control and
22 Safety Analysis or its successor within it?

23 A Let me first clarify what I said earlier.
24 The section that is now titled Safety Analysis and
25 Plant Control is still a separate section, and the

1
2 that function?

3 A As I indicated earlier, Mr. Broughton is
4 personally responsible for that.

5 Q Who, though, underneath him is the primary
6 actor, if you will, on human factors engineering?

7 A We have two relatively junior specialists
8 in this area which report directly to Mr. Broughton, so
9 he does in fact carry out the management activities
10 in this area.

11 Q Before this responsibility was added to
12 Mr. Broughton's duties, where within the GPU system,
13 to your knowledge, was this function being performed?

14 A For new plants, currently under design, the
15 activities within CPU would have been done either in
16 the Engineering Department or in the Project Engineering
17 Management Section, and I do not know what was the
18 situation with the operating plants.

19 Q I would like to go back for a moment to
20 1978 when you joined GPU. What system or procedure
21 was in effect at that time with respect to reporting
22 safety concerns in compliance with 10 CFR Part 21?

23 MR. GLASSMAN: Objection; lack of
24 foundation.

25 MR. WISE: I don't understand what the lack

1
2 of foundation is.

3 MR. GLASSMAN: I don't think you have
4 established this witness' knowledge of a
5 particular regulation.

6 MR. WISE: If he doesn't know, I will take
7 that answer.

8 A I don't know.

9 BY MR. WISE:

10 Q When you joined the company, did anyone
11 give you any instructions or information concerning
12 compliance with 10 CFR Part 21?

13 A I don't recall any specific instructions
14 with respect to Part 21.

15 Q When did you first become aware that there
16 was such a thing as 10 CFR 21?

17 A While I was with Atomics International.

18 Q Were you aware of changes that had occurred
19 in the 10 CFR Part 21 program in the summer of I
20 believe it was 1977 to become effective early in 1978
21 with respect to operating plants?

22 A I have no particular recollection of that.

23 Q Did you have any understanding in April
24 1978 as to the applicability of 10 CFR 21 to operating
25 plants, as opposed to plants under design or

1
2 construction?

3 A I don't remember what I knew in April 1978
4 versus some other time on that subject, at least.

5 Q Did you ever come to have an understanding
6 that 10 CFR 21 applied to operating plants?

7 A I have been told that 10 CFR 21 does apply
8 to operating plants.

9 Q Were you told that before the accident at
10 TMI-2 in March 1979?

11 A I don't know.

12 Q Is there today a procedure which you are
13 familiar with for reporting safety concerns that may be
14 reportable to the NRC under 10 CFR 21 within the GPU
15 system?

16 A Yes.

17 Q When was the first time you became aware
18 of that procedure?

19 A I don't remember.

20 Q Do you remember approximately when that
21 procedure was instituted?

22 A There is a relatively new procedure which
23 is one of the technical functions procedures which is
24 intended to describe the responsibilities as they now
25 exist in the GPU Nuclear Corporation. Prior to the

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GPU Nuclear organization formation, the responsibilities for reporting events at the operating plants lay with the operating utilities, not with the Service Company, and somewhere along the line I became generally aware of that fact, but I don't remember when.

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Q GPU Nuclear was formed after the accident, as I understand it.

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A GPU Nuclear has become officially a corporation only very recently. The GPU Nuclear Group, which was the predecessor of the Corporation, was formed well after the accident.

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Q So if I understand your testimony correctly, you are not aware one way or the other as to whether or not there was a procedure in place at GPU Service for the reporting of safety concerns that might be reportable under 10 CFR Part 21 before the time of the accident?

19

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A I think that is correct. I am not aware one way or the other.

21

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Q If there was such a procedure, you are not able to tell us today what it was?

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A That's correct.

Q Did you ever have occasion before the

accident to consider whether a particular matter was

1
2 reportable under 10 CFR 21 while you were at GPU? I
3 am picking up from 1978 on.

4 MR. GLASSMAN: As I understand, the
5 questions relate to before the accident but
6 beginning 1978.

7 Q That's correct. I am looking at the period
8 when you joined the company up to the time of the
9 accident, did you have occasion to become involved in
10 a matter which was being considered as a possible
11 reportable safety concern under 10 CFR 21?

12 A I don't know.

13 Q Who currently within the GPU system is
14 responsible for making a decision concerning possible
15 reportable safety concerns under 10 CFR 21, as you
16 understand whatever procedures are now in place?

17 A I believe that for the operating plants it
18 is the director of the plant organization that has the
19 ultimate responsibility for making such a determination.

20 Q What I am getting at, though, is, within
21 the unit which you head, what under the procedures you
22 currently understand is supposed to happen if one of the
23 people working for you comes up with a matter which
24 he or she believes to be possibly a reportable safety
25 concern on a 10 CFR 21? What is your understanding of

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2 how the procedure is supposed to work?

3 MR. GLASSMAN: I will note an objection on
4 the record to this line of questioning, which I
5 will set forth as a standing objection. We seem
6 to be getting into areas that are just going to
7 take up a lot of time and are clearly dealing
8 with events and procedures well after the accident
9 that relate to something other than the accident.
10 I don't know why we are spending so much time
11 on this.

12 I will let the witness answer, but my
13 objection is noted. I hope we don't spend too
14 much time on 1981, 1982 matters of this sort.

15 MR. WISE: We have spent gobs of time
16 during the depositions of B&W witnesses going
17 through postaccident matters, so let me say that
18 first.

19 Secondly, I think the relevance of this is
20 simply to find out who we should talk with within
21 the GPU organization to determine what their
22 philosophy is on the 10 CFR 21, which is an
23 extremely relevant matter, as I am sure you well
24 know from a reading of the amended complaint. I
25 am trying to find that out from this witness,

1
2 find out what his understanding is of the process
3 and who becomes involved in it so that we can
4 then determine what further discovery we want to
5 take.

6 I am not deposing this witness as an expert
7 in 10 CFR 21. This is the only way I know of
8 to get that information.

9 MR. GLASSMAN: I will let you continue in
10 that vein. Without getting into an extended
11 discussion here, I am sure you realize there are
12 certain postaccident pieces of information and
13 testimony that may be relevant to this matter,
14 and certainly you have asked about other
15 information that is not relevant.

16 MR. WISE: I am sure you and I could have
17 lengthy arguments as to which things fall into
18 which category.

19 Perhaps the reporter could read back the
20 question.

21 (Record read)

22 A I believe that the responsibility for
23 coordinating such concerns lies with the Licensing
24 Department, and if such a concern were to come to my
25 attention, I would immediately bring it to the

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attention of the appropriate licensing manager.

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Q That would be somebody in Mr. Thorpe's unit?

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A In Mr. Thorpe's department.

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Q I would like now to discuss for a moment your involvement in the April 23, 1978 transient at TMI-2. When did you first hear that that event had taken place?

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A It was shortly afterwards, but I don't remember exactly which date.

Q You in several of your previous answers have mentioned the division of responsibility between the Service Corporation and the operating utilities with respect to existing plants. Is it correct that before the accident at Three Mile Island in March 1979 the Service Corporation would only become involved in matters at operating plants upon the request of the operating utility involved?

A In most cases that was true, although there were some exceptions to that, as I mentioned earlier.

Q To the best of your knowledge, how was it decided within the GPU system which matters would fall within the purview, if you will, of the Service Corporation, and which matters would be handled solely

1
2 by the operating utilities?

3 A There were defined sets of responsibilities
4 for the Service Company, and those areas where there
5 was a continuing involvement with the nuclear plants
6 were I believe well delineated.

7 Q What were those, as you understood them?

8 A The one that I am the most familiar with
9 is in the nuclear fuels area, where the Service Company
10 in fact had responsibility for procuring the nuclear
11 fuel and associated nuclear and safety analyses for
12 the operating plants.

13 Q Were there any others that you can now
14 recall?

15 A I mentioned earlier the gathering of
16 reliability data. The GPU System Laboratory was I
17 believe part of the Service Company, and it performed
18 laboratory type functions for the operating plants.
19 Those are the only ones that occur to me at the moment.

20 But I should clarify my previous answer
21 slightly in the sense that I am referring to an
22 operating plant as one which had been turned over to the
23 operating utility by the Service Company. As I
24 mentioned earlier, the Service Company had the
25 responsibility for the construction, including the

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startup and test of new plants, and so it then became the responsibility of the operating company once it was turned over.

Q In April 1978, I believe both Oyster Creek and TMI-1 had gone commercial. Is that your understanding?

A That is my understanding.

Q TMI-2, as I understand it, did not go commercial until December 1978.

A That is also my understanding.

Q In April 1978, had GPU Service turned over responsibility for TMI-2 to Metropolitan Edison?

A I don't know.

Q It certainly had turned it over by March 28, 1979, would that be correct?

A Yes, I believe that is correct.

Q To your knowledge, did the operating subsidiaries maintain their own capability for performing safety analysis work?

A As I mentioned earlier, for the most part both the operating utilities and the Service Company contracted with others to perform the safety analysis for them.

Q Do I take that to mean that to your

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knowledge the operating utilities did not have a capability to perform safety analysis in house?

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A I don't know what capability they had within in house.

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Q From the time that you joined GPU Service up until the time of the accident, did you ever become aware of any safety analysis work that had been performed, for instance, by Metropolitan Edison?

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A Not that I recall.

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Q Did you have any liaison with anybody at Metropolitan Edison with respect to safety analysis work?

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A Not that I recall. I don't know to what extent you would consider the analysis we did of the April 1978 incident safety analysis. I think in the strict sense of the word, it was not, but we did have some liaison in the course of working on that incident.

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Q What were the circumstances of your becoming involved in the investigation of the April 1978 transient at TMI-2?

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A To the best of my memory, Dick Wilson called me in and indicated that we had been requested to perform an evaluation in cooperation with Metropolitan Edison personnel of the incident, and he

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2 asked me if I would head up that activity.

3 Q How soon after the transient was that, as
4 best you can recall?

5 A I don't remember exactly. I believe it
6 was within a couple of days, but I am unsure exactly
7 when it occurred.

8 Q What did you do as a result of your
9 conversation with Mr. Wilson? How did you go about
10 tackling this problem?

11 A As I recall, we first discussed who should
12 participate from the Service Company, and as I recall,
13 basically we went to TMI and sat down with members of
14 the plant staff who had already been involved in such
15 an investigation. They had started before we had, and
16 we spent a considerable amount of time discussing with
17 them their understanding of what had happened.

18 Q Who besides yourself was involved from the
19 Service Corporation?

20 A I believe that Gary Broughton was. I
21 believe that Ed Wallace was. I believe that Bob Cutler
22 was.

23 Q Who was Mr. Cutler?

24 A He was in the project management
25 organization and had been involved in TMI-2 I believe

1
2 during the construction stage.

3 Q Was there anyone else from the Service
4 Corporation?

5 A Those are the ones I remember at the
6 moment. I am not sure it is a complete list.

7 Q Who do you recall being involved from the
8 Met Ed plant staff?

9 A In our investigation, that role was played
10 by Jim Seelinger.

11 Q Mr. Seelinger I believe at that time was
12 Technical Superintendent for TMI-2?

13 A I believe that's correct.

14 Q Was Mr. Miller involved at all? I am
15 speaking of the Mr. Miller who was at the time TMI-2
16 Superintendent. He may also have been station manager
17 at the time.

18 A He was not a member of the task force. Mr.
19 Seelinger had been intimately involved in the plant's
20 investigation of the incident, and he therefore
21 provided a liaison between us and the other plant
22 people that were knowledgeable in that area, so he was,
23 as I remember, the only plant participant in our
24 task force.

25 Q Following your personal conversations at the

1
2 site, how did the task force proceed? How were things
3 divided up and what various functions were performed
4 in order to pursue the investigation? I am speaking
5 in general terms. I don't want to know a day-by-day
6 or week-by-week review.

7 A As I recall, we basically divided up the
8 responsibilities for looking at various aspects of the
9 transient and assigned them to individual members of
10 the task force, and your asking that question triggers
11 my memory that Rich Lentz was either an official
12 member of the task force or in essence served as one.

13 Q Who is Mr. Lentz and which company was he
14 from?

15 A Mr. Lentz worked with the GPU Service
16 Company and specifically worked for Mr. Broughton.

17 Q Go ahead.

18 A We divided up the activities and asked
19 individuals or groups of individuals to concentrate
20 on one or more aspects of the transient and the
21 associated events, and then to prepare some written
22 material which summarized their area of activity. I
23 frankly don't remember whether we got together and had
24 meetings or whether I got together with them
25 individually, or both. I don't recall.

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Q Do you recall about how long your work took?

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A My memory is a little shaky, but I have a memory that we were asked to make a report to Met Ed management quite rapidly, and I think I remember that that was the order of one week after the transient or after we got started. This report basically was view graphs, and we did make such a presentation, and then on a somewhat longer time scale, we developed a formal report.

Q That would have been a much lengthier document?

A Yes.

Q Who wrote the formal report, as best you recall?

A I pulled it together. But different sections of it were written by different people.

Q Do you recall that Mr. Seelinger had written a section -- or perhaps "section" is not the right phraseology for it -- had written a portion of the report which later became incorporated in the overall report?

A I don't remember that Jim Seelinger wrote anything that was especially for our report. I believe that it is true that some of the material that he

1
2 prepared for the plant report was incorporated in our
3 report as well.

4 Q Were any computer simulations or models
5 used in connection with your investigation?

6 A Yes and no. The early investigation that
7 I have described as lasting perhaps a week or so and
8 which gave rise to I believe essentially all of the
9 recommendations that we generated did not use any
10 computer simulations. On a much different time scale,
11 there was a computer simulation that was done of the
12 transient, but I do not recall that that had any impact
13 on the recommendations that we made.

14 Q The April 1978 event at TMI-2 involved, as
15 I understand it, a problem on the secondary side with
16 one of the steam relief valves. Is that your
17 understanding?

18 A Several of the steam relief valves.

19 Q They apparently blew open or whatever the
20 correct terminology is and began relieving steam, which
21 caused an overcooling transient in the system. Is that
22 a fair statement of it?

23 A It is a slight oversimplification. They
24 blew open as they should have. They just did not close
25 when they should have, and that is really what caused

1
2 the overcooling transient.

3 Q During an overcooling transient, as I
4 understand it, the secondary side takes off more heat
5 from the primary side than would be expected during
6 normal operation, causing the primary side temperature
7 to drop. Is that a fair statement?

8 A Yes, but with the interpretation that you
9 said normal operation. This actually is occurring after
10 plant shutdown.

11 Q The reactor has tripped at that point?

12 A That's correct.

13 Q As a result of the drop in temperature,
14 there is a consequent drop in pressure, as I understand
15 these events. Would that be fair?

16 A As a consequence of the drop in temperature,
17 there is a shrinkage of the water in the primary
18 system, and as a result of that shrinkage and a
19 consequent drop in liquid level in the pressurizer,
20 there is a decrease in pressure.

21 Q During the April 23, 1978 transient, am I
22 correct that the pressurizer level indication went off
23 scale low as the overcooling event proceeded?

24 A Yes.

25 Q Is it correct that the loss of indication

1
2 of pressurizer level was a matter of concern within
3 Met Ed and GPU Service for your task force, if that is
4 a better way to put it?

5 MR. GLASSMAN: Objection insofar as you
6 are asking by the words "matter of concern" for
7 Mr. Keaten's interpretation of other people's
8 mental state. If you would like to ask whether
9 anyone expressed any concern or whether there
10 was any discussion of this, you can proceed.

11 MR. WISE: I will hold that question in
12 abeyance for a moment and ask this.

13 Q Who was the head of the task force?

14 A I was.

15 Q As the head of the task force, were you
16 concerned about the fact that level indication had
17 gone off scale low in the pressurizer during the course
18 of the transient?

19 MR. GLASSMAN: Objection. If you would
20 like to ask him whether he expressed his concern,
21 whether there was anything written down in this
22 regard, you can, but we are not here to find out
23 what his internal mental processes are.

24 MR. WISE: I don't understand the basis of
25 that objection at all. You and your partners and

1
2 associates have asked many, many questions of
3 B&W witnesses concerning what they understood
4 and what they meant about various documents and
5 events before the accident. Are you now saying
6 that you are going to put an objection to any
7 questions directed at that?

8 MR. GLASSMAN: You can ask him anything
9 about what he understood or what he meant, but you
10 haven't put a document or a statement in front of
11 him. You are just asking him in the abstract
12 whether somehow he was concerned.

13 MR. WISE: I must say that that question
14 has been asked of numerous witnesses, particularly
15 with respect to the issue of the internal
16 memoranda at B&W concerning the Davis-Besse
17 incident, and I am absolutely stunned that you
18 think there is anything wrong with that question.

19 Are you directing him not to answer?

20 MR. GLASSMAN: Yes.

21 MR. WISE: I think we better break at this
22 point and consider that, because we may want to
23 go to the Magistrate on that.

24 If you are going to take the position that
25 we can't ask one of your witnesses who is head of

1
2 the task force what he understood to be the
3 problem in view of the fact that you have asked
4 repeatedly almost every B&W witness that you
5 have had testimony from what they understood about
6 safety concerns and so on before the accident,
7 I think we've run unto a real problem.

8 MR. GLASSMAN: I will let him answer the
9 question as you have just rephrased it.

10 MR. WISE: Maybe you better read back the
11 question so the witness has it.

12 (Record read)

13 BY MR. WISE:

14 Q As head of the task force looking into
15 this transient, did you understand that it was one of
16 the things that you were going to investigate, that the
17 pressurizer level indication had gone off scale low
18 during the event?

19 A I understood that one of the things we
20 were asked to investigate was the implications in the
21 primary system with respect to the pressurizer level
22 going off scale low.

23 Q Who selected that as something you ought to
24 investigate?

25 A I don't know.

1
2 Q Was that a direction given to you or
3 something that the task force decided on its own was a
4 matter that should be looked into?

5 A To the best of my memory, that was one of
6 the items that was initially discussed with me at the
7 time that the investigation was set up.

8 Q Were you told why that was something that
9 you should look into?

10 A My memory is that we were asked to consider
11 what the implications of the pressurizer level being
12 off scale low had in terms of possible steam formation
13 in other parts of the system outside the pressurizer.

14 Q Were you either aware of or made aware of
15 any implications that that might have for a report to
16 the NRC?

17 A To the best of my memory, the question of
18 reportability of events was not something that the
19 task force was asked to consider.

20 Q Did you ever become aware of any
21 requirement of a report to the NRC in the event the
22 pressurizer had emptied entirely?

23 A I don't remember.

24 Q Isn't it correct that the task force had
25 as one of its functions to make a determination as to

1
2 whether or not the pressurizer had actually emptied
3 during the course of that transient?

4 A I don't remember that specific item. As I
5 indicated earlier, the task force generally was asked
6 to consider where there might be steam in the system,
7 and you can interpret that as including just how much
8 void there was in the pressurizer.

9 (Time noted: 5:00 p.m.)

10
11 ROBERT W. KEATEN
12

13 Subscribed and sworn to
14 before me this day of
15 1982.
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25

C E R T I F I C A T E

STATE OF NEW YORK)
: ss.:
COUNTY OF NEW YORK)

I, JOSEPH R. DANYO, a
Notary Public within and for the State of New York,
do hereby certify that the foregoing deposition
of ROBERT W. KEATEN was taken before
me on MONDAY, JANUARY 4, 1982;

That the said witness was duly sworn
before the commencement of his testimony and
that the within transcript is a true record of said
testimony;

That I am not connected by blood or
marriage with any of the parties herein nor
interested directly or indirectly in the matter in
controversy, nor am I in the employ of any of the
counsel.

IN WITNESS WHEREOF, I have hereunto set
my hand this 17 day of JANUARY 1982.

Joseph R. Danyo
JOSEPH R. DANYO