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September 24, 1984

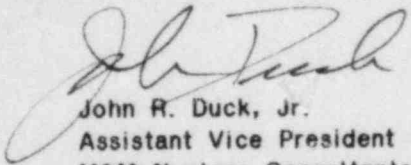
Mr. Jerome Saltzman
Assistant Director
State & Licensee Relations
Office of State Programs
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Georgia Power Company
E. I. Hatch Nuclear Plant
Nuclear Liability Insurance
ANI/MAELU Policies NF-215/MF-78
Endorsements No. 90 and 91/ 74 and 75

Dear Jerry:

Enclosed for your records are two certified copies each of Endorsement Nos. 90 and 91 to ANI Policy NF-215 and Endorsement Nos. 74 and 75 to MAELU Policy MF-78 to the Georgia Power Company E. I. Hatch Nuclear Plant.

Very truly yours,


John R. Duck, Jr.
Assistant Vice President
M&M Nuclear Consultants

cc: J. Wyman Lamb
D. B. Cochran
J. L. Collins
H. L. Davis

jf/enclosures

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NUCLEAR ENERGY LIABILITY INSURANCE

MUTUAL ATOMIC ENERGY LIABILITY UNDERWRITERS

1. Amendment of Advance Premium Endorsement
2. Standard Premium and Reserve Premium Endorsement
3. Additional Premium Due

1. Advance Premium

It is agreed that the Amended Advance Premium due the companies for the calendar year 1984 is \$105,997.50.

2. Standard Premium and Reserve Premium

Subject to the provisions of the Industry Credit Rating Plan, it is agreed that the Standard Premium and Reserve Premium for the calendar year designated above are:

Standard Premium \$105,997.50

Reserve Premium \$ 79,883.10

3. Additional Premium \$22.50

Effective Date of this endorsement January 1, 1984 To form a part of Policy No. MF-78

Issued to Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia and City of Dalton, Georgia

Date of Issue September 18, 1984

For the Subscribing Companies

MUTUAL ATOMIC ENERGY LIABILITY UNDERWRITERS

By J. S. Quattrocchi

Endorsement No. 75 Countersigned by _____
Authorized Representative

ME-36

This is to certify that this is a true copy of the original Endorsement having the endorsement number and being made part of the Nuclear Energy Liability Policy (Facility Form) as designated hereon. No Insurance is afforded hereunder.

J. S. Quattrocchi

John L. Quattrocchi, Vice President-Liability Underwriting
American Nuclear Insurers

NUCLEAR ENERGY LIABILITY INSURANCE

MUTUAL ATOMIC ENERGY LIABILITY UNDERWRITERS

Restoration of Limit of Liability Endorsement

It is agreed that:

1. Payments made and expenses incurred by the companies under this policy have reduced, in accordance with Condition 3 of the policy, the limits of the companies' liability stated in Item 4 of the Declarations and in all Increase of Limit of Liability Endorsements.
2. The limit of liability stated in Endorsement No. 66 which has been reduced is hereby restored to \$ 36,000,000.00. This restored limit applies only with respect to obligations assumed or expenses incurred because of bodily injury or property damage caused by the nuclear energy hazard after the effective date of this endorsement.
3. The limits of liability stated in the policy shall not be cumulative. Each payment made by the companies after the effective date of this endorsement for any loss or expense covered by the policy shall reduce by the amount of such payment every limit of liability, regardless of which limit of liability applies with respect to the bodily injury or property damage out of which such loss or expense arises.

Effective Date of
this Endorsement July 1, 1984

To form a part
of Policy No. MF-78

Issued to Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority
of Georgia and City of Dalton, Georgia

Date of Issue September 18, 1984

For the Subscribing Companies

MUTUAL ATOMIC ENERGY LIABILITY UNDERWRITERS

By [Signature]

Endorsement No. 74 This is to certify that this is a true copy of the original
Endorsement having the endorsement number and being made part
of the Nuclear Energy Liability Policy (Facility Form) as des-
ignated hereon. No Insurance is afforded hereunder.

ME-22b

John L. Quattrone, Vice President, American Nuclear Insurers

Nuclear Energy Liability Insurance
NUCLEAR ENERGY LIABILITY INSURANCE ASSOCIATION

ADVANCE PREMIUM AND STANDARD PREMIUM ENDORSEMENT

CALENDAR YEAR 1984

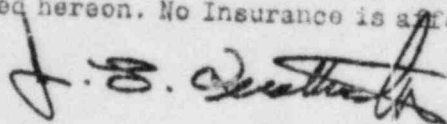
It is agreed that Items 1a. and 1b. of Endorsement No. 87
are amended to read:

1a. ADVANCE PREMIUM: It is agreed that the Advance
Premium due the companies for the period designated above
is: \$ 365,102.50.

1b. STANDARD PREMIUM AND RESERVE PREMIUM: In the
absence of a change in the Advance Premium indicated above,
it is agreed that, subject to the provisions of the Industry
Credit Rating Plan, the Standard Premium is said Advance
Premium and the Reserve Premium is: \$ 275,152.90.

Additional Premium: \$ 77.50.

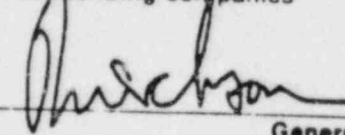
This is to certify that this is a true copy of the original
Endorsement having the endorsement number and being made part
of the Nuclear Energy Liability Policy (Facility Form) as des-
ignated hereon. No Insurance is afforded hereunder.



John L. Quattrocchi, Vice President-Liability Underwriting
American Nuclear Insurers

Effective Date of this Endorsement January 1, 1984 To form a part of Policy No. NF-215
12:01 A.M. Standard Time
Issued to Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority
of Georgia and City of Dalton, Georgia
Date of issue September 18, 1984

For the subscribing companies

By  General Manager

Endorsement No. 91
NE-36

Countersigned by _____

Nuclear Energy Liability Insurance
NUCLEAR ENERGY LIABILITY INSURANCE ASSOCIATION

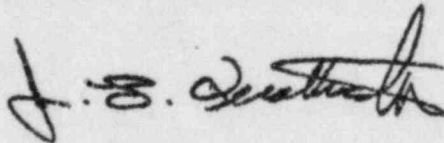
RESTORATION OF LIMIT OF LIABILITY

ENDORSEMENT

It is agreed that:

1. Payments made and expenses incurred by the companies under this policy have reduced, in accordance with Condition 3 of the policy, the limits of the companies' liability stated in Item 4 of the Declarations and in all Increase of Limit of Liability Endorsements.
2. The limit of liability stated in Endorsement No. 86 which has been reduced is hereby restored to \$ 124,000,000.00. This restored limit applies only with respect to obligations assumed or expenses incurred because of bodily injury or property damage caused by the nuclear energy hazard after the effective date of this endorsement.
3. The limits of liability stated in the policy shall not be cumulative. Each payment made by the companies after the effective date of this endorsement for any loss or expense covered by the policy shall reduce by the amount of such payment every limit of liability, regardless of which limit of liability applies with respect to the bodily injury or property damage out of which such loss or expense arises.

This is to certify that this is a true copy of the original Endorsement having the endorsement number and being made part of the Nuclear Energy Liability Policy (Facility Form) as designated hereon. No Insurance is afforded hereunder.

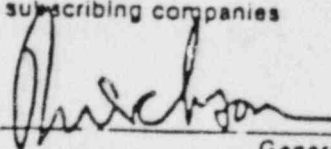


John L. Quattrocchi, Vice President-Liability Underwriting
American Nuclear Insurers

Effective Date of this Endorsement July 1, 1984 To form a part of Policy No. NF-215
12:01 A.M. Standard Time
Issued to Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority
of Georgia and City of Dalton, Georgia
Date of Issue September 18, 1984

For the subscribing companies

By



General Manager

Endorsement No. 90

Countersigned by _____

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

3 IN THE MATTER OF:

4
5 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

6 SUBCOMMITTEE ON REACTOR RADIOLOGICAL EFFECTS
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20 LOCATION: WASHINGTON, D.C.

21 DATE: SEPTEMBER 28, 1984

PAGES: 237-281

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25 RECEIVED BY: _____ DATE: _____ TIME: _____

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION
3
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56 NUCLEAR REGULATORY COMMISSION
7

8 1717 H STREET, N.W. ROOM 1046

9 WASHINGTON, D.C.

10 9.28.84

11 The Panel met, pursuant to notice, at 8:30 am.

12 SRRE MEMBERS PRESENT:13 D.W. MOELLER Chairman
14 JESSE C. EBERSOLE
15 CHARLES J. WYLIE
16 MAX W. CARBON
17 J. CARSON MARK18 ACRS STAFF PRESENT:19 OWEN S. MERRILL
20 JOHN C. MCKINLEY21 ACRS CONSULTANTS PRESENT:22 M. FIRST
23 J. HEALY
24 D. ORTH
25 M. CARTER

P R O C E E D I N G S

(8:35 a.m.)

CHAIRMAN MOELLER: The meeting will come to order.

This is a continuation of the meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Reactor Radiological effects.

We began yesterday morning, and recessed last evening, and will continue on today, and our primary goals, and agenda for the day, are to, (1), discuss the TMI-2 cleanup and voice alternatives, and, once we have finished that discussion, we will go in to executive session, remaining open to the public, and we will review and edit some proposed written comments which are intended to summarize our thinking, and conclusions yesterday, on the generic issues that we discussed.

And once we've finished with that, we will begin the discussion and review of the NRC Reactor Safety Research Program.

I think that that will undoubtedly lead in to mainly the establishment of an agenda of the major topics that we want to discuss more fully with the NRC staff, and to select a couple days in which we can meet and accomplish that objective. The first

1 item on today's agenda, then, is the TMI-2 cleanup
2 endpoint alternatives. We have with us Ronnie Lo from
3 the TMI Program Office who will make the staff's presen-
4 tation on that topic. Do you want to come up front
5 to use the overhead, and so forth. You should have
6 a handout for this particular presentation.

7 Incidentally, I might mention that these cleanup
8 endpoint alternatives are becoming a subject of discussion
9 for several plants. We met a few weeks ago on Humboldt
10 Bay in Eureka, California, and they had sort of the
11 same questions to answer, and I noticed that Dresden,
12 I believe it's Unit 1, is to be shut down, and something
13 done with it. Shipping Port is under way. So they're
14 beginning to happen, and it's becoming obviously a
15 generic issue on what to do.

16 This one, of course, has its unique aspects.

17 PRESENTATION OF MR. RONNIE LO

18 MR. LO: Good morning, You should have in your
19 handout an attached copy of the Commission paper which
20 we discussed about TMI cleanup endpoints, endpoint
21 alternatives.

22 The cleanup of TMI can be divided in to two
23 major cleanup phases--before the defueling operation
24 and after the defueling operation. To support the
25 reactor disassembly and defueling, the licensee has

1 conducted, and is conducting a dose reduction program,
2 and the activities during this program is mainly to
3 a-met, reducing the operator's dose during their operation
4 related to reactor disassembly and defueling.

5 Following the fuel removal, there is a separate
6 phase of cleanup for the remainder of the reactor
7 building and of the equipment. The dose reduction
8 activity takes place mainly in the upper operating
9 elevations of the reactor building. So, we envision
10 that by the time the fuel is removed, especially the
11 basement elevation of the reactor building, will still
12 be heavily contaminated, and we estimate that eighty
13 percent of the cleanup dose associated with the cleanup
14 of the reactor building, and the equipment, will be
15 tied up in the basement elevation.

16 MR. FIRST: What is in the basement, essentially?

17 MR. LO: Cesium 137.

18 MR. FIRST: No; no. I meant what kind of equipment.

19 MR. LO: Some in the basement, the base
20 of the elevator shaft, things like that.

21 MR. CARBON: Could you clarify a point for me.
22 After you clean it up, what are you going to do with
23 it?

24 MR. LO: After, how--

25 MR. CARBON: Yes. The building.

1 MR. LO: O.K. I'm going to get to that.

2 MR. CARBON: O.K.

3 MR. LO: In the Commission paper, we have pointed
4 out that there are three cleanup endpoint alternatives
5 that we should consider, and also, we have mentioned
6 that right off the bat, we have discarded the alternative
7 for entombing the radioactivity on site. We think
8 that being in the middle of the river, and in a highly
9 populated area, Three Mile Island is not a good candidate
10 for entombment.

11 The three remaining alternatives that we suggest
12 that you consider is, first, to proceed as what the
13 present plan is. That is, to immediately clean up
14 the remaining of the reactor building and equipment,
15 to levels, typically, of an operating reactor, just
16 prior to decommission.

17 The second alternative is to wait for development
18 of robotic technology to clean up the rest of the
19 building, and we would, for this alternative, we would
20 see to it that the licensee actively develops the
21 technology at the time of the interim storage. We
22 don't know how long it will take.

23 In the supplement to the programmatic environmental
24 impact statement, we have considered a length of time
25 from zero to twenty years during this interim caretaking

1 period. The third alternative is long-term storage.
2 This alternative will be similar to a SAFSTOR, but,
3 however, it's not being committed just to this decommissioning
4 alternative. What we envision is that maybe, after
5 a long-term storage, the question of decommissioning
6 will be taken up again when Unit 1 is ready for
7 decommissioning, and both units will be decommissioned
8 at the same time.

9 CHAIRMAN MOELLER: In all of these, you're assuming
10 you first take out the fuel?

11 MR. LO: Yes. That is most important, that
12 the first phase consists of taking out the fuel, and
13 by that time, the major threat to public safety would
14 have been removed, and you have some kind of leisure
15 as to what to do next. So therefore, these alternatives.

16 The obvious advantage of some of the alternatives
17 is in the savings in occupational radiation dose,
18 and I want to demonstrate that to you.

19 MR. CARBON: Would you say a word about--you're
20 speaking as though NRC is directing this. What's the
21 breakdown in responsibility? Can the utility say,
22 "We're going to--or, "We're proposing to do so and
23 so, and NRC would approve it", or, is NRC exercising
24 the initiative and saying what must be done?

25 MR. LO: The present operation of TMI cleanup

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1 is that for every major activity, they would write
2 us, they would give us their proposal, and that we
3 would have to approve. And as I'll show you later,
4 for the cleanup endpoints, we expect them to give
5 us a proposal, at the same time give us the analysis
6 of the alternatives of their proposal, to state the
7 reasons why they choose to go to this particular alterna-
8 tive, and at that time we would be able to analyze
9 the advantages and disadvantages.

10 MR. CARBON: Then what you're doing right now
11 is getting prepared to respond to their proposal.
12 Is that so?

13 MR. LO: We intend to ask them to submit to
14 us the proposal during the time of defueling, when
15 defueling is well under way, which we expect -- the
16 defueling is going to take place in the summer of,
17 beginning of the summer of 1985. So, some time in
18 1986, perhaps.

19 MR. CARBON: I'm still not clear. Right now,
20 are you getting--are you--what you would say--are
21 in the process of getting prepared to respond to their
22 proposal when it comes in?

23 MR. LO: They have not given us the proposal
24 yet and--

25 MR. CARBON: I know that.

1 MR. LO: --we intend to ask them. We intend
2 to ask them to give us their proposal.

3 MR. CARBON: O.K.

4 CHAIRMAN MOELLER: I guess, though, what Dr.
5 Carbon is asking, is a very good question. For example,
6 what is the driving force? What is the motivation
7 for GPU to do anything but entomb? You know, let's
8 say they decided they were going to entomb. Then I
9 guess you could say no--

10 MR. LO: Yes.

11 CHAIRMAN MOELLER: You've said you've discarded
12 that or rejected it, so--

13 MR. LO: Right. And we have made it known to
14 them, that we have discarded that, so, don't bother,
15 you know, coming in with that.

16 CHAIRMAN MOELLER: But then what is the motivation
17 or the driving force that causes GPU to propose or
18 select any given option?

19 MR. LO: Well, the cost involved, the main
20 room cost, for example, has also a direct involvement
21 in financial costs, and so that would be a good incentive,
22 to go one way or the other, and, we also have considered
23 that.

24 CHAIRMAN MOELLER: But you're more--you're not
25 the initiator. You just, you mainly respond to what

1 they propose.

2 MR. LO: But we look ahead in to the schedule,
3 and therefore, we would want them to submit their
4 plan to us, so that things will go smoothly when they
5 have to be taking place.

6 CHAIRMAN MOELLER: But do you have, say, monthly,
7 or weekly meetings with them, to offer suggestions,
8 or are you sort of forbidden, or, prefer not to offer
9 suggestions?

10 MR. LO: One important point that we want to
11 make is that before defueling, there's really not
12 significant difference between the alternatives, that
13 they have to do now. So that right now, day to day,
14 the effort is concentrated on defueling, and there's
15 no, there's really no difference on how they, how
16 the endpoint would affect the defueling operation.

17 MR. FIRST: Wayne, let me address one issue.
18 We do do a lot of active thinking about what GPU ought
19 to be doing in the way of cleanup activities. For
20 example, it was at our urging that GPU initiated the
21 dose reduction program back in the fall of 1982. We
22 recognized that their decontamination activities of
23 washdowns, surface washdowns, et cetera, really wasn't
24 doing much for dose reduction, and we didn't see any
25 GPU efforts in planning a series of alternative activities.

1 For example, shielding, removing a known contaminated
2 piece of equipment, things like that. So, generally,
3 GPU does--you're correct in assuming that GPU does
4 the bulk of cleanup planning, and they do submit their
5 proposals for our approval. But we do a lot of active
6 thinking on our own about what they should be doing,
7 and if they're not doing something that we think they
8 should be doing, we'll either write them a letter,
9 or call a meeting, and ask them why.

10 MR. CARTER: I still don't understand, though,
11 who really sets the schedule. I think that's the question,
12 and, it's not clear to me yet, who actually does this.
13 It looks like you folks prompt them to do certain
14 things but I presume you don't prompt them, if you
15 don't want to prompt them.

16 MR. FIRST: Let's put it this way: Generally,
17 we prompt them to conduct cleanup activities as expeditious-
18 ly as possible, and we conduct our own review and
19 responsibilities to ensure that we're never in the
20 critical path.

21 But the schedules, and the financial cost estimating,
22 et cetera, are really proposed by GPU.

23 MR. CARTER: Well, I think a lot of people
24 would disagree with you, that we've been expeditious
25 about doing anything with TMI, including the decommissioning.

1 MR. FIRST: That's true, and a big part of
2 that has been funding controlled. The funding is just
3 now falling in place, and we're very much encouraged
4 about having just about all of the funding needed
5 to complete cleanup, but that didn't occur until just
6 recently.

7 MR. CARTER: Well, let me ask another question
8 a different way. Is there actually, now, an overall
9 schedule for the decommissioning, or, is it still
10 sort of a piecemeal operation?

11 MR. FIRST: No, actually, GPU has not made that
12 decision yet, and we don't really see the urgency
13 to make a decision to either decommission, or, even
14 plan for refurbishing the plant for future power genera-
15 tion. They need not make that decision until, until
16 they're either well in to defueling, or have completed
17 defueling.

18 MR. CARBON: Since there's no need for that
19 decision in the early time, as I just understood you
20 to say, what is your specific purpose in doing this
21 study up here?

22 MR. LO: Well, we have not done a study. We
23 are just proposing the ideas of what kind of alternatives.

24 MR. CARBON: What is your reason for doing that
25 at this time?

1 MR. LO: You mean the reason for--

2 MR. CARBON: Why are you doing it? I'm not complain-
3 ing that you're doing it. I'm trying to find out why
4 you're doing it.

5 MR. LO: This got initiated because of the
6 supplemental, the Programmatic Environmental Impact
7 Statement, which re-evaluates the occupational dose,
8 and in one of the comments on the draft supplement,
9 the Advisory Panel for the cleanup of Three Mile Island,
10 suggested to the Commission, that we should look at
11 the endpoints of cleanup alternatives, and that's
12 how we got in to our previous response in writing
13 the Commission paper.

14 MR. WELLER: Dr. Carbon, I can tell you what
15 the initiator's thinking is behind this.

16 MR. CARBON: Again, who is the initiator?

17 MR. WELLER: The initial request really came
18 from the Advisory Panel, the TMI-2 Advisory Panel.
19 It was a suggestion from the State of Pennsylvania,
20 recognizing, from looking at the estimates of occupational
21 exposure to complete this cleanup, and, you'll see,
22 when Lonnie gets to these numbers, that the bulk of
23 them fall between thirteen thousand and forty-six
24 thousand man-rem. Now that's a pretty hefty man-rem
25 figure, and they recognize that perhaps there are

1 some alternatives that we should be considering, that
2 fall short of complete cleanup, and with the interest
3 in saving occupational exposure. That's really the
4 driving force, because, as Ronnie has pointed out,
5 the most significant environmental impact of TMI-2
6 recovery is occupational exposure. And it's quite
7 clear, in steam generator replacements, or other things,
8 that you people have perhaps reviewed.

9 CHAIRMAN MOELLER: On that line, Dr. Carbon,
10 if I can help--I'm probably repeating--but the Commission
11 set up with the State of Pennsylvania, and so forth,
12 this Advisory Panel which consists of citizens, as
13 well as technically qualified people, not that the
14 citizens aren't. Some of them probably are technically
15 qualified too.

16 And that committee has met with the Commission,
17 with the Commissioners themselves, and interchanged
18 thoughts and ideas, and they did request this, and
19 then that's the same committee that wrote a letter
20 to the Commission requesting that the ACRS help them,
21 and advise them on certain issues.

22 So, I couldn't have answered the question till
23 I heard their comments, so, this, then, is directly
24 in response to this committee's--meaning this Advisory
25 Committee's request.

1 MR. LO: I think if I go to the next viewgraph,
2 the motivation will be very clear. The total estimate
3 for occupational dose, thirteen to forty-six thousand
4 man-rem, person-rem, about one-half of it is due to
5 the cleanup of the reactor building and equipment,
6 and out of that, about eighty percent is going to
7 be the cleanup of the basement elevation, where, really,
8 the workers who are doing the defueling will not be
9 that severely affected by the radiation in the basement
10 elevation.

11 And so at a time when the fuel has been removed,
12 the major threat to public safety has been removed,
13 yet you still have about one-half of the man-rem
14 tied up in cleaning up the rest of the building.

15 MR. CARTER: Excuse me. Could I ask you a question
16 there. Would you give us an idea of how many actual
17 people are involved in each of these phases of the
18 activity.

19 MR. LO: We have estimated that as a number
20 to use, ten thousand workers will be involved in the
21 cleanup for about nine years.

22 MR. MARK: It would help me if you could repeat
23 something you already said. There is a fairly clear
24 schedule, and this is regarded as the first item to
25 go through, whether it comes on schedule, or not,

1 and that is getting the fuel out.

2 MR. LO: Yes.

3 MR. MARK: That's what must happen next, and
4 that's presently estimated to only be complete about
5 three years from now?

6 MR. LO: It will start from the summer of 1985,
7 after the plenum has been removed.

8 MR. MARK: Well, they complete the fuel in 1987--

9 MR. LO: Yes.

10 MR. MARK: --by their own estimates, by their
11 own present estimates, and it's only after that, that
12 some of the other steps--

13 MR. LO: Right.

14 MR. MARK: --could be pictured in any case.

15 MR. LO: Right.

16 MR. MARK: Now, is it after that, that eighty
17 percent of a man-rem would be received?

18 MR. LO: No. After that, eighty percent of--
19 fifty percent, about fifty percent of the man-rem
20 is involved in the cleanup of the reactor building
21 and equipment. Of that fifty percent, eighty percent
22 will be involved, as we estimated it, in the cleanup
23 of the basement elevation, which they are not doing
24 now.

25 MR. MARK: So, between now and '87, when they're

1 mainly occupied with the fuel--

2 MR. LO: Right.

3 MR. MARK: --what's the man-rem for that phase
4 of things?

5 MR. LO: The man-rem will be up to here. The
6 dose reduction program will occur simultaneously to
7 support the defueling operation. So, up to about here
8 will be the total man-rem, which is like, on the high
9 end, will be, forty-six of that--twenty-two thousand.
10 About one-half.

11 MR. MARK: So that is not really affected by
12 the long-range plan for the endstate?

13 MR. LO: No. Yes, that's true, and that's a
14 very important point to note.

15 MR. CARTER: Let me ask you one other thing,
16 since there'll be, if I understand it correctly, these
17 sorts of man-rem totals. These would be spread over
18 almost a decade, or a nine year period, and they would
19 involve ten thousand people. Is that essentially what
20 you've said?

21 MR. LO: Yes.

22 MR. CARTER: O.K. Let me ask a simple question,
23 I guess. How does the NRC view these numbers? Are
24 these considered to be large numbers, or, reasonable
25 numbers, or, just what? You know, during that same

1 period of time, just due to natural background radiation,
2 if I make a calculation correctly, we're going to
3 receive about 200 million man-rem's just as background.

4 MR. LO: Yes. Yes. We think that--we look at
5 the health effects of this thirteen thousand to forty-
6 six thousand man-rem, and we estimated, say, around
7 two to six additional cases of fatal cancer. For a
8 background rate of, say, like one-fifth of ten thousand
9 doses, which is like two thousand. Two to six out
10 of two thousand, background, is a very insignificant
11 number, in the sense that it is quickly lost in the
12 statistics.

13 MR. CARTER: It will be lost in the statistics.

14 MR. LO: It will be, if at all, if it happens
15 at all.

16 CHAIRMAN MOELLER: Now, as I recall, Mel, you
17 had asked earlier about how many people would be involved.
18 Don't hold me to this number, but I think in one of
19 the memos we recently received, GPU said there were
20 seven hundred people working there now. One other
21 thing. You were talking about a dose reduction program.
22 I noticed, in reading, at least for me, the latest
23 report on TMI-2 cleanup, they had some sort of a machine
24 in there that was scraping the top quarter of an inch--

25 MR. LO: Yes, the, especially the operation--operating

1 elevation areas, and they have been very successful
2 in doing that.

3 CHAIRMAN MOELLER: O.K. So they're grinding
4 the top quarter of an inch off of what? concrete floors,
5 and so forth?

6 MR. LO: Concrete floors, yes. Painted concrete
7 floors.

8 CHAIRMAN MOELLER: And we had earlier suggested,
9 and they responded quite adequately--we had suggested
10 to them, since Cesium was an eighty percent contributor
11 to the dose, could they not get some real good Cesium
12 chemists in there, and figure out a way to remove
13 this, and I guess they did and they couldn't, and
14 mechanical--

15 MR. LO: Yes. I think that they wrote a letter,
16 that you have a copy of.

17 CHAIRMAN MOELLER: Right. But what I'm saying:
18 you checked with them, and mechanically, removing
19 the top quarter of an inch was the best way to --

20 MR. LO: Right; right.

21 MR. EBERSOLE: May I ask a question?

22 MR. LO: Certainly.

23 MR. EBERSOLE: Could you sort of clarify, for
24 me, what is the value of the accomplishment? That
25 stuff is now nailed down in this quarter inch, isn't

1 it? It's immobilized, more or less?

2 MR. LO: Yes.

3 MR. EBERSOLE: So you're going to mobilize it
4 by grounding it off, and then you're going to carry
5 it off some place?

6 MR. LO: No. At the same time the grindoff material
7 will be picked up by a vacuum--

8 MR. EBERSOLE: Well, I understand you will do
9 that, but you're picking it up, and moving it, in
10 any case, to some place, I guess.

11 MR. LO: Right.

12 MR. EBERSOLE: And when you get done, what are
13 you going to have, that's worth anything?

14 MR. LO: Well, it's most important to reduce
15 the radiation level in the operating levels of that--

16 MR. EBERSOLE: Are you going to re-use the building?

17 MR. LO: No. That's not the purpose for it.

18 MR. EBERSOLE: So, what's going to--

19 MR. LO: The purpose is to reduce the operation,
20 occupational dose--

21 MR. EBERSOLE: Yes. I'm just trying to get to
22 the practical value of the final accomplishment, which
23 it sounds to me like a clean building that will never
24 be used for anything.

25 CHAIRMAN MOELLER: Well, but it's clean while

1 they're in there doing the defueling and many other--

2 MR. EBERSOLE: Oh, I thought that had been done
3 in front of this.

4 CHAIRMAN MOELLER: No.

5 MR. EBERSOLE: Oh, I see. It's the order of
6 events.

7 CHAIRMAN MOELLER: The quarter of an inch removal
8 is going on--

9 MR. EBERSOLE: It's just to get the rem--

10 CHAIRMAN MOELLER: It's going on right now.

11 MR. EBERSOLE: O.K.

12 CHAIRMAN MOELLER: Now what fraction of, what
13 sort of dose reductions are we, are they securing,
14 or obtaining by the quarter inch removal?

15 MR. LO: Previously, the dose level sat around,
16 say, fifty--seventy-five--fifty to seventy-five man-
17 rem per hour, and right now, after doing that, that
18 they have reduced it to thirty-five man-rem per hour.

19 CHAIRMAN MOELLER: So it's about a fifty percent--

20 MR. LO: It's significant, yes.

21 MR. WYLIE: May I ask, in follow-up to that,
22 if they didn't do that, would the third line out there
23 be seventy-five percent greater than it is, by this
24 grinding floor, removing Cesium, and so on? Or are
25 they significantly--

1 MR. LO: You'll notice that we have--yes. We
2 have a very large range, like two thousand six hundred
3 to fifteen thousand. It's a very large range for the
4 reactor deassembly and the defueling. Part of the
5 range is because of recognizing potential difficulties
6 in defueling. Part of it is because of recognizing
7 the success or non-success of the dose reduction program.

8 MR. WYLIE: But is it possible to say that to
9 a first gross approximation, is the dose reduction
10 program likely to reduce the dose by a factor of about
11 two, or some such thing?

12 MR. LO: Yes, I would say so, because the dose
13 is directly proportional, almost, to the stay time,
14 the total stay time of the workers.

15 MR. WYLIE: So, line three, then, without the
16 dose reduction might be five thousand to thirty thousand?

17 MR. WELLER: No, I think what he's saying is
18 that it still falls within that very wide range. What
19 we really don't know is when the law of diminishing
20 returns is going to set in for dose reduction activities.
21 In other words, when it's going to cost you as much,
22 in your effort, to effect a significant dose reduction
23 itself. And that's the reason for the wide range up
24 there.

25 MR. MARK: The fifteen assumes no success with

1 dose reduction?

2 MR. LO: Exactly; exactly. Compounded by difficul-
3 ties in the defueling operation.

4 CHAIRMAN MOELLER: Is there anyone who could
5 help me with what's the half value there for Cesium
6 gammas? I mean, would a quarter of an inch of lead
7 spread over this do anything?

8 MR. LO: It's a 0.6 Mev.

9 CHAIRMAN MOELLER: Right. I know that but I
10 wished I could remember--I just, I'm sure they've
11 compared the removal to laying lead, you know, rubber
12 sheets, or, you know, they have this portable lead
13 shielding that I've seen they've strung around various
14 areas.

15 MR. LO: Yes. And shielding has been done to
16 quite an extent already.

17 CHAIRMAN MOELLER: So they've already tried
18 that to the degree it can be used. O.K.

19 MR. LO: Right.

20 MR. HEALEY: Dave, I would warn against using
21 anything like leaded rubber sheeting in there because
22 you could make the situation considerably worse by
23 the scatter from the surface--

24 CHAIRMAN MOELLER: And the reduced energy, and
25 so forth. Yes.

1 MR. CARBON: One other question, just for information.
2 What's the magnitude of dose being received during
3 the dose reduction program?

4 MR. LO: It has been quite small, in that the
5 benefit from it has far outweighed the efforts in
6 the dose expenditure. I don't have the exact number
7 with me, but it is well worthwhile.

8 MR. WELLER: You do show your estimate up there,
9 though, Ronnie, of two thousand to five thousand for
10 the total program.

11 MR. LO: Right. That's to give you an idea.

12 MR. WELLER: I might point out, that the total
13 dose incurred to date, I think has been much lower
14 than everyone would have thought. It's only about
15 2000 man-rem, and I'm not sure that GPU is ever going
16 to get up to these high values that we predicted.
17 But there's still a lot of unknowns yet in the cleanup,
18 so, we don't want to prejudge that too much.

19 MR. EBERSOLE: May I ask. The bottom line that
20 governs the efficiency and thoroughness of this is
21 always the pocketbook. Who's bearing the cost of this
22 and--

23 MR. LO: GPU--

24 MR. EBERSOLE: --must have the primary incentive
25 to get it done?

1 MR. LO: Well, GPU is bearing the primary but
2 DOE, and others are contributing to the effort.

3 MR. EBERSOLE: In what sort of ratios?

4 MR. LO: I don't have any idea on that.

5 CHAIRMAN MOELLER: We have a memo on that, and
6 I happen to remember some of the numbers, to give
7 you some rough estimates. GPU, over the next three
8 of four years, was contributing 70 million, EPRI a
9 little bit less than one million, DOE about ten or
10 fifteen million, and a couple other groups in the
11 ballpark of a million.

12 MR. EBERSOLE: Thank you.

13 MR. MARK: The Japanese are putting in three.

14 CHAIRMAN MOELLER: The Japanese are putting
15 in three, right.

16 MR. WELLER: And the State of Pennsylvania and
17 State of New Jersey are adding an amount as well.

18 CHAIRMAN MOELLER: But certainly, GPU would
19 be seventy percent, and all the others might be thirty.

20 MR. CARBON: Well, not to prolong it, but hasn't
21 there been something in the newspapers in the last
22 couple days about somebody kicking in four hundred
23 million, or some such thing? Other utilities?

24 MR. FIRST: I think the other utilities was
25 the news item that they were getting pooled together.

1 MR. WELLER: Yes, that figure is--

2 MR. CARBON: Four hundred million or--

3 MR. WELLER: No, it's a hundred and fifty million,
4 and that's the new commitment that I was referring
5 to earlier. The EEI will now, has now pledged twenty-
6 five million per year for the next six years, and
7 that's the element that was missing from the Thornburg
8 plan.

9 MR. CARBON: Does this come out of stockholders'
10 earnings, or rate structures?

11 MR. WELLER: No, I don't think it's going to
12 come out of--well, I guess, I can't really speak for
13 each individual utility that has pledged to make a
14 contribution because I'm not sure that's been decided
15 yet. But let me say this: There had been a number
16 of utilities, and I'm not sure how many, who have
17 pledged a total of about \$42 million, and, the utilities
18 in Pennsylvania and New Jersey have pledged to make
19 up the shortfall that would arise from not having
20 \$25 million per year. And those monies would come
21 out of monies normally contributed to EPRI.

22 CHAIRMAN MOELLER: One other item on that, Max,
23 that you may recall. It's been about six months ago,
24 that some judge, or whoever makes such rulings, ruled
25 that utilities contributing to the cleanup of TMI

1 would be given tax advantages on this money they contri-
2 buted, and GPU was delighted. and Pennsylvania, because
3 they thought that would stimulate contributions, and
4 it took a little while, but apparently, it has.

5 MR. LO: In one of the alternatives looked at,
6 not the endpoint alternatives, but the cleanup alterna-
7 tives, looked at in the Programmatic Environmental
8 Impact Statement, the supplement to it, is the completion
9 of the cleanup by applying robotic technology. And
10 this is the kind of dose estimate. The bottom line
11 is that, well, the high end of the dose is reduced
12 from forty-six to twenty-eight thousand, and, the
13 lower end is from thirteen to seven thousand, about
14 one-half reduction. And you can see that it comes
15 from the cleanup of the reactor building now being
16 only a very small fraction of the other alternative.

17 And in it they have estimated the interim care
18 period to be zero to twenty years, and assuming a
19 certain person-rem for care every year.

20 The third alternative. We have not explicitly--

21 CHAIRMAN MOELLER: Has the NRC staff looked
22 at robotics in detail, to do an independent assessment
23 of how quickly GPU could move forward to use this
24 technique?

25 MR. LO: No, but we have thought of the usage

1 of robots in the, in relation with how soon defueling
2 can be done, and we have determined that defueling
3 at the present time is the best cost robot.

4 MR. WELLER: Let me make a couple of comments
5 about that. GPU has a program, right now, in concert
6 with the Carnegie-Mellon University, and probably,
7 some time this year, they're going to send a robot
8 down to the basement level, the very highly contaminated
9 basement, which, in which some areas, there are greater
10 than a thousand r/hr fields. But these robots, they'll
11 probably have radiation monitors, TV cameras, but
12 nothing more sophisticated than that yet.

13 They simply don't exist, from the standpoint
14 of being able to send robots down that can affect
15 scabbling, for example, or other cleanup activities.

16 CHAIRMAN MOELLER: And you're saying, from the
17 standpoint of the defueling operation, robots are
18 out for the moment? I mean, they will--

19 MR. LO: The fastest way to defuel is by the
20 present plan. The third alternative, which involves
21 a long-term storage, without even developing robots
22 to clean up, we have not done a explicit man-rem
23 estimate for that, but you can kind of have a good
24 idea on the man-rem saving by looking at the dose
25 estimate for if we were to clean it up immediately.

Tp. 2--

1 Because most of the contamination, the radiation from
2 it is from Cesium 137, with a half-life of thirty
3 years, a storage period will proportionately decrease
4 the man-rem. So, for example, if you put it in to
5 storage for thirty years, you will expect a saving,
6 man-rem saving of about twenty-five percent, because
7 one-half of it is involving cleaning up of the building.

8 What we--we want--I've pointed this out previously,
9 that it is not essential that a decision be made at
10 this time, prior to defueling, that operations, including
11 defueling, will not affect the decision on the endpoint
12 alternatives.

13 And we expect GPU to submit the endpoint proposals
14 when defueling is well under way, and in the proposal,
15 we expect them to look at several, look at the alterna-
16 tives, and also, give us an assessment for occupational
17 dose, any offsite impact, the existing rules and regula-
18 tions at that time, and if any
19 residual activity levels, decommissioning rules and
20 regulations, and also, the cost benefit end of it,
21 the costs in terms of occupational dose, and of the
22 benefit, and maybe, say, offsite impact. And the benefit,
23 in terms of savings in occupational dose.

24 This is what I have prepared.

25 CHAIRMAN MOELLER: Could you comment on the

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1 offsite impacts of the various approaches, what will
2 they be.

3 MR. LO: We do not, of course, have, find to
4 a detailed study, but I only can give you my intuitive
5 feeling. I think that the offsite impact is going to
6 be minimal.

7 MR. EBERSOLE: All of this defueling is, of
8 course, done under water, isn't it?

9 MR. LO: Yes.

10 MR. EBERSOLE: Is there any more than just flooding,
11 in the normal way, of the vessel, and refueling well,
12 or, is that all that's flooded, like it would always
13 be?

14 MR. LO: Dr. Weller will answer you about the
15 defueling plan.

16 MR. WELLER: It's partially the same. What they
17 will do is partially flood the refueling canal, but
18 what they have presently conceived right now, is somewhat
19 of a dry defueling, or, at least dry transfer to the
20 deep end of fuel cannisters, to the deep end of the
21 refueling canal, for then transfer to the A-fuel pool
22 in the fuel handling building.

23 So it would be partially flooded. It would be
24 at least still, I think, fifteen, twenty feet of water
25 over the fuel, so that's plenty of shielding. But they

1 don't want to develop a concept in which workers would
2 have to work at distances of forty, forty-five feet
3 above the fuel, trying to manually manipulate these
4 tools. It's just very difficult at those distances.

5 MR. EBERSOLE: Well, what I was wondering about
6 was, we keep talking about cleaning up the basement,
7 and I was wondering why do people have to be in the
8 basement anyway.

9 MR. WELLER: People don't have to be in the
10 basement. As a matter of fact, you could forget about
11 the basement through defueling, and that's largely
12 what GPU will do, other than such developmental programs
13 such as sending a robot down there for some initial
14 running around, just to visually observe the conditions
15 down there.

16 MR. EBERSOLE: Oh. I got an impression you were
17 cleaning up, taking the concrete off in order to--

18 MR. WELLER: No, not in the basement. They're
19 scabbling now on the 347 foot operation which is the
20 operating floor, the floor on which the bulk of the
21 activities will take place through defueling. They're
22 probably going to scabble as well in the 305 foot elevation
23 which is the elevation the workers enter the building.

24 And right now, conditions in the basement are
25 such, that they have about eight and a half inches

1 of water down there. And I might point out that the
2 water, simply by having water in the basement has a
3 beneficial effect, because over the past year, about
4 a thousand curies of Cesium have leached in to that
5 water.

6 So, in effect, GPU is getting some free curie
7 catching simply from having water present in the building,
8 and what they can do over the next several years, while
9 they're conducting these defueling activities, is simply,
10 periodically process that water, put fresh water back
11 in.

12 MR. EBERSOLE: Is the water over the core, as
13 well as that being continuously reprocessed and polished
14 up, and is it always cleaned?

15 MR. WELLER: It's all being batch processed.
16 I wouldn't say continuous. But all of the equipment
17 is in place to process either continuously, or in batch
18 fashion, as needed. The water right now in the RCS,
19 I think is on the order of about a tenth of a micro-curie
20 per mil in Cesium, so that activity is down pretty
21 low. The activity in the basement water, for example,
22 is about, over, eight to nine micro-mil. So it's considerably
23 hotter.

24 MR. MARK: It seems to me that this experience
25 you report of water in the basement absorbing Cesium?--

1 MR. WELLER: Yes, sir.

2 MR. MARK: --would be very useful data for a
3 discussion of whether entombment is a good thing or
4 not, and other such proposals, because here you've
5 got, at last, a nice measurement and leeching rate.

6 MR. WELLER: Yes, sir. I'm not sure they have
7 an active program to, you know, to gather all that
8 data. We've suggested--

9 MR. MARK: But it is data.

10 MR. WELLER: Yes. There's some data, but there
11 really isn't a, you know, a well-organized scientific
12 program in place to measure leeching rates, and things
13 like that. We do have some gross numbers, and we've
14 looked at those numbers, you know, for the past year's
15 worth of data.

16 MR. MARK: That might have real value.

17 MR. WELLER: Yes, sir.

18 CHAIRMAN MOELLER: One of the questions that
19 I recall they had, or, one of the initial questions,
20 was whether the--I guess it's the plenum was warped,
21 or wouldn't come out easily. When will they know that?

22 MR. WELLER: We have just recently approved
23 plenum inspection activities, and those activities
24 will include not only cleaning of surfaces of the plenum,
25 but the measurement of all the potential interferences

1 in the plenum, all those close points of contact in
2 the Keyway, and the local boss gaps, et cetera, to
3 determine if indeed the plenum has been ovalized, or
4 was ovalized during the accident, and is perhaps even
5 wedged in place.

6 Those activities will begin around the 1st of
7 October and will take place over the next several months.
8 Also included in that program will be efforts to push
9 the actual power shaping rods in to the core, so that
10 they're not dangling there when they ultimately do
11 remove the plenum, and they'll also, as a part of that
12 program, remove the upper end fittings that are now
13 either stuck, or perhaps even welded to the underside
14 of the plenum. So that indeed, you don't have these
15 stalactites hanging off the underside of the plenum,
16 when you ultimately remove the plenum, and put it in
17 the deep end of the canal, on its storage stand.

18 CHAIRMAN MOELLER: Now we talked a little bit
19 about the schedule and you had indicated that it was
20 pretty much dictated by finances, and is the defueling
21 operation dictated by finances? I mean you were--we've
22 heard the number of eighty-five to, I guess began to
23 remove the fuel, and be finished by eighty-seven. Why
24 does it take so long? I mean what is--I realize fuel
25 may be scattered throughout the primary system.

1 MR. WELLER: Yes, sir. You recognize that it
2 is a sequential process, that first of all, you have
3 to remove the head, which was just done this summer.
4 Next, you have to pull the plenum, and plenum jacking
5 is scheduled now for December of this year, plenum
6 removal being scheduled for May, and actual initiation
7 of defueling operations, that the first phase of
8 defueling, let me call it, is now scheduled for July
9 of '85, and is anticipated to last at least through
10 1986.

11 The first phase of defueling is vacuuming, and
12 there are still a lot of items in the critical path.
13 No. 1, a full cleanup system. No. 2, the refurbishment
14 of the A-fuel pool, because as you may remember, there
15 was a tank farm placed in there for the storage of
16 accident-generated water, and there's still tanks in
17 that pool.

18 They also have to modify the transfer equipment
19 from the deep end of the fuel, the fuel pool, over
20 to the fuel handling pool.

21 They also have to complete the development of
22 the canisters which will be utilized to collect the
23 fuel, from the vacuuming process, and also, from any
24 "pick and place" operations, if you want to call it
25 that. Just picking up pieces of, larger pieces of

1 fuel elements, upper end fittings, control rod material,
2 et cetera. So, there are a lot of items in the critical
3 path. Casts have to be built for fuel shipment to Idaho.
4 There are lots of elements in the critical path right
5 now. A July date is really kind of a fast-track date
6 for defueling.

7 MR. EBERSOLE: How do you know that when you
8 lift off the top superstructure there, that you're
9 not pulling out some absorbers which might be important
10 to the criticality problem?

11 MR. WELLER: Criticality, right now, is strictly
12 controlled by--

13 MR. EBERSOLE: That's all by liquid, isn't it?

14 MR. WELLER: Solution. Yeah. Everybody assumes
15 in their criticality analysis--

16 MR. EBERSOLE: That you might pull rods out.

17 MR. WELLER: --that the control rods are, are
18 gone.

19 MR. EBERSOLE: Right. O.K.

20 MR. WELLER: Obviously, they're some place,
21 that control rod material is some place. It could be
22 well-plated out or mixed in the fuel line.

23 MR. EBERSOLE: But it's pure liquid poison.
24 Right.

25 MR. WELLER: I agree, but for--our criticality

1 calculations and purposes, everybody assumes that there's
2 no value to it.

3 CHAIRMAN MOELLER: Right. O.K. And from our standpoint,
4 or from your standpoint, what's the next step in terms
5 of the alternatives for cleanup?

6 MR. WELLER: You mean consideration of alternatives
7 following defueling?

8 CHAIRMAN MOELLER: Yes. In other words, you've
9 given us a status report, but what's next?

10 MR. WELLER: Yes. As Ronnie has pointed out
11 in his SECY paper, he does commit to our office developing
12 plans, and he does describe those plans in the SECY
13 paper. What we plan to do in the way of evaluating
14 various alternatives following defueling.

15 One of the important points in his presentation
16 is, that regardless of which alternative you might
17 consider following defueling, that the path to get
18 there through defueling is virtually the same. So that,
19 you know, decisions made now regarding post-defueling
20 activities will not affect the path, or the occupational
21 exposure to complete defueling.

22 MR. EBERSOLE: Well, that's kind of a backward
23 view in to what might have happened, which, I guess
24 you could go as far as the classical loss of cooling
25 accident. You could not then fill the liquid, portion

1 of the vessel, except at the top of the pipe level,
2 unless you had flooded the whole building. Would you
3 have thought that had this derived from a classical
4 loca, you would be in much greater difficulty to clean
5 up the mess?

6 MR. WELLER: I don't know because there--the
7 activity was certainly well scattered throughout the
8 reactor building.

9 MR. EBERSOLE: No, I'm talking about going
10 down and getting all the junk out. See, I don't see
11 that you could have water now as a cover, unless you
12 fill the building.

13 MR. WELLER: You mean down to the basement?

14 MR. EBERSOLE: Yes. Right on up--

15 MR. WELLER: Well, you can, as a matter of fact,
16 one of the things that we've suggested to GPU that
17 they look at seriously, is re-flooding the building
18 with clean water.

19 MR. EBERSOLE: To cover the core?

20 MR. WELLER: Not to cover the core. I don't
21 think that's necessary, because, what has happened
22 is, that with the previous eight to nine feet of accident-
23 generated water in the basement, at gross curie levels
24 of about 180 micro-mil--

25 MR. EBERSOLE: Yes, but how do you, how do

1 you get the fuel out? How would you get the fuel out?

2 MR. WELLER: There's very little fuel in the
3 basement.

4 MR. EBERSOLE: No, I mean how would you get
5 it out of the vessel if you had a hole in the primary
6 loop. You couldn't fill it with water without filling
7 the building.

8 MR. WELLER: That's true. It would depend on
9 how big the hole is, and whether you could make up
10 sufficiently for it. GPU has, you know, has done a
11 lot of thinking about unassailable leakage. For example,
12 if one or more of the instrument tubes happen to fail,
13 that penetrate the bottom of the vessel--

14 MR. EBERSOLE: Yes. I'm thinking about a locum.

15 MR. WELLER: Another loca? I think the probability
16 of another loca is very--

17 MR. EBERSOLE: No; no. I mean, if that had
18 been the original event, and you could not now have
19 a liquid cover for that continuous pumping.

20 MR. WELLER: For us to flood--you have to flood
21 the air locks and everything else, to flood up to
22 the--

23 MR. EBERSOLE: That was my hypothesis, that
24 that probably ought to be a design feature.

25 MR. WELLER: I see. In other words, design it so

1 that it's--

2 MR. EBERSOLE: As a matter of fact, the Brown's
3 Ferry plant is rigged for that. You can flood it clear
4 up, drywell and all. But that's a small drywell instead
5 of a big building.

6 MR. WELLER: But that's boiler, too, right?

7 MR. EBERSOLE: Yes, right.

8 MR. WELLER: Yes.

9 MR. EBERSOLE: But it makes possible, even if
10 the primary loop is disintact, you can just flood the
11 whole kaboodle.

12 MR. WELLER: Yes, sir. I was concerned at that
13 time about reactor building integrity. I mean, if you
14 had a leak in the line, or the containment liner, there's
15 virtually nothing you can do about it, it got out into
16 the river itself.

17 MR. EBERSOLE: Right. That would be--flooding
18 the building is another problem.

19 CHAIRMAN MOELLER: Max, a historical question
20 here. In consideration of the man-rem levels, did people
21 think of, consider maybe using older people for a lot
22 of this work? I'm serious. I'm thinking of the fact
23 that I'm age 62, I could do work like this, and there'd
24 be no genetic effects. Cancer I think is a long-term
25 process in building up, and I would think that the

1 health effects on older people would be much less severe,
2 seriously. Is there any merit to this?

3 MR. WELLER: Let me say one thing about work
4 in the reactor building. It's pretty strenuous. I'll
5 tell you. You know, we were up there during--

6 CHAIRMAN MOELLER: I think I could do strenuous
7 work.

8 MR. WELLER: --and stay times in the building
9 are probably more determined by fatigue, than dose
10 rate, than anything else. Having to get all suited
11 up, and carrying around relatively bulky clothing and
12 equipment, et cetera.

13 Even these young studs that go in the building
14 are relatively fatigued when they come out. So I'm
15 not sure that, you know, sending older people in the
16 building is a solution to that problem.

17 CHAIRMAN MOELLER: Well, I would discount that
18 to a considerable extent for lots of people, say, age
19 fifty and over. But apparently this has not--

20 MR. WELLER: I don't think that's been a major
21 consideration. You've probably had people of all, varying
22 ages, doing work in the building, some jobs being much
23 less bothersome than others, much less strenuous.

24 MR. MARK: But your Freudian slip in using the
25 word studs does call attention to the genetic effect.

1 CHAIRMAN MOELLER: Okay. Any other questions
2 or comments?

3 (No response.)

4 CHAIRMAN MOELLER: Well, let me thank Mr. Weller
5 and Mr. Lo for coming down and briefing us on this,
6 and bringing us up to date.

7 MR. MARK: Could I ask: the stuff that's creating
8 that exposure level in the basement is, you think,
9 primarily Cesium.

10 MR. WELLER: Yes, sir.

11 MR. MARK: It's essentially all lodged in the
12 concrete walls. Through what depth? Is that known?

13 MR. WELLER: That's unknown. GPU does have plans
14 for taking core borings in the basement, such as they
15 have done already on the 347-foot, 305-foot.

16 MR. MARK: There's a little feeling for it from
17 the depth that exists on the level they're now chipping
18 away at.

19 MR. WELLER: Yes, and what they've found is
20 that the bulk of activity is in the paint, or it was
21 very close to the paint, on the 305 and 347-foot elevations.
22 That's not necessarily the case where you had the water
23 in virtual continuous contact for several years. It's
24 really unknown right now, and GPU may well devise those
25 robots that they're going to send down later this year

1 to do those core borings.

2 MR. MARK: Now if they found that it was in a
3 rather thin skin, which is possible--if they heated
4 that water down there, would the leech rate not go
5 up, essentially, exponentially?

6 MR. WELLER: It could. As I mentioned before,
7 just having water present without heating in the basement,
8 you're getting--they're getting significant curie catching,
9 and that comes free.

10 MR. MARK: Well, that sounds like a great way
11 of doing a lot of work.

12 MR. WELLER: Not having to send anybody down
13 the basement, at all.

14 MR. FIRST: Along the same lines, it would
15 be useful to put some chemicals in that would increase
16 the mobility of the ion, if that was an objective.

17 MR. WELLER: You might be able to do that following
18 defueling, but right now, they still have to be concerned
19 about a boring injection in the primary system, or,
20 say, a boring dilution incident, and going in to the
21 research mode, and having to reinsert that water that's
22 presently in the basement back into the system.

23 So right now, I'm not so sure that, you know,
24 they're thinking all that seriously about putting different
25 kinds of chemicals in the basement. Maybe later, following

1 defueling, when you don't have those concerns about
2 criticality, and boring diluti

3 CHAIRMAN MOELLER: Any other questions, or comments?

4 (No response)

5 CHAIRMAN MOELLER: Well, let me thank you, once
6 again, and I think with those remarks, this will conclude
7 the formal session of our subcommittee meeting. We'll
8 now recess and take a fifteen minute break, and then
9 go in to Executive Session.

10 For members of the public who may be present,
11 the Executive Session will be open to the public, but
12 it will not be recorded. Thank you.

13 (Whereupon, at 9:40 a.m., the open meeting of
14 the Subcommittee on Reactor Radiological Effects was
15 concluded.)

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CERTIFICATE OF PROCEEDINGS

This is to certify that the attached
proceedings,

IN THE MATTER OF:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON REACTOR RADIOLOGICAL EFFECTS

DATE: SEPTEMBER 28, 1984

PLACE: WASHINGTON, D.C.

were held as herein appears and that this is the original
transcript for the file of the Commission.

REPORTER: CHIP GREENWOOD

SIGNED: *Chip Greenwood*

TRANSCRIBER: NEAL R. GROSS

SIGNED: *Neal R. Gross*

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COMMISSION INFORMATION PAPER - SECY-84 277

(JULY 10, 1984)

SUBJECT: TMI-2 CLEANUP ENDPOINT ALTERNATIVES

TWO MAJOR CLEANUP PHASES

- * DOSE REDUCTION PROGRAM

- REACTOR DISASSEMBLY AND DEFUELING

- HEAD REMOVAL

- PLENUM REMOVAL

- DEFUEL

- LOWER INTERNALS REMOVAL

- PRIMARY SYSTEM DECONTAMINATION

- * REACTOR BUILDING AND EQUIPMENT CLEANUP

- (80% DOSE FROM BASEMENT CLEANUP)

- AUXILIARY AND FUEL HANDLING BUILDING CLEANUP

ENDPOINT ALTERNATIVES FOLLOWING FUEL REMOVAL

- (1) IMMEDIATE CLEANUP OF REACTOR BUILDING AND EQUIPMENT TO LEVELS OF TYPICAL OPERATING REACTOR PRIOR TO DECOMMISSION
- (2) INTERIM STORAGE AND ROBOTIC CLEANUP
ACTIVE DEVELOPMENT OF ROBOTIC TECHNOLOGY WHILE INTERIM STORAGE, ZERO TO 20 YEARS.
- (3) LONG-TERM STORAGE
SIMILAR TO SAFSTOR BUT NOT COMMITTED TO THAT DECOMMISSIONING OPTION. MAY DEFER DECISION UNTIL UNIT - 1 IS TO BE DECOMMISSIONED.

DOSE ESTIMATE FOR PRESENT CLEANUP PLAN

TASK	PERSON-REM
DOSE TO DATE	2,000
DOSE REDUCTION PROGRAM	2,000 - 5,100
REACTOR DISASSEMBLY & DEFUEL	2,600 - 15,000
PRIMARY SYSTEM DECONTAMINATION	56 - 970
WASTE MANAGEMENT AND UTILITY	200 - 700
REACTOR BUILDING & EQUIPMENT CLEANUP	5,900 - 21,000
AUXILIARY & FUEL HANDLING BUILDING CLEANUP	500 - 1,400
TOTAL	<hr/> 13,000 - 46,000

DOSE ESTIMATE FOR DEFUEL FOLLOWED
BY CLEANUP WITH ROBOTICS

TASK	PERSON-REM
DOSE TO DATE	2,000
DOSE REDUCTION PROGRAM	2,000 - 5,100
REACTOR DISASSEMBLY AND DEFUEL	2,600 - 15,000
PRIMARY SYSTEM DECON	11 - 190
AFHB DECONTAMINATION	97 - 1,400
WASTE MANAGEMENT & UTILITY	200 - 700
INTERIM CARE OF RR & AFHB	0 - 620
ROBOTIC CLEANUP OF RB AND EQUIPMENT, PRIMARY SYSTEM AND AFHB	300 - 3,500
TOTAL	<hr/> 7,200 - 28,000

* DEFUEL PRIOR TO SUBSTANTIAL RB DECONTAMINATION, ENDPOINT
ALTERNATIVE DECISION NO SIGNIFICANT IMPACT ON OCCUPATIONAL
DOSE,

* GPU TO SUBMIT ENDPOINT PROPOSAL WHEN DEFUELING IS UNDERWAY,

- OCCUPATIONAL DOSE
- OFFSITE IMPACT
- EXISTING RULES AND REGULATIONS
- COST BENEFIT



POLICY ISSUE

(Information)

July 10, 1984

SECY-84-277

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: TMI-2 Cleanup Endpoint Alternatives

Purpose: To inform the Commission of the possible TMI-2 cleanup endpoint alternatives and the staff's plan of evaluation

Discussion: On April 16, 1984, the Advisory Panel for the Decontamination of TMI-2 wrote to the NRC Chairman offering comments on the draft Supplement to the PEIS. One of the comments in the letter (item 5 of Enclosure) suggested that the staff should further examine the alternative of curtailing clean-up efforts following fuel removal and gross decontamination of the reactor coolant system and reactor building. The Panel suggested that this alternative should be quantitatively evaluated with regard to risk to the public associated with leaving some residual radioactivity on-site and the potential health impact on the workforce. During the Advisory Panel's meeting with the Commissioners on May 30, 1984, the need to further evaluate this alternative was discussed. An issue germane to addressing this alternative is defining the endpoint of the cleanup process. The purpose of this paper is to inform the Commission of the staff's plan for evaluation of alternative definition of the TMI-2 cleanup endpoint and the related policy implications of such alternatives.

Background

In the staff's final Programmatic Environmental Impact Statement (PEIS) issued in March 1981, there is a discussion on the expected condition of TMI-2 after the cleanup from

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the accident and prior to the initiation of any decommissioning activities. At the start of decommissioning, the two principal goals of cleanup would have been met. These two goals are: (1) The reactor has been defueled. The irradiated fuel elements and debris have been removed and stored in the spent fuel pool. Shipment of the irradiated fuel to an Away-from-Reactor storage, reprocessing plant or some other disposal facility is assumed to have begun. (2) The large quantities of water-soluble and otherwise readily dispersable radioactivity would have been collected, packaged and ultimately removed from the site. It is also assumed in the PEIS that the general area radiation exposure rates on the operating floor would be in the 5 - 10 mrem/hr range, and approximately 30 mrem/hr in the basement of the reactor building and that the building surfaces have smearable contamination levels in the 3,000 - 4,000 dpm/100 cm² range, exclusive of very localized hot spots. In other words, the radiological conditions in the reactor building would not be significantly different from a normal operating reactor ready for decommissioning. At this point, the NRC would consider the licensee's proposal for either refurbishment or for decommissioning.

The discussion in the PEIS, however, assumed substantive decontamination of the reactor building prior to defueling. It postulated that, following the processing of the reactor building sump water, the removal of the sludge and the washdown and decontamination of the reactor building, defueling would take place under radiological conditions close to those anticipated for a typical operating plant prior to decommissioning. The actual cleanup experience to date, however, indicates that following the processing and removal of the sump water and the washdown of the reactor building, the radiation levels in the reactor building are substantially higher than those predicted in the PEIS. At present, the general area radiation in the upper elevation floors is in the range of 50 - 150 mrem/hr and well over 100 R/hour in the basement.

Occupational Dose and PEIS Supplement

In December 1983, the staff issued a draft Supplement to the PEIS to reevaluate the radiation dose likely to be incurred by the cleanup workers during the entire cleanup. In addition to the present cleanup plan which is to complete building and equipment cleanup

immediately following defueling, the Supplement evaluates several cleanup alternatives. One conclusion of the staff is that the occupational doses, under all the cleanup alternatives evaluated, are likely to be higher than those estimated in the original PEIS. Under the present cleanup plan, it is estimated that about one-half of the occupational dose (about 6,000 to 21,000 person-Rems out of a total of about 13,000 to 46,000 person-Rems) will result from activities related to reactor building and equipment cleanup. The only cleanup alternative discussed in the Supplement that would result in a substantial saving in occupational dose is to defer the cleanup of the reactor building and equipment until these tasks can be performed robotically.

Another important conclusion of the Supplement is that since the most dose-intensive tasks are reactor building and equipment decontamination (unless these tasks are done using robotic technology), any decision on TMI-2 final cleanup endpoint would not have a significant impact on occupational dose, until after defueling. For environmental impact, i.e., occupational dose considerations, cleanup activities can be divided into two major phases; those activities related to defueling and those following fuel removal.

Cleanup Endpoint Alternatives

When the reactor is defueled and the irradiated fuel is removed from the site, the major potential source of risk to public health and safety will have been eliminated. The radioactivity levels in the TMI-2 reactor building are expected to be higher than those of an undamaged operating reactor undergoing preparation for decommissioning, especially in the reactor building basement where the level is expected to remain above 100 R/hour. The major radiation source is expected to be Cs-137 with a half-life of about 30 years, unlike the case at an undamaged operating reactor prior to decommissioning where the major sources would be corrosion products with typically shorter half-lives of about 5 years. Decontamination experience at TMI-2 (e.g., surface washdowns) indicates that the remaining contamination would not be readily removable. On the other hand, it does not appear that the residual contamination will be readily dispersed to the environment. Several

cleanup endpoint alternatives short of complete cleanup are therefore apparently feasible. Consideration of alternatives has been restricted to those which would not result in the dispersion of any significant quantities of the remaining radioactivity outside of the reactor building and thereby pose any increased risk to public health and safety, even over a very long term storage period.

The staff has identified the following potential cleanup alternatives,* each of which would provide a definition of cleanup endpoint:

(1) Complete Cleanup. Following defueling, the licensee would proceed with the present plan to cleanup the reactor building. The endpoint of this alternative would be the same as the condition discussed in the original PEIS; radiation levels would be comparable to those of a normal operating plant following final shutdown. The licensee would then submit a proposal for refurbishment or decommissioning. Available decommissioning alternatives would be the same as those discussed in the PEIS (e.g., DILON or SAFSTOR) and existing policies on decommissioning would then be applicable.

(2) Interim Storage and Robotic Cleanup. Under this alternative, the defueled facility would be placed in an interim storage condition while the licensee actively pursues the development of robotic technology to complete the reactor building and equipment cleanup. The occupational radiation exposures of this alternative have been evaluated in the Supplement to the PEIS. Depending on the advancement of robotic technology, the interim storage period could range from zero to 20 years. Even with a conservative estimate of 20 years of interim storage, there is a potential savings of about 20,000 man-Rem of occupational dose. The cleanup endpoint of this alternative would be the same as in alternative (1), complete cleanup by using robotic technology. At that point, the licensee would submit a refurbishment or decommissioning plan and standard decommissioning policy would apply.

*A previously completed generic study of reactor decommissioning following accident cleanup (NUREG/CR-2601) indicates that the safety and cost factors of decommissioning a post-accident facility do not vary significantly from those of a normal plant. In that study, the endpoint of accident cleanup was defined as reactor defueling and reactor coolant system cleanup. The extent of post-defueling cleanup could influence the applicability of that study to the decommissioning of TMI-2.

(3) Long Term Storage. This alternative would allow the facility to be indefinitely stored in a safe condition following defueling activities. Surveillance and security for the facility will be required during this period. This alternative is similar to the SAFSTOR decommissioning concept. However, it is not a commitment to that decommissioning option, because although the potential for severe consequences is removed when the fuel material is disposed of, the facility would still be maintained with higher levels of residual radioactivity than those found at a normal operating plant after final shutdown. This action could be justified on the bases of minimal risks to the public and occupational exposure savings. With this alternative, the licensee could make decommissioning proposals at a later date,* at which time substantial decay of the contamination would have taken place to effect a significant occupational dose saving. Also, this alternative would define the cleanup endpoint at fuel removal and disposal followed by an extended storage period prior to decommissioning. The unique aspects of TMI-2 may necessitate special license conditions or additional requirements for maintenance and surveillance during the storage period. For this alternative, decommissioning of the facility may have to be conducted as a special case, which is provided for under the proposed rule currently being prepared by the staff.

It should be noted that under the proposed decommissioning rules being prepared, entombment of a facility would only be allowable if the residual radioactivity had decayed to a level permitting unrestricted use of the property within a period of approximately 100 years. Therefore, the ENTOMB option is not an acceptable decommissioning alternative for TMI-2, because the long-lived radionuclides resulting from the accident will still be a significant radiation source for much longer than 100 years, the time period assumed for the assured continuance of necessary institutional controls.

Alternatives for deferment of complete cleanup after defueling have the potential of significant (up to one-half) savings in occupational radiation exposure. Radiation exposure to workers and the potential associated health effects is the most significant environmental

*A possible approach might be for the licensee to decommission both TMI Units 1 and 2 at the same time.

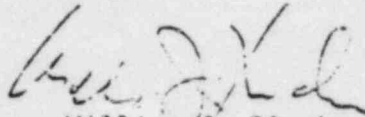
impact of the cleanup. Since the present plan would require substantial cleanup effort even after defueling, alternatives 2 and 3 above have the potential of requiring less resources immediately following defueling than the present plan. Therefore, another potential advantage of these alternatives is to enable the licensee to commit a greater portion of the cleanup funds to the defueling phase. Earlier fuel removal resulting from funding improvements should be considered as a more effective application of cleanup resources to enhance public health and safety.

The Staff's Plan

The staff plans to evaluate the environmental impacts associated with each of the cleanup endpoint alternatives except for the present cleanup plan whose environmental impact has already been evaluated. Prior to the initiation of our evaluation, the staff will require that the licensee provide their evaluation of alternative approaches which they consider feasible, including discussions of the environmental impacts and the cost-benefit aspects of the alternatives. In addition, the staff will be proposing in an Order for Commission consideration that the licensee be required by specific date to provide the staff with a comprehensive plan for post-defueling activities and ultimate disposition of the TMI-2 facility. The staff will use the present cleanup plan as the base case. The criteria against which the base case and the alternatives will be evaluated include the following: (1) potential pathways and dose to maximum offsite individual and to the offsite population and potential health effects; (2) occupational radiation dose and potential health effects; (3) probability and consequences to the public from natural occurrence involving the remaining contamination (e.g., maximum credible earthquake, 1,000 year flood, etc.); and (4) potential for effecting a more expeditious fuel removal effort because of improvements in required resource commitment. Much of the methodology for analysis on environmental impacts related to long term storage exists in-house. The staff plans to apply the methodology taking into consideration the unique conditions of TMI-2 such as the radionuclide inventory, the location and physical nature of the contamination and the site specific environmental parameters such as geology, hydrology and demography. The staff's planned evaluation will

also form the basis for the environmental review of the licensee's actual proposal for post-defueling cleanup activities.

The staff will keep the Commission and TMI-2 Advisory Panel informed of significant progress on this question.



William J. Dircks
Executive Director for Operations

Enclosure: Letter to Chairman Palladino
from Arthur E. Morris
dated 4/16/84