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Marsh & McLennan, Incorporated
1300 San Jacinto Tower
2121 San Jacinto Street
Dallas, Texas 75201
Telephone 214 742-1941

Docket
50-321
366

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

M001
1/1

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 [signature]

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.

[signature]

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 reduced 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 Countersigned by ______ Authorized Representative

ME-22b

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.

[signature]

John L. Quattrocchi, Vice President - Underwriting
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 designated hereon. No Insurance is afforded hereunder.

J. B. Quattrocchi

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

Effective Date of this Endorsement January 1, 1984
12:01 A.M. Standard Time
To form a part of Policy No. NF-215

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 [signature]
General Manager

Endorsement No 91

Countersigned by

NE-36

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 ______

NE-22b

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON REACTOR RADIOLOGICAL EFFECTS

LOCATION: WASHINGTON, D.C.

DATE: SEPTEMBER 28, 1984 PAGES: 237-281

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

NUCLEAR REGULATORY COMMISSION

1717 H STREET, N.W. ROOM 1046

WASHINGTON, D.C.

9.28.84

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

SRRE MEMBERS PRESENT:

D.W. MOELLER Chairman
JESSE C. EBERSOLE
CHARLES J. WYLIE
MAX W. CARBON
J. CARSON MARK

ACRS STAFF PRESENT:

OWEN S. MERRILL
JOHN C. MCKINLEY

ACRS CONSULTANTS PRESENT:

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

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

This one, of course, has its unique aspects.

PRESENTATION OF MR. RONNIE LO

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

The cleanup of TMI can be divided in to two major cleanup phases--before the defueling operation and after the defueling operation. To support the reactor disassembly and defueling, the licensee has conducted, and is conducting a dose reduction program, and the activities during this program is mainly to a-met, reducing the operator's dose during their operation related to reactor disassembly and defueling.

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

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

MR. LO: Cesium 137.

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

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

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

MR. LO: After, how--

MR. CARBON: Yes. The building.

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

MR. CARBON: O.K.

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

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

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

In the supplement to the programmatic environmental impact statement, we have considered a length of time from zero to twenty years during this interim caretaking period. The third alternative is long-term storage. This alternative will be similar to a SAFSTOR, but, however, it's not being committed just to this decommissioning alternative. What we envision is that maybe, after a long-term storage, the question of decommissioning will be taken up again when Unit 1 is ready for decommissioning, and both units will be decommissioned at the same time.

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

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

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

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

MR. LO: The present operation of TMI cleanup is that for every major activity, they would write us, they would give us their proposal, and that we would have to approve. And as I'll show you later, for the cleanup endpoints, we expect them to give us a proposal, at the same time give us the analysis of the alternatives of their proposal, to state the reasons why they choose to go to this particular alternative, and at that time we would be able to analyze the advantages and disadvantages.

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

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

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

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

MR. CARBON: I know that.

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

MR. CARBON: O.K.

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

MR. LO: Yes.

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

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

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

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

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

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

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

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

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

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

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

MR. FIRST: Let's put it this way: Generally, we prompt them to conduct cleanup activities as expeditiously as possible, and we conduct our own review and responsibilities to ensure that we're never in the critical path.

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

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

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

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

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

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

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

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

MR. LO: You mean the reason for--

MR. CARBON: Why are you doing it? I'm not complaining that y'u're doing it. I'm trying to find out why you're doing it.

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

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

MR. CARBON: Again, who is the initiator?

MR. WELLER: The initial request really came from the Advisory Panel, the TMI-2 Advisory Panel. It was a suggestion from the State of Pennsylvania, recognizing, from looking at the estimates of occupational exposure to complete this cleanup, and, you'll see, when Lonnie gets to these numbers, that the bulk of them fall between thirteen thousand and forty-six thousand man-rem. Now that's a pretty hefty man-rem figure, and they recognize that perhaps there are some alternatives that we should be considering, that fall short of complete cleanup, and with the interest in saving occupational exposure. That's really the driving force, because, as Ronnie has pointed out, the most significant environmental impact of TMI-2 recovery is occupational exposure. And it's quite clear, in steam generator replacements, or other things, that you people have perhaps reviewed.

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

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

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

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

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

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

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

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

MR. LO: Yes.

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

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

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

MR. LO: Yes.

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

MR. LO: Right.

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

MR. LO: Right.

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

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

MR. MARK: So, between now and '87, when they're mainly occupied with the fuel--

MR. LO: Right.

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

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

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

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

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

MR. LO: Yes.

MR. CARTER: O.K. Let me ask a simple question, I guess. How does the NRC view these numbers? Are these considered to be large numbers, or, reasonable numbers, or, just what? You know, during that same period of time, just due to natural background radiation, if I make a calculation correctly, we're going to receive about 200 million man-rems just as background.

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

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

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

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

MR. LO: Yes, the, especially the operation--operating elevation areas, and they have been very successful in doing that.

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

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

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

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

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

MR. LO: Right; right.

MR. EBERSOLE: May I ask a question?

MR. LO: Certainly.

MR. EBERSOLE: Could you sort of clarify, for me, what is the value of the accomplishment? That stuff is now nailed down in this quarter inch, isn't it? It's immobilized, more or less?

MR. LO: Yes.

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

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

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

MR. LO: Right.

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

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

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

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

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

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

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

CHAIRMAN MOELLER: Well, but it's clean while they're in there doing the defueling and many other--

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

CHAIRMAN MOELLER: No.

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

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

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

CHAIRMAN MOELLER: It's going on right now.

MR. EBERSOLE: O.K.

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

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

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

MR. LO: It's significant, yes.

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

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

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

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

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

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

MR. MARK: The fifteen assumes no success with dose reduction?

MR. LO: Exactly; exactly. Compounded by difficulties in the defueling operation.

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

MR. LO: It's a 0.6 Mev.

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

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

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

MR. LO: Right.

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

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

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

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

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

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

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

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

MR. LO: GPU--

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

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

MR. EBERSOLE: In what sort of ratios?

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

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

MR. EBERSOLE: Thank you.

MR. MARK: The Japanese are putting in three.

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

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

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

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

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

MR. WELLER: Yes, that figure is--

MR. CARBON: Four hundred million or--

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

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

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

CHAIRMAN MOELLER: One other item on that, Max, that you may recall. It's been about six months ago, that some judge, or whoever makes such rulings, ruled that utilities contributing to the cleanup of TMI would be given tax advantages on this money they contributed, and GPU was delighted. and Pennsylvania, because they thought that would stimulate contributions, and it took a little while, but apparently, it has.

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

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

The third alternative. We have not explicitly--

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

MR. LO: No, but we have thought of the usage of robots in the, in relation with how soon defueling can be done, and we have determined that defueling at the present time is the best cost robot.

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

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

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

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

Tp. 2--

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

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

And we expect GPU to submit the endpoint proposals when defueling is well under way, and in the proposal, we expect them to look at several, look at the alternatives, and also, give us an assessment for occupational dose, any offsite impact, the existing rules and regulations at that time, and if any residual activity levels, decommissiong rules and regulations, and also, the cost benefit end of it, the costs in terms of occupational dose, and of the benefit, and maybe, say, offsite impact. And the benefit, in terms of savings in occupational dose.

This is what I have prepared.

CHAIRMAN MOELLER: Could you comment on the offsite impacts of the various approaches, what will they be.

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

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

MR. LO: Yes.

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

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

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

So it would be partially flooded. It would be at least still, I think, fifteen, twenty feet of water over the fuel, so that's plenty of shielding. But they don't want to develop a concept in which workers would have to work at distances of forty, forty-five feet above the fuel, trying to manually manipulate these tools. It's just very difficult at those distances.

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

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

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

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

And right now, conditions in the basement are such, that they have about eight and a half inches of water down there. And I might point out that the water, simply by having water in the basement has a beneficial effect, because over the past year, about a thousand curies of Cesium have leached in to that water.

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

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

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

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

MR. WELLER: Yes, sir.

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

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

MR. MARK: But it is data.

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

MR. MARK: That might have real value.

MR. WELLER: Yes, sir.

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

MR. WELLER: We have just recently approved plenum inspection activities, and those activities will include not only cleaning of surfaces of the plenum, but the measurement of all the potential interferences in the plenum, all those close points of contact in the Keyway, and the local boss gaps, et cetera, to determine if indeed the plenum has been ovalized, or was ovalized during the accident, and is perhaps even wedged in place.

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

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

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

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

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

They also have to complete the development of the canisters which will be utilized to collect the fuel, from the vacuuming process, and also, from any "pick and place" operations, if you want to call it that. Just picking up pieces of, larger pieces of fuel elements, upper end fittings, control rod material, et cetera. So, there are a lot of items in the critical path. Casts have to be built for fuel sh.pment to Idaho. There are lots of elements in the critical path right now. A July date is really kind of a fast-track date for defueling.

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

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

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

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

MR. EBERSOLE: That you might pull rods out.

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

MR. EBERSOLE: Right. O.K.

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

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

MR. WELLER: I agree, but for--our criticality calculations and purposes, everybody assumes that there's no value to it.

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

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

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

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

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

MR. EBERSOLE: Well, that's kind of a backward view in to what might have happened, which, I guess you could go as far as the classical loss of cooling accident. You could not then fill the liquid, portion of the vessel, except at the top of the pipe level, unless you had flooded the whole building. Would you have thought that had this derived from a classical loca, you would be in much greater difficulty to clean up the mess?

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

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

MR. WELLER: You mean down to the basement?

MR. EBERSOLE: Yes. Right on up--

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

MR. EBERSOLE: To cover the core?

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

MR. EBERSOLE: Yes, but how do you, how do you get the fuel out? How would you get the fuel out?

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

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

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

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

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

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

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

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

MR. WELLER: I see. In other words, design it so that it's--

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

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

MR. EBERSOLE: Yes, right.

MR. WELLER: Yes.

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

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

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

CHAIRMAN MOELLER: Max, a historical question here. In consideration of the man-rem levels, did people think of, consider maybe using older people for a lot of this work? I'm serious. I'm thinking of the fact that I'm age 62, I could do work like this, and there'd be no genetic effects. Cancer I think is a long-term process in building up, and I would think that the health effects on older people would be much less severe, seriously. Is there any merit to this?

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

CHAIRMAN MOELLER: I think I could do strenuous work.

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

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

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

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

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

CHAIRMAN MOELLER: Okay. Any other questions or comments?

(No response.)

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

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

MR. WELLER: Yes, sir.

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

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

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

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

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

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

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

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

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

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

So right now, I'm not so sure that, you know, they're thinking all that seriously about putting different kinds of chemicals in the basement. Maybe later, following defueling, when you don't have those concerns about criticality, and boring diluti

CHAIRMAN MOELLER: Any other questions, or comments?

(No response)

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

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

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

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

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	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 RB & AFHB	0 - 620
Robotic Cleanup of RB and Equipment, Primary System and AFHB	300 - 3,500
TOTAL	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 cleanup 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

Contact: B. J. Snyder, TMIPO
49-27761

R. H. Lo, TMIPO
49-28335

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 cm^2 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., DECON 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 clean.) 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