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NUCLEAR REGULATORY COMMISSION

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ADVISORY PANEL ON THE DECONTAMINATION OF

THREE MILE ISLAND UNIT 2

- - -

Harrisburg, Pennsylvania

Wednesday, February 2, 1983

The meeting was convened, pursuant to notice, at 7:07 p.m., John Minnich, Chairman of the Committee, presiding:

PRESENT:

JOHN MINNICH, Chairman

THOMAS COCHRAN

GORDON ROBINSON

NIEL WALD

CRAIG WILLIAMSON

JOEL ROTH

ARTHUR MORRIS

ELIZABETH MARSHALL

HENRY WAGNER

P R O C E E D I N G S

MR. MINNICH: Ladies and gentlemen, your attention, please. Okay, I am going to call the meeting to order. Temporarily, we are without mikes, so I will try to shout so you can hear me.

I do have an announcement. For those of you from the Harrisburg area who may be interested, on February 9th, which is next Tuesday night, from 7:00 to 10:00 in the Harrisburg City Council chambers in the Government Center on the Square, there will be some people from Suffolk County in New York who take public input on the events surrounding the -- they are particularly interested in anyone who cares to share with them if they in fact evacuated the area in 1979.

They are in the process of preparing their plan for evacuation in case their facility caused them to do that, and they are looking for public input.

There will be some formal announcements made on that, but I told the gentleman today that I would make that announcement tonight at this meeting, and if anyone has any questions on that, you can see me after the meeting.

Now, we will call the meeting to order. I believe we now have a quorum present. Just a couple of housekeeping items, if you will. This panel is now

served by Michael T. Masnek, who is replacing Bill Travers, who had originally been assigned to this panel, and Mike is standing up there, and welcome, Mike, for those of you who have not yet met him.

At the last meeting, someone from the -- one of the organizations, I am not sure which one, Susquehanna Lions or whatever, contacted me and asked if I would write, as chairman of this panel, to Judge Sylvia Rambo, a federal judge in our district, and inquire as to whether or not funds would be available from the suit for $25 million, I believe, that was awarded in the settlement of that class action suit that could be the verdict for the cleanup.

As you will recall, so much was set aside for settlement of claims, and some other moneys were set aside for studies, et cetera. I did that at that request, and received an answer from the judge, and she pointed out that that was not possible to do, that the settlement had been decided and determined, and was in fact allocated, and nothing more could be done in that respect, but I wanted you to be aware that I had done that without any big fanfare or anything like that.

Finally, thanks to Joel, who has worked on putting together an agenda for tonight, we do have quite an agenda, and we are going to start with the Safety

Advisory Board, and call upon Dr. James Fletcher.

If you will, Doctor. I don't know if the mikes are now working, but --

MR. FLETCHER: Well, we will see.

No, this one is not working, either.

MR. MINNICH: For the panel -- excuse me, Doctor. If you will, for the recording purposes, the mike with the black cable is the one that you must direct your voice to so she can understand what you are saying.

STATEMENT OF JAMES FLETCHER

MR. FLETCHER: Well, I will stand, addressing your advisory group, if that is all right with you.

I am James Fletcher, and I am Whiteford Professor of Engineering at the University of Pittsburgh, and I suspect the reason that GPU administration asked me to chair this group was because I was once the administrator of the NASA, and what I was asked to do was to put together a group of experts in what we felt to be the principal regions of concern that would deal with the problem of TMI Number 2 safety, which I then proceeded to do.

But let me first say what our charter is. It is, by the way, spelled out, and it is public information, but in essence, our charter is to advise

the President of GPU Nuclear in regard to the safety of the public in the environs of the TMI 2 unit, and also the safety of the workers that are involved in the decontamination of the TMI 2 unit.

A secondary purpose in our charter was to try to examine the communications between GPU Nuclear and the public, and between the public and GPU Nuclear. This is a secondary purpose, but nevertheless, it was put into our charter, and we take that very seriously.

Not in our charter, but nevertheless much discussed in our meetings, is the matter of perceived dangers as well as real safety, and we get into lots of discussions about that, but we all agreed that perceived dangers are an important part of what we advise GPU on.

To give you an example, there could be an accident which -- conceivably be an accident which really didn't endanger either the workers or the public, but because it was an accident, it might alarm the workers or the public, and we ought to prevent -- avoid those as well, and anything that might have public visibility.

To do this, what I tried to do was pull together a group of widely diverse but very widely recognized people, and we have ten members of our Safety Advisory Board, and in just two more minutes, Mr.

Chairman, I would like to tell you who they are and what their expertise is.

We have -- and I've got a list of them. I already introduced myself. We have John Auxier, who is a nuclear engineer, and has been heavily involved in trying to estimate the impact of radiation effects on human health, and he is from Oak Ridge National Laboratory, only recently left that organization, as I understand it.

Dr. Merrill Eisenbud is a professor of environmental medicine, a long-time expert on the impact of all kinds of environmental effects on human health, was director of environmental health for the City of New York, is now a director of the Laboratory for Environmental Studies at NYU Medical Center.

Bob Friedman, who is here with us tonight -- Bob, would you raise your hand? -- is going to speak to you briefly as one of the participants, is from Penn State University, and he is director of the Center for Science Policy, and his training is in political science, so you can begin to see we have a rather diverse group already, and it is not easy sometimes to communicate.

We have Dr. Clark Goodman, who until recently was at MIT, but he chaired the Radiation Waste Panel for

the other NRC, the National Research Council of the Academy of Sciences, for many years, and he is actually chairman of one of our panels, which I will discuss in a moment.

Dr. Bruce Lundin was one of my colleagues at NASA, but he also was the staff director for the Kemeny Commission review, and is now a -- has left NASA. He was director of the Lewis Research Center.

Howard Raiffa chairs the National Research Council Committee on Risk Analysis, and is probably the foremost expert in the country on risk assessment and risk analysis. He is a professor of management economics at Harvard Business School.

Norm Rasmussen, who is with us tonight -- Norm, would you raise your hand? -- is author of the well-known WASH-1400, known as the Rasmussen Report. I am sure it is the first in-depth study of nuclear safety, of reactor safety, nuclear reactor safety. He is at present just recently retired, I guess, as chairman of the Nuclear Engineering Department at MIT. And he will be talking to you tonight.

Bill Stratton has been involved in the weapons aspect, nuclear weapons business at Los Alamos, but also recently involved in nuclear safety involving reactors, but he has had a great deal of experience on how to make

nuclear weapons safe, and he is past chairman of the Advisory Committee on Reactor Safeguards.

And then, last but not least is Jack Fabrikant, who is on our committee and is -- I would call it a health scientist. He has both an M.D. and a Ph.D., from the University of California. He is chairman of the Advisory Committee on Reactor Safeguards for the NRC, and he would be here tonight except he is from the University of California at Berkeley. So that is a long trip for him. But if necessary, he can visit with you.

Now, before I finish, let me just say that we early on decided to divide ourselves into panels, because we had to get the work done, and we keep changing the panels, but at the present time there are four panels, one panel on what we call external affairs, and Bob Friedman, sitting before you, is chairman of that panel. External affairs includes public, but it also includes workers, because we began to realize that was an important external affairs problem.

We also have a panel on core removal safety which Bruce Lundin chairs. We have one on -- I think we call it waste inventory, to keep track of all the radioactive waste that was generated as a result of the accident, and make sure that all of it ultimately is

disposed properly. We then have a health safety panel under Dr. Merrill Eisenbud, who also would like to have been here tonight, but he had a health problem, but in some future date he will be glad to appear.

I think those are the four principal panels. We are not going to discuss the activities of each of the panels, but simply give you an idea of the kind of things we do by the three of us that are here talking to you and answering questions and so forth.

I might say before I let Norm take the roster here that we have tried to preserve a degree of independence from the GPU company in the following ways. Although we are advisory to the president of GPU Nuclear, all our meetings are held in private, and we do have an output of the meetings which are recommendations to the president of GPU Nuclear.

We also -- I used to keep minutes in my own handwriting. Some of the members objected to that, because they thought that some day they might be misquoted, so we do keep internal minutes which -- for our own use, and those are not generally public documents, but I suppose if they were subpoenaed we would be embarrassed, but we would have to let them go. But by and large the meetings are private, and only our recommendations to GPU Nuclear are in the public domain,

and an annual report, which I guess was the subject of your last meeting, which we are obliged to publish.

We are now about ready to begin writing the second annual report, because as of next April that will be our second anniversary.

With that as an introduction, let me introduce -- oh, you shouldn't hold this against us, but just for the record, I noticed in reviewing these things that all of us have Ph.D.'s, which is a terrible thing. Please don't hold that against us. Even the M.D. has a Ph.D. Just think of us as a group of experts in our field, and let it go at that. Call us by our first names, if you prefer. Dr. -- I mean, Professor Norman Rasmussen.

STATEMENT OF NORMAN RASMUSSEN

MR. RASMUSSEN: Mr. Chairman, it is a pleasure for me to be here. As some of you may know, Harrisburg is where I was born, and I was raised on a farm not far from Middletown, and spent my youth there, so it is a special area for me.

What I would like to talk to you tonight about is the technical issues and some of the reasons for some of the conclusions that you have seen in your first report of our committee, and how I think the committee has changed its opinion on some of those conclusions during this second year.

As you well know, right after the accident, we had a plant that was in very serious condition. It had six to eight feet of water on the floor. The water was radioactive. It had radioactive gas inside the containment. It had damage -- severe damage to the core, the extent of which nobody knew or understood. And it presented a technical problem unlike any that anybody had faced before as to how to clean that up in a safe way so that nobody's health or safety was threatened.

And clearly, no utility in the country has an organization ready to do that, and certainly GPU didn't either. And so their first task was therefore to go out and recruit a group of people with the expertise needed to undertake this difficult assignment.

Now, it wasn't so hard to find a lot of people with the kinds of expertise needed to do this, but to mold them into a functioning organization was a challenging problem indeed, and one of the conclusions of our committee's report at the end of the first year, as you may recall, was that we felt the organization was not yet good enough to undertake a major problem like lifting the head off the reactor.

It was because of several reasons. One was, there were three major organizations involved, Bechtel

National, Bechtel Northern, GPU, and then it interacted with DOE, NRC, and several other organizations as well, and to get all those organizations to operate smoothly together is a challenging management problem, and not easily solved, because the experts you put together may not necessarily have the management skills to make an organization like that function well, and there were clearly some problems in this organization, or we wouldn't have made a remark like we did in that report.

Well, I don't know whether our comments had anything to do with it, but the management recognized this, too, and I am happy to report that in my opinion and, I think, in the opinion of our committee, tremendous strides have been made during this last year to cope with that problem.

They have put together one organization now. They have taken people from the three original organizations, put them into one organization under the leadership of Mr. Kanga. Mr. Kanga is a man with substantial expertise in managing large projects for the Bechtel Corporation, and so he knows the management techniques needed to make a complex organization function, and we now begin to see that organization functioning the way that makes us less concerned about the management of the project than we were a year ago.

Now, how do I reach that conclusion is a fair thing for you to ask, so let me tell you on what basis I have reached that conclusion. One is, of course, we meet regularly and interact with the people, so we have gotten to know the people, and through our knowledge of them and our discussions with them, it seems to me we have all begun to believe in these people as competent people, dedicated to what they are doing and serious about doing it right.

But that wouldn't be enough evidence for me to come before you and tell you that they are a good organization. That is just a hope on the basis of what we have seen. And the proof of the pudding is in the fact that they have now accomplished a number of major complicated tasks and done it amazingly well with little or no difficulties encountered in the project. I would like to describe a few of them to you.

The first major problem inside the containment after the permission was granted to vent it was to get people inside and begin to measure and get ready to do some useful work in there, and they got that accomplished quite well. Very inefficient at first in terms of number of man hours it took to get a man inside containment, but that has been improved as time has gone on.

Then they had to get eight feet of water, 600,000 gallons of water off the basement floor, radioactive water, and that is a non-trivial problem, given the environment that you had to put some of the equipment in, and so on, so that was their first real challenge. They designed a thing, a system called the SDS system, for Submerged Demineralizer System, put it into operation, pumped all that water through the system, which filtered out the radioactivity by ion exchange, actually.

And now the radioactivity in that water resides in sealed cans called the liners from the demineralizer. Some of it has been shipped to Idaho already, and plans are under way to ship the rest of it to Idaho some time during -- I don't know when the exact schedule is.

So, that was a major accomplishment done ahead of schedule and with essentially no problems, and some of you are engineers enough to know that you don't get a result like that by luck. It is only because you have carefully planned the project and thought of a lot of things that might go wrong and have contingencies to deal with them.

So, it was a complicated enough project that luck won't win for you. There are too many places to go

wrong. So, that was encouraging to us on the committee.

The next major activity undertaken was to refurbish the crane, because no major head removal or cleaning up of the reactor system itself can take place without the availability of that crane. That, I am told today, has just been finished. The crane is now operable, so that it can begin to lift heavy shielding blocks when they are ready to do that.

That was also done, and that is a very difficult problem. If you realize people in these suits had to climb ladders to the top of the crane rail, scrub down the crane, replace wires and electrical circuits, to accomplish that with no major problem and no accidents to the workers was also an accomplishment.

The third thing they have done is decontaminated the building from the top down to the major working floor, hosed it all down and washed it off to get rid of as much of the loose radioactivity as possible, and that has gone well.

Then, this summer, they did two more things that were important steps and complicated, difficult operations. One was to remove a lead screw. I won't bother telling you -- It is a piece of steel that goes into the top of the reactor. They removed it to give themselves a one-inch hole to go in through the top of

the vessel with a one-inch camera, go down there and look at what was inside, and our first visual inspection of what the state of the core is was obtained at that time.

And that was a non-trivial operation which had to be very carefully scheduled and worked out so the workers weren't overexposed, because some of the radiation fields are fairly high, which limited the time they could be in the region. And that went well, and got remarkably good pictures of what the condition is in that core. I am sure if you haven't seen them, GPU would be glad to show you --

MR. MINNICH: We have seen them. We saw them at the last meeting.

MR. RASMUSSEN: You have seen those movies. Well, you have probably a feel then for what the delicacy and difficulty of that operation is, and if you have ever seen what a human being has to put on to get in the containment, you realize how hard it is to do some of those things under the conditions those people had to work.

And finally, more recently, after the quick look, which put a TV camera in, they did an operation which was similar, called a quick scan, where they put radiation detecting devices down in and measured the

radiation levels inside the top head of the pressure vessel.

So, all those operations have been accomplished this year, and in my judgment, and I believe the committee supports this, although we haven't taken an official vote, they have been done very well. We have learned a lot of things. But the important thing is, no major mistakes were made. Nobody was hurt. No unusual occurrences of a safety type were encountered. The closest thing we had to trouble, I guess, was people getting overheated in these suits, and some people got heat stroke or something close to heat stroke, a problem we knew would be serious, and that happened to a few people.

So, all in all, I think the committee is pleased with the progress, especially in the management of the project. It seems now to us to be fairly tightly managed. I am sure in an organization that large you or I or anybody could find ways to manage it better, at least what we think would manage it better, and nobody would claim it is 100 percent efficient, but nonetheless, it has done some tough jobs. It has done them well. It has accomplished them basically within the budget and time schedule laid out for the projects, and that is a measure of a well-functioning management

team.

And so, I think by the end of this year our committee will report in its report that we are much more satisfied, and I have, and so have several others on the committee I am on, reviewed the head lift plans, and they seem to us to be well thought out. I have tried to find things they haven't thought of that should be considered, and except for a few minor ones that were rather trivial, I could find no major issue that occurred to me that wasn't covered.

So, I am confident now that that is a functioning organization that can undertake the major next step, which is to remove that head and get out the core.

And with that, I will step down, and let Bob tell you his, and then we will be ready for any questions you may have.

STATEMENT OF ROBERT FRIEDMAN

MR. FRIEDMAN: As Jim Fletcher indicated in his opening presesntation, a secondary activity of our group had to do with the relationships with the community, and I think Jim very nicely talked about one important aspect of that, and that is that when you deal with problems of this kind, technical people on the one hand may see the picture in one way, and citizens in the

community may see it quite differently, so that the perceptions of the problem out there in the community, so to speak, may be very different from the way technical people, whatever side of the fence they are on, see it.

And so, it made it very interesting to add me to the group, because I have zero technical training in the nuclear engineering field, although I do have an involvement in science policy, but entirely from the social science side.

At any rate, the purpose of our panel has been to deal with the communication linkage relationship between the community and the company, and I think it is not surprising to anybody in this room to learn that the relationships since the accident have not been ideal.

Our problem was to deal with them in a way to help both the community understand the company better and for the company to understand what was going on in the community, and we have been doing two kinds of things. As some of you know, and of course several members of the NRC committee have been very helpful in this, in agreeing to be a part of it, we created what I would loosely describe as a group of people.

It is not a committee, because they have never met as a group. Indeed, some of them don't know who

some of the other members are. But we put together a group of people in the larger community, and the larger community really is -- I think I am right -- a four-county area. There are individuals represented, some as far east as Lebanon, and some as far west as Carlysle, who generously agreed to interact with us from time to time on matters of concern on the cleanup.

And without identifying people, because I should say that although some of them may have identified themselves, we have never asked them publicly to identify, and so at this point, without asking them, it wouldn't be appropriate. The individuals come from industry, labor, religious groups, civic organizations, minority groups, political organizations. They come from different localities, and we went out of our way to make certain that they represented different points of view with respect to the cleanup, attitudes toward the cleanup, nuclear power generally, and so on.

There are 25 individuals in all. They have from time to time provided us with their reactions to the aftermath of the accident, progress on the cleanup, specifics on the reporting of the cleanup activities by the company, and indeed, last summer we alerted them to the fact that there was going to be a quick look during the middle of the summer to get their sense of how well

the company presented information, how well the media dealt with it, and so on. And so, we have used them as kind of a sounding board.

In addition, we have ourselves been reviewing a number of surveys that have been conducted about community attitudes in order to feed back to the management of the company general feelings in the community about the cleanup, about restart of TMI 1, and other issues that are pertinent to this.

And I might add, for example, that one of the things that I think is pretty well understood at this point is that while the referendum conducted in three counties last spring was an advisory referendum, it wasn't conducted in the entire area and the turnout was low, that there is a congruence between the general attitudes at that time or shortly after that time regarding restart at TMI 1 and the vote cast in the primary election. The vote was on a fairly ambiguous question, but nevertheless it does represent a sense of the point of view of the community, and I think the company understands that.

I think it is no secret to anybody here that there is considerable fear in the community, a considerable concern in the community. A lot of people are concerned about the slow progress of the cleanup,

and that, as many of you know, has ramifications that relate to the limited funding, and so on and so forth. But there is a full understanding of this.

There is, as I have indicated, a continuing widespread concern about restart of TMI 1. Some people don't want TMI 1 restarted until 2 is cleaned up. Others are unalterably opposed. And there are a core of people who support restart of TMI 1.

There is, I should add, a general feeling of confidence that ultimately there will be a cleanup, and it will be completed. What is important, and I don't think there is any purpose in my -- we could go on at length about the kind of information that we have and have reported back. The important thing, I think, for me to add is that whether the reaction of the community is good or bad, and a lot of it has tended to be negative with respect to the accident, the cleanup, and so on, the company has listened when we have reported it. They have heard us, and I think that their efforts have been to respond to the information that we have given. And I think that is the positive side of the kind of findings that we have.

Jim, do you want to close?

MR. FLETCHER: Yes, Bob. I am the wrap-up person.

Let me just see if I can summarize what we have all said. First of all, I would like to -- I should have said this before -- show some pride in the Safety Advisory Board. We have put together a functioning board which I think I am a pretty good referee at. It is not easy to get a political scientist to talk to a mathematician to talk to a nuclear engineer, but somehow we have managed to come up with a consensus, and I think it provided useful information to GPU management.

The second point I think that was made is that we still notice a -- some skepticism about not only GPU, but about the NRC, the Nuclear Regulatory Commission, in the community, which we perceive, but we are not exactly skilled in changing that. That just happens to be a fact of life at the moment.

On the other hand, balancing that, we notice considerable progress at GPU, both in terms of the steps taken towards cleanup and also towards the pulling together of a competent organization to do that. On the other hand, most of our problems are ahead of us in this cleanup activity, and the next big step will be the head removal, and we have assigned a fair fraction of our group to deal with that problem, and although we haven't come up with our own opinion on it, we think it is a

potentially dangerous operation, dangerous to the workers, at least, and although it is potentially dangerous, we think it can be done safely by proper preparation beforehand, and we don't anticipate any accidents.

But nevertheless, it is the next step, and that is what we are spending a good fraction of our time doing.

So, with that as kind of a sum-up, we stand ready to answer any questions. I want to remind you that we are only a few of the experts, and we can answer when the rest of us have all agreed on something, but if you ask us a detailed question on what health risk this or that or the other does, well, it turns out that Jack Fabrican isn't here, and we may have to defer, but things that we have already agreed on I think we can answer, and also the things that we are supposedly expert on, either Norm or Bob or I will be glad to try and answer.

Thank you.

MR. MINNICH: Thank you, Doctor.

One of the areas that this panel -- many areas that this panel had looked at and was concerned was the worker safety, and we are delighted that you have been involved in that also.

I thought of a couple questions that I have, but I think they really are more to be directed to Mr. Kanga when he gets up here rather than yourself, so I will delay mine. Does any of the panel have any questions? Yes.

MR. COCHRAN: I agree with the chairman that the worker safety is the principal concern in terms of the exposures resulting from the accident, and I am curious as to how GPU or your panel views the work in terms of how does one decide when one has decontaminated enough to permit a particular piece of work to be performed, for example, repair of the crane?

I noticed, Norman, your discussion that you mentioned that the crane had been repaired and the decontamination is going on, and if one simply said that one's primary concern was with worker exposure, one might have presumed that decontamination would be complete, and that the crane repairs were then starting. And I just don't have a feel for what criteria are being used and how the ALARA principle is being applied in terms of how far one reduces worker exposure before one gets on with the other aspects of the work.

MR. RASMUSSEN: Well, I am not surprised, Tom. You ask a very sophisticated question. That is

probably one of the toughest ones to decide in a project like this. The ALARA principle says that you should do everything practical to reduce the workers' exposure, but we think it's important that you look at this project in a somewhat broader sense, because there is some threat of exposure to the public and the workers if you don't get the plant cleaned up as well.

The longer it sits there contaminated, with water in the basement, the more potential we have for some kind of a release that we would like to be sure we get rid of. After all, water in the basement is not the way you would like to contain it if you could. We all feel better now that that radioactivity is in the epicore liners.

So, you are faced with a difficult tradeoff of how many man rem you give workers compared to how many man rem you might potentially give the public or the workers if you don't do anything and take the risk of something, corrosion or some other phenomenon occurring in a longer time period.

And that is not an easy decision to make, and generally you make it by saying, if we can get the dose level down well below the permitted dose levels for workers, it is important to get on with the project, and so you have the basic guideline that you don't

overexpose relative to the NRC guidelines, and you do what is reasonably achievable to get it below that, but in order to get the job done and prevent -- reduce this other risk, you take some exposure.

It is a hard balance to make, and I wouldn't say it has been done quantitatively. It has been done by judgment. But those are the factors one has to weigh one against the other in reaching the decision of when someone gets some exposure.

Does that address --

MR. COCHRAN: Well, if there are no quantitative numbers, there are no quantitative numbers. Do the workers feel like they are getting a fair shake at this? I mean, do they feel like that the primary consideration is given to reducing their exposures, and that they are not going in there sooner than they might otherwise?

MR. RASMUSSEN: Somebody on our panel knows the answer to that one, but -- Do you, Jim?

MR. FLETCHER: No. Let me just say that --

MR. RASMUSSEN: You had better talk here, so it is recorded.

MR. FLETCHER: So far that's -- as Norm says, this is a judgment question, and it really can't be quantified because nobody can quantify one's intuition

about what are the chances that a structural failure will occur over time, or that material that is in the reactor vessel will so contaminate the metal that it would weaken.

Those are judgment questions, and you probably point out it is pretty hard to quantify judgment.

Now, with regard to the attitude of the workers, we feel that is the next important thing. That is why we set up this -- we used to have a panel called the Community Linkage Panel, because we thought that was the important thing, and that's when we set up the 25 people that Bob Friedman mentioned, but we began to realize, as probably you already have recognized, that the immediate problem is the worker safety and their perception of the dangers, and so that is our next task.

I would like to be able to tell you our opinion of what their attitudes are right now, but I would say that is the job, that is the immediate future job of the newly formed External Relations Panel, is to try to look at it from the workers' point of view, and see how they judge the hazards, real and perceived, that are involved in their work.

I know that is not a satisfactory answer, but we have just started to look at it.

Do you want to add to that, Bob?

MR. FRIEDMAN: No.

MR. MINNICH: Henry has the -- Lake Barrett has the radiation received by the workers up to this date. I think it would be useful to have that in the record. I think some of the public might get the idea that there has been a lot of radiation from the statements that were made, and I think it is better to quantify it, and point out that they are below permissble levels.

MR. BARRETT: Okay. On the cleanup, I can give you the numbers for 1982. I noticed Jim Hildebrand from GPU is here, and he can correct me if I don't have these right. No worker received over five rem in 1982. Five rem is the long-term average for workers. They can receive up to three rem per quarter. That would be the maximum. But no worker has gotten over five.

Two workers were between four and five rem in 1982. Eleven workers were between three and four rem. Seventy-seven workers were between two and three rem, and 269 were between one and two rem; 121 were between .75 and one rem; 121 between .5 and .75 rem; 199 between .25 and .5 rem; 289 between .1 and .25 rem, and between zero and .1 rem, there were about 1,000.

The total man rem in 1982 was about 390 man rem which, compared to a normal operating reactor, is

slightly less.

Now, I would like to add that in -- with the increase in productivity and the pace of the cleanup picking up, I would expect the numbers in '83 to be higher than this. We don't have any, you know, exact estimates yet, but it will be going up.

Now, the total since the accident, in 1979 for Unit 2, there were 661 man rem; 1980, 207 man rem; in 1981, 146. So the man rem for Unit 2, you know, have not been that high, but the main -- as mentioned before, the main work is yet ahead.

MR. MINNICH: Just with a yes or no, does a worker have -- if a worker feels they, you know, they just don't want to go in, do they have that right, to say, hey, I don't want to go in, Bob, you know, and do they --

MR. MORRIS: They get paid to go in.

MR. MINNICH: Well, I know they get paid to go in, but --

(General laughter.)

MR. MINNICH: Come on, Art.

MR. ARNOLD: The simple answer, Jack, is, yes, they have that right. I think it is obvious that there are implications to turning down work assignments that one would have to discuss to give you a more complete

answer.

MR. MINNICH: But they do have the right to say, hey, I just feel I've had it and I don't want to go in. I don't want to get into a big discussion on that. I was just curious about it.

Okay. Any other questions from the panel? Yes, go ahead.

MR. WALD: I just wanted to ask Lake, were those the GPU TMI workers that you were referring to throughout, or did you include any other subcontractors, NRC, or what have you?

MR. BARRETT: Those are all the people that were badged, that we required GPU to badge that worked on Unit 2. Many of those were contractors. Some of those were GPU personnel. Bechtel personnel, NRC personnel were all included in them.

VOICE: Don't forget SAB.

MR. BARRETT: SAB people were probably badged also.

VOICE: That is a larger population than the GPU January 14th handout.

MR. COCHRAN: How does the Nuclear Regulatory Commission know that no one got over five rem in a given year then, if some of them were transient workers?

MR. BARRETT: A favorite topic of yours. You

know, it is -- each worker gets his records from the sites that he works at, and it is his responsibility to keep track of his. Generally there has not been a lot of the transient workers at TMI. I don't have the numbers. Most of them are Met Ed people or, you know, sort of full-time contractors. Not much of the -- you know, on Unit 2, like you might see at some other facilities, where people are brought in for short time periods and released.

MR. MINNICH: I apologize. The sound system doesn't seem to be working all that well for some reason or another. I think maybe that is why a mike went out just now. That mike there I don't believe is working at all.

Any other questions? Go ahead, Joel.

MR. ROTH: Yes. I would just like to say thank you, because at the last panel meeting I was quite outspoken, I guess, and perturbed, and had conflict about the report, and had nobody here to answer it, and particularly I was interested in conflict resolution which Phil Fine attempted to answer, but we were still in conflict after that.

But pretty soon after the meeting -- I would just really like to say this publicly -- I did receive a phone call from Bob, and we did get together, and we did

talk, and I think tonight, you know, was the outgrowth of that. So, if that is conflict resolution, I am all for it, and now if we can get GPU to do the same, that would be nice, too. But thank you, Jim, Bob, and Norm.

MR. MINNICH: Yes. Thank you.

Did you have a question? Mayor?

MR. MORRIS: Dr. Friedman, he did mention, I believe, there were 25 citizens involved with giving input to the Safety Advisory Board, and while you did not want to mention names, and I appreciate that, I -- being from Lancaster, and being concerned with the possibility of water dumping, I am wondering if any of the individuals you mentioned were from Lancaster County, who are served by the water in the Susquehanna River, and if so, was there any concern expressed by those individuals on the dumping of the water issue?

MR. FRIEDMAN: I am blocking right now on -- I know that I haven't talked to anyone from Lancaster County myself. I think there is one person from the county. The issue has only come up in a very general way. It isn't an imminent possibility. As a result, we have not raised questions about the water dumping with anybody.

MR. MORRIS: Okay. Realize that water would be the basic concern of many people in Lancaster County,

and if there is only one out of 25, I can see why that may have not come up. I didn't want to put you on the spot of identifying how many, but it is a concern that I would have, and I didn't know whether you would address that or not.

MR. FRIEDMAN: We have not raised it specifically. I will say this. I have had conversations with a number of panel members about this whole problem of what the people out there, so to speak, are afraid of, and what some technical people see as real problems, and we talked about the water issue as a matter that a number of people in the community -- and obviously Lancaster County has a primary interest in it. It is not a big problem in Cumberland County. But it has been discussed generally, but not by me with anybody in Lancaster County.

MR. MORRIS: The only thing that I would suggest, if there is only one out of 25, that you may want to, if you ever get into that issue, you may want to have greater input from the Lancaster County area.

MR. FRIEDMAN: And you should know, there is some room for fluidity in this. We actually added two people who weren't on our original group later on. We had a situation where we thought we ought to have greater representation in York County than we originally

had. Yes, we appreciate that.

MR. MINNICH: Any other questions from the panel?

(No response.)

MR. MINNICH: Thank you, gentlemen. I think maybe you can catch your plane. I remember now, while you were talking, I remember now where I first -- I am not sure that I met you offically there, but where I first was in your presence where you spoke.

MR. WALD: Jack?

MR. MINNICH: Oh, yes, Niel.

MR. WALD: I didn't realize the group was leaving. Can I ask --

MR. MINNICH: Niel wants to catch a plane. I don't know if -- I mean Norman. I am sorry. Excuse me, Niel.

MR. RASMUSSEN: Do you have a question?

MR. WALD: Yes. It was something you touched on, and I thought it might be useful to have your opinion, because we have periodically approached this question. From the standpoint of safety, does your panel monitor the tradeoff in any quantitative way, or is anyone making any quantitative observations about the effect of the passage of time on the risk of inadvertent releases or other consequences from the plant's delay in

cleanup?

In other words, is somebody keeping tabs on what the effect is of another year or another two years, and so on, and does your panel keep an eye on that? Because it relates directly to the question of funding, the urgency of funding, the approaches to various funding sources, and I have never seen -- in our discussions we have never been able to get any quantitative assessment of the increase in hazard relative to the passage of time.

Now you are sorry you didn't leave for the airport.

(General laughter.)

MR. RASMUSSEN: You know, that is clearly a tough issue to face. As we all know, the longer it sits there, the more corrosion there will be, the more things that will fail, but sitting in an environment that -- let me start again.

You asked if I can quantitatively say anything about it, and it is very hard to quantitatively say how fast things corrode and when the failure sets in from corrosion in the environment it is in. When will the pump fail? When will the ventillation fail? We have gotten fairly good at doing it -- well, some people say not so good -- I think fairly good at doing it for well

maintained running equipment, how often that fails, because we have built up quite an inventory of events to judge the frequency on, but we have to, I think, just use our best engineering judgment. We know how fast certain things corrode, so we have some feeling of how long pipes will last and so on.

But to try and quantitatively say how the probability of -- or how the risk to the public is changing with time, I don't think we're good enough to do that yet. We certainly consider that issue all the time, and ask what is likely to be failing, what gaskets or material and so on. Did you want to say --

VOICE: I was going to say, the risk assessment group is just getting started to do something on that.

MR. RASMUSSEN: Yes, the risk -- GPU has started a risk assessment group. They had a temporary one that reviewed some things. They have now made it permanent. But I have done a little in the risk assessment field, and I wouldn't believe them if they told me they could predict the risk of how that plant is going to fail over time if you just leave it there. I mean, you have to worry about all the issues, but I don't believe we could trust the numbers we could predict on that.

MR. FLETCHER: Could I add something?

MR. RASMUSSEN: Sure, Jim.

MR. FLETCHER: I should have introduced myself as a non-nuclear expert, and they say fools rush in where angels fear to tread. That is one of the first questions I had of the nuclear experts, and I asked it again just recently, and the answer came back about like Norm's.

I do remember them saying one number, though. They said if it went another ten years, they would really begin to worry. Now, if that is helpful, I don't know. That is not very quantitative.

MR. RASMUSSEN: There are a number of things we are pretty sure would fail in ten years. Whether they will fail in one, two, or five --

MS. MARSHALL: Could I ask a question, Chairman?

MR. MINNICH: Certainly. You go right ahead.

MS. MARSHALL: Following up on that theme, I believe at our last meeting there was mention made of penetration into the concrete of radioactivity, and also it was said that this was more extensive than had been anticipated. Is there any risk in -- I mean, based on the amount of penetration so far, is there any risk of

further penetration through the concrete given the time schedule that we have? Is that a cause for concern?

MR. RASMUSSEN: That's a hell of a good question. I wish I knew the answer. But the water is no longer there, so one of the mechanisms to move it through the concrete is gone. But I don't know how fast -- I think it is a pretty slow diffusion rate without the water present to dissolve it and move it further in. So I doubt if that is a major issue. Tom, do you think it is going to keep moving into the concrete? It is not something that concerns -- It is deep enough in now that you've got a problem. If it goes a little deeper, it won't change the magnitude of the problem much, is what I think.

MS. MARSHALL: Do I gather, then, it is deeper where the water existed, and not as deep --

MR. RASMUSSEN: Yes, that's correct.

MS. MARSHALL: I see.

MR. MINNICH: Actually, the contamination was a result of water seepage into the concrete.

Since we are on that question, on that particular topic, let me ask a question. In the GPU recovery program estimate, there is a statement that in recent months it has become clear that gamma dose rates in containment are remaining at elevated levels despite

progress made in decontamination.

Have you looked at that?

MR. RASMUSSEN: Oh, yes.

MR. MINNICH: Okay.

MR. RASMUSSEN: That is, of course, a major issue with us, because that is a major source of worker dose, and we and GPU for sure, too, hope that with a good, thorough, careful washing, those dose levels could be reduced tremendously lower than they are now. Now, they have washed it, and they found that penetration into the concrete and some other factors have prevented them from washing away as much of the stuff as they hoped.

They now have a first rough model that identifies where most of the radioactivity, the sump and some other sources, and they are putting that together to sort of calculate what they believe the radiation dose is as a function of position based on what they have estimated the source terms to be, and we were told in our last meeting that that calculation is proceeding, and they are now getting so that they can make fair estimates.

But there is -- a lot of their dose comes from the basement where the water was and in the concrete, but there is still some up above, too, that didn't wash

off as well as they had hoped. So that is a problem.

MR. MINNICH: Hypothetically, if the rate remains high, and one of the next objects is to remove the head, will they still be able to proceed if that rate remains as high as it is?

MR. RASMUSSEN: Yes. Their estimate is that they can do that. They are considering other options to reduce the worker dose as he goes from the door over to the head area by perhaps using appropriate shielding along the way so the worker goes through a much lower radiation field in getting to the job site. You might talk to Mr. Kanga and others about that, because they will know more of the details than I do.

MR. COCHRAN: I am just curious in terms of other plants. Was this containment painted on the inside?

MR. RASMUSSEN: Yes, the concrete was painted.

MR. COCHRAN: And it is still -- the water went through?

MR. RASMUSSEN: Yes. It was essentially all painted. Tom probably knows that, Tom Devine.

MR. DEVINE: Jack Devine.

MR. RASMUSSEN: Jack.

MR. DEVINE: My son is Tom.

Let me try to put that in perhaps better perspective. The reactor building is reinforced concrete. It has a steel liner throughout. It is a completely enclosed steel liner. The problem with the penetration is really an interior concrete within that structure, not penetration through the liner. It is a problem because it has caused a persistent higher dose rate inside the reactor building, and therefore we have to address that problem. It has not been a problem because of migration towards the outside.

Where we have been able to measure depth of penetration, it has been still in fractions of an inch, which is nothing approximating penetration through a four or five-foot thick surface, but it is a problem, because that means that surface washing doesn't get it. You've got to get below the surface.

MR. COCHRAN: I am curious. Where it has penetrated, are those unpainted surfaces?

MR. DEVINE: We have a variety of surfaces, and let me start out by saying that our analytical ability is somewhat limited, because most of this is occurring in the basement, which is not habitable for human beings. So we are lowering instruments and we are deriving information. Most of the surfaces which appear to be the high pickup are surfaces which are unpainted.

In some cases, the basement is painted up to five feet, but we flooded with eight feet of water, so that upper ring, we call it the bathtub ring, is where we are seeing that real high penetration. There is also concrete block. There is a stairwell, for example, that is built with concrete block, just like a regular building. It has no safety function. The concrete block is very porous, and we have seen high radiation areas in those structures.

MR. MINNICH: Is that stainless steel liner -- can radioactivity penetrate that? Is that why it is stainless steel?

MR. DEVINE: It is not stainless. It is carbon steel.

MR. MINNICH: Oh, carbon steel. I am sorry.

MR. DEVINE: It is really part of a pressure vessel designed to withstand the effects of an accident, including pressure and temperature and everything else. Gamma rays penetrate through those kind of materials, but they are attenuated as they go through, so that is why the walls are as thick as they are.

MR. MINNICH: Any other questions?

(No response.)

MR. MINNICH: Thank you.

MR. FLETCHER: Can I just say, thank you for

inviting us, and if you want us to come back at any time, or any of the other members, we would be glad to do so. I might add that Dr. Friedman here has attended most of your meetings as a part of the public, but he just didn't happen to be here at the time you asked the question.

MR. MINNICH: Yes. Well, thank you very much. We appreciate your coming.

MR. FLETCHER: Dr. Friedman is going to stay. Norm and I have to leave.

MR MINNICH: Okay, fine. Have a good flight back, or however you are going.

MR. FLETCHER: Thank you.

MR. MINNICH: Okay. The next agenda item is Mr. Kanga on recovery program estimate. Mr. Kanga.

STATEMENT OF BAHMAN KANGA

MR. KANGA: What I am going to talk about is to briefly review the reassessment that we made for this project for both the schedule and the cost of the project, and you have received the report. I will give you a brief rundown, a summary of it. I will try and answer questions.

Let me introduce Larry Santee, who is manager of schedule and cost control, and we will try to operate the two machines simultaneously so that as I explain

things on the chart here, the rest of the people would be able to look at the other vu-graphs.

In essence, what we have done is to look at a series of different cases or scenarios, depending upon the assumed cash flow available to the project in the different years. The result of the different scenarios is that the total cost varies to some extent, but the major impact is in schedule time of various activities.

What I would like to do is to first define to you the five cases or five scenarios, then explain to you the difference in the cost, then explain to you the difference in the milestones of the various events, and then, if necessary, and if you have some questions, to go into more detail. So let me first -- excuse me.

MR. MINNICH: Before you begin, let me throw one question at you. I believe I heard on the news -- I don't recall seeing it in here -- that the cash availability assumptions are made based on the premise that the Governor's package will not receive total funding support. Is that correct or incorrect? Did I hear that --

MR. KANGA: That is not quite correct, and I think it might be more appropriate if we could do this in two steps, one, to explain to you the various

scenarios, and then perhaps Bob Arnold might want to talk to you about the funding levels that might be available in the future, because I think it would be most appropriate to go to what we have done in terms of various cases, and then for you to judge the probability of one or the other case being actual.

The first scenario or case that we have essentially is based upon the premise that we would have a cash flow of $76 million in 1983, that in 1984 we would have $92.6 million, and in 1985 and later years we would have $100 million, all dollars being assumed in 1983 levels. The actual cash flow therefore in 1984 and beyond would be higher depending upon the escalation that might happen in those years.

The second case that we have looked at is a similar assumption, except that we said that in 1984 and beyond, we will have $100 million available to us, but those would be in the current dollars in the value of the dollars at that time frame, and therefore we have an assumed escalation included in it, and therefore in terms of 1983 dollars those would be a lower number of dollars available to us.

In the Case Number 3, what we asked ourselves, the questions were, in effect, what would be the effect on cost and schedule if in 1985 we had essentially

unlimited cash flow, which would then help us in accelerating the activities related to the fuel removal so that we could complete the fuel removal in 1985, and I would like to explain that when I talk in terms of various time frames and compare the four or five cases, I think it would be more apparent to you than just at the present time defining what we were doing.

In Case Number 4, we assumed essentially the same numbers as in Case Number 1, except that in 1983 and '84 we wanted to see the effect on the schedule if we were to receive $10 million more in those two years.

Our reason for looking at the various cases was to see how sensitive our schedules were to the actual amount of money that might be made available to us.

In Case 5, we took the Case 4 and essentially looked at it with unlimited cash flow in 1984 and '5, to both expedite the start of the fuel removal and reduce the total time interval for removal of the fuel to 12 months.

Our intent in looking at the last case was essentially to see how much acceleration we can have in our schedule in the areas in the early period of the total schedule, namely, in '83 and '84, which is much

more sensitive to the amount of engineering, detail design, and other software packages that we have to prepare, as compared to later years, where the additional money would go in the area of actual physical work which could be accomplished, say, by adding a full two-shift operation to the project.

It would not be very feasible to add a two-shift operation in terms of preparation of design, engineering, and other items.

Let me just briefly go over with you the assumptions and the qualifications that we have in our estimate and schedule, and that is given in more detail in the report, and as we talked about, the estimate was prepared in terms of mid-1983 dollars, so that the amount of money for the whole project was in terms of one essential item. We then applied in various cases the escalation required, and we have made an assumption of 8 percent per year compounded escalation, and that may or may not happen in future years.

We have excluded the debt service on the capital investment. We made the assumption for the base case that the in containment work would be done on a 50-hour per week basis, whereas the balance of the activities would be based on 40 hours per week, and when we go into other cases, to accelerate the defueling

process, we made assumptions that we would be working two shifts in the containment.

We also made the assumption that in some particular cases we would be able to open the equipment hatch to allow movement of large pieces of components. We have excluded any salvage value for any material that we would remove from the plant. We have specifically not attached any cost or schedule contingency factors or allowance, and I will speak to that in a second.

The maintenance of the equipment and facility as investment protection is specifically excluded, and we have assumed that the arrangements can be made for shipping all rad waste off-site, and let me go back to Item Number 8 to indicate to you why we made that decision not to include cost and schedule contingency.

The -- in normal construction work, we apply a contingency factor to both cost and schedule depending upon the detail of the design and the progress of the design. However, in this project, we have to essentially understand the condition of the plant as we progress through the work, and therefore to make assumptions at this time in terms of contingency would be too premature.

We have therefore essentially looked at this total cost and schedule as the best information that we

have at the present time. As we go forward and we find additional information, we would take a look at it, and where necessary, we would modify the cost and schedule.

In the area of Item Number 9, we have specifically on this project excluded any investment protection. In other words, we are not protecting the equipment as we go along in our work, but at the same time we take prudent precaution not to unnecessarily damage any equipment.

So, those are the basic primary assumptions that we have made for this study. Let me now briefly show you the five cases and compare that with the cost and schedule study that was prepared in July, 1981.

In terms of the effort which is for the future years, you will see that the -- in terms of 1983 dollars, between Case 1 and Case 2, we have a difference of approximately $30 million. The total range between Case 1 and 5 is in the area of 520 to 553.6. However, there is significant difference when we look at the program completion between the five cases, where in Case 5 the program completion is December, '87, and the program completion in Case 2 is December, '89, which indicates to you the impact of change in the funding that might be available.

You will also notice that in terms of 1983

dollars, the July, '81, estimate indicates that approximately $644 million to go and the five cases are lower than that number. The July, '81, estimate also indicated the completion of the program by August, '86.

Let me now jump over to the milestone comparison, and what we are indicating here are a number of selected milestones, the dates by which we would complete those milestones in the five cases that we considered in the study, and also to compare that with the 1981 evaluation, and that comparison is in your book, and I would like to essentially review with you just a few primary milestones rather than go through each one of them.

Essentially if you would look at the start of the reactor fuel and debris removal, you see that in Case 1 we are talking in terms of January, '85, whereas in Cases 4 and 5 we are talking of July, '84, in the two cases. This shows you the acceleration that we could accomplish if we had additional funding available as we had indicated early in the project for Case 4 and 5.

Also, the completion of the fuel and debris removal changes from June, '86, in Case 1 to June, '85, in Case 5. As we indicated earlier, in Case 1, the schedule for the removal of the fuel and debris from the

reactor vessel is shown here to be 18 months. When we looked at Case 3, which was additional funding being available to reduce that schedule by six months, we have shown that completion as a 12-month activity.

Similarly, we have shown that as a 12-month activity in Case 5.

Some of the other milestones that significantly change are, as we talked about a little earlier, in the completion of the project or the final shipping of all the rad waste. In terms of our approach to this schedule, in the view of the limited funding, our approach was that we want to remove the fuel as early as we can with prudent care and also to reduce the radiation exposure to as far as practicable.

We have not included complete decontamination of all areas prior to the removal of the fuel. Therefore, you see that in a number of cases the completion, as an example, the completion of the Phase 2 decontamination is later than the defueling processes. We have essentially given priority to removal of the fuel as compared to decontamination of areas and systems which are not necessarily a priority item.

MR. KANGA: In your report, we have indicated to you our base schedule, and it indicates to you the various restraints between the activities, and it shows you the phasing of the work that is necessary. I will not at this time go into those details.

I have some more details that we can talk about if it is desired, but in view of the time I'd like to conclude my presentation at this time and take any questions.

CHAIRMAN MINNICH: Can you go back to, I believe it's either the second or third slide back from the last one you put on there.

MR. KANGA: Yes. What would you specifically like to --

CHAIRMAN MINNICH: The one that showed --

MR. KANGA: The dollars?

CHAIRMAN MINNICH: No, no. The year in which certain projects would be finished, where you pointed out in case five it would be --

MR. KANGA: Is this the one, or are we talking about --

CHAIRMAN MINNICH: Yes. Okay. Case one -- see, I don't know if I missed something. Case one and case two, the cash flow in case two is faster -- is higher, I'm sorry, in the later years, and yet the

completion date is later than in the case one.

MR. KANGA: No. Excuse me. Case two is the case where we assumed that the cash flow would be in current dollars, and therefore the --

CHAIRMAN MINNICH: Okay.

MR. KANGA: -- actual '83 dollars are less in that case. In case three we accelerated the removal of the fuel by six months.

CHAIRMAN MINNICH: Okay.

Questions. Go ahead, Art.

MAYOR MORRIS: If I could ask one question. You're now saying in case one that completion would be projected in June of '88. Back in mid-1981 the projection then was August of '86, I believe.

MR. KANGA: Yes.

MAYOR MORRIS: And the prior and I think only real projection was in August of 1980, which was the very first real projection that was done. Do you remember what the date of completion was according to that one?

What I'm trying to do is see if we ever get any closer than five years. That would have been the very first projection. I think it says in the summary here or whatever, August of 1980 was really the first real definitive estimate of TMI-2 cleanup.

MR. ARNOLD: Mr. Mayor, I don't recall that date and I don't know if we have anybody here -- Jack? -- that does. If any of my people do, why, indicate that.

My recollection is that the July or August 1980 one was approximately one year earlier. There wasn't too much difference in the time duration. The thing that's important to keep in mind, I think, in looking at this, you know, what is a two-year slip, is that for the July '81 and the August '80, for that matter, one of the assumptions for doing the cost and schedule assessment was that there would be unlimited dollars.

And I think that if you look at this two-year slippage, so to speak, my sense is about a year and a half of that is due to the cash restraints, half a year the cash restraints that existed in 1982 and another year in the balance of the effort in having more limited cash flow. And then six months of the two years is a somewhat different understanding of the total technical effort that's necessary.

MAYOR MORRIS: No, I understand the money and the technical problems you run into. I guess I'm trying to say that when the projection is three years away for completion I'll start feeling that the end is in sight.

But so far it seems like every time we have a projection it's always five years from now.

It's just a point that -- it doesn't need an answer. It's just a point that --

MR. ARNOLD: I'll celebrate with you.

MR. COCHRAN: Art, maybe I can help you, because I'm not sure that his definition of program completion is the one, is the dates that make the most sense to look at in terms of making some decision here. I mean, an alternate would be the time of fuel removal, because one might then conclude that subsequent decontamination is driven by worker exposure, for example, rather than polishing up the last nuts and bolts.

MR. KANGA: I think that that's a valid comparison, and we should look at in terms of the start of the fuel and debris removal, which in 1981 estimate was May '84 and compares to case one as January '85. And if you would look at in terms of case four, that's July '84. It's a valid comparison that you might want to perform.

MR. COCHRAN: What does GPU make of just this part of your analysis? I mean, I'm not sure what conclusion you draw from this other than the obvious one, that the results aren't very sensitive in terms of

funding but the final program dates can vary by several years.

I mean, what's your conclusion from all this?

MR. KANGA: The basic conclusion that this chart indicates to you is that certain activities are indeed sensitive to the funding, that we could improve from January '85 to July '84 in start of the defueling process, that we could improve from June of '86 to June '85 in removing the fuel from the reactor vessel. That's a change of one year, depending upon the funding.

MR. COCHRAN: And how much does that cost?

MR. KANGA: The cost, as we showed earlier, the total cost is -- actually, it's interesting to observe that if you take a look at it in terms of 1983 dollars, the total cost of case five compared to case one is actually less. And if you look at it in terms of escalated dollars, it's much more significant because now you have 974.7 compared to 949.6.

MR. ARNOLD: Let me perhaps add to that if I could, Tom, I think pertinent to your question. As you'll note in going through the report, what we tried to do was to understand the effort necessary to get the radiation levels in the plant down to where there would be a consistent radiological condition with an operating

point.

And I think your point is an important one, that that doesn't mean that the plant will be totally cleaned up and that there will be areas in the plant at the time we say the cleanup is complete that will still be contaminated. But they'll be areas where the contamination will be reliably controlled and where the man-rem exposure involved in making further progress would probably not be worth it at that point in time.

And we can't say exactly what the precise conditions will be at a given point in the plant relative to that. We tried to conceptualize what the end of the program is and describe it in that way. And I think that in terms of, you know, my sense of what does all this mean, is that it does mean that to get to the point of the start of fuel removal it's not very dollar sensitive.

We're limited by the technical effort, particularly the engineering effort, the lead times involved in that to be ready to remove fuel. The removal of the fuel would take us between a year and a year and a half depending on the dollars available and can we work a second shift or just basically a single shift; and that the balance of the work effort can be accelerated to some extent with more dollars because of

the plant volume that you're working on is large enough to apply more people.

But in terms of the rate at which you reduce the risk to the public, it's relatively low already by the time we get the fuel removed. So that that latter part of it is not the major increment in reduction of risk to the public.

CHAIRMAN MINNICH. Any other questions?

(No response.)

CHAIRMAN MINNICH: Okay, we want to take the next item, the update on the cleanup.

MR. COCHRAN: John, it may be more appropriate to jump to item five and then come back to the cleanup.

CHAIRMAN MINNICH: Okay, if you don't mind, Bob, an update on funding, and then go back.

MR. ARNOLD: As I understood your question earlier to Bauman related to funding, it was that this cost reassessment assumes that the Governor Thornburg plan is not funded at that level.

CHAIRMAN MINNICH: That's what I thought I heard someone on the news media say. I may have misunderstood.

MR. ARNOLD: I think I would characterize it differently. Not having heard the actual comment that was made, I don't know that I want to say that I

disagree with it. But let me tell you how I would describe it.

At the time Governor Thornburg made his proposal, what we had based upon the August 1981 cost estimate was a funding requirement on the balance of program of $760 million. That was from January '82 on. And he sort of scoped out a way of allocating those total dollars among local, regional interests, and national interests.

Where we are today is that from January 1983 on, this base case, if we add the $635 million that it forecasts as being necessary to complete the program to what was spent in 1982, let's say about $65 million -- it's a little bit higher than that -- we're about $700 million or $705 million as we see it now from the same calendar date of January '82 to the balance of the program.

So we have seen some reduction relative to the $760 million number. If one looks at the different pieces of the funding for the cleanup and where Governor Thornburg would have asked them to be allocated and where are we in terms of having those in place, I think that we're not that far off from the concept that Governor Thornburg is proposing, and it I think is consistent with what we use as our base case. And let's

take the pieces of it.

Under Governor Thornburg's proposal there would be about $50 million a year from the GPU system customers going towards the cleanup. Currently, the Jersey Central customers are paying toward the cleanup at that rate, their 25 percent share of $12.5 million -- 25 percent of $50 million.

We are collecting in the Pennsylvania companies about $22 million on an annual basis of the $37.5 million and we have agreement of the Pennsylvania Commission that with TMI-1 going back into service we would collect at the total rate of $37.5 million.

We did file for an increase in rates in the Pennsylvania companies a couple weeks ago, as I recall, and part of that request was to uncouple the customer revenues towards cleanup from the restart of Unit 1. And you know, we're hopeful that the Commission will agree to do that, so that towards the latter part of this year we will be collecting on a current basis at the rate of $37.5 million from the Pennsylvania companies, which gives us the $50 million per year customer component.

If one did the arithmetic, the utility industry share under the Thornburg plan would have been one-sixth of $190 million, which is $31-plus million per

year. And what we had under way in 1982, just to refresh everybody's memory, was an effort at the Federal Government level to try to mandate the contributions. That effort failed.

I think the industry saw it as unlikely that it would be resurrected in 1983 and at their meeting in Phoenix a couple weeks ago the Board of Directors of the EEI companies, the Edison Electric Institute, which is the industry association of investor-owned utilities, passed a resolution recommending voluntary contributions at the level of $25 million per year for six years, for a total of $150 million.

Governor Thornburg proposed a Federal Government participation at a level essentially equivalent to the industry level, and what we're seeing or expecting in 1983 is perhaps half of that or on the order of $15 million. And that's a part of the $76 million that was shown in the program and on the slides.

We expect that through the next few years at least we would have funding as part of the government's R&D effort that would also contribute towards cleanup activities or have a dual purpose in the range of perhaps $10 to $20 million per year.

We have -- also, it's part of the Thornburg

plan, the contribution from general tax revenues in both Pennsylvania and New Jersey at the rate of $5 million per year in Pennsylvania and $2.5 million per year in New Jersey, and the Commonwealth of Pennsylvania has included in their '83 fiscal budget the $5 million for the first increment of that.

We do not currently have that in the New Jersey budget, but we continue to work with the State Government of New Jersey to see if that can't be brought about.

So if you go back and -- well, and then the last component was insurance, expected at the beginning of 1982 and had in fact about $90 million worth, $85 million worth of insurance. We have about $45 million worth of insurance remaining, which we will use at about the rate of $10 to $20 million per year, depending on how it does the most good.

So if one looks at, let's say 1984, and we'd expect that $50 million from customers, $25 million from utilities, $10 to $20 million for the Federal Government R&D program, the State of Pennsylvania at $5 million and perhaps another $2.5 million with New Jersey, and some balance of the remaining insurance money, say approximately $10 million or so, we're in the range of $100 million for 1984 that we're anticipating. We see

the bulk of that funding, if it comes into place in '84, would be reliable for the next few years at least.

MAYOR MORRIS: Bob, the money that you just got as an out of court settlement of $37 million I guess is going to be in the form of credits. Is that money likely to reduce, then, the need for the total amount of cleanup monies by that amount, by about $37 million, because of cheaper equipment or whatever?

MR. ARNOLD: We have to -- it is in the form of rebates, so we have to spend funds in order to receive the rebate. But the settlement is based upon all rebates we receive going to the cleanup, and that's kind of an accounting, perhaps, issue, because the money may well be spent by Jersey Central on an activity in New Jersey or by Penn Elec in an activity out in mid-Pennsylvania, and we would still receive the rebate and we would be able to flow that back as a credit to the TMI-2.

So the answer to your question is yes, those rebates will in effect reduce the total funding requirements.

MAYOR MORRIS: Has that been included in your most recent projection or would that projection then reduce by $37 million?

MR. ARNOLD: It is not included in the funding

that I described racking up against the funding requirements. The funding requirements that were the assumptions or the calculations that were done in the cost estimate of course ignore where the funds come from.

So that $635 million cost to go is independent of where the funds come from.

MAYOR MORRIS: Okay. But you didn't reduce that because you figured you could get equipment cheaper.

MR. ARNOLD: No.

MAYOR MORRIS: You just assumed that cost, but then the $37 million would come into being as a contribution from, really, from --

MR. ARNOLD: Right, as an offset against the $635 million requirement. I say again, we have to spend the money to get the rebate.

MAYOR MORRIS: I understand, but somewhere that has to come into play in the whole funding picture.

MR. ARNOLD: Yes.

MAYOR MORRIS: Either cheaper equipment or a contribution.

MR. ARNOLD: Yes.

MAYOR MORRIS: One or the other.

MR. ARNOLD: It either will reduce the cost of specific increments of work over what we've estimated -- hopefully we've estimated them accurately in terms of market costs -- or it will come back as an effective credit to the books.

MR. COCHRAN: I heard too many numbers at once. Could you tell me how much hard money you see, sort of money in the hand versus money that's still awaiting the Thornburg proposal or EEI contributions and so forth?

MR. ARNOLD: In terms what --

MR. COCHRAN: What we can count on.

MR. ARNOLD: -- we can count on at this time, we are at about $34.5 million from customer revenues that we're currently receiving.

MR. COCHRAN: That's annually?

MR. ARNOLD: Per year, on an annual basis, and pending a change in the rates it would remain. We have about $45 million of insurance funds. We have a Federal Government appropriation bill that covers a three-year program that would maintain funding at the site at about the $15 to $20 million per year, that serves the purpose of both R&D and cleanup. That's been appropriated for the current year and I guess that's sort of in between the hoped-for and in the bank, so to speak, Tom.

There is the $5 million committed by the State of Pennsylvania. So that's kind of a combination of lump sums available right now and annual dollars available. But if you said the $50 million was over five years, that's $250 million; $45 million of the insurance money. I don't know how you want to -- how optimistic you want to be on the Federal Government. I personally tend to be quite optimistic in terms of the support that this Administration has shown for the program.

I think that, you know, we've got a significant part of the total funding pretty well in place, and I think that the project is the type of thing that tends to reinforce itself, in terms of as we make progress and see success coming I think that we get the additional support necessary to make these things happen to let us complete the project.

MR. COCHRAN: According to my arithmetic, if Edison Electric members coughed up $150 million and did it, instead of over six years, by mid-'86, you've got the money to get the fuel out of the reactor under case one.

MR. ARNOLD: Well, I have a lot of confidence in your ability to do the arithmetic.

MR. COCHRAN: Well, I mean, you've got -- I

just added up about $210 million from the numbers you gave me. The cost to get the fuel out under the case one is about $320 million. And so if you --

MR. ARNOLD: I guess to some extent you get into what motivates different entities to be participants in this. I think we see, and I guess I think the public around Three Mile Island would endorse, that what we're looking at is a program to decontaminate the facility, including removing the fuel, not just simply get to the point of where the fuel's been removed.

But I think there is some good reasons for encouraging the people who acknowledge a role in supporting this program to support it for the total duration.

MR. COCHRAN: I'm not suggesting you shouldn't go ahead and clean it up. I'm just making an observation that you can have the money, if you can get the EEI to step in, to get the fuel out.

MR. ARNOLD: I think that's kind of one calibration on what funds are a pretty reasonable assurance.

CHAIRMAN MINNICH: Any other questions from Bob on the funding?

(No response.)

CHAIRMAN MINNICH: If not, we're going to take about a ten-minute break.

(A brief recess was taken.)

CHAIRMAN MINNICH: I believe we've finished with that particular question and we can now go back to the update and the cleanup. Mr. Kanga.

MR. KANGA: I'll keep this report somewhat brief.

CHAIRMAN MINNICH: Thank you.

MR. KANGA: As we talked about when we talked in terms of the reassessment of the schedule, and also it was mentioned earlier, one of the major items that we are presently working on and have just about completed is the refurbishment of the polar crane which would be required to lift the head. The crane is essentially operational. We have operated it in all the various directions. We have, however, not completed its tests and that's the next set of steps we have to go through to qualify it to be able to lift the head without any problems.

We still anticipate that we will be able to lift the head in the middle of this year, and we are also concurrently working on a number of engineering activities related to the removal of the plenum, which would be the step following the removal of the head. We

are concurrently in the process of working on what is required in terms of equipment and systems for removing the fuel.

We are working on the various interfaces that need to be defined properly for the design and fabrication of the cannisters, and we will in the next few months also start working on the preliminary designs for the fuel racks which would be required in the fuel pool.

In the area of the fuel pool, we have certain tanks which were put in that area after the accident, so we are working on characterizing those tanks, working on how to remove them, and eventually we will remove them before we can put the racks in place.

In the area of rad wastes, let me just very briefly state that in almost all cases we have shipped more rad waste than was generated in 1982, so that in effect we are catching up on some of the rad waste that was stored at the site.

Of particular interest, we have the Epicore prefilters. There were 49 in storage at the beginning of the year. At the end of the year we had shipped 16 out, and as of today we have shipped a total of 21. We anticipate that all 49 of the Epicore 2 liners would be shipped out by the end of the third quarter of this

year.

So we are making progress. We have also shipped this year, in '83 actually, two SDFS liners, and we will be shipping out others in due course. So we have made a concerted effort in terms of reducing the storage of rad waste and we will continue to do that.

Basically that's my report. With your permission, I would, and if time permits, I'd like Dr. Baker to talk about the environmental discharges or, more appropriate, lack of discharges, and also have Jack Devine brief you in a brief way on what we have seen under the head in the recent characterization that we have done, and also talk to you about the future characterization that we'll be doing in the next couple of months.

CHAIRMAN MINNICH: Before we do, I have two quick questions and perhaps maybe some of the panel members would.

Somewhere I saw, and I think it may have been in Lake Barrett's report, that you were having a problem with decontaminating the lead screws. Did I see that?

MR. BARRETT: I think Mr. Devine's going to talk about that.

CHAIRMAN MINNICH: Okay. And also, the higher than expected level of radiation or contamination at the

plenum.

MR. KANGA: That's the topic that Jack would be talking about.

CHAIRMAN MINNICH: That also? Okay. Then I defer. And you've answered my other question about the shipment of the liners, and that's good.

Do the panel members have any questions?

MAYOR MARSHALL: Will the truck strike affect this in any way?

MR. KANGA: No, I do not believe so.

MR. COCHRAN: I have a question, but I'm not sure which, whether it comes now or later. I can ask it now and then you can decide.

CHAIRMAN MINNICH: Go ahead.

MR. COCHRAN: In your new cost estimates, there were substantial decreases of about, according to your news release, $177 million from the previous estimates, due in part to waste -- in the waste processing area, in decontamination. Can you elaborate on that a little bit and tell me also what you foresee in terms of whether the wastes will be stored in Pennsylvania as opposed to being stored at DOE, and so forth?

MR. KANGA: Okay. I'd like to do it after Jack finishes talking, for this reason: He has set up

-- and I have a slide which would then indicate to you the various areas in which the 1981 cost estimate differs from this one, and then we can talk in terms of what you want.

CHAIRMAN MINNICH: Okay.

DR. BAKER: Mr. Arnold has requested, since we didn't get an opportunity to really introduce me, I'm the manager of environmental controls at Three Mile Island. My function is, as the title would indicate, to coordinate all the environmental monitoring that occurs around Three Mile Island.

For the sake of brevity, I'll give you just a thumbnail sketch of what's going on right now or what's gone on in 1982. The program more or less is out there collecting data, and one might consider it to be baseline data in anticipation of the restart of Unit 1; and also, it serves as a guide or a check, if you will, on the cleanup processes, too, to make sure that they are being conducted in accordance with the appropriate regulatory guidelines.

Now, we approach the environmental monitoring program essentially in two aspects, if you will. One is the actual taking of environmental samples, from water samples to fruit samples. There's a whole gamut of environmental samples that are taken, and we tie or

couple that into a site specific computer model and this gives us a feel of how we can -- what's gone on, and permits us to assess any of the releases that may have occurred.

With respect to TMI-2 in particular, the main point or source of release is still from the containment stack when they go into the entries, and if we take a look at the mean rate of nuclides, we look at krypton-85 and tritium from Unit 2 during the releases. And with respect to krypton-85 for 1982, we maintain four constant air samplers on the environment that we collect samples from every week. They also coincide with EPA's stations, and in essence in 1982 we have not seen anything above background levels at any of our monitoring stations.

With respect to the tritium, again from all of the pathways that are monitored we just simply haven't seen anything above what we would anticipate to be part of the background levels around the island. And that in essence is a thumbnail sketch of what the program is. Mr. Kanga kind of pointed out that there was a report of the lack of information on the program. I'll certainly entertain any questions.

CHAIRMAN MINNICH: Questions?

Tom, please move that mike down. No, the one

with the black cord here. See, that's the recording mike so she can hear what you're saying.

MR. COCHRAN: Did you say that you only have four monitoring stations for measuring the krypton offsite?

DR. BAKER: Yes, that's correct, four stations. We had a number of stations out at the time of the Unit 2 containment purge. But what we've done in essence is taken a look at the environmental monitoring or the environmental site specific activities with respect to, say like meteorology. Meteorology plays a large role in where you put these samplers out, and what we did then was we cut back this very large program that we had for the purge of the containment building and got it down to something that was more manageable and a little bit less expensive to run.

I would point out that for 1982, just to give you an idea of the figures, we had 915 curies of kryton-85 that was released and tritium was 111 curies. Those values are, depending upon sites, are within certainly acceptable ranges.

MR. COCHRAN: The 915 was measured how?

DR. BAKER: That was from -- that was detected from the samples that were taken by Radcon, and Mr. Hildebrand could address that.

We didn't see anything in the environment. The 915 curies that was measured was what was released out of the stack. Now, by the time that material leaves the Island and is dispersed, if you will, is dilute, then none of the stations have seen it.

I might say that this is where the computer model comes in, because what we can do is factor in what the release was along with the meteorology that occurred at that point in time and we can project what we would anticipate to be the levels out in the environment to see.

MR. COCHRAN: Could you tell me how many orders of magnitude you could be off in the measurement of krypton-85 at one of these stations because the wind is blowing between the stations rather than over the stations?

DR. BAKER: The sensitivity, if you will, of the actual sample that's taken goes into the analysis, how low or how small of a sample can you see. What the computer model permits one to do is to take that value and, even though your actual sample may not be sensitive enough to pick up what went by, the computer model does.

In essence, if the analysis of the krypton only allows you to get down to 10 or 20 picocuries per

cubic meter of air, for example, that's the level of sensitivity at which that sample can be analyzed at, but less than that was released, then one can plug that value into the computer model and it will project less than 15 or less than 10 picocuries out in the environment.

MR. ARNOLD: (Inaudible.)

DR. BAKER: Yes. As Mr. Arnold pointed out -- I think I made this clear -- there are other air monitoring stations out there, but there are four special ones out, if you will, in the predominant wind patterns around Three Mile Island, that are specifically set to pick up or detect krypton-85.

MR. COCHRAN: Well, my only point is it would seem to me that a proper statement would be that having only four monitors isn't a reliable way to measure krypton-85, that the only reliable way is to measure it at the stack. Now, is that a fair assessment?

DR. BAKER: Yes, that's a fair assessment.

MR. COCHRAN: And that all of this four monitors out there and the fact that you didn't detect anything doesn't mean a hell of a lot; isn't that a fair statement?

DR. BAKER: What it says, what it verifies, is the model says that you will see less than the

sensitivity. If the wind direction, predominant wind direction, is towards one of the sampling stations and one takes a sample of it and the analysis sensitivity of the sample of it is such that you can't get down to what the dispersion value was or what the concentration of krypton is out in the environment, then your sample serves as almost a negative reinforcement that, yes, because of my sensitivity I had less than a certain amount of activity, the computer model will in fact project what that concentration is.

CHAIRMAN MINNICH: Yes.

MR. WALD: We shouldn't lose track of the fact that there are other people measuring krypton-85 out there, EPA for example.

CHAIRMAN MINNICH: And the other elements.

MR. COCHRAN: Well, he said his stations were colocated with the EPA stations, so that doesn't buy you anything.

DR. BAKER: They're in the general areas. They're not side by side. They are in certain stations, others they are not. They're in the general vicinities.

CHAIRMAN MINNICH: You still have your monitoring devices scattered throughout the whole area, do you not?

MR. KIRK: We have general air-sampling TLD's scattered throughout the entire area, yes.

CHAIRMAN MINNICH: Yes, you better -- Bill, I'm sorry. Just sort of refresh the panel.

MR. KIRK: EPA still has 30 air monitoring -- 13 air monitoring stations. We have four krypton monitoring stations, one of which is in essentially the same location as Gary's. The other three differ slightly.

Our sensitivity is two picocuries per cubic meter for krypton-85, which is a little better than the sensitivity they get for analysis. The worldwide average of krypton is running between 20 and 30 picocuries per cubic meter. In the last year our samples have been within that range.

We have in the last several weeks taken a sample directly out of the TMI stack and compared it to the numbers that their rad-safe people were getting, and we got exactly the same answer, which on that particular day, which was 10 to 11 January this year, they released .24 curies.

When they integrated their stack monitor retrospectively, they got the same answer we had gotten measuring the concentration.

CHAIRMAN MINNICH: So you in effect are

checking on them to verify that what they are saying is in fact so?

MR. KIRK: This was a special case. There had been some questions raised as to whether that particular monitor was actually seeing what it was saying was there, so we went in with the sampler we use in the environment for krypton and measured it.

CHAIRMAN MINNICH: Thanks, Bill.

Any other questions?

DR. BAKER: Thank you.

CHAIRMAN MINNICH: Thank you.

Jack?

MR. DEVINE: Mr. Chairman, I'd like to give you a brief overview of some of the work we've done in the last two months with respect to examinations of the reactor vessel in preparation for the head lift, and as I do so I'll try to answer the two questions you raised, which are really at the heart of that question.

As a first step to provide some orientation, I brought some slides, which are really photographs of two models which we use for planning purposes, which I think better illustrate the structures and the geometries and where we're looking for radiation, that sort of thing. I'd like to show those first and then I'll describe the program.

Okay. I apologize that I only have one set of these slides, so those in the audience can't follow on our auxiliary screen.

This first picture is a model of the containment building itself, a cutaway obviously. That's the large cylindrical building on the site that houses the reactor. The reactor system, the nuclear steam supply system is that interconnection of blue pipes and structures in the center, and the reactor vessel housing the fuel is the centermost one.

Looking at that in closer view, again the center structure is the reactor vessel. The reactor vessel is really the lower half of that center cylinder. The upper portion is an auxiliary structure on top of it, and on either side are the steam generators.

Again, another view. You can see --

MR. ARNOLD: Jack, can you identify the polar crane?

MR. DEVINE: Yes, that's a good idea. Mr. Arnold suggested we point out the polar crane. It is up in the top of the building and it travels on this curve, which can rotate, and then the crane carriage can go back and forth. So it covers 360 degrees.

Refurbishment of that crane is necessary to

remove this head structure in order to get at the fuel, and that's the whole program that we've been working on for the last year.

CHAIRMAN MINNICH: I take it the little light figure is a comparison of a human to the --

MR. DEVINE: That's your standard five-foot -- or six-foot, rather, standard man. This structure is about 50 feet tall, and I've got some larger pictures of the head itself. So you see, when we're talking head lift it's really a substantial endeavor.

Let me -- I keep reversing myself here.

That again is a view of that reactor system, the reactor and the head structure, from a little different viewpoint so you can get some idea of how it's shaped. That platform at the top is where all of the Quick-Look experiments were conducted. That's where the men lowered the camera through into the reactor vessel itself.

CHAIRMAN MINNICH: That has to be removed also?

MR. DEVINE: That will come with the head, and I'll show you that in a moment.

Now, this is another model and it shows that central blue structure, that reactor, in cutaway. Now, again I'll move away from the microphone.

The platform at the top is right at the top of this picture. The structure which supports the control rod guide mechanism is in light blue here. The head itself is this portion, which bolts to the reactor vessel, which is this lower portion here.

The plenum that you've heard so much about is this large yellow tube structure here. The fuel is all down in this area. The reactor vessel sits in the containment building and, although there would be no one standing there where this model is shown, that interface is the bottom of the refueling canal. So normally after we remove the reactor vessel head we'll be filling that with water to provide shielding from the fuel. I have some other views that'll show that in better detail.

When we talk of removing the head, we're really addressing that entire structure, which is the pressure vessel top right here, with that large flange and the ring of big bolts all around it, the control rod drive mechanism, some structure underneath the control rod drive mechanism which guides those lead screws as they're moving in and out of the reactor, and then the service area, which is an area for servicing the reactor. It handles cables and that sort of thing attached to it.

That whole unit moves. It's about 25 feet

high, weighs something like 150 tons. It's a very, very large structure.

After that is removed, it will leave the upper portion of the plenum protruding above the level of the refueling canal, which then must also be removed in order to get to the fuel itself. So this whole reactor disassembly program involves first removing the head, then removing the plenum, which is also going to be a rather difficult job because it involves very tight clearances and it's a very large structure, before we can have access to the fuel.

Again, looking at the structure in overview. Our examination program was as follows. First, we lowered that television camera all the way, you know, hanging a small camera through that long tube all the way into this core region down here. In order to get that television camera in, we had to remove a lead screw, which is a long steel shaft and it connects these control rod drive mechanisms to the control rod down in this region.

VOICE: Take the mike with you.

MR. DEVINE: What a great idea. I felt slave to this microphone, but I didn't think of moving it.

You all heard a lot about that examination. It was very successful.

The second part of the examination or an additional stage of the examination program that we've been into recently is the determination of how much radiation is present in this area, and we want to find that out for two reasons. When we remove the head, we are going to be faced with two distinct problems.

The first is that the head structure itself will contain some radioactivity. Keep in mind that that entire reactor coolant system has been filled with radioactive material for a number of years. So after the water is drained down we would expect a substantial amount of residual radioactivity to remain on those structures.

We've known from the beginning that that would be the case, but it's rather difficult to quantify how much that will be, and that led us to this examination program. So the first problem is how much radiation will be associated with this device, because when it is lifted by the crane and then moved over and set on its storage space it will be a source of radiation from which we must protect people. And then after it's set on that storage stand it will continue to be a source of radiation and we're going to have to make sure that it's not an intolerable one.

Secondly, having removed that head, this area

of the plenum, again presumably also covered or coated to some degree with radioactive material, will be a source until we're able to fill that canal with water. People will have jobs to do in that area and we want to be able to predict exactly what that radiation source will be.

That concern prompted us to conduct the examination which I mentioned before. It was done in December. It was very straightforward. It involved lowering a small radiation meter through the same holes that we used for the Quick-Look examination and measuring radiation in this cavity.

Now, the radiation measurement was rather complex because -- well, for a couple of reasons. One, because the only access we had was through that Quick-Look hole, the instrument had to go inside this small tube and that very much complicated our ability to truly understand what was going on in this entire region. It was a masking effect.

Secondly, the whole reactor vessel was filled with water. It will be dry later on. So analytically we had to account for that.

The results from that examination were somewhat different than we had predicted, although I must point out that it was our uncertainty about that

which prompted us the exam in the first place. So we weren't alarmed, I would say, but we were certainly intrigued with the results and there's been a great effort going on since then to try to analyze them.

In a nutshell what we saw was that the radiation levels were higher than we had anticipated and the characteristic shape of them, in other words the location of some of those radiation sources, was somewhat different than we anticipated.

Hand in hand with this examination we have been examining the lead screws, which I mentioned before, which were removed. And one of the interesting things about that examination is that, as expected, they were highly contaminated. They were a source of radiation, but the radiation was not readily removed by normal water washings. It required some more aggressive washing with chemicals to remove the radiation.

Now, what we've done at this point is try to tie those two things together, assume that the lead screw, the radiation on the lead screws, the radioactive material I should say, the contamination on the lead screws, is representative of the whole head region, and correlate that with the measurements of radiation we took with that small instrument and analytically take into account the fact that it was looking inside of a

steel tube and it was submerged in radioactive water. We try to piece that whole picture together to get as early as we can a good idea of whether or not those two problems that I described will be severe and whether or not they will force a change in our head lift plans.

We haven't completed that review yet. Our preliminary conclusion, and I must emphasize that they're preliminary, is that the radiation associated with the head itself as it's lifted up and removed is not substantially greater than occurs in some of the more contaminated operating reactors in the country, meaning that if we use careful procedures to protect people, we put additional shielding on the head itself and on the storage stand where it will be kept in the reactor building, it should present no severe problem.

With respect to the plenum effect, right now the radiation associated with it may be a more significant problem. When we have a good handle on the degree of that there are a number of things we can do, all of which really were planned into the program to some extent.

We can provide additional shielding in this area to protect the people who have to work near that area until the reactor is flooded, or we could provide for some earlier than previously planned partial

flooding to permit extra shielding while we prepare to remove the reactor vessel plenum.

The real key here is that the examinations we've done so far were very early. The difficulties I described, the fact that the instrument had to be installed through a pipe in water, was a complication. We recognized that when we did it, but we wanted to get some information as soon as we can.

We plan in the course of preparations for head lift to repeat those measurements after the water is removed and after we've been able to remove some of the interfering structure in this area. So certainly before we lift the head we'll have a confirmed picture of the radiation level and the risk of having a real surprise when we lift the head is very, very low.

Our effort now was to get as good a handle on that as early as we could, and in fact I think it's been quite successful in that respect.

Are there any questions?

CHAIRMAN MINNICH: With -- excuse me. Go ahead.

MR. WALD: After you, sir.

CHAIRMAN MINNICH: When you take the head off, you have a place where that is then set down?

MR. DEVINE: Right.

CHAIRMAN MINNICH: Will you clean the head up inside or will you have to remove that from the facility and ship it somewhere to be decontaminated? I don't want you to go into a long explanation.

MR. DEVINE: We have not developed our plan to that point.

CHAIRMAN MINNICH: You haven't developed that, okay.

MR. DEVINE: We certainly plan surface decontamination in place, and in fact we are planning right now -- it's another one of the many steps involved in head lift preparation -- to do a washdown of that head before we even lift it or as we're lifting it. Now, what we've seen with the lead screws is that we can certainly expect some adherent contamination that won't be removed and we will have to get to that.

One possible approach might be to put the head back on and then flush chemically later on after the fuel's out. It's very, very plausible.

Yes?

MR. WALD: Yes. Do you have any spectral analysis of what the major nuclides are that are involved, that are your contaminants?

MR. DEVINE: The instrument we lowered in here was a very small ionization chamber, so it provided no

spectral information. The lead screw examinations have been -- and that is predominantly cesium, in the 98, 99 percent range. We've been exploring in some detail the various chemical mechanisms for causing an adherent layer of cesium -- and in fact there are some and that's been a very interesting learning process for us.

MR. WALD: The other question is, can you give us any sort of ballpark figure, highly preliminary, tentative, and with all the constraints on it, R per hour, rad per hour?

MR. DEVINE: Yes, highly preliminary.

MR. WALD: I already said all that for you.

MR. DEVINE: What we're seeing with the reactor vessel head is that inside of the head itself there'll be a fairly high radiation level. About 185 R is an upper bound on that.

MR. WALD: Per hour?

MR. DEVINE: That is heavily shielded. Yes, R per hour. That is heavily shielded by all this structure.

The area around the head at surface level when it's in storage is something -- now, this is presuming we had no shielding and we will be adding shielding. But the numbers -- I have to say that I'm dealing from memory here. The numbers were in the neighborhood of I

think 50 to 100 millirem per hour.

The area directly beneath that on the floor below was approximately 10 millirem per hour. Again, we would provide additional shielding to protect that area.

The most serious area was the area to the side, which is not a direct exposure path for someone, but the reason for that is that there's less shielding provided by the steel, and that was in the few R per hour range. But we plan an arrangement of shielding around that head structure to provide protection against that.

CHAIRMAN MINNICH: Any other questions?

(No response.)

CHAIRMAN MINNICH: Thank you, Jack.

MR. DEVINE: Thank you.

(Pause.)

MR. COCHRAN: Could I show my ignorance and ask you what -- that's a factor of a thousand dose reduction in the shielding, in shielding from the cesium gamma?

MR. DEVINE: I think you have to ask that -- yes, you mean in --

MR. COCHRAN: You went from 100 and something rem per hour to 100 and something millirem per hour,

just going through a couple inches of steel.

MR. DEVINE: The measurements were in different places. There is a couple inches of steel and there's also a substantial amount of other material in that region, which is providing shielding as well.

Tom, let me say, at request I provided very preliminary information. We're studying it very carefully. We've got three different organizations doing comparative analyses, and we're certainly going to deal with it very carefully. I wouldn't want to project that as a confident number.

Ray, do you recall, is that number approximately?

VOICE: (Inaudible.)

MR. DEVINE: I think it's a good number.

CHAIRMAN MINNICH: Lake, we're going to close with you, and I apologize to the audience that tonight we will not, unfortunately, have any questions from the audience. Hopefully, next hearing we definitely will.

I'd like to call Tom Gerusky to just make a quick statement to the panel, and then, Lake, if you'll deal with the transportation routes. And I apologize that the Mayor is not here, because it was really his concern that prompted you to take a look at this issue.

Tom?

MR. GERUSKY: Well, it's going to be short and sweet.

Before the meeting I expressed to the Chairman and Vice Chairman that it would have been best if this portion of the meeting would be postponed, because the compacting document we're talking about for the Northeastern low level waste disposal compact will not be available until two weeks from Friday, when the states finish, the eleven states in the Northeast that are working on this, finish their final draft in Boston.

After that, at that point it then gets sent back to the governors and to the legislatures of each of the states for ratification and comment and change if needed. But each state must pass this document as a duplicate. No one can change a word in the document. And then Congress must approve the document before it can go into effect.

So we're talking about a long-term process. But the Coalition of Northeastern Governors, with the addition of Maine, Delaware and Maryland, have been working on this for a year and a half as a result of a 1980 federal law which said the states are responsible for all low-level radioactive waste generated within their boundaries and that the states could get together,

form compacts, get a site for disposal, and then exclude by January 1st, 1986, all other sources from outside the compact states for using the site.

No compact has been approved yet by Congress. None really has been approved by the states that won't have to go back to the states for change. I don't know if any -- well, the Congressional staff says that there's no way to change the 1986 date, but that doesn't mean that they will allow the compacts to close the sites in 1986.

In any case, there's no way we're going to have a site in the Northeast by 1986 and all the states will have to prepare for that eventuality.

But I will be back with the document, with the backup documents and with the people who are involved and with all the information, and it'll get to you ahead of time so you can read it and digest it and maybe I can answer some questions.

CHAIRMAN MINNICH: All right, fine, Tom. Thank you, and I think that's good. It is of great interest to this Committee.

Lake.

MR. BARRETT: Mine's very short.

Following the last meeting I did talk to Mayor Reid and tell him the truck routing. The truck routing

is down to the airport and over the Cloverleaf Bridge and not over the Wilson Street Bridge for the heavy trucks.

CHAIRMAN MINNICH: Okay. So his concerns have been addressed.

MR. BARRETT: The very next day.

CHAIRMAN MINNICH: And you did make him aware of it. That's good. Maybe that's why he's not here today.

Bob, I would like to throw I guess a challenge out to you, or maybe to your advisory committee. Is there a point in time where someone will take a look at the decontamination process and the question really of -- and it's going to come at some point in time, so perhaps it ought to begun to be looked at -- as to whether Unit 2 will be decommissioned or restarted, and the cost factors and develop whether or not there is a point in time where it may be more prudent to move in one direction than the other when you start comparing prices?

I don't want an answer tonight. That's something that obviously somebody has to give some thought to.

MR. ARNOLD: Well, I wonder if it might not be helpful, though, in a couple of minutes to identify some

of the variables of that issue, though, Jack.

CHAIRMAN MINNICH: Sure.

MR. ARNOLD: First of all, let me assure you the company is very interested in knowing whether from a technical standpoint the plant can be recovered or not, and that has to be determined, I think, before any money can be spent on any recovery effort with any prudence at all. So we will be extremely interested in being able to identify that technical issue as early as we can.

It may well be that it'll be a subject appropriate for the SAB to be looking at also in terms of the investment in worker exposure to get to a point where it can be recovered. So I think it does become an issue for the SAB as well, would be my sense at this point.

Our feeling is that at least through fuel removal and probably for a fair amount of the work beyond that, there's no difference in the approach one would envision. So I think it is some time off before we really get the plant to a point where there's the potential for looking at a different approach in the balance of the work, depending upon what is done with the plant ultimately.

In the interest of not running over the two minutes I promised you, I think those are the things

that we're looking at and we are very concerned and interested in being able to settle that issue.

CHAIRMAN MINNICH: Okay. So at some time there would really be a practical point where you would consider that.

MR. ARNOLD: Yes, there's certainly a practical point for considering it. I think it's still three, perhaps four, years off.

CHAIRMAN MINNICH: Okay. The next question for the panel is, when do you wish to meet again, and bearing in mind that we are interested in getting the information on the low radioactive waste disposal compact and the implications of that compact.

MR. EWING: When did Tom say?

CHAIRMAN MINNICH: He said about two weeks.

Tom, you indicated you would have that material in about two weeks?

MR. GERUSKY: No. It'll be finished in two weeks. I would say another month before --

CHAIRMAN MINNICH: You need another month.

MR. GERUSKY: -- we would be able to get it.

CHAIRMAN MINNICH: Okay. How about in six weeks, then? One, two, three, four, five six. That would take us somewhere around Saint Patty's Day week in March. How about the 16th of March, the day before

Saint Patty's Day? That'd be a Wednesday night again.

MR. EWING: I'm teaching until 4:30 in Pittsburg.

CHAIRMAN MINNICH: Oh, okay.

MR. EWING: How about -- Thursday is okay.

CHAIRMAN MINNICH: Thursday would be better?

MR. EWING: Yes.

CHAIRMAN MINNICH: I have no problem with that. Anybody else? The 17th? Just wear your green that day, that's all. The 17th of March.

Motion to adjourn?

MR. MASNIK: Mr. Chairman, the location?

CHAIRMAN MINNICH: Anybody have a preference other than here?

(No response.)

CHAIRMAN MINNICH: I think so. And the only thing is, tell them we need a better sound system, please.

VOICE: I will.

CHAIRMAN MINNICH: Okay. Thank you, gentlemen, Mrs. Marshall.

(Whereupon, at 9:53 p.m., the meeting was adjourned.)

* * *

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This is to certify that the attached proceedings before the

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Date of Proceeding: February 2, 1983

Docket Number:

Place of Proceeding: Harrisburg, Pa.

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