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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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JOINT MEETING OF THE SUBCOMMITTEES ON

REACTOR RADIOLOGICAL EFFECTS AND

SITE EVALUATION

- - -

Room 1167
1717 H Street, N.W.
Washington, D.C.
November 19, 1982

The joint meeting of the Reactor Radiological Effects and Site Evaluation subcommittees was convened at 8:30 a.m.

PRESENT:

DADE W. MOELLER, Member
JEREMIAH J. RAY, Member
JESSE C. EBERSOLE, Member
M. STEINDLER, Consultant
D. ORTH, Consultant
R. FOSTER, Consultant
J. SHAPIRO, Consultant
R. TANG, Designated Federal employee
T. MC KONE, ACRS Fellow

ALSO PRESENT:

R. ALEXANDER
M. JAMGOCHIAN
A. MILLUNZI
R.P. GRILL
W. OTT
C. PRITCHARD

L. HENDRICKS
R. ALEXANDER

P_R_O_C_E_E_D_I_N_G_S

MR. MOELLER: The meeting will come to order.

This is a continuation of the open meeting of the Advisory Committee on Reactor Safeguards, Subcommittees on Reactor Radiological Effects and Site Evaluation.

I am Dade Moeller, the Subcommittee Chairman. We have with us two other ACRS members this morning, Jerry Ray and Jesse Ebersole. We also have a team of consultants consisting of Martin Steindler, Don Orth, Richard Foster and Jacob Shapiro. R.C. Tang is the designated Federal employee for the meeting, and we also have with us Thomas McKone, who is an ACRS Fellow.

We will be continuing the meeting which was begun yesterday morning. Today we will be covering three topics during the morning related to NRC research. The first one pertains to siting and health, with specific emphasis on siting and the environment. That will be followed by a discussion of occupational protection and then emergency preparedness.

After those three items are completed, we will have a break and then we will hear from the Chairman of the DOE Task Group that is looking at procedures that might be implemented to reduce occupational doses at commercial nuclear power plants.

We will then recess for lunch and the Committee will go into executive session following lunch to prepare our written comments on all of the topics that we have been covering for submission to the Full Committee for its consideration in preparaing the report to Congress on the NRC Safety Research Program. This afternoon's sessions will be open to the public if anyone chooses to attend.

We have received no written statements pertaining to the subjects that we are covering, and no one up to this time has asked to make an oral statement. If there is anyone here now who would like a few minutes this morning to make an oral statement, please so indicate and we will provide the time to them.

[No response.]

There being no response to our invitation, we will move on, then, with the program.

I will first of all call on Bill Ott, Technical Assistant to Frank Arsenault, who will be discussing siting and the environment.

Bill.

MR. OTT: I have passed out to all the members a copy of the Siting and Environmental part of the decision unit. I will make a few remarks about the geology, seismology and the health effects portion.

MR. MOELLER: Do you have any remarks that you can make about the meteorology and hydrology?

MR. OTT: That will be the focus of the few remarks I will make about geology and seismology.

MR. MOELLER: Thank you, because we would like to be informed on that.

MR. OTT: The ACRS letter after the June meeting asked for some de-emphasis on the meteorology program. As a result --

MR. STEINDLER: My problem, Mr. Chairman, I'm not sure that I have the hand out.

MR. OTT: No. There are two pieces of other programs.

MR. MOELLER: Those are his personal notes. Good, thank you. Go ahead.

MR. OTT: These detailed sheets are available to the staff later on.

In response to the ACRS comment about decreasing the meteorological program and putting more emphasis on geology and seismology, the money has been shifted from the meteorology program. In specific, there is no field testing scheduled for FY 84 or FY 85. That project is being terminated and the data is being analyzed, so there is some money still in that project just to make sure that all the money that has been spent

so far hasn't been lost. But there is no additional field testing projected. That money has been more or less split between the geology and seismology programs.

You all received a copy of the seismotectonic --

MR. MOELLER: Excuse me. Did I hear you say that the money that is being saved on meteorology is being used?

MR. OTT: It is being put in the seismology and geology program.

MR. MOELLER: Is that what we recommended?

MR. OTT: I will have to look.

MS. TANG: We recommended deferring the atmospheric dispersion.

MR. MOELLER: I thought not only did we recommend diverting or phasing out --

MR. OTT: Recommended that that be deferred in order to provide money for higher priority research.

MR. MOELLER: Okay. We didn't say that specifically.

MR. OTT: No. And there was some indication that there was some geology and seismology --

MR. MOELLER: You are correct. The seismology, we definitely wanted the seismic research increased. Fine. The response is correct.

MR. OTT: That is really all I wanted to say about the geology, seismology program.

The health effects program --

MR. MOELLER: Excuse me. This covers for our purposes meteorology. What are you doing on hydrology?

MR. OTT: As far as I can tell, the hydrology program is no different than when we addressed you in June.

MR. MOELLER: Is there anyone who could tell us, you know, in a general way what is going on in hydrology?

MR. OTT: I am familiar with portions of the program but not the whole program. I know there is a sizable effort going into the groundwater interdiction topic that was addressed in the original siting program and was deferred to a later date. Specifically I believe we have developed a contract with Battelle-Northwest to look at that in some detail, and that will probably be extending over at least the next two years.

MR. MOELLER: Fine, thank you.

MR. OTT: The second topic I wanted to touch on briefly -- and again, this information will be available to you a little later -- is the health effects program. There were three recommendations, I believe,

in the ACRS letter, the first of which was the suggestion that support be increased for gastrointestinal absorption of actonides. That is being done. The second recommendation is we should support the RBE of fission product neutrons at occupational exposure levels, and funding for that project has been extended.

And the third recommendation was in connection with the second one, that we look at DOE records on neutron exposure of workers in plutonium facilities. There has been some preliminary work done on that. We have looked at the accuracy and reliability and completeness of the recor s and are developing a position right now, but it really would be worth our while to look at that in more detail. Apparently the reliability and completeness of the data just isn't there.

MR. MOELLER: You are saying it will not be to your --

MR. OTT: It will not be to our benefit to look further at the DOE records on fission product neutrons.

MR. MOELLER: Well, that is funny, because yesterday when Ed Vallario spoke, he said that DOE has, if I remember it correctly, was it 30,000 workers who

are exposed to neutrons? And we heard from Don Orth that a number of these workers are -- where you might say in a nuclear power plant you would have 70 or 80 percent of your dose from gammas, that maybe they have 20 percent from neutrons. And Dr. Orth said with these DOE workers, the vice-versa would probably be true.

And now you are telling us that the records aren't there?

MR. OTT: Well this is, again, not my area in detail, but I am quoting from a memo that is being prepared right now so it is not on the official records, but the results of the preliminary contacts were -- I don't want to read through this whole thing. It says evidently there are a number of problems with both the quality and quantity of data on the neutron exposures received by the plutonium workers. The older neutron exposure data is spoty and unavailable for the majority of workers, is usually on the original paper records and has to be manually retrieved and examined and reflects earlier problems with neutron dosimetry. In the last 10 years the quality of the data has greatly improved due to improved due to improved neutron measuring techniques. In addition, the accessibility and format of the data is much improved and some of the most recent data is computerized; however the improved records are

only available for a small segment of the plutonium worker population and therefore they see no benefit in initiating an examination of the plutonium workers' records because of the questionable quality of the data and limited quantity of the more recent data.

What they are saying is that the recent good data there isn't very much of, and the older data is of such questionable quality that they don't feel it will be worth their while to pursue it.

MR. MOELLER: And you did pursue this, for example, with the Office of Nuclear Safety at DOE?

MR. OTT: She talked to Dr. Wilkinson on November 10th about the LANL plutonium workers study. It is not clear from this particular memo. She talked to Dr. Robert Goldsmith, Human Health Assessments Division, DOE. He referred her to Greg Wilkinson. So I am not that familiar with the details of it, but I know they have talked to DOE and talked to the laboratories about the data, the quality, the quantity, what is available.

MR. MOELLER: Don, do you have any comments?

MR. ORTH: There is obviously a discrepancy between the 30,000 number we heard yesterday and what we heard today. It is probably true that at this point in time, going back and saying, hey, the actual neutron

dose was this or that. It would be difficult to do, however, and this is a big "however." We know how the measurements were made, and the fact that we have determined now that some old measuring device was off by a factor of 2, that doesn't mean you can't go back and use the old data. It means you go back and use the old data and multiply it by a factor of 2.

So I think there is an area in here where it might be well worthwhile to look at the basics of whatever is meant by such things as the data are not reliable and sloppy, because I do know that several production sites, regardless of how good the data are in an absolute sense -- in an absolute sense -- and have very detailed records, have never thrown away the first scrap of paper in terms of trying to keep track of their people.

So I know we have -- I guess we have 30 years worth of data at -- well, maybe not quite 30 -- at Savannah River, which has been maintained, and as I said, even though the present day absolute values of the numbers might be off, I think that the methods in which they were measured are all documented and it would be possible to revise them.

MR. OTT: I suspect that is probably true. The decisions that they are making right now might be

tempered by how much money they have available to do that kind of thing.

MR. MOELLER: Jack Shapiro.

MR. SHAPIRO: The question I have is, Don, do you have any idea what the energies of the neutrons are that are monitored? Because in many cases they are in the intermediate range, which are never even picked up by the film badge, if that is the situation.

MR. ORTH: That is why somebody has to go back and look at the data. Yes, we know very well what is coming out, the source of the neutrons in the bulk of some of the facilities. They are relatively fast. Some of them are spontaneous fission. But the vast majority are the so-called alpha N neutrons and relatively unmoderated. So you have high energy neutrons and the alpha Ns are a couple MEV -- a half to a couple MEV as they come out.

Then there are other areas where they definitely are moderated because you are dealing with water solutions. So you have a thermal in one end and you have some others in the other end. And that kind of data where the people worked and everything are available. So even, as I said, you don't know what the meaning of the film badge is in an absolute sense, you can go back and do some revisions.

Now, it is true that it may cost a lot of money and since the data are not computerized, somebody has to go through it and log it in. That is also true.

MR. MOELLER: But it is human data and so forth?

MR. ORTH: It is human data.

MR. FOSTER: I think another key part of this would be whether the actual job assignments of those people are available so that even in the absence of good film badge neutron information, if you knew that a particular individual was working at a particular job for a period of five years, you could probably do a pretty good job of inferring what kind of a dose category he would fall into for epidemiological purposes.

MR. MOELLER: Well, why don't you record mentally, Bill, some of the comments that we have made, because you are spending money on your work at Argonne on the biological effects of neutrons and you are spending money at PNL on neutron dosimetry, and in the sense of priorities, I would certainly do some soul searching to be sure that the money you are spending there will reap more in the way of benefits than what might be gained here.

In terms of that, there is another question we

would like for you to carry back. That is -- well, Bob Alexander is here, so maybe he can answer it. We have noted a description of the neutron dosimetry work that is under way at PNL, I guess under contract from NRC, and we heard yesterday from Ed Vallario a description of the nuetron dosimetry program that DOE has implemented. We saw a lot of similarities and, indeed, what almost appeared to us as duplication in these two programs. So we wondered if the NRC program had been thoroughly discussed with DOE and that indeed the two programs are coordinated rather than perhaps duplicative.

MR. ALEXANDER: They are coordinated. Vallario and I coordinate them very carefully. The programs have different purposes. The main purpose of the Department of Energy program is dosimetry development. It is a dosimetry development program intended to come up with something new in the way of a neutron dosimeter that is practical, useful and accurate.

As you know, the NRC doesn't spend money on instrument development work. Our effort has been more along the area of requirements to try to find out what the performance of the dosimeters that are being used today is and then to see what is available that we could require of our licensees to get better neutron dosimetry.

Since that is an ongoing program, I will get

into some of the details of the PNL program when it comes my turn.

MR. MOELLER: Fine, Bob. That is very helpful and we will hear from you later.

MR. STEINDLER: Mr. Chairman, the question that is being raised here, though, is whether or not some data are better than no data, and I think I guess I would have to express some sympathy for the position that the Staff seems to be taking, particularly in this field, that in effect says unless we have some pretty good ideas of what we are getting into, we are going to spend an awful lot of effort and come up with something that isn't any better than somebody flipping a coin.

I think perhaps the Subcommitee might consider suggesting to the Staff that they ought to have another look since those are the only data on people around. But I can certainly easily understand how they can come to the conclusion they came to, since getting core data into the literature is not something that I think any of us are interested in.

MR. MOELLER: Well, I agree with what you have said, and certainly my words were more an expression of disappointment in what we hoped was a shining light and it apparently isn't; and if it isn't, stick to your guns. You are the ones we depend on to reach these

conclusions.

MR. SHAPIRO: Has there been any more work done on looking at biological indicators of neutron exposure and particular chromosome aberrations and see if one can tie that in with any other health effects?

MR. OTT: I'm afraid I'm the wrong one to answer that question right now.

MR. SHAPIRO: I would just think for the record perhaps some exploratory measurements to see in fact on selective workers if they find anything that looks promising, they could pursue that and come out with some additional information.

MR. MOELLER: I don't have the description of the Argonne work right in front of me, but I'm fairly certain -- it is not human work but is animal work -- but I'm fairly certain those aspects are being checked.

MR. SHAPIRO: I have seen work on the humans, and if one found some positive results, that perhaps might be an indication of doing some more work in the future.

MR. MOELLER: Go ahead, Bill.

MR. OTT: There is only one more observation I wanted to make with the health effects program. That is, there is no reflection of some money that is being used to support NCR, ICRP work on the grants.

MR. MOELLER: Say that again? Even I couldn't hear.

MR. OTT: There was $150,000 going to NCRP. They had asked us for more than that, but we are going to come up with that much money in '84, and there are smaller amounts of money that are going t ICRP and Harvard. So there is some money that is not reflected in the program statements that will go to the program grants.

MR. MOELLER: Thank you.

MR. OTT: With that, I will pass on to the siting and research grant program. As we described in June, the environmental aspects have been zeroed out unless they have some direct relationship to plant safety. When we talked to you in June, we were in the throes of beginning to try and make sense out of what was left of the program. Essentially the total funding for the branch had been cut in half, and half the program, the environmental half, was cut out. There was some safety-related work in that environmental program that we had to sift in to the siting part and readjust our priorities.

We are in the process of trying to put together essentially large program plans for two major efforts, one on external hazards, man-related external

hazards. The Earth Sciences Branch handles natural external hazards. The other one would be a significant, well-correlated program in socioeconomic impacts and such considerations as that.

The first page of that handout indicates the siting demographics and societal issues part of the program. That represents about two-thirds of the funding for the branch. About half of that is involved in that first topic of institutional, economic and societal issues in radioactive waste facility siting. In that there are a number of programs. There is the -- looking at low level waste facilities and the dissemination of inforrmation to the states about the licensing of those in terms of socioeconomic needs.

There is a similar program on socio-economic impacts of high level waste, construction, and operation and the transportation of the waste.

Another program will be looking at development of methods for alternate site reviews for high level waste repository sites and overall cost-benefit balancing techniques.

Then, there's another topic that is planned to look at the development of cost-effective methods for assuring the financial resources that are necessary for low-level waste closure and maintenance at the end of plant life.

The site safety topic is the catch-all for a number of things that were previously -- some considered to be environmental work and some not. I think among the issues considered there are things like biofouling in cooling systems where we have a problem where the cooling system may get in a bad shape and a transient or some other thing may cause the break-off of, say, fouling material and clog the cooling systems or things like that, or cooling system components. It's a fairly significant program.

They are looking right now -- I guess they have just completed an examination of Arkansas 1, nuclear unit 1, where they've taken apart the condenser

cooling system or large portions of it. I'm not aware of the results of that examination were, but the staff is following that rather closely.

MR. EBERSOLE: Could I ask a question on that? The critical aspect of that is the effect on the systems may be sudden, as you point, due to use of chlorine or shaking the systems or whatever. What do we know now about the potential for sudden stoppage of these systems by loosening the accumulated organisms?

MR. OTT: All I can say is they have found fairly extensive fouling in some of those condensers.

MR. EBERSOLE: It's not the fouling per se, but whether it can come off and clog up the whole thing.

MR. OTT: I would suspect that right now, -- the first real data on that is going to come out of this examination of Arkansas Nuclear Unit 1.

MR. EBERSOLE: Are they doing a test to see that excessive chlorine shots will take the cleanse off and all at once the whole system is plugged up?

MR. OTT: They're looking at all those aspects of it. They're looking at the potential for large clumps coming loose and getting into critical areas.

MR. EBERSOLE: I don't know whether it's a real problem or not. If they stay glued on, it's all right, you just keep fixing them.

MR. OTT: Well, we hope to know if we're on the edge of a big problem.

Also, in the site safety topics catchall are maintenance of things like the electricity demand forecasting model and the concept of a cost code which gives estimates of relative costs of nuclear versus coal-fired plants. These were developed by the staff, and we feel it's reasonable to keep them up to date and online down at Oak Ridge for future use.

MR. MOELLER: And how -- I know we've asked this before, but how does the NRC use the data on the comparative costs of a coal-fired versus a nuclear power plant?

MR. OTT: They're generally used in the analyses of alternative generating.

MR. PRITCHARD: This is used in licensing where the need for power and what type of plant is in issue under NEPA. It is also used for special analyses such as at the Indian Point hearings where this code was used to give an estimate of what would be the cost of replacing the Indian Point unit, were it shut down, with othe types of power.

MR. MOELLER: Well, I can see the latter application and that make sense to me. But in reviewing the subject of environmental impacts and reviewing

literally tens of NRC environmental statements, I have never seen one -- and maybe I'm wrong, but I don't believe I've ever seen one -- where you concluded that the nuclear plant was not the best way to go.

MR. PRITCHARD: You are right about that.

MR. MOELLER: Well then, you know, putting myself in the role of a member of the public, I could then ask the question: why are you generating these codes if it never changes any conclusions?

MR. PRITCHARD: It could very well change the conclusion depending upon what happens in the future. And I would say that although this has always been the final conclusion, it has often been a hotly-contested issue in the licensing hearings.

MR. MOELLER: So there have been great debates, and that just doesn't necessarily come through in reading the environmental statement, where they are just reading the final conclusion rather than the turmoil that led to it.

MR. PRITCHARD: Yes, I think that's exactly the situation.

MR. MOELLER: That helps.

MR. OTT: I might say that there are studies that we're doing right now that are looking at the prospects for using nuclear site in different parts of

the county where, say, coal is very heavily utilized. The staff conclusion or the laboratory's conclusion that we're getting back is saying you never see that implication here because nuclear is cheaper; whether it's marginal or conjecture. I can see where this need for this capability is there.

MR. MOELLER: On these man-related external hazards, the second item on your slide is release, spreading and dispersion of hazardous materials. The committee wrote a letter about four or five months ago on control room habitability. We were looking not only at the ability of the operators to stay in the control room and man the plant during an accident -- in other words, an airborne release from the plant itself -- but we were thinking about their ability to stay there should there be an off-site airborne release of some toxic material.

Now, are any of the questions raised in our letter being factored into the research you are doing here?

MR. OTT: I'm going to make a couple of general remarks and then I'll let Dick Grill, who's developing the program plan, address that one in particular.

The program is sort of in its infancy. Dick

is in the process of getting in 189s and developing a comprehensive program to address a whole lot of aspects of external hazards, one of which is the effects of toxic materials and perhaps how they affect control room habitability. I'll let him say a little bit more about that. This is Dick Grill.

MR. GRILL: To answer your question directly, Dr. Moeller, that particular item, control room habitability, sort of falls at the bottom of our priority list. We only have a limited amount of money, a very limited amount of money this year, and not much more next or the following year.

We can see that that is a very important part, but we feel that we need some additional preliminary data before we can look at that in any great detail.

One of the things, as you mentioned, is release and dispersion of hazardous materials. We find that the data base there is really pretty sparse. The dispersal of radionuclides and aerosols has been studied to death.

But coming from the other direction, we just don't have much data. The data we have seems to come from sketchy and very poorly-done things that chemical warfare people did years ago. And in the quantities we are talking about, those typically involved in a

transportation accident, for example, a tank car particularly, even when that material is in an unusable form, it's cryogenic or it chemically changes and is dispersing, we really don't know how that stuff is going to move.

Typically, the staff in their analyses have used Gausian models that are pretty conservative, and we are going to look at that. Until we have that sort of data we can't really tell what effect it will have on control room habitability or what the effect on safety-related equipment is going to be.

MR. EBERSOLE: One aspect of this has long bothered me. We use pessimistic models for release of materials from a damged core. Then, we promptly surround that with a concept of virtually perfect containment, but the containment function per se is a questionable function. We may have a modest accident of some sort and a modest release to the containment, and then have a relatively severe containment failure and have ambient activity level around the control room far in excess of those currently used for the models of control room from an ingestion and shine aspect, both.

REcently, we were looking at pump seals. These are the pumps that handle the post- accident cooling functions, and found out we had not right to

believe that the seals would survive the intrusion of debris and other stuff that would be in the water. They would grind themselves up and from each pump seal there would be delivered internal to the control area in the auxiliary building high GPN rates. This is hot water; I mean radioactively hot as well as thermally hot.

This leads to prodigious increases in hypothetical dose levels around the control room for leakage considerations as well as shine dose. It has long been my thought that we have a potential here for escalating effects leading to a necessity for the people to leave control rooms, and we should certainly know that they don't have to do that, and we don't know it -- or at least I don't know it. This could be in multi-unit plants, by the way.

MR. GRILL: Yes, I understand. But this particular research program does not focus upon radiation dose or control room habitability, rather, in relation to radiation dose. This is looking at control room habitability eventually from the aspect of external hazards -- chlorine, smoke, whatever.

MR. EBERSOLE: Where do you draw the line?

MR. GRILL: Well, the final bottom line here is whether -- I suppose would be whether or not it is advisable to add additional automation just in case the

control room is not habitable. Or that the performance of the operator is degraded in some way.

MR. MOELLER: Martin?

MR. STEINDLER: I guess I find it surprising that your look at the chemical warfare data doesn't give you a fairly decent amount of background. We have had independently, for an altogether different purpose, reason to look to see, at least on a non-classified basis, what the Chemical Warfare Service has available in the area of dispersion of chemical warfare agents.

In this case we were looking at explosive dispersions and found that at least in that field which has some bearing on the kind of concerns you have, that their data was not only well put together but was much more extensive than we could have generated in a number of years of hard work.

I would urge you to maybe have another look to see whether or not buried in this enormous amount of information those people have tucked away you can't find adequate, at least even approximate data that allows you started on the question of dispersion of normal chemicals, for example, for the kinds of things you're concerned with into the control room area.

I am reminded that in the course of going through the review of the Midwest fuels reprocessing

facility, we raised the question of the control room -- in that case, the reprocessing plant control room habitability in the event of an HSF. They were delivering tank HSF in liquid form. As I recall, we obtained from the staff a very reasonable and rational analysis which they must have found someplace in terms of their basic information, albeit now 8 or 10 or 12 years ago.

I would simply recommend that you might want to have another look.

MR. GRILL: We'll certainly do that.

MR. STEINDLER: We had awfully good luck with them 15 years ago, I am reminded. I guess it's just a comment.

MR. MOELLER: Thank you, those are very good comments. The next item on the list -- and it may be that Mr. Grill can help us with it -- is testing protocols and testing consortium. Is that to test -- what are we testing?

MR. GRILL: Two things. First of all, it is to test the validity of the mathematical models we have for dispersion.

MR. MOELLER: Oh, okay.

MR. GRILL: As you probably know, those sorts of tests are enormously expensive. Most of the industry

that is concerned with this have just reached the conclusion -- Shell Oil, for example, says hey fellows, if we have to test alone, we're not going to test because it just costs too much money. So if Shell Oil says that, that means it does cost a lot of money.

So there has been a concerted effort, led by Livermore, to put together an instrumented spill test facility at the Nevada test site. They are asking that funding come from DOE, but prior to that, they have had meetings getting together all of the interested parties -- gas producers, gas transport people, industrial risk insurers, the Coast Guard, the Air Force and a number of them.

I would like the NRC to join this consortium because I think that's a way for us to factor into our tests validation for dispersion models at a reasonable cost. But we certainly cannot, with our budget, afford to fund those ourselves.

As you probably know, mathematical models aren't worth the paper they're printed on unless they're validated.

MR. MOELLER: Well again, back on the subject of control room habitability, one of the questions we raised was the location of the air intakes for the control room and are they properly positioned relative

to the potential for spills nearby. So you would be gathering data here, then, that would help answer our questions.

MR. GRILL: Yes, sir. But again, that is low on the priority list.

MR. MOELLER: Well, why is it so low? You said that right at the beginning, and you know, if I were making the choice, I would have no problem in saying I have less interest in terms of safety in the comparison of the cost of coal versus nuclear than I do this.

MR. GRILL: It's low on the priority list for a couple of reasons. One, there has been quite a bit of work done on control room habitability, at least from the standpoint of doing reports, that allow us to calculate what sort of exposures -- how long it will take for operator incapacitation.

MR. MOELLER: Right. But if you saw our letter or attended our subcommittee meeting or the full committee meeting, you would have heard the people who came and presented information to us. We tried to get a wide range of opinions, and several of our speakers told us -- and they are people who are knowledgeable in heating, venting, air conditioning and air cleaning -- and they told us numerous examples of where they go to a

nuclear power plant and they say to the operators, put your control room on the emergency recycle system; we want to test it out and see how it works on the recirculation system. And they say the operators invariably say to them okay, fellows, we'll do it, but we'll give you 30 minutes to make your tests and get out of here because we stand this room on recirculation for more than 30 minutes.

Well, the books tell us they can stay in it for three or four days, you know. So these systems are not working, and it could have a key impact on safety.

MR. GRILL: I understand. However, part of the problem here is that that particular area falls -- I don't mean to pass the buck, but it does fall under the responsibility of the Human Factors Branch. They are doing some studies on control room habitability related to operator stress following an earthquake, but as far as I know there is no work being done or planned for the kind of control room habitability factors you are talking about.

MR. EBERSOLE: Is the control room habitability, Dade, properly under the purview of the physical occupation of the control room? It seems to me, one separates the psychological from the physical, and I think this is imposrtant.

MR. MOELLER: Well, it's what is the stress that might be placed, at least one set of stresses that might be placed on the ventilation system for a control room. I find that when you put it under human factors, it's lost, it doesn't receive the attention that it deserves, and I've called this out time and time again.

You aren't human factors, but when you go to the human factors reviews, they have a category called control room design, and it lights stars for me and I think great, control room design, we're going to hear all about the ventilation system, the best color for the walls, all of this.

It has nothing to do with control room design. It has to do with the layout in a human factors sense of the controls on the panels. Well, that's human -- you know, that's human engineering.

MR. OTT: The problem here is one that our interest in control room habitability has arisen out of an interest in external hazards beyond the plant. So we are just in sort of the situation of working our way into the plant and finding out where those external hazards can have a significant impact. When we get to that point then we find hey, somebody's looking at control room habitability from a different aspect and we're trying to coordinate with them. But as you can

see, apparently it's low priority in that branch.

And in looking at our program, the way it is developing, first we have to assess the conditions that might effect control room habitability before we can get to the point of worrying about how those gases at the air intakes can propagate through the system and what they can do to the control room operators in there.

MR. EBERSOLE: Didn't TMI-2 furnish an incentive to look at this sort of thing? They had a nice release inside the containment, and then they had a beautiful thing happen. They were under conditions where there was no duress on the containment systems. Somebody was prudent enough to remember they shouldn't turn on the pumping systems that led to the external system so they didn't grind the seals up, and they, by luck and good grace, didn't have an external release.

A little bit of extrapolation leading to a conclusion that one got quite a bit of contamination.

MR. OTT: I don't doubt what you're saying at all. The problem we're having is that our program is coming at it from the other aspect, from outside the plant boundary, in, rather than the other way around.

MR. EBERSOLE: Well then, change it.

MR. OTT: That's a good observation. You might say that we're showing more interest in control

room habitability now than is being shown elsewhere, but --

MR. MOELLER: Well, it sounds like you're doing your part and you're prepared -- if you join this consortium particularly, you'll be contributing. Are you working with Bill Gammill in the Accident Evaluation Branch?

MR. GRILL: Yes, we are. Most of the priorities for this line of research came from an ad hoc group that we developed in 1980 that tried to identify what research in external hazards should be.

MR. MOELLER: They're the group, as I understand it, that is taking our recommendations and deciding how they are going to respond.

MR. GRILL: If I might say one more thing, the first item which is safety-related equipment response to hazardous materials, the reason that heads the list is that we really haven't done anything there yet. We really don't know what the effect -- we've done work on control room habitability but we don't know what effect outside releases could have on safety-related equipment. There are some indications that they could be severe and unacceptable.

MR. MOELLER: What's this last item? What is operator incapacitation?

MR. OTT: That's our way of talking about control room habitability.

MR. MOELLER: Fine. So what are you doing there?

MR. GRILL: As I say, that is the last item on the list, and when we get the rest of the data we want to see not only can the operator remain in the control room, but if he is incapacitated or his function is degraded, what happens then.

MR. MOELLER: What's the impact?

MR. GRILL: What scenarios would follow.

MR. MOELLER: Martin?

MR. STEINDLER: Can I summarize, then, the situation by saying this operator incapacitation term, which really deals with control room habitability under external hazardous materials stress, is at the bottom end of priorities because you think you haven't got enough data to put it anyplace else. And the reason you haven't got enough data is because it's too expensive to get it on your own, and the consortium you're not even sure you can join hasn't gotten started yet.

If that is a biased summary that I'm giving you, then my concern is that that whole question isn't going to see a solid chunk of data for five years. Is that unfair?

MR. OTT: I'll say a couple of words on that and Dick can answer in detail. I tend to agree. We're beginning a program and looking at the information. We're looking at first -- we could try looking at operator incapacitation and find out we don't have any idea of what concentrations we'd have in there to begin with, or what kind of chemicals we're talking about.

So it is a case of trying to look at the program and develop it systematically, and timewise, that comes farther down the track than where we are right now.

MR. MOELLER: What Martin is pointing out is that -- and I'm sure there are analogies to this. I could worry about getting some dread disease; I don't know what it is, and you could trace how the organism -- you know, what transmits it. Maybe it's malaria. You could study mosquitoes or anything under the sun, and you could give me an inoculation that prevents me from ever getting malaria, even if all these other things take place.

I'm not sure it works for malaria, but certainly there are diseases like polio that I could be inoculated for. In fact, polio is a good example. I can give my children or have the doctors give my children a shot and they'll never get polio. And to

this day, we never really understand how they used to get it when they did.

Why don't you look at the control room operator and protect him, period, for anything?

MR. EBERSOLE: Like the Wall of China approach. If you don't know what's out there, whether it's worms or snakes or lions or elephants, and you put up a wall, it will stop them all.

MR. GRILL: I think what you're talking about, Dr. Ebersole, is requiring different kinds of control rooms than we have in most plants.

MR. EBERSOLE: Well, most of them I think are automatically sealed. Now, I won't use the word "tightly". They are sealed to a degree. I think the question is whether that degree could be improved on, in the ALARA principles or something. And then whether or not they have shine protection which is adequate.

I know that the original concept where you had this little bitty leak from the classical LOCA accident is not a good base.

MR. MOELLER: Okay, let's go ahead. I think we see the picture.

MR. OTT: Unless you want to go back and touch on some of the things that we skipped over on the first page. Since we are over, I presume you would like to

proceed with somebody else.

MR. MOELLER: I think I would. Do any members of our subcommittee, the consultants? Martin and then Dick.

MR. STEINDLER: I have a question concerning psychological stress. Are you still engaged, or do you continue to be engaged in, doing some work in that area?

MR. PRITCHARD: Not directly, because it's my understanding that the Supreme Court is going to rule on the previous court decision on the psychological stress issue. So I think we are waiting for the results of that decision.

MR. STEINDLER: Does that mean at this point in time you have no program pursuing that area?

MR. PRITCHARD: Yes.

MR. MOELLER: Isn't that assuming, then? You're pre-judging the court decision?

MR. OTT: No, we're just waiting for it.

MR. MOELLER: Dick?

MR. FOSTER: We are now making risk consequence type evaluations for each of the reactors, based largely on WASH-1400 type considerations. I am wondering whether these man-related external hazards that you're talking about here, and perhaps other external hazards are, in some way, being factored into

those risk consequences which are being developed.

MR. OTT: Not yet. There is some indication in parts of the program that down the road, there will be a need to factor those things in. There's probably a need now, but for other purposes. We will want some kind of a quantitative assessment of the probabilities and risks associated with external events.

Part of what Dick's program is going to look at would be the probability of equipment failure and research conditions.

MR. MOELLER: Any other questions?

MR. OTT: One parting remark. We are scheduled sometime in January to examine in more detail what is being done on the support work for the siting rulemaking, which is sort of in hold while we wait for the source term revisions. But I think that's in January or February.

MR. MOELLER: Thank you. Well, we will move along now with our agenda, and the next speaker is Bob Alexander, and he will be talking to us on his favorite subject, occupational protection.

MR. ALEXANDER: All my life when I have been sitting in a restaurant speaking privately with someone, people from across the room have come over to disagree with me on something, so I really think I don't need the microphone. I look forward --

MR. MOELLER: What did you say?

[Laughter.]

MR. ALEXANDER: Well, everything I say to you today might not be absolutely right, but it will be prett close. As Dade alluded, I have been doing this job for ten years now for the Agency and have had a pretty steady diet of occupational radiation protection for all those years. I look forward to these opportunities to talk to the Dade Moeller Subcommittee.

Dade, do you have one subcommittee or two?

MR. MOELLER: We are combining two here because we are covering the full range of research items.

MR. ALEXANDER: I have the impression, and it is growing stronger, that radiation protection is taking a back burner at the NRC, and this group is one of the few that I have to turn to for help in that area, so I do appreciate the opportunity to talk to you.

I can give you an example to help explain what I was just talking about. Last week I appeared -- was that before the same subcommittee?

MR. MOELLER: Yes, with different characters.

MR. ALEXANDER: With a different set of faces except for Dr. Shapiro. I told you about the so-called occupational ALARA rule we have been working on since 1974, and the fact that I would be making a presentation on that rule to the CRGR, which is the Committee to Review Generic Requirements we have to go through on matters that affect reactors now.

Well, since I talked to you, I have made that appearance. And to give you some insight into what we are up against in the occupational radiation protection area, just as I started my presentation, which was very similar to the one given to the Subcommittee, I was interrupted and confronted with the following proposition. If the average reactor worker is in a safe occupation, why should the NRC do anything about ALARA?

So when you have to start at -- and then the next 30 minutes was used up in debating whether or not the NRC should just impose its limits or whether or not it should try to push doses down below the limits. And although I don't have the final word from the CRGR yet, I am afraid that it is not going to be positive. I'm afraid the rule won't go any further.

MR. MOELLER: Well Bob, you -- go ahead, Jerry.

MR. RAY: Your "if," would you repeat that?

The question was posed to you, presented to you with an "if."

MR. ALEXANDER: If the average worker at a nuclear power plant is in a safe occupation as compared with other occupations in the country, if he is in one of the safer occupations, why should the Nuclear Regulatory Commission take any action or impose any requirements on its licensees to make that worker even safer?

MR. RAY: This depends on the definition of a safe occupation.

MR. EBERSOLE: I was going to say that is a classic manager.

MR. RAY: The exposure is tremendous as compared to a guy plastering a house. It just seems to me that they have made up their mind that it is safe, whoever was providing the restraints to you.

MR. EBERSOLE: What is meant by "safe"? Isn't it the ambiguity in the effects of radiation to human beings that makes it questionable; it really is the basis for ALARA?

MR. ALEXANDER: The basis for such statements is almost in recent years invariably the calculated risk based on risk factors published by the BEIR Committee, and if you do the calculation for people receiving .6 or

.7 rem per year over a long period of time, the fatal disease incidence rate, which is cancer, of course, is comparable to the accidental death rates in industries such as manufacturing, which are considered to be relatively safe.

MR. MOELLER: Well Bob, first, several are wondering, the role of CRGR, to paraphrase it or state it probably incorrectly, but the NRC set up this group to look at various proposed activities within the Commission to, in a sense, to help in terms of priorities, wouldn't you say, Bob? They are the ones that in a sense say, yes, we give you the green light or we will support this, or we will support it enthusiastically or less so?

MR. ALEXANDER: Well, that is a very positive way to state their activities. You don't always get a green light. Sometimes the light is red.

MR. MOELLER: Let me comment just a speck because I wanted to do so and you have given me the glorious opportunity to speak my piece. You were not here yesterday morning and obviously you weren't supposed to be, but in the beginning of our deliberations I proposed the thought, or the thinking of the Subcommittee, and I immediately received, in fact, enthusiastic endorsement, I would say, from my fellow

members.

The statement I made was that we are not giving occupational radiation protection anywhere near the importance that we should within the NRC.

MR. ALEXANDER: Yes.

MR. MOELLER: And one place I began was with the greater than 30 percent increase annually in collective doses that we have seen for the average reactor over the last couple of years. But it is interesting to me that CRGR could come at you with the question they did, because if you look at anything the NRC does today with respect to commercial nuclear power plants, all of their actions are dominated by the collective dose that this particular action will require.

If they are going to require increased inspection, the first thing they do or they should do, and we hope they are now doing, is they have someone calculate how many person-rem will this particular action require. If they hear that a plant is going to replace its steam generators, the first thing they do is say to the utility is, calculate, let us know how many person-rem this requires. We hear about backfitting or we hear about maintenance and in fact we see time and time again that maintenance is requiring, as you told us, a tremendous amount of person-rem.

And I am beginning to conclude, and I could be wrong, but I am beginning to reach the conclusion that we now have a situation in commercial nuclear plants where, because of the dominating influence of the collective dose, then when we have a job to do, do we send in a few highly skilled people and have them do the job? No, we gather up the masses to run them in there and run them out and get the job done that way to keep the individual dose down but building up these high collective doses. And indeed, I am beginning to conclude that safety is suffering from the high occupational doses that we have in our nuclear power plants.

MR. ALEXANDER: I can give you some data to support what you just said that is new to us. The reactor manufacturers have crews of different sizes. The one I am particularly familiar with is the Westinghouse crews, which numbers 108 special workers, highly skilled people. Westinghouse officials testified at the joint EPA/NRC/OSHA hearings on the new EPA radiation protection guidance that these 108 people received individual doses averaging approximately 6 rem per year.

And on questioning, I found out that that wasn't unusual, that that goes on year after year; that these people tend to stay on the job, they are highly

paid, and they get to travel at company expense and enjoy their work and there is no reason to believe they won't stay for a full lifetime, many of them.

Last month I attended a meeting in New Orleans that the Atomic Industrial Forum organized, and the same official reported again. This would be three years later. So the average dose for this work had been reduced by about half, down to about 3 rems per year for the last year. No explanation was given, so I caught him after the meeting to try to find out what had happened: had they gotten the dose down by reducing the dose rates or reducing the working times? No, that wasn't the case.

What they had done to get those individual doses down was to bring in a set of subspecialists, about 300 of them, who are just partially trained -- well, I shouldn't say partially trained. They are not as extensively trained or as competent as the crew of 108, but they bring them in to do jobs that don't require such high training and then use their 108 people where their skills are really required, and that way they have been able to cut their individual dose on half, on the average, for this crew.

So I got the data from him and asked one of my people to analyze the data to see what had happened to

the collective dose, and sure enough, it had gone up by a large percentage. I can't remember the percentage, but the collective dose had gone up by a large percentage in order to keep that individual dose down. And with the continuing lack of insistence on collective dose, I think that is going to continue and get progressively worse.

MR. MOELLER: Well, we plan, or certainly I plan with this group's support to go to the Full Committee with a rather strong statement in the report that we are preparing in support of a whole lot more attention to occupational rad exposure.

MR. ALEXANDER: I might ask you to remember in the preparation of that report that in the Commission's program planning guidance, the subject of occupational exposure was discussed.

MR. MOELLER: Martin.

MR. STEINDLER: I think in order to provide a coherent and focused thrust in this area, I wonder if it is worth five minutes of discussion to find out precisely what the evidence is that leads Mr. Alexander to conclude that in fact occupational dose is not receiving the kind of priority it should. It may be easier to target the comments, particularly in light of the response from Research and in regard to the whole

subject of occupational protection. It starts out with the statement that RES agrees that a greater effort is needed for occupational exposure.

What I am saying is this is a quasipolicy statement, at least coming from the research team. Would it be possible for you to tick off five or six or seven items that support the kind of conclusion you started out with, that occupational protection is receiving less -- I am paraphrasing -- less rather than more emphasis in the Commission's thinking at this point?

MR. ALEXANDER: Well, the two things that stand out the greatest that have already been mentioned this morning, the approach that the CRGR took to reviewing the occupational ALARA rule. The other is the absence of a Commission policy on that subject. That has been published as not requiring a policy.

Then there are other indications. I must hasten to say that our office director, Bob Minogue, continues to provide excellent support for the occupational health protection program, so there is certainly no -

MR. MOELLER: A third factor that maybe perhaps should be included. I am told that under the current plans for over the next couple of years, that the number of health physicists within the headquarters

NRC organization will decrease dramatically.

MR. ALEXANDER: I'm so grateful to you for mentioning that. I was sitting here debating whether or not I should, and I'm glad you did.

MR. MOELLER: Well, could you tell us a little bit about it?

MR. ALEXANDER: Well, in my own branch, which is not a large branch, we had 12 people, and two people have accepted other positions and they will not be replaced in my own branch, and I know that a number of health physicists in NRR have been placed on what is called the "excess" list, which I don't know much about. The Agency has too many people, more than it is supposed to have, and I know from one branch five health physicists were placed on that list.

MR. MOELLER: So that would imply either that they had an abundance and do not need them, or that they are giving less attention to what health physicists are interested in.

MR. ALEXANDER: I think it is the latter.

MR. MOELLER: And it ties back, of course, into our earlier discussion about control room habitability. Bob was here and heard us discuss that. If you look through the roster of qualified professionals in NRC headquarters or field, people who

are qualified in the area of heating, ventilation, air conditioning and air cleaning, I think I can name them on about one finger. They are minimal. So how are you going to addres a problem when you have no one qualified, really, to address it?

MR. STEINDLER: No misunderstand my question. My question was an attempt to elicit some specifics.

MR. MOELLER: No. Yes, I'm with you. I appreciate it.

MR. ALEXANDER: I believe all the specifics I am aware of have been mentioned now.

MR. STEINDLER: But you did make the point that Research tends to be emphatically, or at least as emphatically as they can be, behind the notion that additional work is needed in this area, so that presumably the issue resides outside the Research Division. That, I think, is critical to our task here as I see it, where I think we are at least charged with commenting on the research program.

Is that a fair assessment?

MR. ALEXANDER: I think so.

MR. MATHIS: Okay, Bob, that has been helpful, to get those points on the record and get us oriented. Why don't we now zip through, if we can, in the next 15 minutes your research.

Dick?

MR. FOSTER: One quick question relative to the kind of thing we have been talking to up till now. I am wondering, Bob, if anyone ever put together the comparative numbers of collective dose for a typical power plant, of the collective dose for the public, say within a 50-mile radius versus the collective dose for the occupational exposure for that same one to see how these things came out.

MR. ALEXANDER: Yes, that has been done. The collective dose for the public is miniscule compared with that population.

MR. FOSTER: This is my point here.

MR. MOELLER: Excuse me. Now, we had in our meeting last week, Bob, someone giving us a number, and as I recall, they said that the collective dose to the population was about equal to the occupational collective dose, meaning, you know, for a plant with 500, 600, 700 person-rem a year.

MR. ALEXANDER: Well, I didn't bring the data I have, but we looked into that in my branch fairly recently. I will provide you with what we came up with.

MR. MOELLER: Okay. And now that you remind me, that report that you developed which showed histograms of the maximally-exposed public member and

the average and so forth, if you use that report, then my statement would be in error because that would have shown the population dose would have been much lower than the occupational; and that is more a factual report rather than just what I faintly remembered from last week.

MR. ALEXANDER: The difficult decisions in balancing the protective effort between the public and the worker comes in the potential accident prevention area, where inspections and things like that intended to mitigate the consequences of accidents require worker attention and worker dose, and I will have a little bit more to say about that as we get into those projects.

Is that an adequate answer?

MR. FOSTER: Yes. You perceived correctly that I am going on the tack of, if you are looking for justification for not downgrading occupational radiation exposure, why, here is another piece of evidence, which I think is pretty powerful.

MR. ALEXANDER: We always get shot down on that basis of the accident. Many people fail to attach the probability into the accident situation as opposed to the probability of one for the worker's dose.

MR. FOSTER: One is real life and experienced, and another is a number on a piece of paper that says it

is a probability.

MR. MOELLER: On this list, Bob, why don't you mainly hit the items where there have been significant changes, and then, of course, we will ask the Subcommittee for any specific items they want to discuss. But in view of the time, hit mainly the ones where something new has been developed or it has had an increase in funding or a reduction in funding or something like that.

MR. ALEXANDER: The first one I would mention is the optimization technique development. As a result of your suggestions to us, we have rethought optimization technique development and set aside more money for that, although I feel that the NRC should take the lead in this area, particularly in the occupational applications. So that I think the amount of money that needs to be spent in the area of optimization technique development is still too small.

Is everybody familiar with the term "optimization" as it is being used these days?

MR. MOELLER: No. Go ahead and explain it.

MR. ALEXANDER: Well, I need the blackboard. The optimization was introduced by the ICRP in their latest recommendation as a way of quantifying the ALARA concept. You know, the ALARA concept is philosophical in

nature. In the new recommendations they don't talk about ALARA, they talk about optimization. It is an analytical technique whereby you quantify the ALARA concept.

Incidentally, they say do your optimization analysis first and use it to go by, not the dose limits. You only use dose limits if your answer from your optimization analysis is greater than the dose limit. So that is a completely new philosophy to us.

The way it works is you plot your cost here and your collective dose here, and you plot it first for the cost for protective measures. Of course, as the collective dose allowed becomes larger and larger, the cost becomes smaller and smaller, and on the other side of the coin, if the collective cost dose is zero, then the collective dose is infinity, so you get a curve for anything you are looking at, like the thickness of the shield or something else, of something like that.

Then the health effects cost is plotted. If the collective dose is held to zero, there are no health effects, so you are at the origin, and as you allow more and more collective dose, theoretically you get more and more health effects, and you can calculate that cost using a dollars per man-rem value such as the one the Commission uses, such as $1,000 per man-rem.

Then you sum these costs in order to arrive at the minimum cost when both are considered and the minimum defines your criterion.

MR. EBERSOLE: May I ask a question about this? This bothers me. If the collective dose has a probabilistic input -- let's say you are going to put on a gadget that might prevent an accident from happening which would cause a prodigious dose to a worker. But it is not a probability of one that that will ever happen. How do you handle that here?

MR. ALEXANDER: Well, what we know is we want to handle that. We don't know how yet. One of the projects listed for 1984 is to develop such a technique so that we can figure probability into an analysis like this in order to help us balance the potential public dose, accidental dose, against the worker prevention dose.

MR. EBERSOLE: But you are going to contaminate the ALARA concept with a PRA approach.

MR. ALEXANDER: That is right.

MR. EBERSOLE: That will water it down like crazy.

MR. ALEXANDER: Well, we won't look at it that way. This is the basic optimization technique. What I am interested in doing is not using this for design,

because I'm afraid all the plants we have have not only already been designed but also built, but in operational applications, which I believe is possible if enough work is put in on it.

For example, take any health physics activity, such as air sampling, bioassay sampling, surveying, most anything you would want to look at, and plot down here the frequency and here the cost. Once again, as the frequency increases, the cost goes from zero, probably in many cases levels off like that because you get to the point of continuous after a while. The frequency gets so great that it is continuous. So you probably get a curve that looks like this for any health physics activity.

Then if you look at the cost of the health effects -- I'm sure this would be extremely difficult to do but I'm sure it can be done, particularly by a health physicist, who are among some of the most imaginative scientists in the world.

[Laughter.]

MR. MOELLER: Should we take a recess?

[Laughter.]

MR. ALEXANDER: You get a curve that looked like that. Then once again if you sum these curves and arrive at the point where the slope is zero, you will

define the optimum frequency. And I think there would be many advantages for our being able to take that approach to the recomendations we make in our regulatory guides.

So I think that is the main point that I wanted to make, that we are putting more emphasis on optimization. Now we are getting started.

Let's see, the LWR dose reduction project is a study. One of the main aspects of that study is I want to find out to what extent the reactor people factor in the dose considerations into their selection of their decision as to whether or not to use heavy duty, low maintenance equipment. I strongly suspect that they don't, and if they don't, they should. So this is the main thing we want to do here, to study that and find out if they are not, and I think that will be the answer to find ways to get them to do that. I think the optimization, again, is the answer.

MR. MOELLER: Plus if you can tie it in to the degree of safety provided. I mean intuitively you would think that a more reliable pump would enhance safety and it would reduce collective dose. I think the two are hand in hand. I am saying that high collective doses in many senses are symptomatic of poor operation.

MR. ALEXANDER: Very often. Very often.

The --

MR. MOELLER: That is the optimization one? What other ones?

MR. ALEXANDER: We are putting new emphasis on occupational de minimis levels. This is at the request of our regional people. We are using the term "de minimis level" in a slightly different way. De minimis level as it has often been used in the NRC is a level of radiation dose below which no action needs to be taken. It is so small that expenditure of no resources are justified.

In the occupational area we look at that a little differently. We look at dose levels with respect to a particular protective measure. So you can see that if you make a list of all the protective things you do as a hazard gets greater and greater, then we want to develop de minimis levels below which you do not have to consider some of the more expensive protective measures.

For example, take unencapsulated radioactive isotopes. We would like to publish de minimis levels below which the radiation safety officer need not consider [illegible]say measures, another level below which he need[illegible]sider air sampling.

So that is going to be a big job. We're going to get started on that big job in the 1983 funding, but we see that continuing for several years.

Now, has Steyer already briefed the committee on the decontaminiation?

MR. MOELLER: Yes.

MR. ALEXANDER: Robotics. We have been poking around trying to find out is there really any promise of the application of robotics at nuclear power plants. The answer in't in. We need a feasibility study in that area. There are a lot of very practical problems. I'm told, that if a plant is going to use robots, the designer need to know that from the beginning because they have to make doors certain sizes and they have to provide elevators and things like that, simply to move them around. They have to provide power to them and things like that.

That won't always be available, so it isn't clear that robotics are any answer at all to us. But it also isn't clear that they're not. And one or two firms in the country are interested in doing a feasibility study in the area of robotics, and we want to look into that. But it would be extremely difficult, extremely expensive, for example, to design a heavy piece of in-service inspection equipment that would have to climb

stairs. It could be done, but it would probably just be too expensive.

MR. MOELLER: Is that robotics coordinated with INPO? Someone mentioned that maybe INPO was doing something on this. Well, I guess let me ask the basic question. How closely are you tied into INPO? I know you are on the rad protection program.

MR. ALEXANDER: We are at the threshold of a strong tie-in, Dade. We have had one meeting at which we all just sat around the table and exchanged information about what we're doing, and we've made plans for additional meetings. So I think that we can avoid the sort of thing you're talking about.

Also along that line, I have requested David Harwood at the Atomic Industrial Forum, AIF, EPRI and the NRC and the Department of Energy to try to make sure of two things. One, that we don't have duplication of effort, unnecessary duplication of effort in the occupational area. But the other, which worries me more, have some gaps, some important thing, that is not being tackled by any of these organizations. So I hope Harwood does that.

I guess the final new thing I would like to mention to the subcommittee is the emphasis on beta radiation protection. The beta radiation protection,

that is scan dose primarily, of course. It has taken a back burner all of these years. I think the main reason is that the penetrating radiation -- we've always had a situation, nearly always had a situation where if you protected adequately against the penetrating radiation, the gamma and neutron radiation, that the skin dose from the beta -- those limits would not be exceeded.

But a new wind is blowing among the health physics community with the new ICRP recommendations that have said wait, don't just calculate the dose to the critical organ; calculate the risk to all the organs and make sure that the risk, that some of the risk to these organs doesn't exceed the risk associated with five rems per year whole body from an external source.

So that now we want to measure the skin dose more closely and add the risk of skin cancer to the other risk of cancer to the internal organs.

So the NRC is a part of this. We want to have a role in this renaissance of interest in beta measurements. We are initiating a modest program to determine what are the additional requirements that would be practical for us to impose on our licensees in that area. We do have dose limits for beta radiation but we haven't enforced them that strictly.

MR. MOELLER: Martin?

MR. STEINDLER: Is this list you have up there and that we have in the order of priority?

MR. ALEXANDER: No.

MR. STEINDLER: In terms of the next few years, what are the five most important -- I assume judged by expenditure of funds -- topics that you are tackling?

MR. ALEXANDER: Well, let's see. I believe the optimizing and de minimis work is extremely important. The work that I've been pushing for for sometime now and will be pushing for for a number of years is improvements in health physics measurements. We have very strong efforts going towards that, although some of them have been funded in previous years and they're still going on now.

MR. MOELLER: Excuse me, which item -- or does that include the portable survey? Which items on your list would the improved measurements touch upon? The bioassay?

MR. ALEXANDER: Well, there's a small one there, bioassay. We have performance testing support. Most of that work has been funded previously, but the work is still going on with forward funding.

But the areas that we are emphasizing are personnel dosimetry, processor performance, bioassay lab

performance and surveillance instrument performance. We have accreditation programs -- we're working on accreditation programs for each of those areas. We are not sure that accreditation programs will cure the problem in all cases, but they will go a long way. I must say that in every case, we do have convincing evidence that improvements are needed.

I think that a great deal of importance should be attached to Keith Steyer's work in the decontaminiation and corrosion product buildup area. And we certainly plan to continue those.

For years, we have funded an extensive effort in the area of respiratory protection, and we plan to continue that.

MR. MOELLER: Other questions? Jack?

MR. SHAPIRO: My own feelings and experience around nuclear power plants always brought out two major concerns, aside from the economics of nuclear power. One is, of course, the major accident situation because of the potential as to what could happen under those conditions. We've discussed that.

The other is occupational doses and whether, in fact, you could have a viable nuclear industry if those were not of concern. Now, I get the message that there are many people in this field who really don't

think it's a major problem. On the other hand, I hear that there are others, like Carson Mark yesterday, who feel it was really the most important problem in terms of priority. So perhaps I'd like a couple more comments on that.

Also, how does this fit into the world picture? The rest of the world seems to be more committed to nuclear power than we are. Do you see the same kind of concern coming from them, or have you had experience in that area?

MR. ALEXANDER: Yes. I go to some international meetings and have contacts with a number of European health physicists. Everytime I go to an international meeting and dose data are shown on a slide, the U.S. data are always the highest, usually far higher, than anyone else's. And it makes you wonder if we have given as much attention to protecting the worker as has been done in other countries.

Then I also find that -- this is kind of a sweeping statement, but I get around quite a bit and I have the distinct feeling that the United States health physics program is falling behind the Europeans rather rapidly.

I think one of the reasons for that is that the new NCRP recommendations that were made in 1977 in

Europe, South America and, I guess, throughout the world, a great deal of effort is being put into bringing the national programs into compliance with those recommendations.

So far, all we've done is held a few hearings; we've done very little to educate our people that what we have now isn't adequate, started a long-term program to revise 10 CFR Part 20, the NRC's regulations in this area. And while we keep debating, the Europeans keep moving ahead. I think we are getting further and further behind in almost every aspect of health physics you can name.

MR. SHAPIRO: But you get a feeling that if we keep having this sort of cavalier attitude toward dose, that we are really going to hurt our whole power program? Westinghouse is --

MR. ALEXANDER: Jack, I didn't mean to leave the impression that there is a cavalier attitude. I think, for example, that at the power plants the industry has gone a long way -- the ALARA concept really is not regulated, and they have done a great deal voluntarily. They take it quite seriously and they spend an awful lot of money on it. But we could certainly be doing more, and I think we should be doing more. That is my pitch.

In answer to your question, I believe the most serious area to look into or to contemplate in answering that question is this new concept of a probability of causation of radiation effects. I believe that is going to have a profound effect on the workers themselves and on their employers.

In case everybody is not up to date on the probability of causation, --

MR. MOELLER: Well, --

MR. VALLARIO: Ed had a slide. You mean Vic Bonn's equation?

MR. ALEXANDER: Yes.

MR. MOELLER: He went over that with us.

MR. ALEXANDER: That apparently is going to catch on, and I think that that will provide an incentive at least to keep the individual doses down. But if we're not careful, once again, we're just going to drive collective doses further up.

I think the attention of -- and that's where a regulatory agency should come in. That is what we are here for, as I understand it, in my area; to try to prevent exploitation of the worker by his employer. That's what we're here for. And it's things like that that can result in exploitation of the worker by giving the population a larger risk in order to avoid potential

legal expenses.

MR. MOELLER: Let's see, Martin, and then I think we've got to wrap it up.

MR. STEINDLER: I can give you an unfair summary of what I thought you said. You indicated significant concern and cited some data that not only are collective doses but in some cases individual doses seem to be bouncing around and going upward.

Yet, on a priority basis, under the heading of "occupational radiation protection" things that you mentioned that were most important to you tended to not have an immediate and direct effect on that topic; specifically, optimization, as I see it, having just learned about it five minutes ago and having become an instance expert, tends to become a calculational method for future implementation.

The calculation of de minimis, which was second on your priority list, is, again, a future application of what health physics should or should not pay attention to. It takes a while before we get down to corrosion product buildup, decontamination effectiveness, the decontamination impact on waste solidification, things that are directly related to the whole question of reducing the occupational dose.

Do I have a wrong picture of what appears to

be a set of priorities that doesn't match what the real concern is?

MR. ALEXANDER: No, I don't think so. We want to do both. We don't want to discontinue our cancer research because cardiovascular disease kills more people. We want to have a broad program that addresses all of the problems. The major problems as well as the design problems.

The optimization area you mentioned does directly apply. If we can come up through optimization with an analytical technique that engineers can use, and it is shown to be practical and will work, then they will stop designing to dose limits and start designing to ALARA.

MR. STEINDLER: Let me remind you of what I think was a correct statement you made to begin with. Namely, designs for the future are not likely to be very important. As you say, the reactors that we're likely to see have been designed, and in many cases and in most cases, may have already been built.

If that is the case, then the application or the short-term immediate application of the optimization technique, as good as it is, is going to have an impact much further down the pike, as far as I can see. Is that an incorrect assessment?

MR. ALEXANDER: Well, except the last curve I put up there, I think the operational type, can have an immediate effect.

MR. STEINDLER: I'm just trying to understand where you are and what kind of comments the subcommittee might choose to make.

MR. ALEXANDER: I think you may have attached more importance to the order in which things were discussed than I intended.

MR. MOELLER: Let me offer a comment. I think what troubles Martin is that if reducing occupational doses is your number one goal, then you would be working much more on the control of the source term or having lost control in removing it through decontamination techniques. And am I correct in saying that the answer to that is that you support that work vigorously, but others have the primary responsibility -- other units -- for carrying it out. Is that correct?

MR. ALEXANDER: That's true. I'm in the operations business. The name of the division I'm in is Facility Operations, and that's another reason I tend to focus more on operational aspects.

What might -- I think the direction you're driving at is an interesting one, and I was thinking about it before I got up this morning. It often seems

that the agency needs a better organizational focus on many occupational matters. Those of us who work with workers are scattered throughout the organization, and it is not highly focused. Sometimes, it's not even well coordinated.

MR. MOELLER: Other questions or comments? Yes, Dick?

MR. FOSTER: Bob, you expressed your feeling here that health physics as a trade, a profession, has gone downhill in the United States, and it is also going downhill in the NRC as an organization.

MR. ALEXANDER: Not going downhill, Dick. Getting behind the Europeans.

MR. FOSTER: It's being relegated to a position of less importance.

MR. ALEXANDER: Yes.

MR. FOSTER: The most important place where, to me, this should not be happening is really in industry where the people are actually out in the plants, the workers are getting exposed, the decisions are being made relative to dose reduction or prevention.

What is your view relative to what is happening at the power plants on the health physics programs there? You just, a year or so, went through that fairly extensive review program, NRC's review

program of the health physics program, at most all of the operating reactors -- evaluation of how good those programs are, finding in many cases that they were not up to par.

Now, as an outgrowth of that or other things, is it your feeling that the health physics programs in the field run by the utilities are improving or again falling behind? How do you feel about this?

MR. ALEXANDER: That is an operational type question. I think as a result of the health physics appraisal program where deficiencies were identified that people simply were not aware of, I am told by our inspectors that definite improvements are taking place. So I think that operational health physics for what we know will work -- is getting better. But I think the areas where improvement is needed is one where emphasis and backing from utility management in the health physics area is needed and that problem has not been licked yet.

Second, I think technical improvements are needed in the way measurements are done and in the way radiation controls are effected. Third, I very strongly feel that radiation protection needs to have a broader application in the nuclear power industry. Radiation protection will never be controlled properly if it's

only considered to be a health physics problem. You have to have management of almost every department at a nuclear facility trying to get that down there.

So many operational things that can be done to get doses down that people in health physics have no knowledge or power over will never be done until higher level management want it done and pass the word down to their department heads in all operations of a nuclear power plant.

MR. EBERSOLE: May I ask a question?

MR. MOELLER: Yes.

MR. EBERSOLE: Speaking along the operational lines, what has happened in the last 15-odd years concerning radionuclide concentration levels in the coolants? Have they been going down? I remember way back there was an argument about what was the proper level of activity concentration in coolant, considering the potential for sudden release of this stuff, which is one aspect; considering the buildup of activated corrosion products in the short and long term is another.

There were several basic reasons why you should control this activity level to some level. At the time, I know it was -- I think the accident potential; that is, a sudden leak, was the predominant cause. This was before recombination of BWR

discharges. You had a stack discharge all the time.

Is that activity level going down? It seems to me this is a critical parameter in the plant. How hot are you going to let the coolant be from the standpoint of lay-down of corrosion products or gross leaks or gross failures? Has it been going down? Have there been coordinated approaches toward holding the heat in the coolant down?

MR. ALEXANDER: I'm not the best person to ask that question, but I can give a general answer that might be of some help. That is, where we have looked into this sort of thing, there seems to be a lot of worry about chemistry control of the coolant. I think that worry is based on almost entirely build-up of radioactivity in the coolant and the deposition of the radioactivity on the internal surfaces of the plant.

We have a strong impression that much more could be very readily done in that area if the emphasis were placed.

MR. EBERSOLE: Isn't this the crux of the problem? That's the transport device, the coolant, to work on the concentrations by whatever means -- chemistry, filtration, whatever; keeping it home or letting it go.

MR. ALEXANDER: Yes, that was one of the

principal ways the nuclear Navy was so successful.

MR. EBERSOLE: I thought at the time and still do that it's the focus of what we're trying to do. What will we let get in the coolant and what won't we let get in the coolant. But I don't see much conversation about that, or careful evaluation of the pieces of this problem.

MR. ALEXANDER: That's right, I don't either.

MR. MOELLER: Jerry Ray, and then we'll take a break.

MR. RAY: It's an isolated incident, but on this last point Dick brought up relative to industry sensitivity toward the importance of health physics in their operating modes, the Human Factors Subcommittee of the ACRS a week ago took a trip to Waterford Station in New Orleans. About 18 months ago when we were down there and subsequently, at the ACRS full committee meeting, mention was made that they didn't seem to place the proper emphasis on staffing for health physics.

Well this time when we visited them for purposes of inspecting the control room and panel layout from a human engineering viewpoint, we incidentally learned that they had taken it too hard, possibly because of some more pressure from the NRC staff -- but don't trust me on the total numbers. But it seems that

they have agumented their health physics personnel assignments from a total of about 17 to 27. It was a major increase and they have recruited almost all of them, and they are almost a year away.

So there's an isolated incident where the utility without the experience under their belt is taking the health physics problem seriously, from the viewpoint of spending money for people.

MR. ALEXANDER: There is tremendous variation among the utilities. I can give you an extreme. We know of one utility -- I'm glad I can't think of the name of either of these utilities --

(Laughter.)

We know of one at headquarters where to take care of all the health physics matters they have one health physicist. That health physicist is relatively inexperienced and a relatively young person. There's nothing wrong with being young.

MR. RAY: How many in the plant?

MR. ALEXANDER: I don't know. This is just a headquarters story. At the meeting of the Atomic Industrial Forum recently, somebody got up from the utility headquarters and just painted a beautiful picture; everything was computerized, they had their finger on everything going on in these plants. And I

went up to him and asked how many people do you have and he said 40.

Now, these are utilities of about the same size. We have tremendous variation. And then, of course, the health physics program, as you were indicating, is a reflection of how many people are conducting it.

MR. MOELLER: Well, we are running somewhat behind. I think I will declare, though, a 15-minute recess. Thank you, Bob, for coming and sharing your thoughts with us.

MR. ALEXANDER: It's always a pleasure, Dade

(A short recess was taken.)

MR. MOELLER: The meeting will come to order.

We will resume with the presentation on emergency preparedness, which will be handled by Michael Jamgochian. Mike?

MR. JAMGOCHIAN: Good morning.

As Dade mentioned, my name is Mike Jamgochian. I work in the Human Factors Engineering Branch, Division of Facility Operations, Office of Research.

I have been requested this morning to discuss the fiscal year '84-'85 budget that Research has projected in the area of emergency preparedness. We are involved not only with research, but also with the development of standards, regulatory guides, and regulations.

This morning's presentation will primarily focus on the Research budget as requested.

MR. MOELLER: Actually, we want you to focus on the projects, not the budget. You are saying Research budget. We would like mainly a description of the most prominent areas, subject areas that you are going to be working in. We are not -- Well, we are interested in budget insofar as a project is being increased or decreased, but we are not interested in detailed numbers today.

MR. JAMGOCHIAN: Okay, fine.

(Slides.)

MR. JAMGOCHIAN: The overall objectives of the research involved with emergency preparedness is, one, to assist in upgrading emergency preparedness at licensed facilities. How can the staff help licensees be better prepared, help state and local governments be better prepared to handle emergencies in and around nuclear power plants?

The second objective is to provide a basis for regulatory positions on emergency preparedness. This is primarily responsive to our licensing offices to request specific research done in this area.

(Slide.)

MR. MOELLER: Questions?

MR. STEINDLER: On that last vu-graph, if there is no basis for regulatory positions, how can you assist in the upgrading of emergency preparedness at this point?

MR. JAMGOCHIAN: Okay. I will be able to answer that further down. This is a difficult answer, but actually there are two separate objectives. The first, we look at what is the licensee doing today, what are the regulations today, how can we help the licensee do better, how can the regulations be better written,

where are the problem areas.

The second objective is primarily focused on what is the technical basis for emergency planning, preparedness requirements for fuel cycle and material licensees or for advanced reactors, that type of thing, regulations that have not been written or regulations that are in the process of development.

The first project is human factors in emergency response. The basic approach that the staff is involved with is to evaluate the decision-making process in the early stages of an emergency relative to the taking of protective actions. We will review plans that discuss with reactor operators, senior reactor operators, and plant managers and evaluate the criteria and factors behind making the necessary decisions for the public to take protective actions.

We will evaluate considerations which are not formalized in the written procedures. Okay, as you probably well know, the regulations require a licensee to have the capability for the notification of off-site governmental authorities prior to -- well, during an emergency. They have got to be able to assess the magnitude and course of an accident, and make those recommendations for the taking of protective actions.

The state and local governments would analyze

those recommendations and if necessary warn the public. Now, this goes back to the installation of prompt public notification systems, which was a very widely discussed area during the formulation of the emergency planning regulations.

So this research project is to look at what goes into a reactor operator at 3:00 o'clock in the morning, what goes into his thought process relative to recommending the sounding of those sirens. There is bad public relations. He is going to wake a lot of people up. Are people going to panic? Are people out to ten miles going to panic? Are people beyond ten miles going to panic? Is he going to lose his job if there really isn't an accident and those sirens are sounded?

There is a whole great deal of things that goes into this. Now, these things or some of these factors were discussed between you folks when we formulated the original recommendation and the Commission at the state and local governmental workshops. People had said, hey, have you considered whether people are going to panic when the sirens go off? What are people supposed to do?

So, yes, things were talked about and things were discussed. Indeed, all of these factors were discussed, but nobody really analyzed them in depth.

Here is where we hope to do that.

MR. FOSTER: Question. Is human factors, which is involved in this, focused mainly on the plant operators, or is it focused on the public?

MR. JAMGOCHIAN: It is focused on operators, plant management, and senior reactor operators.

MR. FOSTER: So that this doesn't get into the area of, I am a member of the public, and when I hear the whistle blow, what my action is going to be?

MR. JAMGOCHIAN: No, sir, but when you look at what the reactor operator has to think about, he thinks about John Q. Public eight miles out hearing that siren, okay?

MR. FOSTER: And tries to second-guess what --

MR. JAMGOCHIAN: Exactly. Exactly. Is he more concerned with waking John Q. Public up or a problem with panic than he is with the machine, man-machine problem?

MR. ORTH: But by definition, that then means that you have to worry about what John Q. Public is going to do and analyze the probable public reaction.

MR. JAMGOCHIAN: Me and this project?

MR. ORTH: Yes, in the project. If he is going to ask that question and you are going to answer it for him --

MR. JAMGOCHIAN: Tangentially, but the research involved here is not going out to John Q. Public, and what are you going to do when that siren sounds.

MR. ORTH: Shouldn't it?

MR. JAMGOCHIAN: Not really, because FEMA is more involved with John Q. Public's movements.

MR. ORTH: Then have they got a program to do that?

MR. JAMGOCHIAN: They are involved intimately with the sounding of these sirens. Can people hear them? Are they adequate? What are people going to do? Do people know what they are supposed to do when the siren sounds? They are involved with a great deal of research in that, yes, to answer your question.

And your second question is, are we coordinated? Yes.

(Slide.)

MR. JAMGOCHIAN: Now, I am presenting this project primarily because I presented it at our last meeting where I discussed the research projects for your report to the Commission, I believe, for '84 and '85. We are involved with a rulemaking proceeding on emergency planning for fuel cycle and material licensees. Now, as many of you may know, the rulemaking

that went along with emergency preparedness for power reactors had a NUREG manual that sort of told folks, okay, here is how you implement that regulation, here are the elements that we are going to look at to see if your plan, state, local, and licensee plans are in good shape.

Well, what we want to do is develop the same kind of handbook which would help licensees, fuel cycle and material licensees and the states around these licensees to develop their plans and to be consistent, and that the review by FEMA and the NRC will also be consistent.

Now, this was to begin in '84 and '85. I met with FEMA in, let's see, in June and July, and we had budgeted a significant amount, I think $200,000 in '84, and $100,000 in '85. The FEMA folks were very interested in this, and as I told you at the last meeting, that we were negotiating to try and do many of my projects together.

Well, we were able to enter into an interagency agreement, and FEMA had money on hand in '82 and '83, and NRC had a little bit of money on hand in '82 and '83, so this project has already started at Sandia at a significant savings to the NRC, over a $200,000 savings than originally budgeted, primarily

because both agencies went into this, both agencies are reviewing it, and the amount of cooperation and coordination is really quite good.

We hope that that is a first step among many steps in the right direction. I personally feel, and my management feels that the more things that can be done with an interagency agreement in the area of emergency preparedness, if you really think of emergency preparedness, it is hard to say, okay, one agency, you stop at the fence, and by God the second agency takes over from the fence on out.

Now, that is the way it is divided between the bureaucracies, but Lord, it is very difficult to really make that workable unless the two agencies cooperate extensively. We have tried and succeeded, especially here, in that cooperation effort, so this project really, you shouldn't include in your '84, '85 report, but it is progressing in fact quite well.

MR. ORTH: For clarification -- Everybody's got their hand up, but I spoke first.

(General laughter.)

MR. ORTH: Would emergency plans for support of fuel cycle and material licensees -- exactly what kind of emergencies are we dealing with here? We are not talking about a Class 9 accident, obviously, so what

is going into this?

MR. JAMGOCHIAN: Okay. We are analyzing what type of accidents can happen based on what the man is licensed to possess, the amount of material, what types of material. We are -- Now, again, this is in the very early stages of this rulemaking, so bear with me. We are evaluating using dispersion factors, release fractions, and we are trying to put some sort of a limit if you own or if you are licensed to possess a certain amount of material, a certain kind of material, then you should have in-house emergency plans, because that type of material and that amount of material will give so much dose out to a certain distance if released.

Now, you are frowning. You are saying, many of these folks --

MR. ORTH: Seven forty is what you are reminding me of, but go ahead.

MR. JAMGOCHIAN: Many people don't have what they are licensed to possess on hand. Well, in fact, the Commission --

MR. ORTH: My question was, if you make the assumption that because a man has X grams of, pick a number, americium, on hand, therefore it can all get dispersed to the environment, if we assume that that 100 percent release as the first cut as what we plan

emergencies on, we are back into the trap that has led to an infinite amount of mischief in our whole business.

So that is sort of what I was asking the bases and what kind of things we are looking at.

MR. JAMGOCHIAN: To develop a realistic source term in this rulemaking, especially over the last week, is a great deal of concern that has been focused upon it, and we are trying to get as realistically as possible. We are not assuming that, yes, whatever the man has on hand or whatever the man is licensed to have on hand can get out to the public. There are various modified factors.

Then we get to the debate, are those modified factors realistic to conservative, because some of them are judgmental calls.

MR. ORTH: Okay. Second question, then, is, are you only focusing on the radioactive materials involved here? For example, a UF 6 plant may have a little bit more flooring stashed around.

MR. JAMGOCHIAN: We are not just looking at radioactive material. We are looking at material they may have on hand concerning toxicity. Now, how we do that is the big problem.

MR. MOELLER: Jesse Ebersole, and then Martin

Steindler.

MR. EBERSOLE: Dr. Orth stole my thunder. I was going to put it a little bit differently, what sort of excited state are you expecting the fuel facility to be in that gives you some sort of source term. As it stands now, I don't know what you've got for a source term, and without that, I don't know what you do. It seems like the first thing you've got to do is identify that fraction of whatever the inventory can become mobile by whatever means.

Until you do that, you have not got anything to work on.

MR. JAMGOCHIAN: Well, your first step is, what is the maximum amount the man is licensed to possess. The next step is, how does that and how much of that can get out.

MR. EBERSOLE: Right. That is the part on --

MR. JAMGOCHIAN: Let's take a look at a fire, all right, where a significant amount of that stuff -- now, what percentage of it, and that is the iffy part and the delicate part, how conservative is the proper approach?

MR. EBERSOLE: But until you develop that, you really are running around in the dark about emergency preparedness, aren't you? I mean, you don't know what

that is yet. It could be anything.

MR. JAMGOCHIAN: Well, again, it is being developed. Now, to be very honest with you, an advance notice of proposed rulemaking was published June of 1981. Okay. And it basically announced the Commission's intentions of establishing emergency preparedness requirements for fuel cycle and materials licensees.

In it, it laid out the concept of, we are going to use license possession limits, we are going to use PAG's, we are going to use in this magic formula certain dispersion modifiers. We are not going to consider that sealed sources can be inhaled. We are not -- you know, certain of these modifiers, and receive public comments on this advance notice.

Nobody complained about these modifiers, these dispersion modifications we had put in, and many of the fractions that were used were obtained from licensing using good judgment.

Now, Sandia is looking at those again, and seeing how much judgment is in there, can they be modified, are we being too conservative? We are very aware of the source term problem.

MR. MOELLER: Martin?

MR. STEINDLER: I guess I have several

questions. One, what prompted this rulemaking in the first place?

MR. JAMGOCHIAN: Well, you recall a few years ago TMI occurred, and everybody was running around saying emergency planning was the magic word. The Commission at that time as well as other responsible agencies in the government as well as Congress had said to the Commission, and of course the Commission likewise said, we need emergency planning. That is when we developed the emergency fuel planning.

MR. STEINDLER: I am talking about this fuel cycle.

MR. JAMGOCHIAN: During those discussions, the Commission said, what about -- in fact, it was Mr. Kennedy at the time -- what about fuel cycles? What about materials licensees? The staff shrugged. The Commission then directed the staff, you will move in this area. Of course, not as expeditiously.

MR. STEINDLER: I guess I have to second, third, and fourth the concern that you are using possession limits as a basis for anything. Even 740 didn't assume that 100 percent of the inventory is dispersible. I am surprised, I guess, that no one has responded to your advance notice of rulemaking, perhaps because not enough people read it, or perhaps because

nobody took you seriously, but if in fact you are going in that direction, I would recommend strongly that the technical basis for that is almost non-existent.

The second, I guess, major question I had -- that was a comment. The second question I have is, you in fact claim to save some money by starting in '82 rather than '84 or '85. I gather then the '84-'85 schedule didn't conflict with what has to be a relaxed schedule for the rulemaking.

What prompted you other than economics to accelerate this effort?

MR. JAMGOCHIAN: It was primarily economics. We know we need this handbook. We know we need this analysis. If we can get it done half as cheap and if another agency will go in with us, let's get it on.

MR. STEINDLER: So you made a decision presumably to spend money here rather than somewhere else on some kind of a priority list, and you had to have some available funds in '82 and '83, and I assume that you had to take them from somewhere else or reprogram them.

MR. JAMGOCHIAN: It was $50,000, okay? That was available in '82 that we were considering the evaluation of the technical basis for fuel cycle materials licensee rulemaking, so we were able to pull

$50,000 off of that, and FEMA gave us $50,000 to start this project.

Now, to answer your first comment, I may have given you the wrong impression. The advance notice of rulemaking was published, and we did receive comment letters. I think we received 19 comment letters. None of the comment letters focused on the release fractions and dispersion fractions that we planned on using. They commented in other areas, one of which was the PAG's. You shouldn't use the lower number of PAG's, things like that.

MR. STEINDLER: Was there enough information in the advanced rulemaking to allow someone to comment on your release fractions? All the rulemaking documents I have ever read tended to be so fuzzy that I couldn't figure out what was going to happen subsequently. Is this an unfair statement of the present one?

MR. JAMGOCHIAN: I helped write it, so I really can't comment, to be honest with you. I think the reason a lot of people didn't comment on it, they never realized, hey, this is going to affect me. It asked a lot of questions. It was in the Federal Register, four pages long, quite thick. I think primarily a lot of people didn't read it.

Now, the bigger licensees did in fact read it

and did in fact give good comments to it. I think once a proposed rule is written and published, people are going to say, whoa, this does in fact affect me. I am in fact going to comment on it.

To give you some more background relative to your comment on licensee possession limits, the Commission, at the same time they put out this advance notice, perceived a problem with 61 licensees, fuel cycle licensees, because of their large license possession limits, and in fact put out orders to these 61 licensees to establish on-site preparedness based on license possession limits modified with these certain factors.

As the regulator, that is all you can go on, what the man is licensed to possess, not what he has possessed in the last ten years.

MR. STEINDLER: I don't have to agree with that, do I? I hope not. Because that is nonsense.

MR. JAMGOCHIAN: But the Commission did. Okay? What happened as a result of those 61 orders was that I think 26 licensees came in and modified their license. When they went in for a license ten, twenty, thirty years ago, they said, sure, give us the world, it is not going to cost us any more. But now that they realize, hey, to have a license to possess such large

quantities is in fact going to cost them something, they are coming in and saying, we have never used this, we never intended to use this much, so let's modify it.

MR. MOELLER: Well, I guess the question that goes through all of our minds, though, is how cost effective is this work if you look at the total quantity to get out and the probability that it will be dispersed? Could you not in looking at the fuel cycle and material licensees, could you not almost in a day, on the back of an envelope, screen it down to the key, few key facilities or types of facilities on a generic basis that you need to look at?

MR. JAMGOCHIAN: Well, I haven't been able to do it in a day on the back of the envelope. The licensing folks have not. Their first guess to the Commission, their first screening process, there is approximately 9,000 licensees.

MR. MOELLER: Nine thousand must be evaluated?

MR. JAMGOCHIAN: Nine thousand are being evaluated.

MR. MOELLER: How many generic groups might these fall into?

MR. JAMGOCHIAN: I don't know. I would say six to eight, something like that. Now, in the

presentation before the Commission on those orders, they had said they perceived the rulemaking in their first cut to come up with approximately 1 percent, so that is 90 licensees that would require preparedness.

MR. MOELLER: Well, see, that is what I was driving at.

MR. JAMGOCHIAN: Right, but then you have to go to the next step, should you have on-site preparedness, should you have off-site preparedness, and where do you establish that? That is the hairy part. That is where you need a couple of pads instead of the back of an envelope.

MR. MOELLER: How does this handbook compare, or is it the same handbook Don Solberg told us about yesterday?

MR. JAMGOCHIAN: I don't know what he had mentioned. I think he is involved with risk analysis. I believe the handbook you are mentioning is "How Does Licensing Analyze the Risk from a Facility"?

MR. MOELLER: Yes.

MR. JAMGOCHIAN: We are coordinating our work with him with his folks, and we hope that their work, which is much more extended and much more expensive, will complement ours and confirm what we are doing is in fact correct.

We are now in the process where we don't know where to establish that line. Should you just have on-site because once you go over that line and have off-site, it's an exponential step because then you involve FEMA, you involve state governments. Oh, it's quite a hassle.

MR. EBERSOLE: Mr. Chairman.

MR. MOELLER: Jesse and then Martin.

MR. EBERSOLE: This modifier with which you multiply the inventory to get a source term, are you satisfied that those modifiers are accurate as they should be or low enough as they should be before you

start off on the expensive process of developing emergency procedures which might be against a modifier that is far too large?

MR. JAMGOCHIAN: Well, let me answer that in this way. We have met with Sandia three times, and they have presented what their approach is, how they are proceeding, and they have come up with modifiers. Members of the Staff have, especially the licensing folks, have said, well, I think in this instance for this licensee that's way too high, where other folks have said, no, that's way too low.

And in fact, just two days ago the Staff met by themselves, and we are going to modify the modifiers because we felt they were too conservative and not enough judgment was put on them. It is a growing and learning process, and it's going to be a judgmental call, there's no question about that. And it will be controversial, no question about that.

MR. MOELLER: Martin. And then we must move on.

MR. STEINDLER: Just a comment, I think, to the assembled subcommittee. I believe this to be a critically important area for several reasons, one of the most key being because it is at the interface of the industry versus the rest of the world. As a consequence

to Don's commentary in a way, it is fraught with the possibility for an enormous amount of mischief by reason of ignorance.

And I would recommend to us that if we have any comments to make on that, that this particular program and others in the same general vein should be commented on in the area of caution for the need for peer review and certainly the need from a broad base of competent input that currently exists within NRC and DOE as a matter of experience, to say nothing of having some industrial participation of what the real world is like.

That isn't to say that there shouldn't be any emergency preparedness. All I am saying is, if done wrong we can screw things up most easily by a program of this kind than any other that I can think of offhand that we have heard about.

MR. MOELLER: Well, and I can see it being important not because there is a major problem there but rather to determine the extent of whatever problem there is.

Okay, we will go ahead, Mike.

(Slide.)

MR. JAMGOCHIAN: This project has been placed instead of the handbook that was just discussed in '84 and '85. What we plan on doing is evaluating the need

for and the technical basis for emergency preparedness requirements for advanced reactors.

The questions that will be looked at are: Do we need them? How far? What kind of response time is there? What kind of source term? What kind of emergency plans? Should they be similar to LWRs; should they be similar to research reactors, whatever?

MR. MOELLER: Okay. Well, you have the CRBR, and that's it for quite some time.

MR. EBERSOLE: Will you consider, for example, HCDAs for emergency planning even though it might not be considered in the design? I guess that's the kind of question even a look at --

MR. MOELLER: Use the mike, Jesse.

MR. JAMGOCHIAN: These are all questions that are going to be looked at.

MR. EBERSOLE: Right.

MR. MOELLER: What is your time schedule on this?

MR. JAMGOCHIAN: To begin in '84, hopefully to be completed in '85.

(Slide.)

MR. MOELLER: Yes, Dick.

MR. FOSTER: Have you identified characteristics of advanced reactors which would lead

you to believe that something different is going to be needed in emergency preparedness than you have for light-water reactors?

MR. JAMGOCHIAN: No, sir. I haven't done any consideration in this project at all. It is something that the funds were budgeted primarily for that handbook on fuel cycle material folks. The funds are available, and we felt that we could start our project in this area at that time.

MR. NORBERG: Jim Norberg. I think that one of the obvious things is the difference in source term if you're talking about a plutonium fuel reactor.

MR. FOSTER: But does that lead you to take different kinds of --

MR. NORBERG: Possibly. Possibly, it might. But this is --

MR. MOELLER: Pass the microphone over to him. Complete your last statement.

MR. NORBERG: Yes. Possibly because of the source term differences, for example, in an LMFBR, where you're talking about a plutonium fuel reactor, this could lead to different kinds of emergency actions that might have to be taken.

We have not gone into this in any great depth, as Mike pointed out, but it is this sort of thing that

we are going to be looking at when we look at the technical basis for the advanced reactors. And we are really talking at this point in time going beyond the LMFBR because there are no other advanced reactors on the near-term horizon. That's the sort of thing, and I think Dr. Ebersole brought this point up, too.

MR. MOELLER: Martin.

MR. STEINDLER: Are you suggesting you put a project like this into the budget process, and I assume, allocate a certain amount of money in planning for '84 and '85 without having much of an idea what this thing is going to look like or why you need it?

To rephrase the question somewhat differently, could you tell me what kinds of planning you go through in order to introduce a project into the budget stream and in fact, I assume, what kind of process that you go through to allocate not only a title to it and put it in the stream?

But you also presumably have to allocate some resources from '84 to '85 for your planning so that you must have an idea of the magnitude of what the effort should be or you would like it to be. But I sense you don't have anything other than a title in terms of the depth of thought that you have given so far as to why the thing is needed, who is going to use the answers, et

cetera, et cetera, et cetera. Is that a fair statement?

MR. JAMGOCHIAN: Well, slightly. Who the customer is going to be, why it is needed, is it necessary to establish emergency plans for advanced reactors. Some of the questions that this research will come up with are: What kind of response time do we have? What kind of source term do we have? What types of source term? These are questions that have to be asked.

All right. If the conclusion is that no emergency plans are necessary, that is fine. If the conclusion is, yes, for instance, no emergency plans are necessary because you have such enormous response time, then --

MR. STEINDLER: I am sorry, that's a straw man. I didn't say you had no emergency plans that are required. I am responding in a sense to Dick Foster's comment. How do you know something is different?

MR. NORBERG: Jim Norberg again. We're trying to, in research, trying to get ahead of the game a little bit rather than being completely in a responding mode like we have had for years. In this area, this is an area that we feel if the LMFBR or other advanced reactors are going to come into being down the road, we would like to get our foot in the door a little bit

earlier in the area of emergency planning as well as in other areas.

We're talking in general in the human factor areas to look at advanced reactors also. This is just one aspect. It was not a large program to start with at this point in time because the immediacy of it is not that apparent, but we feel that we should be getting ourselves ahead of the game rather than always being behind it. I think that is the thinking behind our planning in going into the advanced reactor research at all at this point in the time frame we are looking at here.

MR. MOELLER: Don.

MR. ORTH: I am not questioning whether or not -- well, emergency planning has to be looked at, but isn't what you're saying is this really translates into a source term study? The thing really is mistitled, because when you evaluate the source term, that's when you will find out whether or not you need anything different from an LWR or anything else.

So what I am saying is, shouldn't you just retitle this and maybe we can go on?

MR. MOELLER: Right. Well, what did you do on the FFTF?

MR. NORBERG: We have not done anything at

this point in time on the FFTF in our branch. I think this has been handled strictly in the licensing area, but I don't know personally what was done in terms of looking at emergency preparedness.

MR. MOELLER: Well, that might then be a good place to start to find out what they did.

MR. NORBERG: I agree.

MR. EBERSOLE: Why isn't it appropriate to tie this effort directly to the Clinch River breeder?

MR. MOELLER: That's why I asked. That's the only one they had. Sure. They ought to tie it directly. And I think Martin and Don and Dick's point they have raised is the key to the whole thing. It is going to be the same kind of people doing -- you know, they're running aroumd the same public involved, so it really boils down to primarily a source term question.

Okay, well, let's go on.

(Slide.)

MR. JAMGOCHIAN: The next project we plan on doing is confirmatory research on the optimum frequency and scope of emergency exercises. The approach we plan on following is to review past and ongoing exercises, look into the results, see if what is required is adequate or needs improvement.

Right now, the regulations require an annual

full-scale emergency planning exercise, full-scale being the licensee, state, and local government, and many times, federal participation. There is a great deal of push being made to relax that exercise frequency from 1 year to every 2 years, primarily because -- well, the rationale behind that is that it is felt that too much time and too much money is being spent in the conducting of these exercises.

The exercise up at Zion cost approximately a quarter of a million dollars. It took a great deal of effort to plan for, to conduct, and then to critique.

It is felt by states, by licensees, and by many federal folks that that is too excessive, and they should be relaxed to every 2 years. The Staff proposed to the Commission last April that that in fact be relaxed. The Commission voted that down and said, come back in another year, we will have more experience under our belt and we will evaluate that.

MR. MOELLER: Well, what do the Germans, the French, the U.K., the Japanese, and the Canadians do?

MR. JAMGOCHIAN: Well, it's totally different across the spectrum. I am not familiar with all of them. Some do conduct it on a yearly basis. Almost all have the licensees conduct it on a yearly basis.

Now, depending upon their governmental

structure, sometimes the federal government participates, sometimes it's just the local government. I know in Canada the provinces participate every year, I believe. But there is still a question. There's a lot of political motivation involved in this, in that it's costing a great deal of money and a great deal of time, and what is the optimum frequency?

MR. MOELLER: Martin.

MR. STEINDLER: I assume this is, in effect, a generic program rather than site-specific?

MR. JAMGOCHIAN: Yes, sir.

MR. STEINDLER: Do you have any assurance whatsoever that you can obtain a generic answer that is meaningful for any specific site; that an answer is obtainable in the first place; and then two, that the generic answers will be meaningful for a specific site? I don't need to tell you with your background the ramifications of the question I am asking you.

MR. JAMGOCHIAN: Well, it is felt really that you can look at what exercises are being done, the movement of people, how often people are changed from their positions on the state level, a local level; is there a problem with coordination between licensees, local and state governmental authorities during these exercises? Is it really bad?

When FEMA and the NRC goes out to evaluate thse things, they have certain criteria they measure the exercise against. If after a 2-year lapse -- well, the way the proposed rule is worded and we anticipate in presenting it to the Commission is that they will have to have an annual exercise unless FEMA and the NRC make a finding that the exercise was done so well that they don't have to do the next exercise.

Okay. That wording was, in fact, suggested by Mr. Gilinsky at the last presentation, rather than to say, blanket, everybody has to do it every 2 years, unless you really mess up, you've got to do it the year in between.

So you are really looking at the individual states, you are looking at the movement of people, that kind of thing in the approach to handling this.

MR. STEINDLER: I just want to comment that the FEMA group determined early on, again in the fifties, that national exercises alerting you for nuclear war was a once-a-year exercise. The same question was raised, both locally and nationally, in the course of what was then the Civil Defense Agency as to how frequently should we have exercises that in effect toot all the sirens in the country, and it took the better part of a solid weekend for -- now we are talking about the fair number of million of people who were actively participating in this. The answer came back: once a year. For what that is worth.

MR. JAMGOCHIAN: Well, FEMA in fact -- that is why I brought this up in the last discussion. FEMA was making a presentation to the Commission next door relative to offsite preparedness around Indian Point. In their last presentation there was a major thrust saying, hey, the states need relief, it is costing a lot of bucks and a lot of time, and a lot of complaints are coming from the local governmental authorities because they have a lot of volunteers in that preparedness organization, volunteer firemen, volunteer sheriffs,

volunteer civil defense folks, and these volunteers are having to leave their jobs to play in our exercises, and they are complaining about that.

MR. MOELLER: Well, let's hustle along. We are really going way over.

MR. JAMGOCHIAN: The last one.

(Slide)

This is to evaluate qualifications that possibly are necessary for emergency preparedness personnel. We want to look at the licensee's plants, review exercises and talk to primarily corporate and plant managers during actual exercises in actual emergencies if they exist and evaluate how they could have been handled in a better manner.

MR. MOELLER: Well again, and maybe it is saying the same thing, but I gather what you are going to really look at is the training that is necessary for emergency people?

MR. JAMGOCHIAN: Yes, sir.

MR. MOELLER: Yes, Dick.

MR. FOSTER: This emergency preparedness personnel, are you talking about people that are employees of the plant or are you talking about the local sheriff?

MR. JAMGOCHIAN: No, not the local sheriff.

We are talking about employees of the plant but usually higher than the senior reactor operators, the folks that have to handle the real emergency at a high level that deal with possibly the Governor's Office, the NRC, people like that: can they be better prepared with handling news media, with -- we really have no problems. Sheriffs know how to block roads, county police know how to evacuate folks. They do it every day. We are worried about the corporate manager who says things or doesn't handle the emergency properly with, say, the governor's staff.

MR. FOSTER: If he doesn't meet your criteria here, are you going to say he is not qualified for his job?

MR. JAMGOCHIAN: We are trying to question whether it isn't necessary that he get better training. Right now the regulations require that we review directors and/or coordinators of plant emergency organizations and licensee headquarters support personnel. That is the way the regulations are written today. We are saying should those regulations be modified to include other plant managerial people.

MR. MOELLER: Martin.

MR. STEINDLER: Why is this pushed off until '95? Why isn't that being completed this year?

MR. JAMGOCHIAN: Primarily because of money.

MR. STEINDLER: So it is a question of priority?

MR. JAMGOCHIAN: Yes, sir.

MR. MOELLER: On a separate subject, the Committee has asked several times, and Brian Grimes has come down and met with us several times on the subject of what is the potential impact of a seismic event on emergency response, and we were looking at a seismic event which, because of some unforeseen reason, caused a reactor accident and at the same time disrupted the siren system and knocked out a few bridges and so forth.

You have no research or studies looking into this subject?

MR. JAMGOCHIAN: No, sir.

MR. MOELLER: Any other questions of comments?

[No response.]

MR. MOELLER: Thank you very much, Mike. When I said we were running behind, you were not really the person that put us behind schedule. You maintain your schedule pretty well, as well as others.

Okay, we will move now into the last formal presentation this morning, which is a report on the DOE dose reduction working group. We have with us Andrew Millunzi from the U.S. Department of Energy to lead that

presentation.

Andy, I might point out to you, as you know but let me put it in the record, that all of us did receive a copy of the draft report of the working group, and we fully realize that it was indeed a draft, but we very much appreciate your taking time to make it available to us. And the consultants here and the members of the Subcommittee have read the working group draft, so we will be prepared to interact with you on it. I hope to offer some useful comments.

MR. MILLUNZI: Very good. Thank you.

I guess first of all I want to say thank you for the opportunity to meet with you again. We really look at this as a privilege and a very worthwhile thing for us to be able to be interacting with you as frequently as we have been. That is why we were very anxious to get to you that draft copy.

I hope you recognize that what I have done is made available to you something which was really the rough draft.

MR. MOELLER: Right.

MR. MILLUNZI: We are very happy with the front part of that report in that it really expresses how we have approached this job and what we think the real problems are. The area that needs to be worked

over as far as a great improvement in the wording is what I call the back part in Sections 4, 5 and 5, which have to do with the description of the R&D.

I would like to say, though, that the end results are still the same. We are very happy with our reviews so far, with the logic that we followed and with the answers that have come out. Of course, we want to find out if we have missed the boat somewhere, and that is why we have offered it to everyone else, to get their review and comment.

I would like to say that part of giving this review to you is in response to the requirements of the public law, but I would also like to say that independent of that public law, I think I know myself being charged with it totally, I would have done this anyhow because I do want to make sure that we really get a cross-section.

So with that, as I look around the room I see a number of consultants who I haven't had a chance to meet with and interact with before, so maybe I could go back and provide a background so they would know where we are coming from.

MR. MOELLER: Please do. And for your background, Martin Steindler is from the Argonne National Laboratory, Don Orth is from the Savannah River

plant, Dick Foster formerly was with Battelle-Northwest, the Pacific Northwest Laboratories, and is now retired, and Jacob Shapiro is the radiation safety officer for Harvard University. Tom McKone is an ACRS Fellow with us who is very interested in this area. Ms. Tang is our engineer supporting us on the Committee. And then you know, I think, Jesse Ebersole and Jerry Ray.

MR. MILLUNZI: I would like to go back and repeat that what we are doing here is in response to an act that Congress passed in 1980 which told us to have an expanded and accelerated LWR program plan. In that bill there were a number of items. The thing of importance to this group is that they gave us a list of ten research areas to do work in, and they told us that we could look at that, and if we felt the list was too long, we could cut out what we felt was appropriate as long as we gave our rationale and gave them the opportunity to agree or disagree.

Then they asked us to develop a comprehensive program management plan to implement that R&D activity. The fourth thing they asked us to do and mandated us to do was to coordinate the ongoing LWR safety activity in the country and also with the foreign countries.

So in this there were ten areas. One of the areas is dose reduction to the worker. I would like to

say that with the advent of this bill -- so we got started on the bill.

Our initial reaction was to assemble a group of people from the national labs and from vendors and the industry to go visit national labs, utilities, utility owners groups and other organizations in the industry to find out from them what were their ideas on what the R&D needs should be and how to approach it. What we got back was a very long list of individual R&D activities.

Now, at the Department we are using this bill to be consistent with the mandate that the President has given us in that we are to assist in a revitalization of the nuclear industry. So therefore, as such we are not interested in doing R&D for the pure sake of doing R&D. Really we think what has to be done is you have to identify what are the issues in the nuclear industry, what are the safety issues, and then determine what role technology plays in resolving those issues, and then try to improve the technology in those areas to resolve those issues.

So in short, one might say we are end user oriented, especially in the area of LWRs. With this kind of approach, you end up that the priorities come out to be to keep the plants which are on line at 100

percent availability full power, to bring the plants which are in the pipeline up to that condition as fast as possible, and third are future plants.

Therefore, when we got this big, tall stack of R&D, we looked at that R&D and said, if we did it all, what would we do with the answer? And the roar of silence was deafening. We had a lot of individual R&Ds. I would have to say that in the safety community that is what we did.

So we provided a program response in Congress into two phases. One is a program definition phase, and then another would be a program definition phase where we would identify the requirements, and then and only then would we start to implement the R&D to implement that program.

In order to identify the problems, we embarked on a sophomoric approach which we find very few people follow: that is, first, what are the issues; second, what do you have to do to resolve those issues? Don't think about what is ongoing or what people have up to this point. Just first, with a clean sheet of paper, what are the issues and what do you have to do to resolve them.

Then third, review everything that has been accomplished or is under way which would contribute to

the resolution of those issues? Four, make the subtraction, and what drops out is what remains to be done. Then, consistent with the mandate from Congress and really our intention at the Department, we then want to get together with the NRC, with EPRI, with INPO and the rest of the nuclear industry to determine how we could in a most cost effective and fastest way resolve those items that we have identified.

We are not interested in the Department in getting a huge R&D program. We really are interested in getting the problem solved, and we know it has to be done in cooperation with everyone else, and we are really hard at that. Therefore, when we got this long list of R&D, then we got into the program definition phase.

To help us in that, we have formed ten working groups. They have representatives from over 50 organizations, and we have about 158 or 160-some -- I have lost count -- technical experts across the board in various areas assisting us in defining the requirements. I would have to say that it has been a quite interesting year and a half for me because we found it is very difficult to get the technologists to understand why do we want to do this work and what are the problems.

It is very easy for somebody, especially under the guise of safety, to start talking in motherhood, and when you really look into it, what they are doing is improving the individual technological areas. So to get on this, we found we had to develop a framework by which we could start to identify the issues, and that we did, and that we called the integrated approach to reliable, safe nuclear power.

One of the key things we found is you just cannot separate safety from economics; they go hand in hand. They only reason we are talking about a system which is a way to generate electricity using the process heat from the fission process, the only reason we have this industry is that 30 years ago we convinced ourselves we could meet both the economic criteria and the safety criteria. So when these plants have been developed and they continued to be designed, constructed and maintained, there always has to be the tie between safety considerations and costs.

So we did develop that framework, and surprisingly enough, you find that you can put all of the technologies into that framework and try to decide what the issues are because they all have to be aimed at how they contribute to the utility being able to produce electricity economically and safely.

So, even in the area of dose reduction, we were able to do that, so we did follow that process in here, and that is what we tried to describe in the opening part of the document. So I realized before I was banging this with these glasses. I have to say I always kid after you have known me for a while. I have never had to wear glasses before last week.

[Laughter.]

Our objective was, consistent with everything else I said this morning, to develop potentially cost-beneficial changes in the generic design and operation of nuclear power plants that can reduce the irradiation exposure to workers during plant operation and maintenance.

MR. MOELLER: Let me ask a question, Andy, at this point, to seek out your thoughts. Do you believe that by reducing occupational exposures at these plants, and, of course, all of the things that you are going to do to carry that out, do you believe that will lead to safer plants?

MR. MILLUNZI: I think our concern, the bottom line out of all of this --

MR. MOELLER: Is safety.

MR. MILLUNZI: Is safety, of course, but we try to make sure that we never lose track of the other

aspects.

MR. MOELLER: Right.

MR. MILLUNZI: Now, our concern in the safety area is that things seem to be moving in the wrong direction, and now that we recognize it, we have to now take actions to make sure they don't go in that direction. The plants right now are safe, we believe, but we are looking downstream, which is the proper role for the government, and I wish we could do it across the board, especially in this industry, and have a little bit more statesmanship and a lot less political considerations in all of this.

MR. STEINDLER: Hear, hear.

MR. MILLUNZI: Being statesmanlike, we have to look down the path, and we are concerned in the safety area that things may go in the wrong direction. The main cause for that, as is in the report, is that the utilities, who have the prime responsibility for the safety of a power plant -- as you on the Committee know, I have said this before, and I will repeat it over and over again. The prime responsibility for safety is the utility owner, it is not NRC and it is not DOE or anybody else.

So when you look at these problems and you are talking about improving safety, and that is what this

bill is about, you have to be thinking about how you improve the ability of the utility industry to discharge that responsibility. Of course, the vendors and everyone else have a safety responsibility in that they have to develop and produce their projects so they will meet their end of the bargain, but in the end, it is the responsibility of the utility.

Now, the utilities are charged with protecting the worker all the time, and there are laws towards that end. So in meeting the laws, what the utilities have done is they have developed a workforce and they put a limit on the amount of individual exposure that they had, which keeps them far below even the NRC limits.

Now, what is happening is as the plants get older, the radiation fields are getting higher, and also the amount of maintenance that is required on any operating machine as it gets older is increasing, and therefore the radiation fields are higher. So in order to stay below the NRC limits and to be in cooperative compliance with ALARA -- I really don't find malicious compliance -- but being in cooperative compliance with ALARA, they have to hire more and more people.

Well, what is happening now as these plants get older, coupled with the fact that more and more plants will becoming on line, the required workforce,

especially in the maintenance area, is increasing. Therefore, it is placing -- will be placing -- not yet, but it will be placing a higher burden on the utility management to assure themselves that they get well-qualified, trained people to do the maintenance.

It turns out that in a nuclear power plant there aren't any safety issues until the utility gets to operate it and maintain it, and the subject of radiation dose, the workers get most of their dose at greater than 75 percent during maintenance. So now you have to focus in on the maintenance.

The maintenance crew requirements are going up if they are going to meet the ALARA in the fashion that they should. That bothers us because if the guys don't maintain the plants right, then how can their fellow workers who have to operate it?

I would like to recommend to the Committee as we pull the whole response together and we meet with the Full Committee, the operator, in our parlance, is not the man in the control room, it is everyone involved with the operation, so that puts a higher burden on the people who have to operate it. So on that basis, we are concerned. Will we have enough well-trained people and an adequate supply? In some of these areas, especially like the welders, as we have pointed out in the report,

there is a huge competition for those guys from other industries, so how do we make sure we get our share in this industry to do their job properly. That is our concern relative to safety. Okay?

MR. MOELLER: Thank you.

MR. MILLUNZI: So I am not going to go over all the history and go over the numbers again. You know about things increasing, that the average worker dose stays constant but the population -- you well know that.

MR. MOELLER: The curves are all in here.

MR. MILLUNZI: They are in the report. I have discussed what the approach of the Working Group was. In the report is the membership. I guess I tried to keep my name off of all of them, but everybody knows I am all of them. But the people who are on the Working Group are listed in the report.

MR. MOELLER: Did you have much to do with the selection of these people, or did you call INPO and they just sent you Kindley and Smith, or did you have some choice?

MR. MILLUNZI: I really received outstanding cooperation from everyone in doing that. I worked very closely with Dennis Wilkinson himself. I called him up and told him of the problem, for example, for Mr. Color and Mr. Taylor at EPRI. Everybody we talked about, we

started out talking about what we were trying to do, trying to stress that the Department really meant business and asked them to nominate.

They gave the people's background and they asked if that met what we were expecting. So we did have that kind of an indirect way.

MR. MOELLER: And you have been happy with it?

MR. MILLUNZI: We have been very happy with it, yes, indeed.

The issues we have identified are two. One is what are the health effects to the worker in his occupatinal exposure. And two, then, the other one was what was the effect of this exposure on plant safety, reliability and economics. We looked at these health effects both in the individual and in the population. I think the short of it is that the working group endorsed the ALARA principle. They recognized, they came to the conclusion that the industry is maintaining the exposures down as low as possible, that those levels are far below the NRC requirements; therefore, they think from the health standpoint, with the present regulations and understanding, that there really isn't the health problem, that you really are talking about an economic and safety problem.

By that I mean there is a direct economic

problem and there is this indirect -- I want to emphasize the "indirect" -- safety problem that I expanded on in response to Dr. Moeller's question.

What we then looked at are we have noticed that there are increases in the exposures that are going on, both in the reactor and in the population. So we looked to try to find out what were the major causes. The major causes were increasing activity buildup on the out-of-core surfaces of the primary coolant system with increase of plant operating time, just corrosion product, which is highly radioactive material, namely, the cobalt just being moved off from the materials and deposited around the system.

The second one was the increasing number of retrofits, modifications and inspections mandated by the NRC. You see this when you look at the increases, especially after March of 1979, in the curves that we have given. It is based on that. That is a major basis for that conclusion.

Second is, of course, the increasing requirements for maintenance on the plants as they get older.

Now, what we have done then is not looking at what is going on. We say what makes sense to be able to reduce that. We found out that the dose is the product of multiplying the fuel strength times the exposure time. We took the two parameters apart to see what made up the fuel strength and what made up the exposure time. Then we went to work to see how you would attack each one of the parameters.

Well, to reduce the radiation source term, what happened is, we figured there were two sub-items that would handle that whole subject totally. That would be, one, prevent contamination, and two, remove it. In the prevent area, you are talking about chemistry control, high temperature filtration, and materials control. In contamination removal, of course, we are talking about decontaminating the whole system.

Now, in the area of trying to reduce the time that the workers are in the field, we looked at operation on maintenance practices, the subject of remote systems, the effect of system and component failures, and how this ties in with increased productivity. Hopefully increased productivity would say he stays in the field a lot less time.

MR. EBERSOLE: Back in that first area where you asked a question earlier, I don't know if you were

here or not, about what is the criteria that determines to what degree you keep the coolant system cleaned up and reduce the source term. This is either with full flow demineralization and cleanup or bypass, whatever.

I have difficulty in identifying any particular change in some old regulation that says you keep it clean enough so that if a pipe bursts somebody doesn't get hurt, when there are really other objectives -- which is laydown of fission products and corrosion products -- which is along the same line you are talking about. But I haven't seen anything coming forward in any significant way that we are dedicated to making the coolants, the transport coolants cleaner or whatever.

MR. MILLUNZI: What we have done on this is that we see that that is an important area to control the chemistry.

MR. EBERSOLE: Well, that's one aspect, or clean it up if you can.

MR. MILLUNZI: Or clean it up if we can. The cleanup, that is the idea behind the filtration.

MR. EBERSOLE: What are the guidelines at this point in time about the design basis for the degree of cleanup or the degree of control? Do you have an analytical structure?

MR. MOELLER: You may not be -- we should probably ask someone in the NRC, but in your study, you have told us the contamination in the older plants, the older the plant, it builds up. Do you know, does the activity that is freely moving in the cooling system, does that increase with time?

MR. MILLUNZI: Yes. Well, it levels off. You really don't get a constant until about ten years. I think we put that in the report.

MR. EBERSOLE: That is the laydown you are talking about.

MR. MOELLER: Sort of equilibrium after ten years.

MR. MILLUNZI: You get into an equilibrium after about ten years, and that is what the comment in the report is referring to.

MR. EBERSOLE: Is that improved by changing the degree of cleanup or changing the chemistry?

MR. MILLUNZI: Well, we are in the process right now, Dr. Ebersole, of moving from this definition phase. We are into the implementation phase. That is one of the areas that we think has to get looked at, and we will be -- the answer to your question, and I hope I can come back in about two months to you and give you our rationale.

MR. EBERSOLE: Thank you.

MR. MILLUNZI: And I hope to have it. When we do come back, I hope it is in a hardheaded, logical way, and I hope you keep us honest, that we are not just doing technology for technology's sake. Then, we went and took those two pieces apart. Now, out of this we came up with the tables which are in the report where we took into account our prioritization logic, which is in the report.

I would be very interested to hear Dr. Steindler's response to that. I heard you asking questions about prioritization earlier. But we did go through it using the priorities that we had.

Then, what we have done is, looking with the first priority being the old pipes or pipes which are on line, what we found out is, you had to break -- the prioritization had to get broken down as we stated in there. Our logic is, first of all, maintenance was number one because that is where the highest source of contamination and fields came from, et cetera.

Then we looked at the differences between PWR's and BWR's. One thing we have found throughout this whole study is, it is very hard to apply generic specific requirements on any plant in any field.

MR. STEINDLER: Hear, hear.

MR. MILLUNZI: When we looked at this for the PWR's, the largest problem is the maintenance, of course, of the steam generator. I would also like to quickly accentuate the fact that is in the report that much of the problem in this area is attributed to a few plants out of all the PWR's, and it is our own belief right now in looking at the various utilities and in the subject of dose reduction, it really has to be the attitude of the management. I think that gets reflected throughout a plant.

We see plants which don't seem to have the steam generator problems. They don't have other kinds of problems either, apparently, so I want to emphasize the important need for the management attitude towards all of these subjects, and in particular this one.

MR. MOELLER: Jesse?

MR. EBERSOLE: It used to be feared that turbine maintenance was going to be a problem with the boilers. Has it turned out that that is not much of a problem?

MR. MILLUNZI: Well, that is so far. I want to quickly add, Dr. Ebersole, that we are really in a living industry, and things continue to change. My answer is not a political or bureaucratic dodge. It is really to say that as of today, it looks like that. I

don't know what tomorrow will bring, or what have you.

But as we are doing it today, I would like to add to everyone here, we recognize that the definition of these requirements is a living thing, so we intend to have these definition groups in existence at all times. They are heavily weighted with the end users of the data. The objective there is to make sure that we have end user R&D that has been identified, so that we will then as time goes on be updating our understanding, and I hope we do a good job so that the list we are talking about today will not be the same list as tomorrow, and we have gotten things completed, not that something jumped ahead of us in priority.

If you look at some programs, that is really what has happened. An issue has not been closed off. We just have a knee-jerk reaction to today's high priority. Hopefully, we can do that, and as we get smarter and new evidence comes in, we will be continually reassessing this. So, here is the list.

Now, short-term effects, we wanted to know what kind of R&D would make sense and would have an immediate effect. Less than a year, six months to a year. If you did the R&D, you got the results, and it went into place. You'd have an immediate payoff. Then there were things that had the long-term effects, and as

we said in the write-up, that is a lot greater than a year or two years. We are having a little bit of problem setting that up right now.

When the final document comes out, we may have changed that definition of long-term, but I am going to try not to, because two years is a long time.

MR. MOELLER: Well, that was a problem then that I had with this table, and I think you have just explained it. The heading on it is Dose Reduction Method Priorities for The Operating Plants, and I thought you meant -- I didn't realize you meant R&D. You are talking now, these are the priorities for doing R&D in support of these actions?

MR. MILLUNZI: Once again, Dr. Moeller, these are the methods. Now you look at what is the role of technology in these methods, so if that is the important method, you say what technology plays a part in that and what should we do.

MR. MOELLER: Then I might suggest that the title be slightly changed, because you see, as I look up there, in the righthand column it says decontamination of the whole circuit, including fuel. Well, you say that gives me long-term effects, and I say, well, why, if I decontaminate it, it would help me tomorrow, but you mean the R&D is long.

MR. MILLUNZI: Yes. As Ms. Tang will tell you, my own personal copy is just rife with comments.

(Slide.)

MR. MILLUNZI: Then, once again, the data we give you are on the items for the new plants. So, now, going through this logic and finally getting ourselves down, and we did go through then and review all of the ongoing work, at this time I want to say often times you read the statement in there that the ongoing -- we expect the ongoing program to help solve the problem. This is a general statement for all items. We are not endorsing at this time the total content of those programs.

What we have done is, we have looked at those programs, and we see that there are portions of it that will resolve the issue. We have not made any comment or any evaluation on the total program and other pieces of it. Okay?

Now, with that in mind, and reviewing the ongoing work, we have come down to the section in here on recommendations for additional work. Staying again with the logic of the source reduction, we look at contamination prevention. Under that we have the item on operational and chemistry controls, and there we are looking at the total subject in the following way.

We are now into the implementation phase. We are starting to ask the kind of questions that Dr. Ebersole is asking. What are the functional requirements in looking at it from an operating plant requirement? We are not looking at it from the technology area standpoint. In other words, looking at it and saying, gee, in this area we don't understand the movement of iron, let's say, across this.

What we are saying is, where does iron play an important role? It plays an important role in the BWR. What are the conditions in a BWR and what can we look at in that area and really try to put a fence around the R&D and equate it to the functional requirements of where it is going to be used, but even with doing that, we are going to try to answer those kinds of questions as we have stated out here.

Now, there is in the writeup, for example, here, there is a mixture of an item which those of you who know me know I am not too happy about. It is one thing to determine what has to be done. It gets to be a bit of technical arrogance and presumptuousness telling somebody how to do it. In here, there is an area where it really isn't -- they have gotten in the writeup here how to do it.

For example, requirements were identified to

use the advanced analytical techniques now becoming available to monitor all chemical constituents in order to determine a correlation between cooling chemistry and rate of activity buildup. To me that is very presumptuous. We haven't looked at what the requirements are yet in determining the rate buildup. We don't know the precision and the accuracy by which we have to do this, so how is somebody already identifying that we need a sophisticated piece of equipment to do it? In the end, his intuition might be right, but I don't want to give the impression that we have done the work which would justify the explicit identification of that equipment.

However, I will say, though, that the sentence immediately before that, we know that we have to look at this chemistry problem. We will probably need a loop, and one does not exist in the country. The other -- the next area is high temperature filtration. This is all again under what do you do to remove the source? Then the last thing, of course, is the materials control. I want to say I have very large apprehensions about this item called materials control, and I want to make sure that we don't end up with the phrase I kind of use all the time, a technological sandbox.

We here especially want to make sure the

efforts are well focused and the problems are really identified, and we only work in that universal subject called materials in that part of the galaxy that is related to nuclear power plants.

Next is the item on contamination removal. There, we're talking about decontaminiation, and in response to Dr. Moeller's comment on the chart, what they were trying to synthesize there is the fact that it appears at this time that you have to go from small models, and eventually you end up testing in a full system.

Then we come to the next item -- how do you reduce the time for the people in the field. One is looking at the subject of automation.

MR. MOELLER: On that -- it's a nit, but you say since Section 6.2.1 -- since the approach to ISI automation -- what is ISI?

MR. MILLUNZI: In-service inspection. All the acronyms have to come out. We really kill ourselves in this business with all the acronyms that we use.

But anyhow, it appears to us, to the working group, that the approach to automation to date has been fragmented. In our response to Congress, they wanted us to look at automatic controls and we had told them that there's a lot of other work that had to get done before we could begin to consider automatic controls. Because you're really talking about why do you need them. You have an automatic item in there called an individual.

Obviously, what you would probably look at,

have to look at in the long run, is using automation where the individual will not be able to respond fast enough to achieve the reliability, and the safety levels that you want. But you need to define all these requirements before you look at automation.

So in this area we really think we need to do a survey of the state of the art and really put things in perspective. You can imagine with my previous comments how we will approach that state of the art report.

There is also a strong desirability for the availability of automated equipment for these plants, especially which are online, because as these plants get older and older the maintenance problems really get higher. You have the problem with the plant that is in existence and we now have a problem wherein all the retrofits have been coming in and this problem of the retrofits, especially relative to seismic, the work areas are getting to be pretty tight. In some areas, it's extremely tight.

So now trying to get this automated inspection equipment in there, it is going to be more and more difficult to look at it from a generic standpoint. In other words, we are probably going to have to solve that problem in the end on a plant-by-plant kind of basis.

Therefore, it is going to require that efforts in this area be worked out very closely with the utilities and especially with the online plants, and work out a cooperative means whereby we do the long-term, generic parts of it which are properly our responsibility but get them to be in a position that they look at the details of the detailed equipment that goes in there to do their job.

I mean, it would be very presumptuous for anybody in Germantown or Bethesda to design a piece of equipment to go into any particular plant. So we will be very conscious and very concerned about that. And it is a very good example of why you have to work very closely with the utilities.

The next one is the improvement of productivity. Now here is a subject where we may have some problems with certain people, but you just have to remember that increased productivity is a component of safety, and we are looking at that to try to find, once again, what is the proper role between the R&D and the operator/owner who has this responsibility.

So in conclusion, these are the four areas that we have found after coming through this whole logic train. We have come down to the final four items in the following order of priority: system decontamination for

both PWRs and BWR, the second one is water chemistry and water treatment, the third item is in-service inspection and maintenance automation, and the fourth one is material changes, particularly replacement of high cobalt alloys.

MR. MOELLER: It's interesting. I thought it was just a very helpful report, but it's very interesting to me to look now at your four items, because you have stated that they are in order of priority. And I must say as I read it, I was happy. Now I have a question, having let a day or so go by.

It is interesting that your number one priority item is directed not at preventing contamination but to remove what is there. I guess in a sense I could justify that priority personally because you could say to me well, the plants are all contaminated, so the number one priority is to clean them up.

MR. MILLUNZI: Also, it appears to be the easiest problem at this time. There's a matrix of how these priorities were developed. There are a lot of open questions on the question of chemistry control. Dr. Ebersole touched on that.

MR. MOELLER: Surely, if we're putting a new plant into operation I would want to emphasize water

chemistry to prevent contamination.

MR. MILLUNZI: But in looking at the situation now, we have 75 plants which are operating, and we have a like number -- and I hope North Anna is the last one; it doesn't look like it will be, but North Anna is the last cancellation because we have an equivalent number coming online and they are already designed.

MR. EBERSOLE: Let me ask a question. If you have an old plant and you're on this equilibrium level of contamination, then you come along and improve the chemistry and filtration, isn't it true that it will go to a new and lower level of laydown activity? Won't it redistribute to a new level of equilibrium concentration on surfaces?

MR. MILLUNZI: It probably will.

MR. EBERSOLE: It takes time.

MR. MILLUNZI: Yes. But what we're concerned about is containing sufficient understanding so that you can get that in place. So we're saying gee, it looks like even though the order of priorities is one, two, three, four, there are certain aspects, of course, of the work that would have to go on in parallel. Even though the priority is two, we would expect to be doing priority two work when we're doing priority one work. But we want to keep everybody focused on what it is that

we're trying to do and why. And it looks like the quickest way and the surest payoff way is decontamination.

Now, if the people who are responsible for doing the work on water chemistry control and writing the specifications, if they do their job faster than people collectively think then gee, that would be absolutely great, because then maybe we could cut out some work. And we will always be updating and reviewing, so hopefully, we could change the priorities. But that is the snapshot to date.

MR. MOELLER: Martin?

MR. STEINDLER: I guess I have a number of questions or comments. I think that order of priorities mixes both operating plants and new plants, and as a generic order then, which is what I hear, I think it's a little bit misleading. By the time you get done reading this thing, you realize theye are really two quite separate propositions you're addressing. You've tried to combine them all in one order of priority. And it has the problem that I think Dade alluded to.

I guess my second point is, following up on Dr. Ebersole's comment, I don't see enough attention to the whole question of chemistry as a method of keeping the total inventory down. The question simply being if

you pull all of the cobalt out of an ion exchange pot, it will never end up on the pipes. That's too simplistic and everybody knows that.

But the aim in that direction I think requires a little more emphasis that I see here.

MR. MILLUNZI: One of the problems I had with the report, in preparing these reports there's a lot of background work and a lot of details that we obviously aren't going to be putting into this report.

First of all, we have such a wide spectrum of management and other types of people who are going to be reading this. Our first responsibility is responding to Congress. So we are trying to put a report together that for people as busy as they are, we get the essence across to them.

Now, behind that simple phrase of water chemistry are items that you're talking about. What I would like to ask you to hold off on, -- and I fully expect you to put us through the meat grinder -- is when we get to fleshing that out and we get the specifics of the program and the logic of the program and the ordering by which we go after each of the parts, then I think we could address your concerns. But we decided not to put it in this report; it would just be too cumbersome.

MR. STEINDLER: One other question for informational purposes on your initial program plan, the program management plan for the conduct of the demonstration program.

MR. MILLUNZI: We sent that to Congress last year.

MR. STEINDLER: Does that have a number so we can get a hold of it?

MR. MILLUNZI: I'd be --

MS. TANG: Is that part of the things you gave us in July?

MR. MILLUNZI: I gave it to you before we had submitted it.

MR. MOELLER: Jack, I guess, had a quick question and then we'll go with Don.

MR. SHAPIRO: All these points you've been discussing I heard maybe over 20 years ago in connection with another program. I just wonder -- for example, the situation of high cobalt alloys. If we could get rid of the cobalt, everything would be great. This has been going on for 20 years. Is there any chance of getting rid of the cobalt?

MR. MILLUNZI: There are so many factors involved in that. When we really get to see the program details, I think then collectively, everybody in the

business can take a look at that. And I think we ought to answer that question at that time. I think that is one of the reasons, for example, why the materials thing ended up way down at the bottom.

The second one, the third one, and finally you get down to materials, and that's one of the reasons it's down there on the list. If you look at it in reality, these plants that are out there now, instead of costing what they really should be costing, like a couple hundred million dollars at the time they were built, they don't need to cost the several billions that they do now.

But in any event, you're talking about a high capital investment in something that's really in place. And is it very realistic to go in there, and how much of a materials change can you make? That is one cost. Then you have to balance that off against another cost, of retreat and attack in a new direction. Maybe the new direction will get it to the same goal and it won't cost you so much.

And people are really thinking that for existing plants, there is a limit to the amount of work you can do on the materials game unless chemistry, for example, can affect the corrosion behavior of the material so that it would not be compatible with the

existing. And that's why the water chemistry part is up there next to number two.

So that was one of the things behind my snide comment about the universal materials, making sure you stay within the galaxy of importance.

MR. MOELLER: Don?

MR. ORTH: Several comments. The first one, you started off by going through the several different steps you have to go through, identifying the issue and what can be done about it. Your step three was you're doing all the things that have been done, subtracting those to find out what's left.

Will you comment on how much of step three -- what the status of step three is?

MR. MILLUNZI: Step three is essentially done. I tried to explain that earlier. We have not completed yet an explicit review. But if you look at the membership of our working group, we have just about every major performer in this area. So we are hopeful, or we are very confident that we have an excellent coverage of what the ongoing work is.

I'm not claiming that we are 100 percent, but we certainly are complete enough to have confidence in the results. We have more than way over 95 percent of those programs that have been identified. But what we

also haven't done is gone into the programs and reviewed the program in its totality to see what it is doing.

I draw a picture -- if I can draw a box, that's a total, ongoing program. What we have done is reviewed that program, and we know that in that program there's a certain amount of that box that will apply to the issue we have identified. We know that if that work gets done, that along with the others will sum up to a resolution of the issue.

So we haven't done a review of why are they doing the rest of it, and does it make sense or any of that.

MR. ORTH: Well, that leads into my second question to some extent, which is a continuation of the discussion that we maybe already heard too much of on the water chemistry, because some four plus years ago, we heard long discussions of the water chemistry as it influenced things like transport through the system, its effect on things like steady states where yes, indeed, you can lay stuff down and pull it off as a function of what you did to the water chemistry.

So yes, you people are aware of that work but you haven't really factored that into the details of the program, is what I understand from what you just said.

MR. MILLUNZI: We have factored it in. The

detail with which we do that will be increasing now as we actually get closer and closer to developing the details from the past.

MR. ORTH: That sort of leads into my third generic comment. What will you be allowed to do by the NRC? Certain of these things you could probably do fairly easily, but if one gets around to trying to decontaminate inside the reactor, you run into a group that says no, you're going to lead to stress corrosion and cracking, you need a five-year program to convince us that this one little thing you're going to do isn't going to make it fall apart.

So again, that enters in. What you are allowed to do is going to enter into what you can recommend and the order of priorities.

MR. MILLUNZI: Well, we are trying to -- I'm going to watch my words very carefully here. We really want to look at this thing as much as possible from logic. And we don't want to, in the beginning, encumber ourselves with what ifs or that this little area that has some kind of a power is going to prevent us from doing anything.

What we want to do is identify what makes sense and then, with the power of that logic, hopefully we can get people to agree that it ought to get done,

and we are going to do it on a case-by-case basis.

MR. ORTH: My point in this is -- I'm agreeing with you, but it means that somewhere in this, somebody ought to be evaluating what of these things you are opposing really are going to run into those kinds of interferences so that when you write your report or make your recommendations or whatever you're going to do, you can point this out. So that if it needs implementation in order to do it, you're ready to do it rather than turning out a report that says logically, this is what we have have to do, but later on somebody says it may be logical but we're still not going to let you do it. I'm just saying I think you have to bring that pretty well upfront.

MR. MILLUNZI: I agree with you, and our intention --

MR. ORTH: It's not in there anyway.

MR. MILLUNZI: No. Because what you have there is a definition. A second half of this effort is going to be the implementation, and the considerations that you rightfully have pointed out will be dealt with, plus others.

The utilities, for example -- you're going to have to get some utility in the end which says yes, I'd like to let you do that to my plant. The first question

he's going to ask me is run that by me again; why do I want to do that? So you're absolutely right.

MR. EBERSOLE: Well, when you run that by him again and you tell him why he wants to do that, it will inevitably be that it's cheaper to do it that way in the long or the short term, and that's the way the business is run.

To that extent, how are you getting the utilities to do things which it's not really very clear are, in fact, cheaper in the long term or the short term? Like reducing worker exposure.

MR. MILLUNZI: I think we are happy with the efforts we have put forth and they are beginning to see that efforts in this area don't only apply to meeting ALARA.

For example, this report really points out, when you look at it, there isn't a health problem but boy, there really is an economic payoff because you hopefully are decreasing the down times.

MR. EBERSOLE: In that connection, then, why isn't it necessary that you speak to the economic aspects you're doing here? We don't intend to do that very much, but that is the point at which the utility will respond when you tell him he's doing something that affects his pocketbook in a favorable way.

MR. MILLUNZI: And I don't blame him. I think Ed's right.

MR. EBERSOLE: That's their only motivation.

MR. MILLUNZI: I really do feel in all their interactions -- I guess I need this really for the record -- I haven't found any of them that were not concerned about their safety responsibilities. In fact, I'm a little bit concerned that they get to a point where there's an imbalance. But we tend to approach them, and it's obvious that what we have to say there has to make sense to them.

There are some other problems here, you know, also in this whole safety area. I bring this up now when you look at any of these problems. It is difficult, when you talk to a utility, to be able to show him that incentive because in a lot of the public service commissions and the utility commissions, there is no reward; there isn't a guaranteed reward for doing it efficiently. That is another part of the problem that the department is trying to work with, which isn't directly from the safety area but it's from our institutional format.

MR. EBERSOLE: I've heard it said that supervisory agencies of some sort won't give a utility credit for putting in an NRC safety feature because the

NRC doesn't require it. I put the "require" in quotes. Where they put it in as a conservative gesture, they really don't get credit for it.

MR. MILLUNZI: That's going to be a great challenge for us in dealing with the utilities, to do that. We are hopeful that the way the report comes out it is logical and the department, with its working group, comes down to the point where dose reduction -- in summary, dose reduction is not only a health problem; it has direct economic impact and indirect effects on safety. That's really how you can summarize that report.

I think in the GAO report Senator Glenn kind of approached that. They approached us, and I think they fairly described what our thoughts were. And I hope you recognize why in our dealing with GAO we phased out the ongoing dose reduction programs with the clear understanding that we really had to have a better definition of what the requirements are to do this part of the job before we did anymore dose reduction work.

In this business, if you start an R&D program, you just almost are committed to run it till the end. You have a big investment, it costs a lot of money to close it out. We just wanted to say stop right now, we want to know where we're going and why, and then put the programs in place vigorously. And that is what this is.

We feel that a vigorous program has to be a very close cooperation between ourselves and the industry. The role, for example, for NRC in this one has me very much -- in my mind, the NRC should be describing what the requirements are relative to the exposures to the workers, and they have done that. Now it should be left to other people to show how they are going to meet that, and it should be left them to do it.

You know, we get a lot of R&D that goes on. A lot of times you're trying to do it to help the utility. They're supposed to be helping the utility, but it has to be left to the utilities and the industry, the vendors, everybody involved.

MR. EBERSOLE: But I thought you were talking about not really meeting minimum requirements, but doing better than that.

MR. MILLUNZI: Doing better.

MR. EBERSOLE: We were talking about public utilitie commissions not giving utilities credit for installations for improving the minimum. Does the NRC interface with them to put pressure on them to make the utilities pass with better than a C grade?

MR. RAY: The NRC with the commissioners, not with the utilities.

MR. EBERSOLE: Right.

MR. MILLUNZI: I don't know the answer to that.

MR. EBERSOLE: I've heard them say many times, I won't put that on, it's not my rate structure.

MR. MILLUNZI: That's a fact.

MR. EBERSOLE: It goes back to the public utility commissions. They have no incentive to make anything any better.

MR. MILLUNZI: The utility doesn't without an economic incentive.

MR. EBERSOLE: Right.

MR. MILLUNZI: That's true.

MR. MOELLER: Martin and then Dick.

MR. STEINDLER: Since economics is an important issue here, are you going to be able to find out from the specific utilities, or even generic terms, the economic impact of some of the things that are going to proposed, when applied?

MR. MILLUNZI: We will have to do that in a very responsible way. We will try to get as much information as we need to be able to really structure the program. It will be very difficult, but we think we will be able to apply the controls so we don't get people in there asking questions about the economics, which are nobody else's business but the utility's.

But I don't know that you really need to get

to the nitty-gritty of it. I'm hopeful that when we start to talk with the utilities and give them the logic we have here, that the operations people obviously have to see more possibilities than I can dream of, because they all know the plants better, they know where their maintenance costs are.

I think we'll get to the pertinent information but we have to -- I'm very allergic to making sure that we don't get in there and mess around things that are really proprietary to them.

MR. RAY: How good is your liaison with the INPO representative? It seems to me that's an excellent channel for that kind of information, and also, a channel to get the message back to utility management.

MR. MILLUNZI: I'm going to be talking with them in December, and our relationships with INPO couldn't be better. They're absolutely excellent.

MR. RAY: I don't know Smith and Kinley. Are they live wires or did they give you a couple of office people?

MR. MOELLER: No, they're good, they're good.

MR. MILLUNZI: And our relationship with INPO and Wilkinson and Payne, and Zabrowski and the staff are just excellent.

MR. MOELLER: Dick?

MR. FOSTER: This goes back to the relative priorities of your four items; specifically, on the decontamination versus the water contamination thing. Am I correct in presuming that in this decontamination item, you took a hard look at the kind of materials which were involved in building up crud relative to half lives? Do you have in this a pretty good feeling that once you go into this, how long that particular cleanup is going to last?

I guess it boils down to: is it really cobalt, and perhaps some other very long-lived hard gamma emitters that are giving you the problem versus short-lived materials?

MR. MILLUNZI: I think that assumption seems to be verified is the cobalt. However, in that item I used an example that I thought that the definition phase people were getting into the business of telling people how to do it. I think in their minds the answer to your question is they wanted to look to see what the answer to your question is. So they want to confirm what they think is the real problem.

Apparently, no one has really done that. I think people have done it, and I'm just asking what degree of precision is required.

MR. FOSTER: Well, one of the things that is

involved here is you want to make sure you are working on the right isotope, that you might do a tremendous job in cleaning up all of the short-lived nuclides and then remember later on that gee, I could have done the same thing by leaving the plant shut down for another 48 hours.

MR. MILLUNZI: That is right. It is like somebody taking a piece of pipe and scraping all the rust off of it. Any others?

MR. MOELLER: Yes, I had two comments. Are you looking at the fact, and this came up yesterday, that when you call for major decontamination of these plants, that you are going to produce increased volumes of low level waste, and they may have chelating agents and so forth that may be an unusual or slightly different bulk low level waste now being generated?

I would think it would be very important when you transmit this to the Congress to point out to them therefore since these wastes are going to be produced, therefore it is imperative that we move forward with the establishment of their regional disposal sites.

MR. MILLUNZI: I appreciate that. I think that is a very good comment. I don't know the answer to that. I don't know the answer to it, and maybe they talked about it in some of the meetings that I have not been present at, but I am unaware of it. So we will look into that.

MR. MOELLER: The second comment in a general sense that I had is that -- and this is -- I show my own professional bias, but you have listed four priorities, and they are all, for lack of the right word, I guess

they are engineering approaches. You have not given me a single managerial, although you have said orally it is important for management to understand. Why don't you put in a fifth priority and say we need better health physics programs, or something like that, or we need management to be committed to the need for this, and whatever that entails?

MR. EBERSOLE: That gets back to the economic thing.

MR. MOELLER: That is why I hesitate to say it, because it sounds so biased, but do you see what I am driving at?

MR. MILLUNZI: Yes, I do, and let me offer you a knee-jerk reaction to try to handle that problem. Would it be sufficient if we can find a way in the general statement to put in the oral statement that I made that the success of this is very dependent on that?

MR. MOELLER: Fine. Then I would be happy. Management's commitment, support, and the adequacy of the essential people.

MR. MILLUNZI: I always end up saying that orally, don't I?

MR. ORTH: I think it is a little more than that, Dade. I think it comes down to, is the equivalent

somewhere with management, time motion studies kind of things. There are a great many operations that you really can get done in less time, and it involves the health physics reviews of what is going on, but it also involves some good maintenance engineers looking at what has to be done in prelining the job, mocking things up on the outside so you can run them all in.

It requires that generic management involvement. It is a whole area in which you can make tremendous differences. We have had very hot jobs on occasion, and with the limited number of skilled people that we didn't want to burn out, where we took the effect of actually mocking stuff up, trying it out, testing it, seeing if things would work, then going ahead and doing it, and you can save tremendous amounts of time and money overall with a little bit of forethought along that line.

MR. MILLUNZI: I think we have got that in the report already, the concept of the preparation and all this.

MR. ORTH: It is also something that can be done immediately without even waiting for research basically.

MR. MILLUNZI: One of the key items we are going to try, and I don't know how successful we will

be, that we have right now is how much does each guy get. We see what the total dose is. What we haven't done is go the next step and see where it happens, and in part of doing that, based on that, you can start to define where you should be doing mockups, and that is what is behind all of this. But I agree with you.

MR. MOELLER: What we plan to do now, I know you want our comments, and we have given you a number of them orally. I think what we will ask and try, and I think this is an improved committee procedure, we will ask each of the consultants who have read the report to write out their comments, and we will just informally send them to you.

MR. MILLUNZI: I would appreciate this.

MR. MOELLER: This is a minor comment, maybe minor, but on Page 3, near the bottom of the page, about six lines up from the bottom, you state, and you have a sentence there, I will send this to you. Page 3, six lines up from the bottom, you say, "Using the radiation limits set by the BEIR Committee." Well, see, the BEIR Committee never set any limits. The BEIR Committee's assignment was to quantify the relationship between dose and effect, and they didn't set any limits.

MR. MILLUNZI: That is right. They got confused with the second half of that.

MR. MOELLER: Right.

MR. MILLUNZI: As I recall that sentence when they were writing it the sentence didn't have the BEIR Committee in there. It was just with the NRC, but somebody said, don't forget BEIR.

Any more general discussion or comment on this subject?

MR. STEINDLER: General comments, no. I have a specific one. It says, "The working group does not believe," on Page 6, "The working group does not believe that a radiation exposure of workers has a negative impact on plant safety."

MR. MOELLER: I would argue with that.

MR. STEINDLER: Then it goes on to say, "But recognize that there is a risk that safety concerns could increase as a result of this." That is very soft and it is subject to a lot of argument. In fact, one of the arguments that leads to, what shall I say, the enthusiasm with which dose reduction is viewed is that it in fact does impinge on safety, although not quantifiably.

MR. MILLUNZI: Would you think it is fair to say that in my presentation that our position really isn't reflected in this sentence, and we will change it?

MR. STEINDLER: That is correct.

MR. MOELLER: Each of our consultants will write out the comments and give it to you.

MR. EBERSOLE: Could you put in here some sort of coupling statement to indicate that you believe, as you said, that reduction of dose to workers, there are economic incentives that are not easily seen, they have to be pried out, and the mechanisms for identifying the economic incentives need to be worked on, because in the long run that is the incentive that the utilities work with?

MR. MILLUNZI: Without telling you and everybody else in the world exactly what that report is going to be, economic incentives is being applied everywhere, not just in this item.

MR. MOELLER: Well, thank you very much.

MR. MILLUNZI: Thank you.

MR. MOELLER: I certainly want to compliment you overall in a very useful report. It is something that I very much enjoyed seeing written down. We will conclude.

MR. RAY: For a rough draft, I think it's in excellent shape.

MR. MILLUNZI: Thank you, and I look forward tc coming back to you again, and as I mentioned to Ms.

Tang and to Dr. Moeller, I really extend the invitation to everyone else. We are very anxious to get everyone's inputs, and I would be most interested to talk to you.

MR. MOELLER: Okay, that concludes the formal portion of our subcommittee meeting. We will now recess one hour for lunch, and then we will resume at 1:45 in executive session to address the several items that I mentioned yesterday, and particularly to summarize our written reports for presentation to the full committee.

Let me thank the Reporter for being with us and for her patience in listening carefully to what was being said and putting it down on paper.

With those remarks, I declare the meeting adjourned.

(Whereupon, at 12:45 p.m., the meeting was adjourned.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

in the matter of: ACRS/Joint Meeting of the Subcommittees on Reactor Radiological Effects and Site Evaluation

Date of Proceeding: November 19, 1982

Docket Number:

Place of Proceeding: Washington, D. C.

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

Jane N. Beach

Official Reporter (Typed)

Jane N. Beach

Official Reporter (Signature)

SITING, DEMOGRAPHICS AND SOCIETAL ISSUES

- INSTITUTIONAL, ECONOMIC, AND SOCIETAL ISSUES IN RADIOACTIVE WASTE FACILITY SITING
- SITE SAFETY TOPICS
- DEMOGRAPHIC AND LAND USE INFORMATION FOR REACTOR SITES
- ECONOMIC AND SOCIAL IMPACTS OF REACTOR ACCIDENTS

T1

MAN-RELATED EXTERNAL HAZARDS

- SAFETY RELATED EQUIPMENT RESPONSE TO HAZARDOUS MATERIALS
- RELEASE, SPREADING AND DISPERSION OF HAZARDOUS MATERIALS
- TESTING PROTOCOLS/TESTING CONSORTIUM
- MISSILE IMPACT ON SAFETY RELATED STRUCTURES AND EQUIPMENT
- OPERATOR INCAPACITATION

T2

OCCUPATIONAL RADIATION PROTECTION

- BLIND TESTING OF INSTRUMENT CALIBRATORS
- LWR DOSE REDUCTION
- PROPER USE OF PORTABLE SURVEY INSTRUMENTS
- ULTRA-SENSITIVE DETECTION TECHNOLOGY IN BIOASSAY APPLICATIONS
- OCCUPATIONAL DOSES TO MEDICAL PERSONNEL
- NEUTRON DOSIMETRY
- BIOASSAY LAB PERFORMANCE TESTING SUPPORT
- OPTIMIZATION TECHNIQUE DEVELOPMENT
- EXTREMITY DOSIMETRY GUIDANCE
- INTERNAL DOSE CALCULATIONS SUPPORT
- RESPIRATORY PROTECTION SUPPORT
- BETA RADIATION MEASUREMENTS AND DOSIMETRY
- OCCUPATIONAL DE MINIMIS LEVELS
- CORROSION PRODUCT BUILDUP, DESIGN CHANGES
- DECONTAMINATION EFFECTIVENESS
- DECONTAMINATION IMPACT ON WASTE SOLIDIFICATION
- ESTABLISHMENT OF BIOASSAY PERFORMANCE TESTING LABORATORY
- RADIATION PROTECTION TRAINING GUIDES
- NPP WORKER EXPOSURE REDUCTION THROUGH ROBOTICS
- WORK RESTRICTION INDICES FOR BIOASSAY AT URANIUM MILLS
- PILOT STUDY, EXTREMITY DOSIMETER PERFORMANCE STANDARD

T3

EMERGENCY PREPAREDNESS RESEARCH

FY 84 - 85

DIVISION OF FACILITY OPERATIONS

T5

OBJECTIVES

RESEARCH TO:

1. ASSIST IN UPGRADING EMERGENCY PREPAREDNESS AT LICENSED FACILITIES.

2. PROVIDE A BASIS FOR REGULATORY POSITIONS ON EMERGENCY PREPAREDNESS

PROJECT: HUMAN FACTORS IN EMERGENCY RESPONSE

OBJECTIVE: ASSIST IN UPGRADING EMERGENCY PREPAREDNESS AT LICENSED FACILITIES

ISSUE: CAN THE DECISION MAKING PROCESS IN THE EARLY STAGES OF AN EMERGENCY BE IMPROVED

SCHEDULE: CONTRACT LET WITH ORNL IN JUNE 82, WILL CONTINUE INTO 83; MAY EXTEND INTO 84

PROJECT: HANDBOOK ON DEVELOPMENT OF ADEQUATE EMERGENCY PLANS IN SUPPORT OF FUEL CYCLE AND MATERIAL LICENSEES.

OBJECTIVE: TO DEVELOP A HANDBOOK (SIMILAR TO NUREG-0654) WHICH CAN BE USED BY LICENSEES, STATE AND LOCAL GOVERNMENTS.

ISSUE: WHAT ARE THE ACCEPTANCE CRITERIA FOR ADEQUATE EMERGENCY PLANS FOR FUEL CYCLE AND MATERIAL LICENSEES.

SCHEDULE: ~~TO BEGIN IN FY 84 AND COMPLETED IN FY 85~~
CONTRACT STARTED WITH SANDIA IN 9/82 WITH AN INTERAGENCY AGREEMENT BETWEEN FEMA AND NRC.

PROJECT: EVALUATE TECHNICAL BASES FOR EMERGENCY PREPAREDNESS REQUIREMENTS FOR ADVANCED REACTORS.

OBJECTIVE: TO PROVIDE A TECHNICAL BASIS FOR MAKING REGULATORY DECISIONS RELEVANT TO EMERGENCY PREPAREDNESS AROUND ADVANCED REACTORS.

ISSUE: IS THERE A NEED FOR REQUIRING EMERGENCY PLANNING AROUND ADVANCED REACTORS.

SCHEDULE: TO BEGIN IN FY 84 AND COMPLETED IN FY 85.

PROJECT: CONFIRMATORY RESEARCH ON OPTIMUM FREQUENCY AND SCOPE OF EXERCISES

OBJECTIVE: PROVIDE A BASIS FOR REGULATORY POSITION

ISSUE: WHAT IS THE OPTIMUM FREQUENCY AND SCOPE OF FULL SCALE EMERGENCY PREPAREDNESS EXERCISES

SCHEDULE: TO BEGIN IN FY 84 COMPLETED IN FY 85

PROJECT: EVALUATE QUALIFICATIONS NECESSARY FOR EMERGENCY PREPAREDNESS PERSONNEL

OBJECTIVE: ASSIST IN UPGRADING EMERGENCY PREPAREDNESS AT LICENSED FACILITIES

ISSUE: SHOULD THERE BE SPECIAL QUALIFICATIONS REQUIREMENTS FOR EMERGENCY PREPAREDNESS PERSONNEL, AND IF SO, WHAT ARE THEY

SCHEDULE: TO BEGIN AND BE COMPLETED IN FY 85