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TECHNICAL REVIEW BOARD (NWTRB)

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Monday, March 14, 1994

The Commission met in open session, pursuant to notice, at 2:03 p.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
FORREST J. REMICK, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

WILLIAM C. PARLER, General Counsel

JOHN HOYLE, Assistant Secretary

DR. JOHN E. CANTLON, Chairman, NWTRB

DR. D. WARNER NORTH, NWTRB

P-R-O-C-E-E-D-I-N-G-S

2:03 p.m.

CHAIRMAN SELIN: Good afternoon, ladies and gentlemen.

This afternoon the Commission is pleased to welcome John Cantlon and D. Warner North from the Nuclear Waste Technical Review Board to brief the Commission on the status of their activities.

Doctor Cantlon, Doctor North, we're very pleased to have you here.

The safe and secure long-term disposition of high-level nuclear waste is, of course, an important challenge confronting the federal government and the industry. In fact, many think it's one of the half dozen or so largest environmental challenges in the country. Congress considers the timely resolution of the issue a top priority and it has given this responsibility to the Department of Energy. The Department's recent efforts have been to look at ways to expedite its progress. As an independent board created by Congress, you have the unique role in this national effort to resolve the nuclear waste problem and, in our modest opinion, you're performing a special and really quite impressive service.

The Commission also has a role. We are

to, at the beginning, try to identify key issues that have to be solved and eventually be called on to license the facility or not to license the facility. So, we're very interested in receiving your briefing on the status of the Board's activities and the state of the DOE Civilian Radioactive Waste Management Program.

Apart from the major licensing questions, we also have the question of allocation of our resources. So, even managerial and questions of rate and progress are also important to us.

So, Doctor Cantlon, without any further adieu, we look forward to hear what you and Doctor North may have to tell us today.

DOCTOR CANTLON: Well, thank you, Mr. Chairman, members of the Commission.

(Slide) It's a pleasure for us to be here today. As you've noted, my name is John Cantlon. I'm Chairman of the Nuclear Waste Technical Review Board and accompanying me here is Doctor Warner North, a member of the Board.

About a year ago we talked to you about the Board and its perspective on the Department of Energy's program to manage civilian spent fuel and defense high-level waste. Today we'd like to update

you on progress during the past year and on the Board's views regarding some of the key decisions that we expect the DOE to be facing during the coming year. Then we'll provide some observation on NRC's role in the effort and we'll close our remarks with a brief synopsis of the Board's latest report to Congress and the Secretary of Energy.

(Slide) The Board, as you know, was created by Congress in '87. The Nuclear Waste Policy Amendments Act was the device and is charged with evaluating the technical and scientific aspects of the waste management program. This includes site characterization activities and activities relating to the packaging and transport of high-level radioactive waste and spent fuel.

As you're also aware, the Board is an independent agency with the federal government, not a Department of Energy or any other regulatory agency.

(Slide) Members of our Board are nominated by the National Academy of Science and are appointed by the President. I have served on the Board from its creation and became its chairman two years ago. Currently ten of the Board's eleven memberships are filled and I've listed in the overhead there the members for you. We all serve

part-time. The Board is organized into seven panels. They're shown in the next viewgraph.

(Slide) Since the Board's inception and especially during the last year, the Board has witnessed considerable progress in the Civilian High Level Waste Management Program. For example, after several delays, construction of the underground excavation of the exploratory studies facility at the mountain has been started. Also, the management and operating contractor is beginning to integrate the program and its various components, storage, transportation and disposal. The Board strongly believes that the momentum of these activities should be maintained.

The coming year promises to be one of additional progress. Also one during which many important decisions will be made. Some of these decisions are the direct responsibility of DOE. An example is the decision whether to pursue the development of a multi-purpose canister design. Other decisions will involve interactions with other bodies, especially the Nuclear Regulatory Commission.

Here, an example would be decisions whether to amend the siting guidelines, 10 CFR Part 960. Still other decisions, for example regarding the

Administration's proposal to Congress for dispersing of the Nuclear Waste Fund receipts, will not be made, that decision obviously, by the DOE but by the Congress.

The Board has been encouraged by Secretary O'Leary's recent efforts to improve the program. For example, she's created the position of Chief Scientist and is proceeding with a financial and management review of the Yucca Mountain project. She's taken steps towards broadening the stakeholder participation in the program and on October 7th, Doctor Daniel Dreyfus was confirmed as Director of the Office of Civilian Radioactive Waste Management, all I think desirable events.

At our Board's January 1994 meeting, Doctor Dreyfus listed several short-term goals the OCRWM program had set for itself. These included returning the emphasis of the repository program to science and site characterization, institutionalizing stakeholder interaction and proposing a new funding mechanism to increase the monies that would be available to the program.

To achieve this latter goal, the DOE recently requested the creation of a special fund to give OCRWM increased access to the revenues coming

into the fund. In the Board's view, relatively too little funding has actually been going into the direct cost of scientific research and engineering activities that are essential to characterizing the Yucca Mountain site and to laying a sound basis for the waste management system. Based on its four year review of the program, the Board believes that simply increasing the program's funding might not ensure that adequate funds will be allocated to the most important site characterization activities, or even to other critical research.

In a February 1994 letter to Congress and to the Secretary, the Board repeated its earlier recommendations for an independent review of the OCRWM management and organizational structure to be initiated as soon as possible. The Board believes that this review can and should be undertaken without slowing the momentum of the important site characterization activities currently underway at Yucca Mountain. Whether the program budget remains level or is increased, program management should ensure sufficient and reliable funding for site characterization, performance assessment and system studies which are critical for integrating the program.

(Slide) The Board believes that the management of spent fuel and high-level waste, that is the transport, storage and disposal of waste, should be viewed as a system whose separate elements and subelements are highly interdependent. The Board has been concerned that DOE decisions about some components of the overall waste management system are being made without adequate regard for the effects of those decisions and those could have impacts then on other components or on the entire system.

In our presentation to you last year, we discussed the Board's views on several of the major issues facing the program at that time. Today I'd like to update you on the Board's views on two of those subjects, development of a multi-purpose canister and research on engineered barriers. Then I'd like to summarize the conclusions and recommendations of a recent Board report on underground exploration and testing at Yucca Mountain. Finally, I'll close my remarks with some observations about the NRC's regulations for a high-level waste repository.

(Slide) First, the DOE is now examining the feasibility of a concept it calls the multi-purpose canister. This concept involves permanently

sealing spent fuel in a canister at the reactor where the spent fuel is generated. During all subsequent storage, transportation and disposal operations, spent fuel would remain sealed within the MPC. If necessary, overpacks or casks would be used for shielding and protection during storage or transportation or to provide corrosion resistance after disposal. This is not simply a storage-related decision.

Development of an MPC has potential ramifications for a decision about the thermal loading of the repository, and the thermal loading decision in turn will affect how much waste can be put into one repository; how the waste will be loaded into the canisters; how long the waste must be aged prior to disposal; how the waste is packaged, handled, transported and emplaced in the repository; and how and when the drifts are backfilled. It also will affect how much the overall waste management program will cost. Therefore, the MPC development decisions, as well as the decision about thermal loading, should be approached carefully, especially since future underground thermal tests will be required to support a thermal-loading decision.

The DOE has evaluated alternative MPC

designs and has studied the effects of those designs on the rest of the waste management system. In general, large MPC designs offer economic advantages, but often affect other parts of the waste management system such as the repository design. The Board believes that a systems analysis is an important prerequisite to the final design of an MPC. Such an analysis, which does not require a large-scale effort, should assess the tradeoffs of alternative concepts for major parts of the system, storage, transportation, and disposal, and provide a technical basis for decision making. Given the uncertainties associated with disposal, for example what is the thermal loading to be of the repository, the question of how a true multi-purpose canister can be made a reality is a difficult one. Nonetheless, an attempt at least should be made to address this issue in a substantive way given present technology and what is known about the repository and the site.

(Slide) A second issue that concerns the Board is the low priority that DOE has placed on studies of engineered barriers. A well-designed system of engineered barriers working together with well-characterized geologic barriers, will increase our confidence in the long-term performance of a

repository. For this reason, the Board has recommended that the DOE place greater emphasis on the engineered barrier system as a way to build redundant radionuclide containment into the repository design. This redundancy, in our view, should help to add confidence about the repository safety, especially in the face of inevitable uncertainties associated with predicting natural geologic, hydrologic and climatological consequences far into the future.

CHAIRMAN SELIN: But this wouldn't -- just to make it clear, this would not be a substitute for less work on seismology or geology or any such. It says put the best engineering together with the best science that you can --

DOCTOR CANTLON: Right. Yes. We believe so.

(Slide) With respect to designing the waste package itself, the Board believes that extensive materials testing is required. Of greatest importance is determining how various materials will hold up over long periods of time under the possible underground conditions. Despite this strong and repeated Board position, the Board has until very recently chosen to reduce the funds going into the waste package development program. We believe that

this is unwise to defer studies in this area. As the DOE reviews its budget priorities during the coming year, the Board recommends that increased funding be directed to the engineered barrier development.

In October of last year, the Board published a report entitled, "Underground Exploration and Testing at Yucca Mountain." In that report, the Board expressed its strong support for the DOE's plan to rapidly construct an underground tunnel, to identify and provide access to potentially significant geologic features of the Yucca Mountain site. It has long been the Board's view that the significance of some geologic features, especially those that are nearly vertical, cannot adequately be evaluated using surface-based drilling. This is because there is only a small likelihood that vertical bore holes drilled from the surface will intersect such structures at repository depth. A bored tunnel, however, would cross such features perpendicularly, allowing physical access to them for visual examination and scientific testing at the repository level.

The Board also recommended that the DOE should reinitiate its underground thermal testing program as soon as possible to allow the development of instrumentation and procedures to gain as much

testing experience as possible prior to initiating testing in the core test area. The Fran Ridge large block heater test is a start, but the program currently lacks sufficient field testing experience, proven instrumentation for underground testing, and a well developed testing strategy. As I noted earlier, a significant issue currently facing the Yucca Mountain project, is a research base for determining the most appropriate thermal loading for the repository. A well-developed program of thermal testing is needed to support a thermal-loading decision.

The Board found that the lack of a testing strategy was also evident in other areas of proposed underground testing. The Board recommended that existing plans should be expanded to produce a comprehensive strategy for exploration and testing. Priorities and goals should be based on specific intermediate goals, should be consistent with scientific needs of the site characterization and repository design, and should be consistent with realistic funding expectations.

Finally, the Board found that the DOE's plans for construction of the exploratory studies facility are not consistent with practices in

underground construction industries. The Board recommended development of a more efficient system for managing design and construction of the facility that contains larger accountability and incentives for cost-effective and timely performance by the contractors.

Let me now briefly discuss an issue more directly of concern to the NRC, the NRC's regulatory requirements for the Yucca Mountain repository.

(Slide) The Board is aware that the Energy Policy Act of 1992 calls for a general review of the repository regulatory requirements, including those of the NRC. However, any needed amendments to the NRC's regulations are to follow completion of the reviews by the National Academy of Sciences and the Environmental Protection Agency. Several years could be required to complete those reviews. Meanwhile, the repository program is having difficulty implementing certain aspects of the NRC's regulations and some NRC criteria may actually be unnecessary for repository safety.

The most obvious example is the ground-water travel time criterion, 60.113. The DOE is now conducting studies to estimate groundwater travel time even though many hydrologists do not believe that it

is a very meaningful indicator of the suitability of the site. At Yucca Mountain, other parameters, such as percolation, flux through the unsaturated zone, might be better measures of the waste isolation capabilities of the site.

Another example of less immediate urgency, but possibly of greater significance as the repository design matures, is the provision in Part 60.113 that allows alternative numerical goals for the performance of the major subsystems of a repository. It is not clear at what stage in the licensing process the NRC would approve or specify alternative goals, nor is it clear how the NRC would decide what those goals should be.

It has been more than ten years since NRC's regulations were promulgated. In those areas where there are known problems with the regulation, the Board encourages the NRC to develop needed guidance or amendments now rather than waiting until completion of the reviews of the National Academy of Sciences and the Environmental Protection Agency are through.

In summary, the Board expects a number of important decisions to be made, at least in a preliminary way, in the year ahead. These decisions

have the potential to significantly move the program forward. In some cases, the Board has reservations about the adequacy of existing information to support the decisions and review of this information base will be a significant area of investigation by the Board during the coming year.

Doctor North and I would be happy to try to respond to questions.

CHAIRMAN SELIN: We have a lot of them just because you cover such interesting material. Let me start with a couple of fairly small ones and then get broader and broader.

The first has to do with the rule. The staff is very sympathetic to the position that you put up on groundwater and, in fact, is reviewing our position on that. In fact, they come to the opinion that we shouldn't wait for an EPA standard, et cetera, we ought to get going.

More broadly, we are working with our contractor to take a full look at the regulatory environment to see other inconsistencies or places that have to be updated. Do you have other examples where you see our regulations causing problems without contributing to safety?

DOCTOR CANTLON: We could certainly put a

little thought rather than trying off the top of --

CHAIRMAN SELIN: That would be very helpful.

DOCTOR NORTH: I think a point we might make to you is given that the repository concept is evolving substantially from what was in the site characterization plan and the basis for the 104 study plans at that time, we need a sense of strategy, how DOE should be collecting information in the process of its license application given that the site is found suitable, and what NRC's priorities are in terms of what information they feel is most important to have. We feel, for example, that the thermal loading issue is quite critical and that much more should be done than is set forth in the study plans and the SCP when the recognition of the importance of that issue was not as strong as it is now.

This past week we have had meetings of panels from our Board dealing with the seismic issue and the volcanism issue. With respect to volcanism, we were very encouraged by the state of DOE's planning and performance assessment and by the interaction between the DOE program and the criticism from NRC. It would appear that the discussion is focusing and a lot of issues are getting, I would say, well

ventilated, if not actually forming a consensus.

On the seismic issue, however, we were quite disappointed. We felt that DOE was a long way from having an integrated picture and the importance of that issue for near-term decisions on potential repository design wasn't being adequately recognized. This would appear to be an area where both NRC and DOE might be moving more aggressively to determine what information do you really need and how can that be provided soon rather than waiting until the license application period.

CHAIRMAN SELIN: Well, let me just comment. First of all, strategies is to us as prose is to Voltaire's character. We may have been speaking it all our lives, but we never recognized it. DOE is supposed to do strategy, we're supposed to respond.

On the other hand, we are supposed to be looking at specific plans for show stoppers, in particular, far in advance. You are probably in the best position to look at the two at the same time. We're aware basically of volcanism, seismicity and probably the thermal load is the three major areas that have to really be settled or at least illuminated before a great deal of progress, but we can only respond to the plans that say, "If you do what you're

planning to do, we have doubts that you will be able to answer the question." We can't go back and say, "You should be doing it differently or some other fashion."

However, having said all that, we are trying to guess ahead of time where the major issues will be, how to respond, to in effect have regulations that are both robust and relevant. Your insights on those would be useful. I appreciate the talk about strategy, but if you could get down to nuts and bolts, that would be even more useful.

The second question I wanted to ask you about had to do with the multi-purpose canister. It's pretty easy to see the advantages and the lack of disadvantages having the same canister for both storage and transport. But when you get to disposal, it seems to be at least the possibility that there be some major tradeoffs or major questions given up in the attempt to be able to do the same canister. Do you have some feelings on that?

DOCTOR CANTLON: Yes. We're very much concerned about that and have had some conversations with the DOE on the issue. Obviously if you make a choice to go with a large robust canister and in-drift emplacement, which has many desirable features,

economically and handling and safety and protection from seismic issues and so on. On the other hand, if it's clear that you cannot retain the radionuclide retention qualities of the rock at a high thermal load, if that degenerates based on experiments and now these require fairly lengthy experiments in order to confirm that, then making this early decision on the size will have to be undone. DOE has done some very good thinking about this at a sort of first order level. They're quite aware that they're taking a risk in moving ahead. Obviously, they're driven by the 1998 commitment that they've made to the utilities for beginning the fuel acceptance, which then drives a decision which really ought, in the best of all worlds, to be based on solid scientific and technical assessments of the rock.

Of course, because they were delayed in getting underground at least a year by the way they proceeded, even getting the thermal experiment started down in place there and getting the corrosion experiment started in place so that the data will be acceptable to you people, that it's relevant because it really characterizes the conditions under which those things will be retained, has in a sense necessitated then DOE to take a substantial risk.

CHAIRMAN SELIN: Well, to follow-up on these, since your charge is beyond just a repository in this, the whole question of the waste questions, are you proposing to take a look at the advisability of that tradeoff? I mean I could see where trying to do too many things with one system might actually lead to slowdown rather than progress.

DOCTOR CANTLON: Well, yes, we are. We are and have been looking at that issue and have had some candid discussions. I would say that DOE acknowledges what we're saying. They have essentially made a decision to incur that level of risk in order to meet the pressure of the utilities. Now, the cost of making --

CHAIRMAN SELIN: I don't really understand that. If it were just to meet the pressure of the utilities, they'd be better off with a dual purpose canister that could do storage and retrieval and just not worry about eventual --

DOCTOR CANTLON: Well, that's basically what they're ending up with, of course. Our question is is that dual purpose canister going to be designed with enough knowledge so that it is really compatible with adding particular kinds of jackets? Well, that's one issue. But the other issue then is the size, the

starting size. If you wanted essentially to have all bases covered, you could end up with some kind of a canister that could be aggregated together into a large canister, but that's a very tough design question and so on.

So, we don't know yet what the response of the bidders will be to the draft RFP that DOE has put out and we will be looking at those later on. Some of the early drafts that we've seen virtually were silent on the repository end of things. So, hopefully, that will get addressed in a little bit more detail and it will be thought through. Whether or not a cost effective design can cover all the bases or not is -- you know, that's a good, tough engineering question.

CHAIRMAN SELIN: I have some broader questions, but I'd prefer to allow my colleagues to follow-up on these direct things and then come back to these.

Commissioner Rogers?

COMMISSIONER ROGERS: Well, yes. There's sort of a collection of little things that are specific and some more general things.

I think you have said some words about the SCP. The question is to what extent do you believe that the SCP is really binding the NRC to, in a sense,

an outmoded approach to looking at all the issues? A lot has changed since the SCP was first issued and the design concepts and different priorities have changed. To what extent do you think that the SCP itself needs an overhaul?

DOCTOR CANTLON: Well, we have certainly kicked that issue around in the Board. There's no question but what doing a full SCP overhaul would be very costly and even delaying problem for DOE. I think that not much good would come from it other than a fairly substantial delay in the program because that is not a simple undertaking. On the other hand, I think your question about whether or not the old SCP isn't in a sense a kind of binder and a delaying factor, that's a difficult question to answer rigorously. But we do know that we listen to presentations in which the simulations are based on the site characterization plan model when everybody knows that major features have long since gone away. So, the tail end of that original plan is still out there grinding data sets away. So, it is really imposing some undetermined level of burden on a system. We haven't done any quantitative look at that.

Now, when we've discussed candidly with

the program managers at various levels, they've said, "Well, we've been doing a more or less continuous change process." So, at the level of the home office, we no longer have the original site characterization plan, we have this changed model. So, at least at our conceptional level, we're no longer wedded to where we started because the program has learned a great, great deal. Indeed, we just left testimony on budgeting and Congress is very upset because all they see is a product of their multi-billion dollar investment is a 200 foot hole in the mountain.

Well, to be honest and to give DOE credit, there is an enormous amount of information that has been compiled and you people have ensured that the quality of that information is now at a level that it can actually enter a regulatory proceeding and survive. So, what's difficult for the general public to understand is that there is an enormous amount of information accumulating. It's getting woven together into a better interactive set. Whether or maybe the right question is how to move from the original site characterization plan to something a little less burdensome on the system is I think a management question. My guess is DOE is struggling with that themselves.

DOCTOR NORTH: I think it will help them a great deal though, is if you can join the struggle with them to try to understand what information will be enough given the change in the repository concept. For example, if they go from vertical emplacement of thin-walled containers to horizontal emplacement of containers of the level of 125 tons, that will obviously have very different implications for the seismic analysis, for what information one might need to have to be sure that ground motion and fault displacement don't pose a serious challenge to the integrity of the repository

Now, this is an area, one specific, where we were somewhat dissatisfied in our meeting last week that there had been a reevaluation of the test plans, an additional analysis showing what kind of information do you need at what time frame in order to deal with those issues. So, we're concerned that DOE not fall into the mind set of using the study plans as a checklist. Yes, we have all these various data elements that we agreed back in 1989 or whenever the last revision was that we would provide. Rather, that that whole process be reexamined so that we can assure that as DOE proceeds it is getting the information that is needed for the program, both the early

determination of site suitability and the information that they will need if they proceed to the licensing application, and that the right sorts of priorities are being set as they deal with budget limitations and have to choose which elements of information they will, in fact, provide you.

Another example would be how much drifting in Yucca Mountain is really necessary. We understand, based on Doctor Dreyfus' recent testimony, that they are considering cutting back on some of the ancillary drifting that we had originally anticipated would be done to explore various fault structures. How important is that information? I think it's very useful for NRC and DOE to engage in dialogue on these issues earlier rather than later so that they understand the character of your thinking and you've communicated to them your views of the criticality of various information items.

CHAIRMAN SELIN: No offense meant, but I don't understand your answer to the question. Are you saying that we cannot work off a moving target? That's the one thing that's absolutely clear. Are you saying that the SCP should be --

DOCTOR NORTH: I think the target is moving and the issue is how do we track it from both

sides.

CHAIRMAN SELIN: We can't track it. We have to have at some point a logical argument that says, "We believe these are the questions that have to be answered in order to satisfy you, the NRC's needs." This is basically a design basis reconstitution applied to a test plan.

DOCTOR NORTH: Yes. I think one wants to avoid just in time engineering and analysis.

CHAIRMAN SELIN: But what I don't understand is your recommendation on how that be done. You don't want to redo the whole SCP since there's a lot of other material in that.

DOCTOR NORTH: No. But, for example --

CHAIRMAN SELIN: You can't just sit down and have an ad hoc discussion of issues. So, we have to respond to a statement that says, "We now believe these are the questions," and how should that statement be put to us?

DOCTOR NORTH: Well, it seems to me that one thing you might do is recognize that there is a change in the baseline as they are conceiving it from vertical thin-walled containers to the possible use of an MPC in disposal phase as well as storage and transportation phase, and a move to horizontal

emplacement as opposed to vertical emplacement with very different implications with respect to an air gap versus backfilling around the container.

If you were not satisfied that their old study plans are responsive in this new situation, which I suspect you would not be, then it seems to me you want to urge them to engage you in dialogue saying how they are going to deal with a very different situation than the test plans and the SCP that are a matter of historic record now. I'm not sure that you have to take all the initiative. You might ask them to take the initiative.

CHAIRMAN SELIN: We can't do that. They have to come to us and say, "Our plans have changed." I mean obviously we know their plans have changed and it's obvious that if they change the plans there's no assurance that the old test will satisfy the new questions. But until they come to us and say, "Our plans have changed and here's our new test plan or at least mod 1 of the test plan and here's how we propose to answer this," we can't do that.

Your conversation sort of sees a student and a teacher involved in a thesis discussion and we're not. We're the panel at the end. What do you call it, the defense board that has to take the thesis

as given and say it passes or it doesn't pass.

COMMISSIONER ROGERS: We are very involved with details now that we're very uncomfortable to what extent we're getting sucked into, in a sense, telling them what to do. We cannot do that for all kinds of reasons. The concern is that we see these changes taking place, but I guess they haven't really come to us and said, "This is now what we propose to do and we'd like to know to what extent we have to -- what do we have to do to satisfy your concerns about that?" I don't believe that's happened yet.

DOCTOR CANTLON: As I listen to the rethinking -- and of course you've got new leadership in there and they're just really getting in the saddle now. So, I think it's premature to try to characterize the way they're proceeding, but it does seem to me that more in line with what the chairman is contemplating, that I visualize DOE moving aggressively to sort of lay out a real strategy, thought through and so on, present that and then begin to lay that out. Move in, get the mountain characterized in their view as something adequate. Then proceed with the licensure.

CHAIRMAN SELIN: If they come to us with a Gadankin experiment, you know a virtual test plan,

say, "If we had such a plan, we had such a construction plan and we had such a verification philosophy, would that meet our needs?" we can answer those questions. But we can't be continuously interacting with them.

DOCTOR CANTLON: And I think really one of the elements of the cost of the program has been probably a far too early wedding of the regulatory and the conceptual aspect of the program. Early on, the way they proceeded was really grounded in the detailed regulations as opposed to really getting after the Gestalt of what it was they were trying to do.

CHAIRMAN SELIN: What information do you need to answer the safety questions.

DOCTOR CANTLON: Yes. And I think I see for the first time DOE moving on what I think is a much healthier way, and that is to put the regulatory set of issues off until they're ready to come to you with a pretty well articulated Gestalt of what the system is going to look like, what it is they plan to do now to document that that's going to be safe. I think that's a much more intelligent and much more cost effective way to get at this program. I'm very, very encouraged by it.

COMMISSIONER ROGERS: One of the comments

that -- well, a comment that you've made several times in your report here is a reference to either a comprehensive strategy when you're talking about strategy, but the word comprehensive I think is the important one, a systems analysis of a system or the whole thing, and that seems to have been lacking throughout the whole program. I think you've called for that before years ago.

DOCTOR NORTH: Our first report.

COMMISSIONER ROGERS: Right. And yet that seems to be the most difficult thing to get anybody to do. We've tried here, just within some of our own people in asking for a crack at a systems analysis that absolutely feel absolutely flat. Couldn't do it. You made the comment that it didn't have to be complicated or it didn't have to be a big effort. But it seems to be the stumbling block for all of these big programs. I wonder if you have any thoughts as to why that is, because that seems to me to be the thing that's always lacking. It's always the Achilles heel of a program, that everybody has got their focus on the bits and pieces and lo and behold the thing falls apart because they don't all fit together. It's happened time and time again in major projects over the years, and yet that seems to be the place where

it's most difficult to get one's intellectual arms around it.

Over the years I've wondered why this is so difficult. I've had some ideas. Possibly it's the tunnel vision of the professionals who can only look at what they know very well and they just don't look on either side far enough or are not interested in it. It may be that their educations have been faulty in that regard and yet it seems to be the most critically absent element in any big project. Everything is all cut up into pieces and everybody has got a piece of it and then it doesn't all come together. I wonder whether you see any hope here of actually getting hold of this from that point of view. The appointment of a chief scientist perhaps might lead to that approach, but the very word "scientist" gives me a little bit of discomfort there because scientists tend to look more sharply focused at what they're interested in and ignore those things that they feel are not critically important to what their particular interests are, and I happen to come from a science background.

So, I would have been perhaps even more pleased to see now a chief scientist, but a chief systems engineer appointed. Do you think there's any possibility that -- I guess that person hasn't been

named yet or I don't know what's been written down in the way of qualifications that are being looked at, but it seems to me it's not a scientific problem, it really is a systems engineering problem that they have on their hands. I wonder if you've expressed any thoughts to DOE in that regard.

DOCTOR CANTLON: Yes. Well, as Warner mentioned, from our view first report we've observed the same criticism of the project. It was the absence of a sort of overall Gestalt of the thing, a systems view, conceptual design and so on that has been the weak part of it. We raised that with each of the OCRWM directors through the years. We have talked at great length to the M&O that was hired essentially to provide that synthesis.

To answer your question why it is that it's so difficult, I think part of it as you've indicated. You have individuals who are trained in discipline, in multi-disciplinary studies in any human activity are the most complicated and time consuming. They're much more costly to do. I've been involved in a number of them through my career and I must say none of them are easy and they're very costly to get the integration. It is a learning curve of getting the disciplines to talk to one another in language they

can actually use. When you now render it into models in which the models have to articulate with one another and then someone has to come in and simplify them to get enough capacity in a machine to handle the complexity of that operation, you've got another level.

So, I guess I would say I'm beginning to develop a degree of greater optimism than I've had that they, A, understand what the challenge really is, are beginning to put together the kind of people that can address it. Have they done it yet? No. The M&O people would tell you they're beginning now to really lay down an attack on the problem.

And then coming back to the earlier concept, and that is DOE as a totally unregulated agency entered the regulatory world naive as hell and, in a sense, let the regulation dictate what it was they were to do. I think that contributes to the difficulty they have had in bringing together this Gestalt and conceptual design. But I think the people who are in the chairs today, far better than any of their predecessors, understand what the challenge is and are, in fact, addressing it. So, I am beginning to get optimistic. I'm not yet optimistic, but I'm beginning to feel that I can see a degree of progress.

DOCTOR NORTH: I'd like to expand on Doctor Cantlon's answer with a few examples. In the area of performance assessment, we encourage them in our first report that this should be an iterative exercise. One can't expect to get these complex systems issues right the first time. You have to practice and determine by iterative attacks on the problem which are the most important issues and how to refine in the right details. We perceive that that is going along reasonably well now. They're beginning to make a good deal of progress in terms of how to integrate across the many geological issues and the engineered barrier issues as well.

The move to consider the multi-purpose container we view as an important step forward into the system's work. A year and a half ago we were criticizing them because we didn't feel they'd done a good job of the system's tradeoffs. They have presented us with analysis that is at least a good start on those issues and we now feel that what they need to do is to continue to do that analysis rather than to stop with what is in the request for proposal that they're about to put out. There may be substantial risk that the first MPCs will not be properly adapted for the disposal function, but that

then will need to be recognized early so that we can adapt the strategy accordingly.

So, we feel they're beginning to get the idea. They're beginning to make some progress and we're hopeful that they will continue and indeed accelerate in terms of having systems engineering and I'll call it top-down analysis as a way of focusing the decisions in the program so that they use the right scientific and technical information and not do it piece by piece, discipline by discipline.

COMMISSIONER ROGERS: I was concerned about your comments with respect to the cutbacks in testing programs. Do you see that as turning around? Are they beginning to turn that around?

DOCTOR NORTH: Yes. Listening to Doctor Dreyfus' testimony today, it's clear that even if they don't get expanded funding, it is their intent to address more of their resources to the funding of the needed science and engineering that is absolutely essential to proceed. So, this is a good sign.

COMMISSIONER REMICK: There's one thing I don't understand about the relationship between the thermal loading and the multipurpose cask. I understand that the question of thermal loading of the repository is extremely important from a lot of

geological, hydrology, all those type of things, but it seems to me that the cask, whether it's a large cask or a small cask on a macro scale, one matches the cask with -- or the canister and its overpack with the thermal loading by spacing. To me that doesn't seem like it's a problem. Is it the other problem that the thermal loading can affect what the canister should consist of? There's something I don't quite understand there.

DOCTOR CANTLON: The hydrologists in creating the model of what happens in the unsaturated zone, the heat from a high heat source will essentially reflux the water out of the unsaturated rock. That then will go up and condense and create essentially cascades of water coming down into the repository, and, if you now have a hot repository and have them spaced evenly, you'll heat the whole mountain up and that water will go up and leave the repository. That's the model. The modelers are saying that.

Now if you have very, very large containers that will generate high heat, if you pull them apart, then you get these little recyclings, and that's -- but, again, it's at a modeling level and the data look pretty convincing.

COMMISSIONER REMICK: -- by the decay of the fuel and so forth? I mean, there are --

DOCTOR NORTH: That's one dimension that can help.

DOCTOR CANTLON: That would be one, but --

COMMISSIONER ROGERS: Yes, but then there's the lifetime of the repository question there.

DOCTOR CANTLON: Indeed.

COMMISSIONER ROGERS: I mean, you know it's going to be hot for a certain couple hundred years, but then after that the spacing and so on and so forth really starts to take over and become very important, doesn't it?

DOCTOR CANTLON: Well, to get the hot repository you want to age the fuel to get rid of the high early peak and then pull the canisters in so you get uniform heating and drive the temperature above the boiling point of water and hold it there for nearly 10,000 years, if you design it properly.

COMMISSIONER REMICK: Are we talking about that much variation in a multipurpose canister?

DOCTOR CANTLON: Oh, yes.

COMMISSIONER REMICK: Because, I think there are limitations on transportation with the overpack for transportation on what you can carry. It

doesn't seem to me that there would be that great a variation in canister size.

DOCTOR CANTLON: They're talking about 21 fuel assemblies, which is a pretty good size container.

DOCTOR NORTH: 125 tons.

COMMISSIONER REMICK: But the other direction would be one fuel element, right?

DOCTOR NORTH: Yes.

COMMISSIONER REMICK: Between one and 21.

DOCTOR NORTH: Hauling them one unit at a time through the transportation link makes for very expensive transportation.

COMMISSIONER REMICK: I agree. So it's not one and 21. It's probably something in-between. How much variation in heat generation are we talking about here that would affect the local recyclings?

DOCTOR NORTH: Well, let me explain some of the issues involved.

COMMISSIONER REMICK: Yes, please.

DOCTOR NORTH: One of the things that we're concerned about is the alteration of the geochemistry. For example, as you boil that water out of the rock you leave certain salts behind in the fractures such that, if the water starts to drip down

that fracture at a later time when the repository is cool, it picks up some very corrosive materials that might then drip on the container. So, we're concerned that those issues should be understood and dealt with appropriately.

DOE's recent performance assessment looking at the container included scenarios all the way from the container lasts only a hundred years because of such corrosion processes at one extreme all the way to the container will last for a million years at the other extreme.

COMMISSIONER REMICK: So should I conclude one shouldn't decide about the MPC until all those are solved?

DOCTOR NORTH: What we are concerned about is that both the materials science research, the container materials, and the behavior in the altered zone, as they're calling it, that being a new term for what we used to call "near field," be well understood so that those scenarios have been appropriately evaluated and we have designed the full set of engineered barriers as well as possible.

COMMISSIONER REMICK: That tells me don't go ahead with the MPC at this time.

DOCTOR NORTH: Well, what it says is we

might want a flexible MPC strategy that can be suitably adapted. For example, we can put the right overpack on an inner wall that is compatible with a variety of overpacks and which has the flexibility to accommodate different designs with appropriate corrosion resistance.

DOCTOR CANTLON: See, there are possibilities that the initial MPCs which are driven, of course, because the utilities want to get out from under the burden, you know, those could be put into an underground MRS for a while and just well-ventilated for a hundred years.

COMMISSIONER REMICK: Why underground? Even simpler above ground, isn't it?

DOCTOR CANTLON: Well, it might be. Might be.

COMMISSIONER REMICK: I think it would be, wouldn't it?

DOCTOR CANTLON: Well, it all depends on where it is. If you're going to haul them out to the site -- the whole MRS issue, you know, is really up in the air now and it doesn't look like it's going to come any earlier than the repository at the rate they're going.

COMMISSIONER REMICK: Another question.

Explain to me percolation flux. I understand -- I know very little hydrology and geology, but I can picture measuring ground water travel times. I can out to 1,000 years either with post-activation neutron analysis or techniques that people use on a shorter period of time, so I think you can measure water travel time somewhat reasonably. But how do you measure percolation flux and relate that to some reasonable measure of how the water would travel over large distances?

DOCTOR NORTH: I think I can describe the problem. I'm not sure I can describe the solution. I think the character of the problem is that one number may not be enough. You may have a relatively wide fracture in one spot that acts as a shunt that takes the water down to repository depth relatively quickly where nearby the flow is through the matrix of the rock rather than the fracture and it may take 100,000 years.

COMMISSIONER REMICK: Isn't that true whether I measure percolation, flux, or ground water travel time?

DOCTOR NORTH: Well, you're in an unsaturated zone, so it's a very inhomogeneous kind of a medium.

COMMISSIONER REMICK: That I understand, but how does percolation flux solve that problem? It seems to me that's a problem, I agree, but how does -- there's something I'm missing.

DOCTOR NORTH: I think what we're looking for is a set of modeling tools that will allow us to deal with the unsaturated zone geohydrology such as we find it.

COMMISSIONER ROGERS: Well, isn't the issue that if you're talking about ground water travel time you're talking about travel time, period?

DOCTOR NORTH: Yes.

COMMISSIONER ROGERS: And anything you can possibly measure, however small. If you're talking about flux, you're talking about quantity, and so that's a different kind of measure.

DOCTOR CANTLON: The point variability is enormous.

COMMISSIONER REMICK: Quantity per unit time, right?

COMMISSIONER ROGERS: Yes, but, I mean, it's quantity. But the point is that it's a measure of how much gets out, not does any get out, and how soon is the earliest precursor of a larger flux, you know, get out. I mean, when you have travel time the

first you can detect, I take it, is the travel time when you first detect something. And you're not measuring flux. You're not measuring quantity. You're not saying there's a lot of this stuff coming out. It may be a few molecules, but you've detected it, and so travel time is just a point measurement whereas flux gives you essentially more of a sense of what the quantity is that's coming out.

COMMISSIONER REMICK: Yes, but I would think flux would be a very local measurement. It seems to me the flux would --

COMMISSIONER ROGERS: Well, they're all going to be local measurements, aren't they, I mean, in a sense? But if you're talking about just point by point measurements of travel time and you've got a bunch of numbers there, that still may not be any quantity of anything coming out. You've just -- you may be able to detect the first arrival, but you haven't said how much is coming along with that.

DOCTOR CANTLON: Depending on where it's going and where it's been. It's an extremely complicated problem of trying to bet at it, unlike in the saturated zone where you're really looking at ground water travel time from a repository where you have toxic or hazardous materials in one point.

You're not trying to calculate where it's going. In a saturated zone you've got a very, very different thing, and that's I think where your language came from. Everybody was thinking about a saturated zone problem.

COMMISSIONER REMICK: No, I agree with that. But what I don't understand is measuring percolation flux, unless I can't visualize what one does in that, how you're going to do that. What we're worried about is release, I assume, from the site where the public might be, how we're going to do that over great differences and have any meaning to it, because it seems to me it would vary.

DOCTOR CANTLON: It would vary all over the map.

COMMISSIONER REMICK: And so I don't know physically how we're going to do it in a meaningful way.

DOCTOR NORTH: Well, we may have to look at fracture flow and matrix flow as different phenomena and have models that will deal with each of them and deal with them in different regimes. Nevada in geological history, recent geological history, has been much wetter than it is at the present time. Now what does this mean in terms of flow through the

unsaturated zone?

COMMISSIONER REMICK: Good question. Good question. Okay. I'll talk to our hydrologist and see if I can't get a better understanding of how we're going to do this.

I don't want to belabor the issue of our involvement and the strategy. I think that's been elucidated by Commissioners Selin and Rogers. We just don't do that, and so I don't want to belabor it. We respond.

But you brought up another point which I think is related. You said something about, I think, you recognize that Part 60.113 has flexibility, has other words, "or as the Commission might otherwise decide" or something like that. But you asked the question, "At what point does the NRC identify those goals," and I think the same answer applies there. It seems like it's an infinite number of possibilities that we might hypothesize, what might be needed and so forth, so once again I would just stress that DOE should bring us proposals that we can consider and give an answer to, hopefully in a timely manner, and that's the way we have to respond.

We can't anticipate all the possibilities that DOE might face and the possible solutions. It

would be a never ending process. It may be unfortunate that we are one of those "bring us a rock and we'll tell you if it's the right rock and, if not, bring us another rock." We're sometimes criticized for that, and rightfully so, but it also makes some sense that people have to bring us proposals that we can analyze and hopefully get an answer to.

DOCTOR NORTH: To me this is a very important insight that I've learned from this meeting, that perhaps we as a Board should be stronger in recommending to DOE -- our job, after all, is to criticize their program -- that they should take a more proactive role in coming to you with, let me call it "strategy," instead of the details at the level of study plans.

CHAIRMAN SELIN: That's true as long as there is at the end of their proposal on the table to which we can respond on an open ended proposition.

DOCTOR NORTH: Yes.

CHAIRMAN SELIN: You know, we're normal folks. We have a lot of people who find this really interesting. They love to start going back and forth with details, but that's not our job. We have to guard against being coopted, being part of the piece, et cetera. We're already in a very tricky, very

sensitive situation.

COMMISSIONER REMICK: That's all I had. Thank you.

CHAIRMAN SELIN: Let me go back to a point that Commissioner Remick raised. I now think of a better way to state my question to you. It would be interesting, you might find it a useful way to pose the question on the multi-purpose canister, about whether there's likely to be any benefit to even include the eventual repository use in the design at this point, whether there's enough information to make that useful or whether it's just likely to take enough time and effort that should just be left for another stage because it's very clear what one would do in terms of a dual purpose canister. One can talk about the possibilities of overpacks, but trying to analyze a non-defined situation has an enormous possibility for delay.

Now, it's not our business whether that's done or not, but it is our business that the fuel, even at the power plants, be taken good care of and if we see people heading to an approach that's likely to slow things down, I think it's reasonable for us to say, "What are you doing? Is there a likely benefit to making the design and the analysis much more

complicated?" Were you to undertake that question, that might not be a bad way to pose the issue.

DOCTOR CANTLON: If the risk proves to be a warranted risk, one that pays off in the end, the American taxpayer and the utilities and everybody else will be substantially advantaged. So, it's probably a warranted kind of risk, providing -- you know, accepting the fact that DOE feels obligated that it must move by 1998. If you look at European and other countries where they really built in interim storage in their system to begin with, none of them are under this kind of a time line. So, we end up with a much more complicated challenge on our hands and this, I suppose, warrants some risk taking which DOE appears ready to do.

CHAIRMAN SELIN: Well, I also heard Doctor North's answer as saying one might not even know how to pose the question about what features would be called for in order to be able to comply with an ultimate repository when the design is so early. I hate to be this responsive to a question that has been asked, but he's almost trying to kill three birds with one stone, two of whom are in one thicket and one is flying around we don't know where.

DOCTOR CANTLON: Well, the primary issue

is canister size.

CHAIRMAN SELIN: Yes. You sort of broached the question, so let me ask you directly. What reaction, if any, would you have to the concept of first doing an MRS and then eventually doing a repository in Nevada if the law allowed that, since that's been raised?

DOCTOR CANTLON: MRS in Nevada?

CHAIRMAN SELIN: Yes.

DOCTOR CANTLON: It makes imminent sense to everybody except Nevada.

CHAIRMAN SELIN: Well, specifically Senator Johnson has raised the issue and Doctor Dreyfus was not prepared to answer that. But from a technical, scientific, et cetera --

DOCTOR CANTLON: Well, you'll recall from our testimony last year that we raised the question we shouldn't be in a big hurry to close the repository, that a great deal of reassurance will be given to everyone if we can monitor those canisters out into the future substantially longer than the 50 years originally visualized. So, in a sense that makes it an underground MRS.

So, the difference between a repository and an underground MRS at a licensure level is, I

think, one of the things that makes a difference. You wouldn't necessarily have to provide confirming data on the behavior of the site should half the canisters leak or ten percent of them leak if you were going to have the capacity to put it in and take it out.

CHAIRMAN SELIN: Let me see if I understand it. You're, in effect -- I mean I'm putting words in your mouth, so make sure these are the right words. You're in effect defining an MRS as a reopenable or --

DOCTOR CANTLON: Non-closed.

CHAIRMAN SELIN: -- non-closed repository, not a repository that adds features that might be appropriate for an intermediate period, with such features as institutional things or active ventilation or things like that. You're talking about basically the same design, just not sealed.

DOCTOR CANTLON: No. If you were really going to operate it for a long time, you'd probably want some additional ventilation. You'd want long-lived ventilation instead of short-lived ventilation. Our Board has not discussed this. So, I'm a little hesitant to get into any details.

DOCTOR NORTH: We would be eager to see DOE's analysis on these issues and we have not seen

any of them. It is certainly the case that as the fuel is aged and becomes cooler some of the problems of repository design become more tractable. Now, one could cool the fuel underground or one could have an MRS on the surface on the surface at that site, which would eliminate the need for further transportation. We think that it would be useful for those concepts to be explored. It's hard for me to judge how much it's appropriate for DOE to do that under the existing state of the law. But I certainly welcome the discussion that apparently occurred at the recent hearing between Senator Johnson and Doctor Dreyfus.

CHAIRMAN SELIN: I was just trying to figure out what an intermediate storage at a repository meant, whether it was just not closing the site irrevocably or whether it was using features, adding features that one might use for 100 years that you couldn't use for 10,000 or 20,000.

DOCTOR CANTLON: There are a number of things that one could visualize. For instance, you might want a little bit better drain control in the floor of the drifts pretty much like some of the low-level waste containers in which you have total containment should there be a breach. So, it could have design features.

CHAIRMAN SELIN: Let me go on -- if we can talk strategy, we can then even go further and talk philosophy. We've been admirers of your reports and at the same time have sort of wrung our hands that they seem to have had so little impact on the project. Is there some understanding of why they've had so little impact? More precisely, whether there's any reason to believe that things will be different now and they'll have a greater effect?

DOCTOR NORTH: I'm not sure I would agree with your premise. It seems to me we've had a lot of impact on their program. We can certainly identify issues and areas where our advice has not been heeded. But there are many, many others where our advice has been heeded. The issues have been picked up and have become central issues within their program and in many instances they have taken a suggestion from ours and that has become the character of the new program. For example, the exploratory studies facility, which used to be called exploratory shaft facility.

DOCTOR CANTLON: I would say that we can identify a number of areas where they clearly have listened to what we've said. So, the areas where they have gone their own way, maybe the most dramatic one was on tunnel size where we had a clear difference of

opinion. This all depends on one's attitude about whether the repository is going to be there or not. We felt it would have been absolutely meeting the requirements of assessment to use a smaller diameter tunnel. On the other hand, if you're going to drill a tunnel and it's going to be successful as a repository, it might be big enough to handle that.

But the other areas, we criticize them on systems. They have aggressively addressed the systems in again a kind of an iterative fashion. So, I think as one looks at the major questions we've raised, we've seen the program change. Now, a good bureaucrat makes changes on his own initiative and we do our best job if they invent solutions that coincide with our criticism. So, I guess I don't worry too much about whether or not DOE jumps through each one of the hoops. After all, we're a critic, an assessor, not a manager. They have many, many tough management issues. I've sat in management roles a good part of my life and the manager is very, very different from the auditor.

CHAIRMAN SELIN: I apologize for the tactless way in which I put my question. Let me rephrase it.

You clearly had a big impact on the design

of the facility and a number of technical and tactical questions. But the three grandest questions you have come at again and again without their responding. Number one is why does so little money go into the hole in the ground? Number two is why don't you distinguish between what it takes to characterize the site versus to build a site, which is not exactly the same question. And number three, why don't you do an overall systems analysis instead of breaking it off into pieces, which as several of you said took not the laws that nature has given but Part 60 has given and worked against that. Those have been, in one way or another ever since your first report, ultimately, really infinitely sensible things.

My attempt to be complimentary clearly backfired a little bit, so we'll start again. But is there any reason to believe you will get different responses to those three questions now?

DOCTOR CANTLON: Yes. I must say I listened to Doctor Dreyfus' testimony today and I think he addressed each one of those three issues. They are going to aggressively now look at site characterization and put the licensure set of issues secondarily. That we've argued from the beginning. Their systems work, as I was commenting in more detail

earlier, we think is now on a trajectory of coming to closure in an interactive fashion. He explicitly told the Appropriations Committee today in the hearing that they were shifting more of the funding into the direct science and technology issues and diminishing the kind of interaction they have with the regulatory side of the issues. So, I guess I would say they've now invented the solution and that's great.

DOCTOR NORTH: We have brought up the recommendation for a management review of the overall program, not just the project, in part because we don't feel we're terribly well qualified to deal with the first two issues on your list which really transcend the kinds of scientific and technical issues that our Board is well qualified to deal with. We're encouraged by the recognition that these are indeed problems by Doctor Dreyfus and his new management and it would be wonderful if those problems get solved reasonably quickly. We're not optimistic that they can be solved in months or even a few years. It's going to take some dramatic restructuring of the program, we think, to do that. But it's really not our expertise how that restructuring should be carried out. That's really a management task.

COMMISSIONER ROGERS: I wonder if you

could just say a little bit more about your recommendation that NRC proceed to amend Part 60 before the National Academy report is in? It sounds a little bit contrary to the general approach that you're suggesting and everything else in your report, namely that we plow ahead with a process that takes a couple of years to do without having in hand the NAS report which ought to be available within that time. I feel a bit uncomfortable with that recommendation.

DOCTOR CANTLON: Well, I guess what we're saying --

COMMISSIONER ROGERS: I mean I don't know exactly what you're referring to in the changes.

DOCTOR CANTLON: What we're saying is that if you put each one of these in sequence, you've now pushed the regulatory situation quite a ways into the future. You're at least two years away probably. We were just wondering whether you couldn't have now that you could be responding to the 1992 Act which is addressing site characterization for Yucca Mountain, if you couldn't be a lot more explicit in site assessment as opposed to choosing sites, that there are ways that things might be addressed differently. The language, for instance, of the total system being the licensable unit, the engineered and the non-

engineered, we thought some thinking internally might actually speed that process, while if you have nothing done beforehand you wait until NRC is done and EPA is done and now you've gotten it. You're three agencies later and we thought maybe you could save some time by giving that --

COMMISSIONER ROGERS: Well, some kind of a parallel effort that doesn't necessarily lead to a final rule before --

DOCTOR CANTLON: Oh, absolutely.

COMMISSIONER ROGERS: Is that really what you're talking about?

DOCTOR CANTLON: Oh, absolutely. Just thinking through the different challenge that you're now posed with as opposed to when the original regs were written.

DOCTOR NORTH: The language that is in Doctor Cantlon's statement is that the Board encourages NRC to develop needed guidance or amendments now rather than waiting until completion of the reviews that are in process at this point. We're urging you to anticipate, not make a final ruling of any kind. Clearly you don't want to do that.

COMMISSIONER ROGERS: Yes, but that guidance has a very heavy effect.

DOCTOR CANTLON: Yes, you have to be very careful, obviously. The public is looking over your shoulder.

COMMISSIONER ROGERS: I mean, that guidance is something that people in general take very, very seriously, so it's not a just kind of general admonition to do good. There's meat in the guidance, usually.

DOCTOR NORTH: Well, in some cases you may want to encourage dialogue among a number of organizations and affected parties on the issues to try to clarify the situation before you commit yourself in any formal way.

COMMISSIONER ROGERS: Well, that sounds very reasonable. Thank you.

COMMISSIONER REMICK: Any guess on when the Academy study will be out so we have that in sight?

DOCTOR CANTLON: Not from me.

COMMISSIONER REMICK: You clarify one issue, a question I had about the size of the boring machine, but you made a statement in your testimony that was something like that the approach being used by DOE is not consistent with modern mining technology or underground construction. Was that only the size

or was there more to that?

DOCTOR CANTLON: No, no. That didn't refer to the size, although that also would be true that they would go to the smallest size tunnel that would do because they're stronger and a whole lot of other reasons, but it really has to do with the way you operate and contract with it when you have that kind of a valuable machine sitting there. When it's sitting it's using money, and so there are approaches to managing those things. For instance, you could run three shifts instead of one shift. You'd set it up so that you'd have a very rigorously defined way in which the scientists would come in and get at it and you'd design ways in which they can get at it without having the machine shut down, as long as it can be made safe.

But it really dealt with the experts that we had who manage underground things like metros and all those good things, irrigation systems, and they were just surprised at the nature of the contracting and the lack of sufficient rewards and so on for efficient use.

DOCTOR NORTH: For example, many underground construction operations are set up so that the construction firm owns the machine. If something goes wrong with the machine, they are under great

incentive to get it fixed and get it operating. In this situation, DOE is going to own the machine and so the contractor is much less motivated to diagnose problems and get them fixed as quickly as that is possible.

COMMISSIONER REMICK: The three shift versus one shift, is that a budgetary type thing?

DOCTOR CANTLON: Oh, sure.

COMMISSIONER REMICK: A limitation?

DOCTOR CANTLON: That old water meter really runs when you've got three shifts going.

DOCTOR NORTH: And we have that problem right now with the LM300 drilling rig, very expensive state-of-the-art machine which they at this point only have money to run on one eight hour shift a day. Now we are urging that that problem not be replicated with respect to the tunnel boring machine.

COMMISSIONER REMICK: If DOE was successful in getting additional budgetary that they've asked for, would that help solve that problem?

DOCTOR CANTLON: Yes.

COMMISSIONER REMICK: So it's purely budgetary? That's why DOE --

DOCTOR CANTLON: No, no, there's -- and they are addressing the question of contracting styles

and so on, so, no, it's more than simply money. It's how they spend that money.

COMMISSIONER ROGERS: There is a cautionary note there, though, I think, that has to be exercised. My recollection is, on a visit that I had to the Canadian laboratory, underground laboratory, I believe that's where I heard this a couple years ago, that they pointed out, I think, that as they did drilling there that they could not allow the contractors to follow the customary mining practices where, you know, you've got to get through a certain number of feet per day and so on and so forth however you can because they felt that the condition of the walls that was very important for their purposes could not be maintained under the normal style of underground mining and that they had to therefore impose additional requirements that would not be acceptable if you were simply going to go and drill for -- you know, if you were creating a mine for ore or something of this sort.

DOCTOR CANTLON: I think this was a drill and blast technology.

COMMISSIONER ROGERS: Well, yes, but it was even more than that, I think, so that the condition of the walls was very important in their

view and that they had to pay more to get the kind of condition that they wanted, so I'm not sure that just simply taking over customary mining practices would in fact be acceptable without some modification there.

DOCTOR CANTLON: Yes. We would agree.

CHAIRMAN SELIN: I gather you'd feel better if they started with that and had specific reasons for falling off it instead of just --

DOCTOR NORTH: Yes, and we asked for those types of reasons early in the program. That was one of the reasons why they decided they would not pursue shafts with drill and blast excavation, that the tunnel boring machine offered many advantages in terms of the character of the walls.

CHAIRMAN SELIN: Okay. Well, you failed only in one aspect. You have not proved to us that you're incompetent to ask management questions to go with the technical questions, but otherwise we thank you very much for an excellent session and apologize a little bit for asking questions that we really should put to DOE as well.

Thank you for coming in.

DOCTOR CANTLON: Thank you.

(Whereupon, at 3:25 p.m., the above-entitled matter was adjourned.)

CERTIFICATE OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING BY NUCLEAR WASTE TECHNICAL REVIEW BOARD (NWTRB)

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: MARCH 14, 1994

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcript is a true and accurate record of the foregoing events.

Reporter's name: Peter Lynch

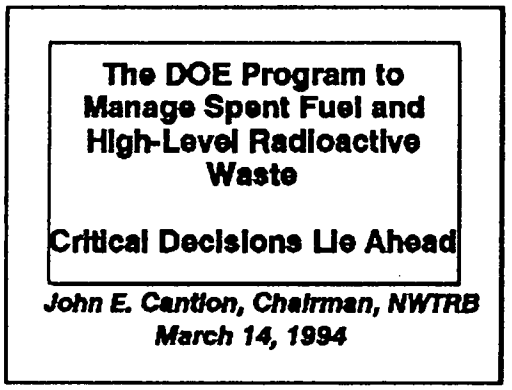
The Department of Energy's Program to Manage Civilian Spent Fuel and Defense High-Level Radioactive Waste: Critical Decisions Lie Ahead

Dr. John E. Cantlon
Chairman, Nuclear Waste Technical Review Board

U. S Nuclear Regulatory Commission

March 14, 1994
Rockville, Maryland

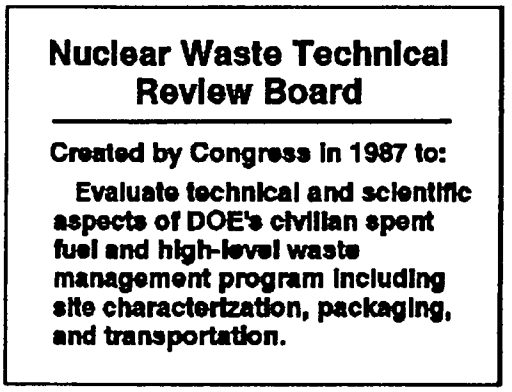
Viewgraph 1



Good afternoon, ladies and gentlemen.

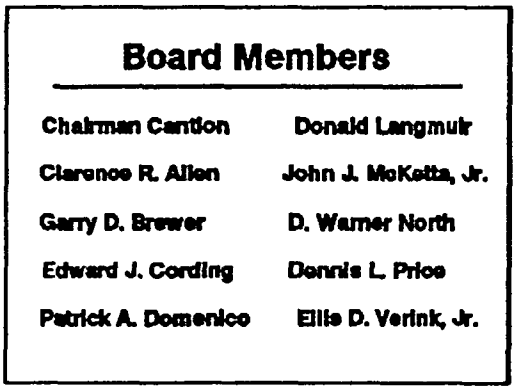
It is a pleasure to be here today. My name is John Cantlon, and I am Chairman of the U. S. Nuclear Waste Technical Review Board. Accompanying me is Board member Warner North. Approximately one year ago, we talked to you about the Board and its perspectives on the Department of Energy's (DOE's) program to manage civilian spent fuel and defense high-level waste. Today, we would like to update you on progress during the past year and on the Board's views regarding some of the key decisions we expect the DOE to be facing during the coming year. Then, we will provide some observations on the NRC's role in this effort, and will close our remarks with a brief synopsis of the Board's latest report to Congress and the Secretary of Energy.

Viewgraph 2



The Nuclear Waste Technical Review Board was created by Congress in the 1987 Nuclear Waste Policy Amendments Act and is charged with evaluating the technical and scientific aspects of the DOE's waste management program. This includes site-characterization activities and activities relating to the packaging and transport of high-level radioactive waste and spent nuclear fuel. As you are aware, the Board is an independent agency within the federal government, not part of the Department of Energy or any regulatory agency.

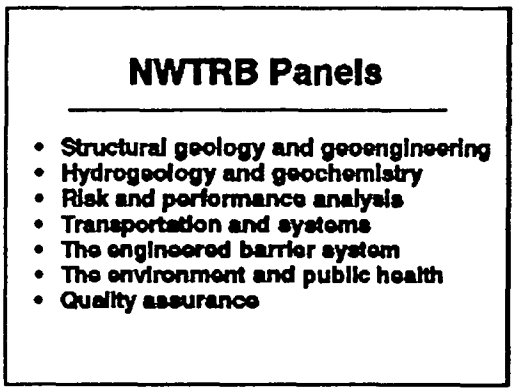
Viewgraph 3



Members of our Board are nominated by the National Academy of Sciences and are appointed by the President. I have served from the Board's creation and became its second chairman two years ago. Currently, ten of the Board's eleven memberships are filled. I have listed the members for you on this viewgraph. We all serve part time.

The Board is organized into seven panels. They are shown on the next viewgraph.

Viewgraph 4



Since the Board's inception, and especially during the past year, the Board has witnessed considerable progress in the civilian high-level waste management program. For example, after several delays, construction of the underground excavation of the exploratory studies facility at Yucca Mountain has been started. Also, the management and operating contractor is beginning to integrate the DOE's efforts in all the components of the waste management system — storage, transportation, and disposal. The Board strongly believes the momentum of these activities should be maintained.

The coming year promises to be one of additional progress, and also one during which many important decisions will be made. Some of these decisions are the direct responsibility of the DOE. An example is the decision whether to pursue development of a multipurpose canister design. Other decisions will involve interactions with other bodies, especially the Nuclear Regulatory Commission. Here, an example would be a decision whether to amend the siting guidelines of 10 CFR Part 960. Still other decisions, for example regarding the administration's proposal to Congress for disbursing Nuclear Waste Fund receipts, will not be made by the DOE, but the civilian high-level waste management program will be strongly affected by them.

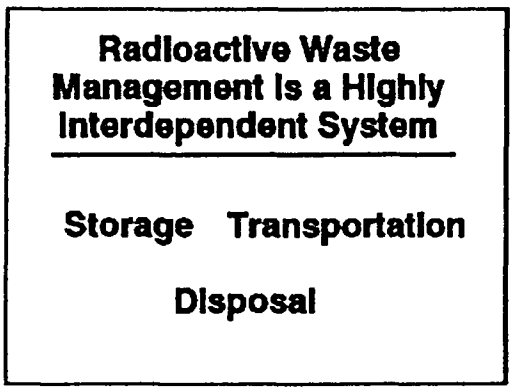
The Board has been encouraged by Secretary O'Leary's recent efforts to improve the program. For example, she has created the position of chief

scientist; she is proceeding with a financial and management review of the Yucca Mountain project; and she has taken steps toward broadening stakeholder participation in the program. On October 7, 1993, Dr. Daniel Dreyfus was confirmed as director of the Office of Civilian Radioactive Waste Management (OCRWM).

At our Board's January 1994 meeting, Dr. Dreyfus listed several short-term goals the OCRWM program had set for itself. These include "returning the emphasis" of the repository program to science and site characterization, "institutionalizing stakeholder interaction," and proposing a new funding mechanism to increase monies going to the OCRWM program. To achieve this latter goal, the DOE recently requested the creation of a special fund to give the OCRWM increased access to revenues coming into the Nuclear Waste Fund.

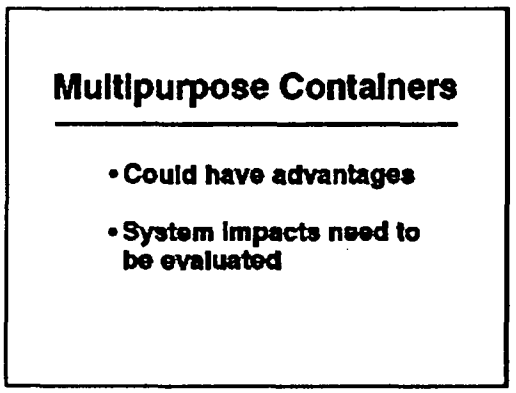
In the Board's view, relatively too little funding has been going to the direct costs of the scientific research and engineering activities essential to characterizing the Yucca Mountain site and to laying a sound basis for the waste management system. Based on its four-year review of the program, the Board believes that simply increasing the program's funding will not ensure that adequate funds will be allocated to the most important site-characterization activities or to other critical research. In a February 1994 letter to Congress and to Secretary O'Leary, the Board repeated its earlier recommendation for an independent review of the OCRWM's management and organizational structure to be initiated as soon as possible. The Board believes that this review can and should be undertaken without slowing the momentum of important site-characterization activities currently under way at Yucca Mountain. Whether the program budget remains level or is increased, program management should ensure sufficient and reliable funding for site characterization, performance assessment, and systems studies, which are critical for integrating the program.

Viewgraph 5



The Board believes that the management of spent fuel and high-level waste, that is, the transport, storage, and disposal of waste, should be viewed as a system whose separate elements and subelements are highly interdependent. The Board has been concerned that DOE decisions about some components of the overall waste management system are being made without adequate regard for the effects those decisions could have on other system components or on the entire system. In our presentation to you last year, we discussed the Board's views on several of the major issues facing the program at that time. Today, I would like to update you on the Board's views on two of those subjects: development of a multipurpose canister and research on engineered barriers. Then, I would like to summarize the conclusions and recommendations of a recent Board report on underground exploration and testing at Yucca Mountain. Finally, I will close my remarks with some observations about the NRC's regulations for a high-level waste repository.

Viewgraph 6



First, the DOE is now examining the feasibility of a concept it calls the multipurpose canister (MPC). This concept involves permanently sealing spent fuel in a canister at the reactor where the spent fuel is generated. During all subsequent storage, transportation, and disposal operations, spent fuel would remain sealed within the MPC. If necessary, overpacks or casks could be used for shielding and protection during storage or transportation, or to provide corrosion resistance after disposal. But this is not simply a storage-related decision.

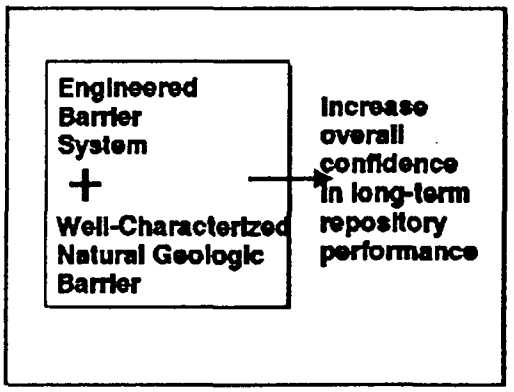
Development of an MPC has potential ramifications for a decision about the thermal loading of a repository, and the thermal loading decision, in turn, will affect how much waste can be put into one repository; how the waste will be loaded into canisters; how long waste must be aged prior to disposal; how the waste is packaged, handled, transported, and emplaced in the repository; and how and when the drifts are back-filled. It also will

affect how much the overall waste management program will cost. Therefore, MPC development decisions, as well as the decision about the thermal loading, should be approached carefully, especially since future underground thermal tests will be required to support a thermal-loading decision.

The DOE has evaluated alternative MPC designs and has studied the effects of those designs on the rest of the waste management system. In general, large MPC designs offer economic advantages, but often affect other parts of the waste management system, such as the repository design. The Board believes that a systems analysis is an important prerequisite to the final design of an MPC. Such an analysis, which does not require a large-scale effort, should assess the trade-offs of alternative concepts for the major parts of the system — storage, transportation, and disposal — and provide a technical basis for decision making. Given the uncertainties associated with disposal (e.g., the thermal load of the repository), the question of how a true multipurpose canister can be made a reality is a difficult one. Nonetheless, an attempt at least should be made to address this issue in a substantive way, given present technology and what is known about the repository and the site.

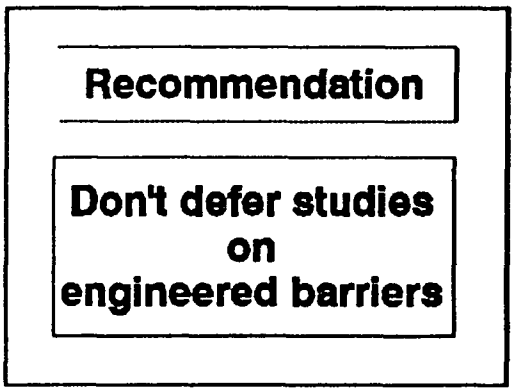
A second issue that concerns the Board is the low priority the DOE has placed on studies of engineered barriers.

Viewgraph 7



A well-designed system of engineered barriers working together with well-characterized geologic barriers will increase our confidence in the long-term performance of a repository. For this reason, the Board has recommended that the DOE place greater emphasis on the engineered barrier system as a way to build redundant radionuclide containment into the repository design. This redundancy, in our view, should help add confidence about repository safety, especially in the face of the inevitable uncertainties associated with predicting natural geologic, hydrologic, and climatologic processes far into the future.

Viewgraph 8



With respect to designing the waste package itself, the Board believes that extensive materials testing is required. Of greatest importance is determining how various materials will hold up over long periods of time under possible underground conditions. Despite this strong and repeated Board position, the DOE has, until recently, chosen to reduce the funds going to the waste package development program. We believe it is unwise to defer studies in this area. As the DOE reviews its budget priorities during the coming year, the Board recommends that increased funding be directed to engineered barrier development.

In October of last year, the Board published a report titled Underground Exploration and Testing at Yucca Mountain. In that report, the Board expressed its strong support for the DOE's plan to rapidly construct an underground tunnel to identify and provide access to potentially significant geologic features of the Yucca Mountain site. It has long been the Board's view that the significance of some geologic features, especially those that are nearly vertical, cannot adequately be evaluated using surface-based drilling. This is because there is only a small likelihood that vertical boreholes drilled from the surface will intersect such structures at repository depth. A bored tunnel, however, would cross such features perpendicularly, allowing physical access to them for visual examination and scientific testing at the repository level.

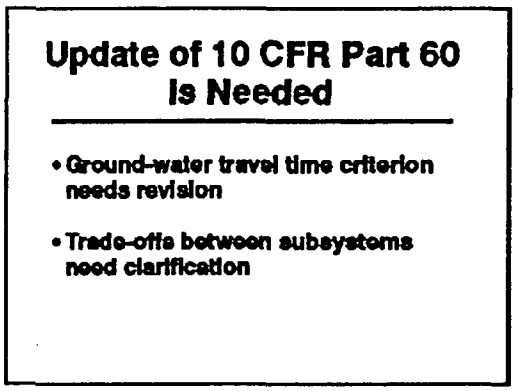
The Board also recommended that the DOE should reinitiate its underground thermal-testing program as soon as possible to allow the development of instrumentation and procedures and to gain as much testing experience as possible prior to initiating testing in the core test area. The Fran Ridge large block heater test is a start, but the program currently lacks sufficient field testing experience, proven instrumentation for underground testing, and a well-developed testing strategy. As I noted earlier, a significant issue currently facing the Yucca Mountain project is a research base for determining the most appropriate thermal loading for a repository. A well-developed program of thermal testing is needed to support a thermal-loading decision.

The Board found that the lack of a testing strategy was also evident in other areas of proposed underground testing. The Board recommended that existing plans should be expanded to produce a comprehensive strategy for exploration and testing. Priorities and goals should be based on specific intermediate goals, should be consistent with the scientific needs of site characterization and repository design, and should be consistent with realistic funding expectations.

Finally, the Board found that the DOE's plans for construction of the exploratory studies facility are not consistent with practices in the underground construction industry. The Board recommended development of a more efficient system for managing design and construction of the facility that contains greater accountability and incentives for cost-effective and timely performance of the contractors.

Let me now briefly discuss an issue of more direct concern to the NRC — the NRC's regulatory requirements for the Yucca Mountain repository.

Viewgraph 9



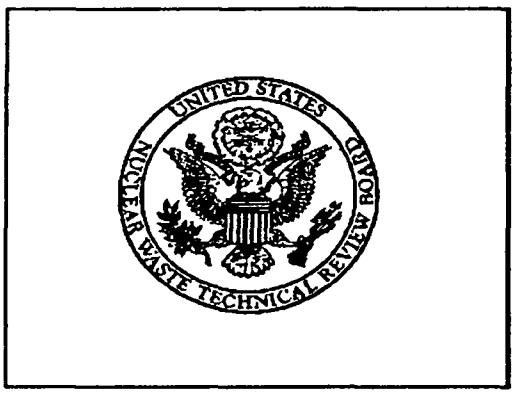
The Board is aware that the Energy Policy Act of 1992 calls for a general review of repository regulatory requirements, including those of the NRC. However, any needed amendments to the NRC's regulation are to follow completion of the reviews by the National Academy of Sciences and the Environmental Protection Agency. Several years could be required to complete those reviews. Meanwhile, the repository program is having difficulty implementing certain aspects of the NRC's regulations, and some NRC criteria may actually be unnecessary for repository safety.

The most obvious example is the ground-water travel time criterion of § 60.113. The DOE is now conducting studies to estimate ground-water travel time even though many hydrologists do not believe it is a very meaningful indicator of the suitability of the site. At Yucca Mountain, other parameters, such as percolation flux through the unsaturated zone, might be better measures of the waste isolation capabilities of the site.

Another example of less immediate urgency, but possibly of greater significance as the repository design matures, is the provision of § 60.113 that allows alternative numerical goals for the performance of the major subsystems of a repository. It is not clear at what stage in the licensing process the NRC would approve or specify alternative goals, nor is it clear how the NRC would decide what those goals should be.

It has been more than ten years since the NRC's regulation was promulgated. In those areas where there are known problems with the regulations, the Board encourages the NRC to develop needed guidance or amendments now, rather than waiting until completion of the reviews of the National Academy of Sciences and the Environmental Protection Agency.

Viewgraph 10



In summary, the Board expects a number of important decisions to be made, at least in a preliminary way, in the year ahead. These decisions have the potential to significantly move the program forward. In some cases, the Board has reservations about the adequacy of existing information to support decisions, and review of this information base will be a significant area of investigation by the Board during the coming year.

Dr. North and I will be happy to respond to questions.

Nuclear Waste Technical Review Board

Letter Report to Congress and the Secretary of Energy

February 1994

Nuclear Waste Technical Review Board

UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
1100 Wilson Boulevard, Suite 910
Arlington, VA 22209

February 24, 1994

The Honorable Thomas S. Foley
Speaker of the House
United States House of Representatives
Washington, D.C. 20515-6501

The Honorable Robert C. Byrd
President Pro Tempore
United States Senate
Washington, D.C. 20510-1902

The Honorable Hazel R. O'Leary
Secretary
U.S. Department of Energy
Washington, D.C. 20585

The Nuclear Waste Technical Review Board issued its *Special Report to Congress and the Secretary of Energy* almost one year ago. Since then, the Department of Energy's (DOE) civilian radioactive waste management program has made progress in many areas. After several delays, underground excavation of the exploratory facility at Yucca Mountain has begun, and the management and operating (M&O) contractor is beginning the integration of the entire civilian radioactive waste management system — including storage, transportation, and disposal. In addition, the Board has been encouraged by Secretary O'Leary's recent efforts to improve the program. Specifically, she has created the position of chief scientist to help integrate important scientific and technical activities at the Yucca Mountain site; she is proceeding with a financial and management review of the Yucca Mountain project in Nevada; and, through a recent initiative, she has taken steps toward broadening stakeholder participation in the civilian radioactive waste management program. Finally, she moved swiftly to find a permanent director for the program. The Secretary's choice for director of the Office of Civilian Radioactive Waste Management (OCRWM), Dr. Daniel Dreyfus, was confirmed by Congress on October 7, 1993.

At the Board's January 1994 meeting in Washington, Dr. Dreyfus made a presentation to the Board on behalf of Secretary O'Leary. During his remarks, he outlined current program goals and indicated he would soon be inviting comments on how to improve the current focus of site-characterization efforts at Yucca Mountain and how to shape the program to accommodate future budget realities. It is apparent that within only a short time, the director and his staff have succeeded in recognizing many of the key issues that need addressing in the coming months. In an effort to provide timely and constructive comments on important programmatic issues, the Board has decided to submit this short letter report, which contains three recommendations.

Telephone: 703-235-4473 Fax: 703-235-4495

Summary of the recommendations

At the January meeting, Dr. Dreyfus listed several important short-term goals the OCRWM program had set for itself. These include "returning the emphasis" of the repository program to science and site characterization, "institutionalizing stakeholder interaction," and proposing a new funding mechanism to increase monies going to the OCRWM program; Dr. Dreyfus said that, once the future budget profile of the program had been determined, program activities would be "recast to use those resources efficiently." In light of these program goals, the Board would like to make the following recommendations.

1. The Board repeats the recommendation it made in its *Special Report* in March 1993: *an independent review of the OCRWM's management and organizational structure should be initiated as soon as possible.* The problems created by OCRWM's large and unwieldy organizational structure, as well as by previous management decisions, should be addressed sooner, rather than later. The Board believes that this review can and should be undertaken without slowing the momentum of important site-characterization activities currently under way at Yucca Mountain.

Now that the Secretary has requested the creation of a special fund to give the OCRWM increased access to revenues coming into the Nuclear Waste Fund, an independent review is needed more than ever. This is because relatively too little funding has been going to the direct costs of the scientific research and engineering activities essential to characterizing the Yucca Mountain site. Based on its four-year review of the program, the Board believes that *simply increasing the program's funding will not ensure that adequate funds will be allocated to the most important site-characterization activities or to other critical research.* Simply increasing funding also will not ensure that the program will meet its current schedule deadlines. The Board believes that a timely, independent review of the OCRWM's management and organizational structure will provide an excellent basis for the needed reshaping of the program, regardless of future funding scenarios.

2. The Board believes that it is vital to maintain the momentum of current site-characterization efforts and recommends that, *whether the program budget remains level or is increased, program management should ensure sufficient and reliable funding for site characterization and performance assessment, which is critical for integrating the program.* During the past three years, the OCRWM has cited a lack of funds as the reason for postponing or slowing critical site-characterization activities, including underground excavation and surface-based testing, as well as research in other important areas. At the same time, however, the number of people working on the program has continued to grow. Program managers need to place a greater emphasis on a number of critical activities, including underground excavation, surface-based testing and mapping, thermal testing, and waste package development. At the very least, sufficient monies should be guaranteed for those activities that will facilitate the identification as soon as possible of any obvious features that would disqualify the site.

3. The Board recommends that the OCRWM *build on the Secretary's new public involvement initiative by expanding current efforts to integrate the views of the various stakeholders into the civilian radioactive waste management program during the decision-making process — not afterward.* Because both the lay and the scientific communities have important roles to play in the evolution of this program, the Board hopes that the OCRWM's recent stakeholder workshops are only the first in a series of constructive interactions with OCRWM stakeholders. Furthermore, the Board encourages the DOE to establish a *long-term framework* for constructive interaction with OCRWM stakeholders on important high-level waste management issues.

The following discusses these three recommendations in more detail.

Recommendation 1: Independent Program Review Needed Now More Than Ever

As it did in its March 1993 *Special Report*, the Board recommends that *an independent review of the entire OCRWM's management and organizational structure be undertaken as soon as possible.*[1] The Board believes that the large number of program personnel, the many organizations involved in the U.S. program, and the diffuse nature of its organizational structure will continue to create very difficult challenges for program managers and adversely affect the technical program.

The U.S. civilian radioactive waste management program is proving difficult to manage. It currently employs approximately 2,790 people spread among a dozen major and almost two-dozen minor contractors, several national laboratories, various government agencies, and others.[2] The program's organizational structure is multilayered, program entities are geographically dispersed, and responsibility for decision making is spread among too many managers. The result is a lack of overall program integration. This contributes to major inefficiencies, which, in turn, affect every aspect of the technical and scientific program and hinder the integration of the program's different scientific and engineering components. Finally, OCRWM management historically has devoted such significant resources to overhead and infrastructure that relatively limited funding has remained for important science and site-characterization activities.[3]

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[1]*Others (U.S. Representatives Philip Sharp and Richard Lehman in August 1993, and the General Accounting Office in May 1993) have made similar recommendations.*

[2]*January 27, 1994. Memo to the Board from the DOE's Office of External Relations, Office of Civilian Radioactive Waste Management. The numbers, which include contractors and approximately 250 federal DOE employees, reflect the number of people working on the OCRWM program as of the first quarter of fiscal year 1994.*

[3]*NWTRB. 1993. Special Report to Congress and the Secretary of Energy. March 1993. Or, most recently, for example, at the Board's July 1993 meeting the OCRWM attributed its under use of outside expert judgment in a performance assessment study to a lack of sufficient funds.*

In the past, the Board has questioned the technical basis for a number of management decisions. For example, at the Yucca Mountain site-characterization project office in Nevada, decisions often do not reflect standard practice in the underground construction industry. The cost-plus award-fee contracts being used encourage neither competition nor innovation.[4] The Board also believes that the OCRWM is overdesigning the underground exploratory studies facility planned for Yucca Mountain. The excavation of the exploratory facility could be accomplished more quickly and at less cost if the surface and subsurface support facilities and utilities were reduced in scale and simplified.[5] The Board believes that decisions like these could continue to divert funds from important site-characterization and related research activities, no matter what the OCRWM's budget.[6]

Recently, the Secretary asked Congress to create a "special funding mechanism" that would provide the OCRWM with increased access to monies flowing into the Nuclear Waste Fund.[7] Given this request, the review recommended by the Board in its March 1993 *Special Report* takes on even greater significance. Although the Board believes that the OCRWM must direct more funding to site characterization, *simply increasing OCRWM's budget will not ensure that adequate funds will be allocated to the most important site-characterization activities or to other critical research and testing; nor will it ensure that the current program schedule is met.*[8] And simply increasing the program's budget will not solve the OCRWM's significant organizational and management problems, which continue to affect the technical program.

The Board believes that, in addition to helping address the OCRWM's management and organizational problems, an independent management review of the entire OCRWM program would provide program managers with a framework that would allow, for example, (1) better integration of the science and engineering in the program,

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[4] *Questions about the efficiency of the DOE's award-fee contracts also have been raised by DOE Assistant Secretary Thomas P. Grumbly. (See Energy Daily, Monday, July 19, 1993.)*

[5] *NWTRB. 1993. Underground Exploration and Testing at Yucca Mountain. Report to Congress and the Secretary of Energy. October 1993. (See discussion beginning page 13.)*

[6] *The Board hopes that the constructive organizational changes being made at the Yucca Mountain project in tandem with the financial and management review of the Yucca Mountain project announced by the Secretary on January 27, 1994, will address some of these problems.*

[7] *When asked by the Office of Management and Budget to comment on the funding mechanism, the Board chose to defer comment to those more competent in such matters.*

[8] *A number of important activities must take place before repository operations, currently scheduled for 2010, can begin. For example, repository construction should begin around 2001. But before that happens, for example, the DOE must (1) complete the underground exploratory facility (the main portal-to-portal tunnel is not scheduled to begin before August 1994); (2) initiate and secure data from long-term in-situ thermal testing, which is not scheduled to begin until 1997; (3) submit a final environmental impact statement.*

(2) more informed judgments about opportunities for reducing the duplication of efforts by multiple contractors, and (3) a restructuring of the program while maintaining the continuity of scientific and technical activities.

Unfortunately, such a broad-based review of the entire OCRWM has neither been initiated, nor, to the best of our knowledge, been planned. As already mentioned, the Secretary has announced a financial and management review of the Yucca Mountain project, and this limited review could play an important initial role in an overall review of the OCRWM program. However, neither this limited review, nor the recently completed selective compilation of comments by parties interested in the repository development program,[9] would substitute for the kind of independent review called for last year in the Board's *Special Report*.

The Board suggests that the Secretary of Energy appoint a small, independent group of internationally recognized experts with extensive experience in managing large, complex programs and in system acquisition to conduct this review. Although necessary, knowledge in the nuclear waste management field alone would be insufficient to carry out the review. Given these kinds of experts, such a review should not take long, nor require a large staff. The review can and should be conducted *concurrently* with ongoing site-characterization activities.

Recommendation 2: Maintain the Momentum of Site-Characterization Activities

In the past, the Board questioned continual delays in site characterization. Now that excavation activities at the Yucca Mountain site have finally begun, it is crucial that the momentum of these activities be maintained.

In previous reports and in its *Special Report*, the Board expressed concern about the OCRWM's decision to devote such significant resources to overhead and infrastructure that relatively limited funding remains for site-characterization activities. The OCRWM has cited a lack of funds as the reason for postponing or slowing some critical activities, such as underground excavation and surface-based drilling and testing. The Board also recommended in several reports against reducing the funding to support development of a long-lived waste package.[10] While these important scientific and engineering activities were being either postponed or slowed, however, the number of

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[9]*Thurber, James A. Draft Report on Published Works and Comments Regarding the Office of Civilian Radioactive Waste Management Program, 1989-1993. December 13, 1993.*

[10]*In its Fourth Report (1991), the Board recommended that engineered barrier development and testing be funded continuously and at a level sufficient to evaluate its contribution to long-term predictions of repository behavior. In its response to that recommendation (in the Fifth Report) the DOE indicated its agreement with this recommendation but explained that budget constraints were responsible for the constricted development of engineered barriers. The Board was recently encouraged to see small increases in funding going to research in this area. Waste package design is a critical area, especially in light of recent emphasis by the DOE on the development of a multipurpose canister.*

contract employees working on the program continued to grow. For example, since July 1991 the number of contract employees working full time on the program has increased 34 percent to a total of 2,540 in December 1993.[11] In addition, substantial resources are being committed to the construction of a complex underground exploratory facility with a very large main tunnel, a large and complex core test area, and surface and subsurface facilities and utilities that exceed the actual requirements of the current excavation plan.[12]

Given these kinds of management decisions, the Board believes that, no matter what OCRWM's future budget, delays in the scientific investigations at the site easily could continue. For example, if underground excavation is delayed or slowed (a real possibility) during fiscal year 1995, the underground exploration needed for identifying any obvious features that could disqualify the site also will be delayed. And initiation of the underground in-situ thermal testing needed to support decisions about repository and waste package design and about repository licensing likewise will be delayed. This is critical because in-situ thermal testing may take a decade or more to complete.[13]

To ensure that the momentum of activities currently under way at Yucca Mountain continues — *whether the budget remains level or is increased — funds must be allocated in such a way as to ensure sufficient and reliable support for site-characterization and iterative performance assessment, which is essential for focusing the technical program.* Program managers need to place a greater emphasis on a number of critical activities, including underground excavation, surface-based testing and mapping, thermal testing, and waste package development. Determining whether or not Yucca Mountain is suitable for locating a permanent high-level waste repository is probably the program's most important short-term goal, and its high priority should be reflected in the allocation of the program's funds.

Recommendation 3: Expand Efforts to Integrate Stakeholder Views

The continuing involvement of stakeholders and other members of the interested public is critical to the progress of the OCRWM's program. The Board has seen — in the U.S. program and in programs in the seven other countries it has visited — that public perceptions about the potential risks associated with nuclear power and the waste it generates must be addressed. Without substantial public involvement, the goal of siting a permanent repository could be even more difficult to achieve, no matter what the sophistication and depth of the technical and scientific program.

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[11] *In July 1991, there were 1,890 contract employees working on the program, in addition to approximately 250 federal DOE people. These numbers are available from the OCRWM on a quarterly basis.*

[12] *NWTRB. 1993. Underground Exploration and Testing at Yucca Mountain. A Report to Congress and the Secretary of Energy. October 1993.*

[13] *NWTRB. 1993. Special Report to Congress and the Secretary of Energy. March 1993.*

At the January Board meeting, Dr. Dreyfus was asked to comment on the findings of a task force report commissioned by the previous Secretary of Energy, which determined that a "widespread lack of trust in the DOE" exists, "specifically in the waste management office's activities."[14] The report suggests that some of this distrust stems from the DOE's historical exclusion of potential stakeholders from the decision-making process. Dr. Dreyfus responded that one of the Secretary's major goals is to create an environment of openness and interaction with program stakeholders. Indeed, the Secretary already has initiated a new public involvement policy.[15]

The Board supports the DOE's efforts to broaden the public's participation in the decision-making process and *recommends that the OCRWM build on the Secretary's initiative by expanding current efforts to integrate the views of the various stakeholders into the civilian radioactive waste management program as it evolves.* The Board believes the views of the interested public must be integrated into the program *while key decisions are being made — not afterward.* Both the lay and the scientific communities have important roles to play in the evolution of this program. We hope that recent stakeholder workshops[16] are only the beginning of an ongoing series of constructive OCRWM-stakeholder interactions. The Board also encourages the Secretary to consider establishing a long-term framework for constructive interaction on high-level waste issues with OCRWM stakeholders similar to the Environmental Protection Agency's recently completed *year-long* superfund study.[17]

In conclusion, the Board recognizes that OCRWM's new program managers are facing a wide variety of significant challenges. The Board also understands that the recommendations it is making will not be easily implemented; there are no quick fixes for this complex program. With that said, however, the Board strongly believes that, no matter what future funding trends may be, these recommendations should be implemented to achieve an efficient and cost-effective program. We hope that the

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[14] *Earning Public Trust and Confidence: Requisites for Managing Radioactive Waste. 1993. Final Report of the Secretary of Energy Advisory Board Task Force on Radioactive Waste Management. November 1993.*

[15] *On December 17, 1993, the Department of Energy released for public comment a draft of its new public involvement policy.*

[16] *The OCRWM has held four stakeholder workshops in recent months on general issues, the multipurpose canister, and on the waste management system.*

[17] *In June 1993, the DOE participated in a Keystone-led effort to hammer out consensus on high-level waste. Unfortunately, the effort died after the first meeting. Recently, a similar effort was undertaken by the EPA to look at ways of revamping procedures to clean up hazardous waste dumps across the United States. The results of this year-long study of the superfund program by environmentalists, industry leaders, Indian tribal leaders, and others included consensus on a number of issues and several wide-ranging recommendations for program improvement.*

Congress and the Secretary of Energy will consider our recommendations seriously as important decisions are being made about the funding structure of this vital national program.

Sincerely,

John E. Cantlon, Chairman

Clarence R. Allen

Garry D. Brewer

Edward J. Cording

Patrick Domenico

Donald Langmuir

John J. McKetta, Jr.

D. Warner North

Dennis L. Price

Ellis D. Verink, Jr.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

TITLE: AFFIRMATION/DISCUSSION AND VOTE

LOCATION: ROCKVILLE, MARYLAND

DATE: MARCH 18, 1994

PAGES: 4 PAGES

DISCLAIMER

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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AFFIRMATION/DISCUSSION AND VOTE

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Friday, March 18, 1994

The Commission met in open session, pursuant to notice, at 11:30 a.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission
KENNETH C. ROGERS, Commissioner
E. GAIL DePLANQUE, Commissioner

STAFF SEATED AT THE TABLE:

KAREN D. CYR, Acting General Counsel
JOHN C. HOYLE, Assistant Secretary

P-R-O-C-E-E-D-I-N-G-S

11:30 a.m.

CHAIRMAN SELIN: Good morning, ladies and gentlemen. We have an affirmation session with three items before us, this morning. Mr. Hoyle, would you lead us through the proceedings, please.

ASSISTANT SECRETARY HOYLE: Yes, sir. There are three items. The first is SECY-94-038, subject "Supplemental Ethics Regulations." In this paper, the Commission is being asked to approve supplemental conduct regulations for employees of the NRC relating to outside employment and security ownership restrictions. All Commissioners have approved the supplemental regulations with edits and clarifications proposed by the Chairman and Commissioners Remick and de Planque. May I have you affirm your votes, please.

(Chorus of ayes.)

ASSISTANT SECRETARY HOYLE: Thank you. The next one is SECY-94-067. The title is "Georgia Power Company - Staff Motion for Stay of LBP-94-06." The Commission is being asked to respond to an NRC staff motion to stay the effectiveness of Licensing Board Panel issuance 94-06. The Board decision order the staff to release to Mr. Allen Mosbaugh and the Georgia Power Company all of the easy-to-separate factual information contained in the Office of Investigations report in the Vogtle matters and the remainder of the OI report subject to protective order.

All the Commissioners have approved a housekeeping stay to maintain the status quo in this proceeding pending a final Commission decision after response from the other parties on the staff motion. May I have you affirm your votes?

(Chorus of ayes.)

ASSISTANT SECRETARY HOYLE: And the third item is SECY-94-008, "Petition for Adjudicatory Hearing." The Commission is being asked to respond to a petition by Environmentalists, Incorporated, seeking an adjudicatory hearing regarding the removal of radioactive components of the Yankee Nuclear Power Station and their shipment to the Barnwell facility in South Carolina. All Commissioners have approved an order denying this petition. May I have you affirm your votes, please?

(Chorus of ayes.)

ASSISTANT SECRETARY HOYLE: That is all I have, Mr. Chairman.

CHAIRMAN SELIN: Thank you very much.

(Whereupon, the foregoing proceedings were concluded at 11:36 o'clock, a.m.)

CERTIFICATION OF TRANSCRIBER

This is to certify that the attached events of a meeting of the United States Nuclear Regulatory Commission entitled:

TITLE OF MEETING: AFFIRMATION/DISCUSSION AND VOTE

PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: MARCH 18, 1994

were transcribed by me. I further certify that said transcription is accurate and complete, to the best of my ability, and that the transcription is a true and accurate record of the foregoing events.

Elizabeth Ann Tipton

Elizabeth Ann Tipton