UNITED STATES OF AMERICA

NUCLEAR WASTE TECHNICAL REVIEW BOARD

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FULL BOARD MEETING

***

Task Force Studies, MPC Concept,

System Studies and Performance Assessment

***

Doubletree Hotel

Washington Room

South Tower

300 Army-Navy Drive

Arlington, Virginia

Tuesday, January 11, 1994

The above-entitled meeting was convened, pursuant to notice, at 8:15 a.m.

PARTICIPANTS:

John E. Cantlon, Chairman of the NWTRB

Clarence R. Allen, Member of the NWTRB

Garry D. Brewer, Member of the NWTRB

Edward J. Cording, Member of the NWTRB

Patrick A. Domenico, Member of the NWTRB

Donald Langmuir, Member of the NWTRB

John J. McKetta, Member of the NWTRB

D. Warner North, Member of the NWTRB

Dennis L. Price, Member of the NWTRB

Ellis Verink, Member of the NWTRB

Thomas Isaacs, DOE

Nils Rydell, Swedish National Council for Radioactive Waste (KASAM)

Dan Dreyfus, OCRWM

Chris Whipple, National Academy of Sciences

J. Linehan, NRC

Robert Mussler, Deputy Nuclear Waste Negotiator

Robert Loux, State of Nevada

Steven Kraft, Edison Electric Institute

Lynn Shishido-Topel, National Association of Regulatory Utility Commissioners

Dwight Shelor, DOE

Ron Milner, DOE

Dean Stucker, YMPO

PARTICIPANTS [continued]:

Jim Crane, TRW

Donald Gibson, TWR

NWTRB STAFF PRESENT:

William D. Barnard, Executive Director

Dennis G. Condie, Deputy Executive Director

Leon Reiter, Senior Professional Staff

Sherwood Chu, Senior Professional Staff

Carl Di Bella, Senior Professional Staff

Daniel Fehringer, Senior Professional Staff

Russell McFarland, Senior Professional Staff

Victor Palciauskas, Senior Professional Staff

Paula Alford, Director of External Affairs

Frank Randall, External Affairs

Vicki Reich, Librarian

Karyn Severson, Congressional Liaison

Helen Einersen, Executive Assistant

Linda Hiatt, Management Assistant

C O N T E N T S

C O N T E N T S [continued]

P R O C E E D I N G S

[8:15 a.m.]

WELCOME AND OPENING REMARKS

CHAIRMAN CANTLON: Good morning. If you'll have your seats, we'll get the session underway.

My name is John Cantlon. I am the Chairman of the Nuclear Waste Technical Review Board. This is the Board's Winter Meeting, one of four of the meetings that the board has each year.

The board, as most of you certainly know, was created by Congress to provide a technical and scientific independent assessment of the Department of Energy's High-Level Nuclear Waste Management Program.

The board is authorized to have 11 members, 10 of which have now been appointed. The nominations for the board are made by the National Academy of Science and the appointments are made by the President.

We serve four-year terms. All of us are part-time. We have a full-time professional staff of 10.

With me on the board this morning, Dr. Ellis Verink, Professor Emeritus in Metallurgy, University of Florida -- Ellis, raise your hand so people can see who you are; Dr. Dennis Price, Professor of Systems Engineering, Virginia Tech; Dr. Warner North, Consulting Professor in Risk Assessment, Stanford University and a principal in

Decision Focus, a consulting firm; Dr. John McKetta, Professor Emeritus, Chemical Engineering, University of Texas; Dr. Donald Langmuir, Geochemist, Colorado School of Mines; Dr. Pat Domenico, Professor of Hydrology, Geo-Engineer, Geology at Texas A&M; Dr. Edward Cording, Professor in Geo-Engineering, University of Illinois; Dr. Garry Brewer, Professor of Resource Management and Dean of the School of Natural Resources, University of Michigan; Dr. Clarence Allen, Professor of Geology, seismic specialist, Cal Tech University. My field is Environmental Biology and I am retired as Vice President for Research and Graduate Studies at Michigan State.

Our agenda over the next two days covers task force studies, multi-purpose cask concepts, system studies, and performance assessment.

Leading this morning's session will be Dr. Garry Brewer. This afternoon's session will be lead by Dr. Dennis Price, and tomorrow's session on performance assessment will be led by Dr. Warner North.

Garry?

SESSION INTRODUCTION

DR. BREWER: Thank you, John for the introduction and welcome to everyone, welcome to the rest of the panelists.

We have a very, very full agenda today and I will be serving as much as traffic cop and ringmaster as gentle host to one and all assembled here.

As John said, I am the Dean of the School of Natural Resources and Environment at the University of Michigan. I've been on the board about a year and a half. My general area of interest and coverage for the board is environment, public health, and in the general area of things that typically are thought of as being "softer."

In fact, one of the major themes of the sessions today and tomorrow, if not a theme that shoots throughout every one of the presentations, is really dedicated to the proposition that the setting or the environment -- not environment in the natural sense but the setting in which we are all operating -- really has a great bearing on the technical things that are possible.

By the same token, the technical things that are possible have implications and impact on the setting in which we are doing business. Indeed, this is business that we are talking about here. It's important to keep that in mind, that you can't simply talk technical without having a very, very good sense of the setting or the context of the environment in which the science and the technology is being done.

All indications are, and it comes from no less a source than the Secretary of Energy herself, Hazel O'Leary, last month, that we are probably at some sort of turning point or sea change with respect to the setting or the environment in which the work is being done.

On December the 3rd in a statement that did not get nearly as much notice as her public statements of December the 7th, she makes the comment that the United States is ready to presume a new stance in the area of nuclear waste disposal. The December 7th pronouncement on public disclosure in the area of radiation, of course, caught everyone by surprise by the wellspring of interest that it really tapped in the body public, public trust, public confidence and that is really part of the idea of setting or background.

I would like to just report in her own words what she had to say about public trust and confidence because it is the theme for this morning's session. This is from the Secretary. This is a direct quote in the New York Times on December the 7th: "You can't do anything in this agency without trust and confidence," Mrs. O'Leary said in the interview, "but I had no idea that this would be as big a piece of building trust as it has become."

I thought a narrow public would focus in on it, but I was wrong. A turning point, a sea change, a time to really reflect on where we have been and where we are going, to reflect on changes in the context of the setting in which we are doing business. I am really pleased to introduce a panel of genuine experts on the general and very difficult subject of trust and confidence.

The issue here is not to really question what we are trying to do, all of us in this room in one way or another, which is how best to protect human and environmental safety and health. That's not at issue. Really the issue is how do we do it. That in one way or another is the subject of the two days in front of us.

Tom Isaacs will take the lead this morning. Tom is instrumental in the Task Force on Alternative Program Strategies. A report generated -- again, these things have their own life and they started years ago -- the Task Force actually began in mid to late 1989, as I understand the history of it -- a report published in March of 1993, "A Proposed Alternative Strategy" from the Department of Energy, Civilian Radioactive Waste Management Program, how timely, and in this internal critique by the Task Force we see both critique and constructive options to think about in terms of the redirection of the program. The roles of openness, learning, and public trust and confidence are highlighted throughout the report.

Our second speaker this morning is Nils Rydell of the Swedish National Council for Radioactive Waste, the report from Sweden. The Swedish example -- Nils is an individual with perhaps as much experience in the Swedish program as any one person in the world -- and the Swedish example is often held up as one in which the public is listened to. The Swedish example is one that is often held up as a program which is making some progress.

The idea of looking at other settings, other contexts in which the technical and the scientific activities are underway, really was at the base of our motivation to invite Nils to join the session this morning. While the Swedish example will perhaps offer some very constructive lessons to be taken and used, the differences also have to be understood and accommodated for our own purposes.

After a short break, we will turn to Todd LaPorte, team member of the Secretary of Energy's Advisory Board, which has recently in November of 1993 with an exquisite sense of timing given the issues published the final report of the Secretary of Energy's Advisory Board, "Earning Public Trust and Confidence, Requisites for Managing Radioactive Waste."

When Todd is finished we will then turn to Dan Dreyfus, the relatively new Director of OCRWM, the Office of Civilian Radioactive Waste Management for response to the presentations, for an update in the sense of new direction, new beginning, whether or not public trust and confidence in the setting has taken on the importance that many of us as individuals on this board believe it has.

We have experimented with and had some success as a board in recent meetings with a Roundtable. Typically the Roundtable has come at the end of the session. We thought i this particular instance that it would be valuable to construct a Roundtable and panel after the formal remarks are given involving many of the stake-holders in this enterprise, the stakeholders from the NRC, from the negotiator's office, from the state of Nevada, from NARUC, from the Edison Electric Institute. Each of these individuals has been invited to speak for a brief period of time to leave time at the conclusion of this block of the morning session for discussion and then questions and answers from the public from the floor.

Let me get on with this because our program is full by way of introducing our first speaker, Tom Isaacs.

Tom is the Director of Strategic Planning in International Programs in OCRWM, the Office of Civilian Radioactive Waste Management in the Department of Energy. He manages programs and policy, strategic development, contingency planning, risk management and international cooperation. He also represents the Department at the National Academy of Sciences, which is another interested party in all of this discussion of where is the program going.

Tom has had extensive experience in the technical development and safety in advanced nuclear reactors. He's held several policy - technical management positions within DOE, within ERDA, the Energy Research and Development Administration, the old Atomic Energy Commission and so forth.

It is with great pleasure that I introduce and offer to you, Tom Isaacs, our first speaker of the day.

TASK FORCE REPORT:

PROPOSED ALTERNATIVE PROGRAM STRATEGY

[Slide.]

MR. ISAACS: Good morning. It is a pleasure to be here. I appreciate very much the opportunity to come before the board and this audience and talk to you about the Task Force Report which I had the privilege of chairing just a year ago today.

I want to start by briefly going through the background of how this Task Force came to be chartered and what its intent was before I get into the discussion of the results because I think it is important to understand the context in which things like this are done, although Garry gave a very fine introduction to some of that.

[Slide.]

MR. ISAACS: Just about a year ago, you know, there was a change of administration. There was a general sense upon the land at the time, I think, that this program probably wasn't doing as well in a lot of people's minds as it ought to be.

Just before Secretary Watkins left office, he exchanged a letter with Senator Bennett Johnston in which he promised Senator Johnston that by April 1st of 1993, that we would develop a -- these are his comments, his quotes, "conceptual revised strategy for the disposal of high-level waste for public review."

Five days before the change of administration, the Task Force, an ad hoc task force -- a very small task force -- was chartered to meet that April 1st commitment.

So while it is true we have been working on these various options in a whole variety of forum for a long, long time -- and it is no surprise to anybody -- the Task Force itself had a very short time frame in which to come together. Most of the members didn't know one another on January 15th when the Task Force was assembled.

But we had to, within seven weeks, come up essentially with a final draft that could then be tabled for the Department's consideration.

I think that the fact is that the well spring of this activity was the continuing escalating cost estimates for what it was going to take to determine whether or not

Yucca Mountain was suitable, the fact that schedules were continuing to recede into the horizon faster than we could catch them so people's confidence that this program would come in at a reasonable cost and in a reasonable time were eroding.

At the same time it was hard to find milestones or progress that people could grab onto and feel comfortable that at least we were taking bites out of what was necessary in order to come to a conclusion on the program.

The program had gone from $100 million estimate for site characterization to $6.3 billion. A lot of people didn't think that was realistic. The famous line that Senator Johnston referred in this hearing of, "The program is broke" certainly rang in everybody's mind.

The task force was asked to look at developing this conceptual revised strategy only for disposal. So, it is important to recognize that we were not asked to look at the storage component of this -- and we did not look at the storage component other than as it was necessary in order to put together the repository program in a way that we thought made sense.

Dr. Brewer's comments about putting the program together in a way that encourages public trust and confidence is very, very important from our point of view, that it is not simply holding stakeholder meetings that is going to lead to public trust and confidence. It is not simply listening to people, although those things are essential.

The way in which the program is put together and the way in which the program is run are as important to building over the long period of time this program is going to be around public trust and confidence as anything else.

So, with that the Task Force began its job. One of the first things we decided was that if we could recommend a creative new concept for running this program that didn't require opening up the Act and changing the law, or didn't require major changes in the regulation other than those that were already underway through the Section 801 process of the National Academy of Sciences to redo the regulations, that we would be better off if we could recommending a proposal that didn't require a law change.

We weren't precluded from recommending it, but the general consensus of the group was that if you went in there to try to open up the Act, probably the last thing you were going to get was what you went for.

We thought there was an awful lot more flexibility in the current law and the current regulatory framework than the Department had taken advantage of. So, our report did not recommend any major changes in laws or legislation. But if it came to the fact that this program needed something like that in order to be successful, I don't think any of us would be particularly unhappy to that realization that we might need to do something. But we don't think that was necessary.

This report took place, was tabled nine and a half months ago. That is a fair amount of time. I think it is fair to say that in that time some things have changed in this program and a number of things that we have recommended, for example, are being considered, and a number of them have been undertaken.

In no way -- and this is probably the most important opening remark -- in no way did we intend this report to be the last word on how to fix this program. Quite the opposite. We had intended it to be the first word on how to fix the program.

There is no question in our mind that the way in which programs like this get adapted is through open dialogue, discussion, iteration, and true concern for the views of all the interested parties.

So while we tabled a fairly specific prescription for how one might consider revising the program, it was more to open up a dialogue on the creative ways that one might look at running the program rather than to tell you this is the way to do it.

Could I have the next slide, please, John?

[Slide.]

MR. ISAACS: I just want to quickly show you who was on the Task Force. You see it is a mixture of people both inside and without the Government.

If I could, please go to the next viewgraph.

[Slide.]

MR. ISAACS: But I think the most important thing was that this Task Force with seven weeks to do its job recognized very early that it was not going to reinvent the wheel, nor did it really need to reinvent the wheel, that there was a tremendous amount of information already available.

If there is one thing this program doesn't lack, it is advice. I mean, this program gets advice from virtually everyone. Of course, that advice is most often parochial in nature, understandably, and it is often conflicting, but it is most often very insightful and very good.

So, we started with the point of view, let's start from the premise that the criticism that the program has gotten over the years -- both outside and inside -- was constructive criticism. Let's use that as a point of departure for how to consider fixing the program.

So we looked very closely and, in fact, decided to use the reports that came out of this very board as one of the principal documents, if you will, or insights that should be used in considering how to frame the program. We looked at the very important National Academy of Sciences rethinking report of 1990. The OTA had done an extensive report.

As Garry Brewer had suggested for approximately four years, we had been holding a number of different kinds of meetings with stakeholders and interested parties to analyze various features of how to run the high level waste repository program. We had many suggestions and many reactions to suggestions on how the program might be configured.

Lastly, we had -- and we still have -- very fine and extensive interactions with programs similar to ours being conducted both in Europe and Canada. There is some very interesting similarities and differences. We thought we ought to take advantage of those as well.

So we tried to put together a different strategy that took advantage of that advice, that generally responded to the sincere concerns of the parties that were out there, and that drew on the experience on others such as you will hear from Nils Rydell shortly in the Canadian situation.

Could I have the next approach?

[Slide.]

MR. ISAACS: If there is anything new in what we tried to suggest, it is not individual elements of our strategy. We give credit to you in the room for thinking of the kinds of things that need to be done in order to get this program to run as well as it can possibly be run.

What we tried to do, perhaps, is to integrate these ideas into a single program that met the objectives of the country, met the spirit and the intent of the law in a way that hopefully would be more successful and would also, engender more confidence that we were being successful.

[Slide.]

MR. ISAACS: I have already mentioned this briefly, but I want to emphasize the fact that the task force went out of its way to suggest that this report be a departure for extensive review and discussion and, in fact, in the report itself, in the second paragraph, we go out of our way to say that and we encourage the department to ask for the comments of groups like the TRB, like the Board on Radioactive Waste Management, and like the ACNW of the Nuclear Regulatory Commission to comment on these kinds of things.

We also felt very strongly that there needed to be a variety of ways in which stakeholders, and that is people who are interested in this program and have a stake in its outcome, have the opportunity be part of how one comes to a conclusion on things like this, and much of that has been done so far and I am delighted to see that the board did make an early response to the report and would be encouraging it to continue to look at whether or not it wants to respond further.

I think we all understand that there is no set of words that you can put on a piece of paper that everyone with regard to how this program should be run are going to agree to, but the fact that we have a process and a continuing process and collaborative process is essential.

[Slide.]

MR. ISAACS: How did we get into this situation? Let me just talk for a minute about the old assumptions that went into this program. It is interesting to note that when we looked for what was the strategy for the program when the task force was created about a year ago, it was very hard to find something that we could call a strategy. We have an implicit set of actions and assumptions, but what we didn't have was a simple declarative English description of what we were trying to achieve and why. In fact, it is fair to say that some of the old assumptions which had fostered the kind of framework that we had for the program were probably not very relevant any more.

As all of you know, when the '82 act was passed, as hard as it may seem in retrospect, we were going to have not one but two repositories operating very early and each of them was going to be accepting about 3,000 metric tons of spent fuel a year. How did we come with 3,000 metric tons? As much as any reason, 3,000 metric tons was picked because that was the expected amount of spent fuel that would be discharged from reactors each year, so that by the time the first repository started to operate and we began accepting 3,000 metric tons very quickly, we could bring the system into a relative steady-state and then very quickly afterwards, just a few years later, a second repository would come in, also accepting 3,000 metric tons a year, for a total of 6,000 metric tons a year being accepted into the country so that we can begin to draw down the inventories at the various reactors. That was one assumption that was out there that we needed to take, at a very high rate, all of the spent fuel in this country and get it underground as quickly as possible.

There was no MRS in the system at the time. The expectation was that you would have two holes in the ground, two repositories, with very small black storage capabilities and, as has been said, to coin a phrase that the giant sucking sound you would hear would be spent fuel being sucked out of reactors down into the holes in the ground and that was the relative framework of how the program was going to go at that point in time.

It was also expected that there would be as much money available from the Nuclear Waste Fund as was necessary, that we would not have any constraints in that regard, and there were a lot of incentives 10 and 11 years ago, 12 years ago, in people's minds to get that fuel in the ground. People were concerned, for example, that the utility industry could not revitalize nuclear power unless that spent fuel was accommodated. The utilities wanted the fuel off the site. People on the environmental side were concerned about proliferation, they were concerned about the rise of nuclear power, and figured the best place for waste is far, far away deep underground. So there was a consensus that getting it all underground as rapidly as possible made sense. Others didn't quite feel that way, felt that the spent fuel was a resource and that we shouldn't move to hastily and there were some provisions in the act that acknowledged that but, nonetheless, the expectation was, all of it in the ground very quickly.

[Slide.]

MR. ISAACS: The new realities are that there is only one repository and, under the current program, it is unlikely that we are going to get it before 2010, and that there is no question that somewhere for a long period of time the great majority of spent fuel is going to be stored somewhere on the surface of the reactor sites, some storage sites, and perhaps near the repository. There is no question but that we will be in a state of long-term spent fuel storage for some period of time.

We have also seen now the fact that the money isn't necessarily all available. While we might have a big bank account in the Nuclear Waste Fund, the Congress has its hands around the throat of that bank account and doles out that money in ways that it sees fit, and it doesn't always come in the same amount that the program would need, and we need to recognize that.

As I have already said, the costs have continued to rise and the schedules have continued to slip, and we show little visible progress toward results. That doesn't mean that there hasn't been a tremendous amount of valuable information gathered and a tremendous amount of results accomplished. I want to emphasize, it is the visible part that we haven't done a very good job of right now.

Furthermore, we know that there is no urgent safety need to get rid of waste and I need to say this has been misunderstood. The task force didn't want to imply that there was no need for disposal of waste or even rapid full-scale disposal, but that the NRC had said that, thank goodness, it is safe to store waste on the surface of the earth, so that the argument that somehow we needed to get it underground as quickly as possible to get into a safer mode is not there. The waste is safe where it is right now. The waste will be safe, very, very safe, if we ever put it into a licensed repository, and we have had a rise of dry storage technology which has relieved some of the pressures, if you will, of the repository schedule because at least we know that there are technical ways of handling the waste at the surface.

These new realities, we felt, presented some opportunities to us.

[Slide.]

MR. ISAACS: The program currently plans on spending $6.3 billion and going until at least the year 2001 before it would determine whether or not the Yucca Mountain site was suitable, and then it would go another nine years and several billion more dollars to be licensed and constructed before the first stick of spent fuel went into the ground. As I told you, even these dates are considered optimistic by a lot of people. That has resulted in a divergence of concerns, but concerns on everyone's part. Groups like the utilities and Congress see the costs rising, hundreds of millions of dollars being spent every year, no results in hands or in sight, whereas groups like the State of Nevada and the environmentalist groups figure with this many billion dollars already spent, how can the Department and the country not find the site suitable. They feel it has already been declared suitable by DOE and we are simply waiting for the right time to make the announcement. So the confidence, if you will, on every one's site have eroded and continues to erode and that is, as Dr. Brewer said, in some senses why we need to fix this thing.

[Slide.]

MR. ISAACS: Why is there a problem? Because we have a first of a kind, perhaps one of a kind facility here that has to operate for many, many thousands of years, and we were going to go to a one-step process here, try and identify ahead of time all the information that we needed to gather that we might conceivably need to determine whether the site is suitable or not, gather that information and go to our regulator one time and say, this is all the information, give us a license and go away and we will put the waste in the ground for all time, ensure there will be a closure determination, but we will determine upfront whether this site is suitable, and then we will go immediately to a full-scale facility as rapidly as we can and start disposing of waste as quickly as we can.

[Slide.]

MR. ISAACS: So what did the task force decide? The task force came up with three essential conclusions -- and there are many aspects of it that I don't have the time to go into, and I encourage you all to read the report and to talk about your questions or your comments on it -- but three major things we thought were important in order to consider how to fix the program.

And whether you agree with the way we suggest it or not, is less important than that a debate be discussed and conclusions be reached by the program on these issues.

One of them is we got to define success, and what I mean by that simply is, we need to all have a common understanding of what it is we are trying to achieve here. And we need to do that in a way that fits what the country needs, and it needs to be something that is built through consensus.

The second thing is what we call a robust safety concept, and what we mean by that is simply that we need to determine whether or not we think that site is good based upon a set of simply, declarative statements that can be tested and demonstrated to be true or not true in ways that are meaningful and understandable, not only to the technical community, but to the entire community of folks, and I am going to talk about that.

And the third one is what I have talked about already, which is that we need an incremental approach, both before and after licensing. We need to take a set of small, sure steps, and base our continuing the program on the successful completion of the other steps, one, so that we understand ourselves the steps necessary for success, and, secondly, so that we can see whether or not we are being successful in achieving them in any kind of reasonable way and, if not, we can do something about it.

But let me talk now briefly about each of these three recommendations.

[Slide.]

MR. ISAACS: What do we mean by success? I offer up to you a slightly different definition of success than the program has considered heretofore. It is not the only definition that one might consider, but it is relatively straightforward, and it does have significant implications for the way the program might be run.

We could have a definition of success in this country that says what we need is a suitable repository site; one that is then licensed for disposal by our regulator; some waste in the ground -- and some can be defined through a set of discussions, but it doesn't mean all waste necessarily; the option to emplace the rest of the waste in the ground when the people who will be running this program in this country then decide to or not; and a place to store waste in the meantime.

That set of definitions takes the pressure off the need to go immediately to a full-scale disposal of all the nuclear waste that exists right now. It recognizes the sequential iterative nature of a problem like this. It recognizes the fact that we aren't going to make the decision today of whether they are going to put 70,000 metric tons of waste in Yucca Mountain, which is not going to happen until 2020 or 2030 anyway, and leave them that choice, the people who will be running the program at that period of time.

It doesn't require them to do it, but it allow them to do it. If the people in that time want to go forward with full-scale disposal, we will have provided them with a system, but we will not have made it unalterable. It gives them that clear option for disposal, so the problem is solved, but we bear the political, institutional, and financial costs of providing that option.

It is important to recognize in this program that it is not we who will decide when this facility becomes a repository. This facility become a repository when you close it, and even under the best of circumstances, it would be our great-grandchildren, not we, who decide when this thing is a repository. That is not bad. That is good. That is an opportunity to run this program in a way that we think would be much more meaningful and much more sensible.

[Slide.]

MR. ISAACS: So the first recommendation I have on behalf of the task force is let's agree on what it is that the country needs to accomplish.

Secondly, define a robust safety concept. Right now, the program is predicated on a 6,000-page site characterization plan that had tried -- and did a very fine job, I might add -- ahead of time of trying to assume, up front, the full range of information that we might need in order to close on whether or not Yucca Mountain is a suitable site and get it through the licensing process.

It is based upon 10 CFR 60, the current regulation of the NRC, as to what is necessary in order to get that site licensed. The first thing I would say is that the NRC is not the principle agent responsible for safety at the repository; we are. And that we have to start by declaring to ourselves what we think is necessary in order to determine whether we can convince ourselves, and the technical community, and the larger community of that.

Then the NRC is the independent assurance to the country that we have done that job well. What we need to do first is define a set of testable, understandable, site features that together build that confidence for us. It is not in place of the kinds of work we are doing now, it is a new way of looking at the sum total of all the work that needs to get done.

We need to look not just at the natural barriers; we need to look at all of the things that are available to us, both the natural barriers, the engineered barriers, and the unique institutional features.

We need to look at things like robust and long-life waste packages as a corollary to the natural system to help deal with the uncertainty that will surely be there after we finish running the site.

We also need to recognize that this is not an open-ended research project. I liked the words that Garry Brewer said, that this is a business. We are in business. And we are not in the business of understanding everything there is to know about things that might be relevant to Yucca Mountain. We are in business to know those things that are essential to determining whether or not that site is suitable, if it is suitable during the license application and at design so that we can move forward in the system implementation stage.

[Slide.]

MR. ISAACS: It was always assumed that the site characterization plan would be recalibrated and refocused, and we are suggesting that now is the time. We know an awful lot about that site. Let's pick the things that we can test. Let's make our site characterization plan an investment decision on those things that are testable. There are a lot of things out there that are interesting to know about Yucca Mountain, many of which -- no matter how much time and money we spend, we are not going to demonstrate in a licensing regime -- we can count on for safety.

It is nice to know they are there. We will take some comfort in knowing they're there. Let's spend out money where -- the investment in science and technology are on things where we can have demonstrable results that will meaningfully influence, one way or the other, whether or not that site is good. And let's focus our characterization activity with a very keen eye toward that kind of thing.

If I could have the next slide, please.

[Slide.]

MR. ISAACS: What is a robust case for safety? Again, I don't plan on telling you that the next two slides are the answer and you are to shake your head. What is needed is discussion, but I will give you some of the features that we thought were important, and it goes right to the heart of what Garry Brewer talked about, and it is a mixture of things that look at the technical and institutional needs of this program in this country that hopefully will lead to some confidence.

First, there is no question that we have to meet and exceed any likely standards or regulations, and that is normally done through performance assessment. But performance assessment is a complex set of codes, and models, and computer calculations. That alone is unlikely to convince anybody, including the people inside this room, that that site is or is not suitable. So that is not enough.

We have to do performance assessment, but the real value of those codes and models is in helping to shape and prioritize the program, and give a measure of assurance as to whether or not we think we are in the right ball park, not to predict performance.

We are not the first ones to say that. It is said much more eloquently by this technical review board and by the National Academy of Sciences in rethinking high-level waste.

The program needs multiple features. They ought to be redundant, they ought to be conservative and diverse, and they ought to include both natural and engineered barriers. As I said, long-life waste package should be considered -- a robust engineered system should be considered not in place of the natural barriers.

We are not suggesting that if the site is found unsatisfactory that you conclude it satisfactory because you have engineered the result, but as an accommodation to the sure uncertainty that comes when you try to predict performance over the many, many tens of thousands of years that this facility will have to perform.

The system should also be built in a way that uncertainty increases slowly with time, and, as I say here, that performance degrades gracefully with error, which simply means you ought to build a system so that if you are wrong about any one thing, the system doesn't fall apart. That is not hard to do. It is just common discipline engineering practice.

If I could have the next slide, please.

[Slide.]

MR. ISAACS: Some other features that need to part of this robust case for safety -- and I am serious about these. Many of these are not the kind of things that are traditionally thought of as inside the box; they are thought about as outside the box.

The features that you count on ought to be demonstrable. If you can't -- it is what I said earlier --if you can't demonstrate it, it is not of much use to us. It ought to be one in which natural analogues could be found. It is much more comforting, in the geologic time frame, to look at something that is analogous and see whether or not it has performed as expected, and whether what your system is going to do is likely to perform the way that the natural analog did.

We can retrieve this waste. We can survey this waste. In fact, we can even repair the facility if necessary. These are wonderful virtues that are not necessarily available at other kind of nuclear facilities. We ought to take advantage of it.

International consensus is important. The only people -- since there is only one repository program in this country -- the only people who are also looking at comparable challenges today, with the exception, perhaps, of something like WIPP which is dealing with a different kind of waste, are other countries.

We can learn a lot from one another. Where we are doing things independently and come to similar conclusions, there is a lot of reason to have confidence. When we are doing things differently, we ought to ask why. There are a lot of lessons to be learned that -- you will hear a lot from my colleague, Nils Rydell, about their program in a moment.

The closure decision is something that is very important. It is not a repository until you close it. We have recommended, for example, that we go for a longer period of time of allowing that facility to be open. We should not close that facility before its time. We should close that facility when the people out there determine that it is ready to be closed. That is a wonderful virtue of the repository program, and one that should not be lost on us.

If I could have the next, please.

[Slide.]

MR. ISAACS: Now what is the third element of our proposal? It is that we should do things incrementally both before and after the license. This is a complex, highly controversial, first-of-a-kind facility and we ought to take small, short steps and make clear interim decision points and we ought to lay out those decision points in a way that we can either mark progress or lack of progress. That is necessary for Senator Johnson but it is necessary for all of us. We have got to guide this program like the money was our own. We have to run this program like it was a private concern in that regard -- dollars should follow success, and that is the way the program ought to go.

So we are suggesting that we need to know as we go, as we spend billions of dollars of ratepayer money, whether or not this site is looking suitable.

One of the most important things is we need to recognize as we go through this program that if in some corner somewhere somebody knows that this site isn't going to make it across the finish line for some reason, I want to know it now. I want to stop. I want to move on to the next thing, and so the program has to focus ourselves and our regulator in ways to make sure that as we spend money it's because we have increasing confidence that we ought to be spending this money. Next slide, please.

[Slide.]

MR. ISAACS: What does that mean? And again, some of these things are being done in the program, mind you, but I am suggesting that we need to do them perhaps with a renewed sense of priority and attention. We need to start making findings against our own site suitability guidelines and in fact we ought to consider revising those guidelines. They are DOE's own guidelines. They were done in a time frame when we thought we were going to have an extensive, long-term site comparative evaluation and many of the guidelines were put in there to help the beauty contest go forward of deciding which sites ought to be invested in and which sites ought to be dropped. We don't have that situation in this country anymore. The law changed and those site suitability guidelines ought to be focused and our money ought to be focused on things that help us determine whether or not that site is suitable and the repository for this country or not.

We also suggested that we press, if you will, that the Department of Energy take a more proactive stand in picking out the key technical issues and deriving reports that would go to the NRC and request back preliminary safety evaluations and reports from the NRC so that in writing at a management level we start to get the kind of interaction with our regulator that we need to determine whether or not we are getting closer to the kinds of information that are going to be necessary.

Everyone knows and the report acknowledges that you will not have a licensing decision, you will not have a firm decision. The issues remain open until the licensing process itself, but we all need to have a broader and growing awareness of what we mean when we talk about reasonable assurance. We need to know what the key issues are early in this process so we can spend the money on the things that are going to be important to licensing, and as I have already said, we all of us need to know whether or not this site is looking suitable.

[Slide.]

MR. ISAACS: That is before the license. Presuming that we find Yucca Mountain suitable, and that is a presumption -- it may not be -- and presuming that we are able to license it, our recommendation is that we go into the licensing process, first of all, with a conservative design. It makes much more sense from our point of view to get through the license even if the design is less than optimum, even if we perhaps spend a bit more money, than it is to sit there and argue about the relative efficacy of certain engineering designs which might save a little bit of money but might cause the licensing process to be protracted, so we are suggesting err on the side of conservatism. It makes sense from a confidence point of view anyway.

We are also suggesting an incremental staging here. Most large-scale engineering projects when they start first of their kind start with small-scale facilities. You learn from experience and then you optimize and you build larger scale facilities. Because of the reasons I mentioned earlier about the presumption that we needed to get this waste in the ground early, the Department didn't put its program together quite that way. It wanted to go fast to a full-scale facility. We were going to build a full-scale, 3000 metric ton a year surface facility for processing waste before the first stick of waste went in the ground.

My assumption, I think, on behalf of the Task Force, is we are likely to learn something in putting the first waste in the ground that might help us optimize how we want to put the other 70,000 metric tons in the ground.

So we recommended, first of all, an off-site R&D facility for the packaging of the waste. We ought to do that soon. First of all, it will be a physical measure of progress. You'll actually have a facility. This is something comparable to what the Swedes have done with their waste encapsulation facility.

We are going to have to package tens of thousands of canisters. That is a lot of waste. We have not done that yet. We are going to need to do it in cans that are going to have to last for a long period of time or maybe a very long period of time and the waste is going to be in a whole variety of forms. We ought to start the research process and the operating process to figure out how that waste package is designed, what waste is loaded, how the closure goes, and we ought to do that first in a cold situation and then in a hot situation and we ought to package some waste at this R&D facility.

If we can't get an existing facility somewhere in the country to do this, we might have to wait until we get the construction authorization from the NRC and build it on the site. They are going to have to build a waste packaging facility somewhere, some time, for this program to work. We think that would be most useful and that would also allow you to, if you go into the licensing process, and ask for either contiguous with or as soon thereafter as possible for a license to emplace waste along with your construction authorization, we can get waste in the ground years earlier and billions of dollars cheaper than the current program just by that fact alone. It won't be all the waste. It won't be huge quantities of waste but I maintain that it is on the table, whether we need to do that as early as possible or not.

Imagine a repository open for business and some waste in the ground and I think most of us would be very,

very pleased with that progress, so the first thing is we think we need a waste packaging R&D facility. We think we need to use that facility, package the waste, and the first waste that would come out of there would go into the ground years earlier because as soon as you have got a license to construct a facility, since you already have a facility constructed, you already have a ramp, if you meet the provisions of the NRC to have essentially complete surface and underground disposal capability for the waste that you want to put in the ground, you can get a license to emplace and we could get waste in the ground perhaps four or five years earlier from that way alone.

We also think that once you get a license you ought to build a pilot-scale plant on the site, that rather than going to a full-scale, 3000 metric ton a year facility, and there is something like this in the current program, why not build, say, a several hundred metric ton a year pilot plant. You can build it cheaper. You can build it faster. You can get the facility in operation and start to emplace waste not in the hundreds of metric tons but in the tens of metric tons and learn from this process.

This is going to not be as easy, I believe, as a lot of people think. We're talking about very large cans of highly radioactive, highly heat-producing waste that have to go deep underground into a variety of tunnels.

Operationally, from a safety point of view, and from an engineering cost point of view surely we will learn and be able to optimize based upon the smaller scale operation.

If we then decide we need a licensing amendment to run things more efficiently, more economically we can do that later and as I have already said, we think you ought to design this facility so that it can be open for as long as possible."

[Slide.]

MR. ISAACS: What is the result of this?

Well, we think we can get through the characterization process in less time and for less money by focusing the characterization on those issues that are important to safety. We think we can get licensed waste in the ground sooner with a smaller investment or concurrently if the site isn't good we'll know it sooner and for a smaller investment and therefore the investment risk of this multi-billions of dollars with no progress will be minimized.

Last, we believe that we can put together a set of clear, interim milestones that can mark the progress or lack thereof in this program and what comes out of this I believe is the beginning of building a credibility for the program that will only come with a lot of hard work over a long period of time and which you'll hear from Todd LaPorte far more and from others far more on that issue itself. Next slide, please.

[Slide.]

MR. ISAACS: We also suggested that we needed some management institutional initiatives in the program. No set of plans are going to work if you don't have a team put together that is operating efficiently in its conduct and it is important that the program be conducted in a professional way and be seen as producing it in a professional way and it be done in the kind of open environment that is required for this program, so we suggested, as many others have, and we are but one voice of many, that there ought to be some kind of a management look by the program and indeed I believe that is going to happen.

In particular, we thought, as did this board, and of course many of the things I have said have come from this board, that there ought to be a particular look at how the management of the scientific investigations are conducted. People have talked about Chief Scientists. People have talked about other things. I am not sure the words Chief Scientist resonated very well with our Task Force. It's really we need good scientific and technical program management.

We need to know what we need to gather and what we need to analyze and we need an iterative, real time management of that process, so we recommend an independent review of the program, particularly with regard to the management of the scientific investigations.

We also felt from an institutional point of view that in addition to running the program in a way that hopefully will engender public trust and confidence that we need to have more formal mechanisms for dealing with both the technical and scientific community and also with various non-technical stakeholders who have as much standing as we do in this program, and so we suggested a number of mechanisms for that but I would again encourage you to think that it is not the Department alone who will decide how that interaction takes place. That itself must come from a discussion.

[Slide.]

MR. ISAACS: In conclusion, what we are trying to do was suggest that there are some creative new ways to run this program. Our way is not the right way. It's not necessarily the wrong way. It is a way and it was intended to open up the discussion in that regard for public review and for review by groups like a technical review board who understand very well the fact that the content of the program and the framework for the program says a lot, not only about its technical integrity but for its prospects for success.

We think there are some new realities in the program. People understand them but they haven't been reflected in kind of a rigorous fashion and so our report was intended and continues to be intended I believe by all the task force members as a starting point for a broad dialogue that we believe under new leadership can lead to a very effective and efficient program, and with that I'll stop.

DR. BREWER: Thank you very much, Tom.

Our typical thing is to open up for questions from the board and if we have a moment, questions from the floor. since I am in charge this morning, I wonder, could you characterize what the reactions have been to the report? It's been officially on the street since March of '93 but it was known to exist even before that, so it is about a year old, and what is the reaction and where do you think it is all going to head? Your point of view?

MR. ISAACS: I'm probably a bad person to ask that question of because I'm biased.

DR. BREWER: Well, that's why I asked.

MR. ISAACS: We tend to see things through our own lens. I was asked to brief this report twice extensively to the National Academy of Sciences Board and you have Dr. Whipple here in the audience, who will be on the panel later, and I will leave it to him to reflect the board's views other than to say I think we had a very cordial and valuable interchange for two one and a half hour sessions with that board and I am delighted that they took the interest in that regard.

We received what I considered to be relatively modest written comment back that I have seen. I am out in California these days on essentially a sabbatical, so I am not sure I have seen all the comments that have come in.

The comments that I have seen in writing, a number of them have been rather positive. There haven't been many but USGS, the ones that we received were both quite positive. I would say that the NRC, and they will take and speak for themselves as well, didn't say there was anything fatally flawed but as a regulator should took a measured approach toward this thing, suggesting where there might be some rough spots that would need to be discussed.

I don't need to tell you what your own comments were.

The state was not pleased with this report in their written response. Bob Loux I believe is on your panel and again I would prefer that they respond directly to you and the industry discussions that I have had have been relatively favorable.

You know, if you don't like something, it's unlikely that somebody is going to come up to you and say, boy, that report you wrote really sucked. That normally doesn't happen, so the people who have come up to me and to my colleagues on the board have generally been the ones who have said that's terrific, we really think that this is long overdue, this is the way you need to run the program -- but I would hasten to add that that is probably a selective group.

DR. BREWER: Thank you. Other members of the board? Questions?

DR. CORDING: Ed Cording. I wondered if you could comment on what you feel it would take to obtain a license for a small amount of waste for disposal as compared to the full-scale disposal. Is there a difference in what one has to achieve to dispose of even a small amount of waste compared to the design quantities we have been talking about for the facility?

MR. ISAACS: In our view there was no difference, that we would have to go in for a full-scale license even if we were going to emplace a small quantity of waste first.

The difference comes, I believe, in the recognition that I think all of us have that we will surely know much more about whether this repository is going to work the way we think it is going to work after we have some waste in the ground than before, and that to ask us to make a full-blown case in licensing, which doesn't require confirmatory testing of a substantial nature after the license, doesn't reflect reality, so we would go in with as much credible information as we could for a full 70,000 metric ton repository, acknowledging and running the problem in a way that we know that after we get that license we will put some waste in the ground and we will begin an extended confirmatory process that will lead to further confidence later in the game that what we thought was going to happen indeed is what is going to happen.

There's going to be surprises in this program.

I think one of the things the Department needs to do is to get out front now and say, you know, there's going to be surprised, you can't know everything there is to know about what you are going to find under Yucca Mountain. That is true of any of these geology projects, and we can accommodate those kinds of things. It is more setting up a set of realistic expectations but I think we have to go for a full license in that regard.

DR. BREWER: Clarence Allen of the board.

DR. ALLEN: Just to follow up on Garry's question, what has been in your opinion the most disappointing and frustrating aspect of the reaction to this report?

MR. ISAACS: I think the board had hoped for a earlier, broader dialogue on the issues that we tried to raise in the report. The fact that there is a --

DR. ALLEN: Dialogue with whom?

MR. ISAACS: Among the interested parties. The report was put out for comment as was suggested some months after we tabled it. The comments came in. There weren't very many of them. There hasn't been yet the kind of broad debate about this kind of framework. I think that is going to come.

I think that's expected but I mean boards are impatient by their nature and after you have worked hard on something you would like to see it produce some results. I think it has produced them. I think we will continue to be influential in discussions. That's what caused you all to ask us to come talk to you today.

If there was a frustration I think it's that we would have liked to see more active dialogue on the report.

DR. BREWER: Dennis Price.

DR. PRICE: You are requiring an additional packaging R&D facility and then a number of incremental steps. You have already anticipated that siting a packaging facility like that may be a problem like the MRS siting is a problem and then there are a number of incremental steps that you see going through and decisions to be made, at each decision point an opportunity for debate and perhaps including foot-dragging and other things.

With these various number of points along the path to completion that would enable obstruction and other problems to occur, what kind of discussion went on in the board about that aspect of your plan?

MR. ISAACS: There was a fair amount of discussion on the task force about those kinds of things. We felt that the Department of Energy had a lot more discretion to be proactive than the Department had taken credit for to date and so we felt that many of these kinds of activities could be pursued.

You are absolutely right, Dennis, that the nature of this program is that every time we try and take an action there will be forces out there predictably who will have certain kinds of reactions and will try and thwart us. They have been fairly successful in that regard to date and we need to try to do some things somewhat differently.

We may have difficulty with a packaging facility, that's true. I don't see it in quite the same light as an MRS. I may be wrong, but if we can't site it and get a facility like that going then I would maintain that the country needs to come to the realization that if it can't do something as simple as figure out a place to take a few waste packages and start doing some research on how to package them well so the country can feel confident some day that this stuff is gone, and I don't know how to deal with it other than that very straight-forward way.

DR. BREWER: Warner North of the board.

DR. NORTH: Warner North. I would like to ask you what you would do differently.

The report was written quickly by your task force. You have had almost a year since it was released. You have had the opportunity to reflect both on the comments that you have received and what you didn't receive. What might you do differently and what would you recommend to others that hopefully are going to engage in further discussion on these issues?

MR. ISAACS: I think the thing I would suggest differently would be probably more process than content, and incidentally, a number of my colleagues are sitting here in the front row and if they would like to chime in at any point in time, I would suggest you do so.

I would suggest probably a slightly different process. You know, it's an interesting thing, as a Secretary is leaving out the door he says by the way, we are going to make a present to the new Secretary and you are the guy who gets to come forward and say, you know, this is from your old Secretary, by the way he was a Republican. It made for a delicate dance of sorts there.

I would do the process probably differently. I would want to involve the senior managers within the Department in the development of this process first. That didn't happen that way. In fact, we were essentially encouraged to do it ourselves because of the credibility problem that, you know, I wouldn't want to join any club that would have me as a member that engenders in things like this. It was very difficult to move that process.

We tried. We called and actually visited a few key people in the community, if you will, to get their advice on things that they thought would be real important but to have seven weeks to shake hands, say here is what we are supposed to do, draft a report, talk to people, and get that thing into final shape was a real challenge, particularly since two of the people -- one lived in Nevada, one lived in California. I was moving from Washington to California during the report and it was a very difficult process.

I think I would go with a different kind of process than the one we had and I think taking the time, going slow to go fast, is what you have to do in something like this and I would have taken the time to do that process a bit differently and had more interactions and iterations.

Now there is time to do that, in my view.

DR. BREWER: Any other questions from the board?

DR. NORTH: Warner North. A follow-up. I would like to ask you to expand on the idea of retrievability. If waste is put in the repository at the level of hundreds of metric tons, what is involved in getting it back out again with acceptable safety, with affordable costs?

Did your task force think about that level in any more detail? Are there some insights from your discussions of it that you might share with the rest of us?

MR. ISAACS: Yes. I am not sure we looked at it in the detail you might be suggesting, Warner, but we thought both from an operational point of view and from a credibility point of view that it would be important after we got the facility going and were emplacing waste that as part of the actual design of the operation we take some of that waste back out to demonstrate to people that when we talk about retrievability we can indeed retrieve some waste.

We also suggested an extensive lag storage, which some people misunderstood that we were proposing an MRS at the site.

In order to say to people that you can credibly retrieve waste, you have to have a place to retrieve it to if you take it out of the ground, so we suggested that there be extensive lag storage at the site for a variety of reasons, one of which was to have a place to retrieve all the waste to should you for any reason want to take it back out of the ground.

Clearly there would be some operational disadvantages in terms of being prepared to take some of that waste back out of the ground. We did not calculate how much that might cost us but we thought it was important in terms of the framing of the program.

We do think, incidentally, since you are giving me an opportunity to say it, that lag storage at the facility makes a lot of sense from a variety of points of view, not as an MRS. We would not encourage lag storage until we had received a construction authorization from the NRC so it would not be an MRS in that sense, but to allow for a decoupling for that facility for lag storage to complement the other federal storage, whether it is at reactors through MPCs or through some kind of an MRS, whatever it may be, to complement that and to allow the decoupling, if you will, of waste acceptance from waste emplacement, which many people including this board have suggested.

DR. BREWER: In the interest of time let me pass to Staff. Any questions?

[No response.]

DR. BREWER: Tom, thank you very, very much for a good presentation.

MR. ISAACS: Thank you.

DR. BREWER: Provocative. Our next presenter is Nils Rydell, from whom Tom promised we would learn a lot about the Swedish program, and given his experience I have no doubt that that will be true.

Nils is an expert of the Swedish National Council for Radioactive Waste. He has been involved in the Swedish nuclear program from essentially its inception. He participated in the design and operation of its first research reactor in Stockholm, participated in the design of the first nuclear power plant, was a superintendent of that plant, was the project manager for Sweden's first commercial nuclear power plant, has gone through a succession of increasingly responsible positions within the Swedish system looking at the whole issue of birth to termination or death and the whole cycle of nuclear power and fuels.

He was the technical director at the Swedish National Board on Spent Nuclear Fuel, which is the supervisory authority for R&D on spent fuel management. After retirement, he has moved to the National Council for Radioactive Waste. The Council on Waste reports to the Secretary of Environment and Natural Resources in Sweden.

Welcome, Nils.

REPORT FROM SWEDEN

MR. RYDELL: Thank you, Garry. I'm asked to report on recent developments within the Swedish Nuclear Waste Management Program, and I will come to that if I can get the first slide. Thank you.

[Slide.]

MR. RYDELL: I will jump directly to the subject.

I will give you some background, a few words on Sweden's Nuclear Power Program, some more words about the Nuclear Waste Program, quite a few about the new strategy, again some words on the comments that I have received, and a few words on the government, which had decided in December upon that program. If we could get the next one?

[Slide.]

MR. RYDELL: Our Nuclear Power Program is small, of course, compared to the United States. We have four nuclear utilities, four nuclear sites with altogether 12 nuclear power units. Nine of these have boiling water reactors, three have pressurized water reactors.

The total -- you can take the next slide by the way.

[Slide.]

MR. RYDELL: The total net electric capacity of these 12 units is about 10,000 megawatts electrical and they supply about 50 percent of the total electricity production in Sweden. The rest is chiefly by hydro. We have very little fossil fuel electricity.

After the Three Mile Island accident, the Swedish public became concerned about the safety of nuclear power. A referendum was held about the future of Swedish nuclear power. Based on that referendum the Parliament decided that there should be no more additions to the Swedish nuclear power park and the plants that were in operation all were on firm orders and that nuclear power should be phased out so that the last unit would be stopped at 2010 at the latest.

You can see the siting of them. They are all sited along the coast from Forsmark, Oskarshamn and Barseback and Ringhals.

Coming over to the Swedish Nuclear Waste Program, it started really already back in 1973 so it has come of age by now. That was early. It was government-initiated from the nuclear research station at Studsvik who started the issue by assembling a group of politicians and experts from the nuclear industry, nuclear research centers, universities and so on to the AKA committee and this should propose how we should manage the spent nuclear fuel from our reactors nationally.

They proposed reprocessing and they also proposed interim storage, a low-level waste repository, transport system, and even pointed out a few sites for the disposal. That was done in 1976. Just imagine how nice it would have been if the government was alert and interested in nuclear power with this group five years earlier when the first nuclear power unit was ordered and it had worked as fast. We might have had a repository accepted by the Parliament before anyone really understood how difficult this ought to have been.

[Laughter.]

MR. RYDELL: The work was started immediately, in fact by another organization called CLAB, which was a governmental organization but they didn't come very long until there was a shift in government. A more anti-nuclear government came into power. They proposed and the Parliament decided on the so-called Stipulation Act in the beginning of '77.

By this act the utilities were required to describe a complete managed system for the spent fuel before they were allowed to fuel new reactors. This didn't concern the old reactors. They had their licensings. But there were two new reactors almost completed, and of course delays in their start-up would have been very expensive, so the utilities had to work fast and they formed a task force, the KBS Project Group. They had a common daughter company for nuclear fuel supply. It was joined to that company and their task was of course then to describe a total management system, make a safety assessment of all aspects included in the disposal, provide the necessary data to support that safety assessment, and they did this in one year.

[Slide.]

MR. RYDELL: The first KBS report came within one year and that was sent by the government on a national and international limit for comment and critique.

Answers were received from around 50 Swedish and 20 international entities, among them notably the U.S. National Academy of Sciences, and the report was, after that review, approved by the government as sufficient evidence that the spent fuel and ensuing high-level waste could be safety managed and disposed of.

The first report, incidentally, was on vitrified high-level waste. That was still an option then. Later reports a few years after described disposal of the spent fuel as such. Now if I could get the next slide, please.

[Slide.]

MR. RYDELL: The utilities were very upset initially by the Stipulation Act. They thought it was unfair to give them such a heavy task on such short notice. But, in retrospect, I think they are fairly pleased with the outcome and they should be because it has some consequences which were beneficial to the utilities and to the waste management in general, I think. The utilities had to take the initiative and they have kept it since, and it is a great advantage to have the initiative because the discussion is then carried out on your terms and not on everybody else's terms.

They had to devise already at the outset a complete disposal system with interim fuel storage transfer facilities and a repository. That gave them the basis for a long-ranging strategic plan on how to implement the necessary steps in the management of their spent fuel up to final closure of the waste repositories.

They got approval of their concept for a repository as one way to reach the goal, a safe disposal system. This gave them, of course, then a focus and a structure for their subsequent R&D work. They could concentrate very much on the information needed for that type of a repository. They still had to assess alternative disposal methods, but they could do this against an established reference, reviewed and accepted by a large part of the scientific community, the nuclear authorities mind you, and the government.

It was not in the Stipulation Act, but it came as a consequence of that that a fee system was implemented to cover the costs of the spent fuel management and also decommissioning, by the way. The electricity customers pays part of their bill as a fee on nuclear electricity which is then collected by the utilities, sent to the government and funded in the Bank of Sweden, interest is laid to the fund, and this fund is kept separate from the government budget.

[Slide.]

MR. RYDELL: SKB gets its expenses covered from the fund, and that is after authorization by the Nuclear Power Inspectorate.

Now the conceptual disposal system is valuable because you can, for better or for worse, make a cost estimate of the whole management system up to the final closure in 2060, or something like that, and you can know the incomes because there is a fee on the electricity and you know roughly how much electricity is going to be produced.

This total budget introduces a measure of economic discipline on SKB because the long-term total expenditures must balance the long-term total incomes of the budget, fees and interest. There is, of course, a requisite for a total budget, and that is that you budget for a total amount of fuel.

Now it is kind of ironic the consequences political decisions may have, this same government with its anti-nuclear stance who thought that they had caught the utilities with a Stipulation Act, actually they had made a great public relations drive on the KBS concept by setting on it an international limit, so everybody had to read the report and learn about the Swedish system, and this helped to raise interest for international collaboration. We started very early with that, and it is good to say that the first active partner we had was the United States in the first Stripa Project back in 1977, I think. That has been continued and the U.S. also participates, for instance, now in the new Hard Rock Laboratory.

[Slide.]

MR. RYDELL: If we look on the next slide, that is about the infrastructure that has developed within the program. You can take the next one, we have a spent fuel and low and intermediate level waste transport system. We consider both Sigyn there, which is a roll-on/roll-off cargo, and you can see the transport roads all are along the coast. The waste facilities are at Oaskarshamn and Forsmark at present.

[Slide.]

MR. RYDELL: If you take the next one, we have an interim storage facility with spent fuel stored deep underground or fairly deep underground. That can be expended way over the capacity needed for the full present Swedish nuclear power program, even if that would be extended there would still be capacity available in CLAB to accommodate the fuel.

[Slide.]

MR. RYDELL: If you take the next one, many of you have seen these bases, but I will show you them anyhow. We have also a repository for low and intermediate level waste, operational waste on the reactors, the SFR, and that is in operation. The transport system is in operation since '83, the CLAB, the fuel storage since '85, and the SFR, the repository for low-level waste since '88.

What is needed now is a plan for encapsulation of spent fuel and that is planned to be located wall-to-wall to the interim storage. So we take the fuel from the interim storage, you put it in containers and then you go to the disposal site. Of course, we need a deep repository, and the first step will be a deep repository for demonstration deposition.

Of course, that we have this infrastructure gives us a lot of flexibility. We are not tied to any times where if we missed them there would be very hard consequences. We can revise time schedules without thinking too much about consequences, and it is also obvious that the initial assessment of our system back in 1977-78 was made without guidance from criteria of regulations on high-level waste management. There was an overriding criteria that possible releases from a repository should not cause individual dose commitments. They should be well below .1 milliSievert per year. It is only recently, it is only the last year by the way, that the Nordic authorities on radiation protection had issued criteria for spent fuel disposal. In this work, of course, they have had the benefit of many years of research work on disposal in Sweden and elsewhere.

[Slide.]

MR. RYDELL: If you would look on the next slide, I would just show you the components of the Swedish disposal system. I guess you recognize it. The repository is designed as a configuration of corridors joined by some transport corridors. In the floors of these corridors, we have pits, we put down the spent fuel container there and it will be embedded in clay, probably bentonite, and the spent fuel container is rectangle-shaped. That design has recently been modified. Now they talk about a steel pressure vessel surrounded by a mantle of copper for corrosion protection and the fuel will be put into the steel pressure vessel. So far it is not yet decided whether there should be some filling material in-between the fuel and the steel container.

The total amount of fuel, assuming that all power reactors will be operated up to 2010, will be about 7,800 tons counted as heavy metal content, and the number of containers, at least before this one, was around 5,500. So it is a measurable size of a repository.

The safety principle of the disposal in Sweden as elsewhere is to isolate the radionuclides by multiple, independent barriers, as you understand. Now, when the KBS group made their first design, that overriding concern was to get as early acceptance as possible, and they had little time to collect and analyze data on properties of the bedrock and to assess the complex interactions of radionuclides with the groundwater and the rock. Therefore, they designed the repository with a conventional layout and with as durable disposal containers for the waste as they could devise.

In this way, they were less dependent on concurrence among experts from various geoscientific disciplines about the performance of our ancient crystalline bedrock as a barrier to radionuclide migration. If that was a strong motive at the very beginning, it has stayed a strong motive all the time up to now. SKB has devoted considerable funds to geoscientific research, but we are still in the position that we will never know sufficiently much about the details of the geology to be able to substantiate a very thorough performance assessment of the rock. So we will need strong engineered containers so that the independence of the geology becomes less pronounced because we will have difficulties in displaying it against all criticism.

I have included a little in the paper about regulation or spent fuel disposal. Of course, there are much in the way of regulations, but it is only the most important. As I said initially, it is the owners of the nuclear power plants that have the responsibility for the disposal of the fuel, both technically and financially. Now they have joined their forces on that and formed a joint company for that. They have to submit every third year their R&D program for critique and comment and to an authority designated by the government.

In Sweden, this goes by older practice in the administration that the one who is responsible forwards the report to a big number of concerned groups and universities, scientific and academies, communities with nuclear power facilities, concerned citizens groups and so on. The main reviewer assembles the responses and he makes his own evaluation and then he gives his verdict, so to speak, and sends to that the government for a decision.

That has several advantages because the program is reviewed every so often and SKB gets some kind of confirmation that they are on the right track. They get some assurance that they are not going to be overturned in the end. SKB will further have to submit an environmental impact statement and a preliminary safety assessment, both for the encapsulation plant and for the repository, of course. The point here is that the environmental impact statement and the preliminary safety assessment of the repository will have to be submitted at the stage when SKB will start detail investigations of their prime disposal candidate sites, so that they don't invest a great deal of money in detail investigations without a review of the environmental impact statement which may come as a result of the detail investigations. That is also a kind of assurance that either they would be stopped in time, or if they proceed they will have some assurance that they can proceed.

Now, at last, I come to the change in the strategy. Up until '92, SKB talked in terms of a once and for all full disposal program for the first step, and that should start in 2010 with the construction and in 2020 with disposal.

In its review of the '89 year's program, the National Board for Spent Nuclear Fuel, the predecessor you could say to KASAM, said that they didn't do it this way. That they would take it in smaller steps and check the steps and prove the case before they continue. At first the utilities were very concerned about that. They didn't believe they could do it. But with time they found that this was a good idea. So now they have decided that is the way they are going to do it.

That has, of course, had far-reaching consequences in the program because if they say we are going to make this now and we are going to start implementation, and also to say which concept they wanted to use, they had to start plans for encapsulation, and they had to start the process of obtaining a site. Nobody was surprised that they took their old KBS system as the design, but these things have now to be reviewed and the government has to say what about it. I will come back to that.

Now I am going to do something which normally you shouldn't do in oral presentations, I am going to read directly because SKB has given their kind of arguments for this demonstration step and they have certainly formulated their words carefully, so I can just as well read them as they are, I couldn't do them better myself.

They say in their Research, Development and Demonstration Program in '92 that: "In the planning of the present program, SKB considered that possibility of demonstration disposal, this possibility of building and commissioning the repository in stages. The result is that SKB finds that a demonstration phase has considerable advantages. The present program thereby calls for completion of the research, development and demonstration work by first building the final repository as a deep repository for demonstration deposition of spent nuclear fuel. When the demonstration deposition has been completed, the results will be evaluated before a decision is made whether or not to expand the facility to accommodate all the waste. This plan also makes it possible to consider whether the deposited waste should be retrieved for alternative treatment. The latter option means that it must be possible to retrieve the posited fuel during the period the facility is being operated for demonstration purposes. The siting process is only affected to a limited extent by whether the planning applies to a deep repository for demonstration deposition or to a complete deep repository. The requirements on background information from SKB in the different phases (preinvestigation, detailed investigation, construction of repository) are essentially the same."

[Slide.]

MR. RYDELL: Then SKB explains in some detail the advantages it has found with the demonstration step, and you can see them here. They say the most important reasons for SKB's plan to build a repository for demonstration deposition is that this makes it possible to demonstrate the following without the necessity of making what are sometimes described and perceived as definite decisions.

You see there, it is the siting process with all its technical, administrative and political decisions, the step-by-step investigation and characterization of the deep repository site, the licensed system design and construction, the full-scale encapsulation of the spent fuel, handling the chain of spent fuel from CLAB to deposition in the repository, the operation of a deep repository, the licensing of handling encapsulation and so on, and possibly, and I put that in parenthesis, retrievability of the waste packages.

They long-term safety of the final repository cannot be demonstrated through field tests, and that has to be done with performance assessments and so on. They also say that the reason they are planning a demonstration deposition is not doubt as to the feasibility and safety of the disposal scheme, the plan should be viewed as an expression of an awareness of and a respect for the fact that the solution of the nuclear waste problem arrived by their research and development work, needs to be demonstrated concretely to concern people in society far beyond the circle of experts and for confidence building purposes.

It is SKB's opinion that the demonstration deposition of spent nuclear fuel with full freedom of choice for the future is a good way to enlist broad support for the method of disposing of the nuclear waste. The new strategy has included that.

[Slide.]

MR. RYDELL: That is similar to an earlier one, but you can see here that we have here the demonstrated repository, and they are optimistic and think that everything is going to be fine, and so they have drawn the rest of the repository just a little bit of distance away from the demonstration repository. There could be some comments on that.

[Slide.]

MR. RYDELL: That is the last one. They have a time schedule, and you can have a look at it while I am talking. They want to have an encapsulation plant with test operation before the year 2010 and full-scale operation from 2020. They need at least one site for detail investigations before the year 2000, and the demonstration disposals should start around 2008.

What did we think about this, the reviewers? I have described the procedure. Most of the -- well, I can say every reviewer, without exception, thought that the step-wise approach was a good proposal, everybody, and that was a little bit surprising because even in the international scale this was somewhat of a novelty. The promoters of waste disposal have been a bit afraid of the step-wise approach as some kind of sign of weakness, but this is, I think, the first time that this has been proposed and everybody was happy with it.

Many of them observed that the new strategy was not yet well integrated with the R&D work. It had obviously been decided fairly late in the interval between the report before and this report. So they presented their arguments for the demonstration but they didn't really describe how this demonstration project would interact with the supporting research program and how it would interact with, benefit from and eventually supersede the Hard Rock Research

Laboratory, and they didn't expound on what lessons they foresaw they might learn from the demonstrations except those related to the licensing procedure.

Some reviewers questioned the term "demonstration," they meant that this first step should be called "Step One" and nothing else. Since SKB had not indicated any other difference between this steps and the next than its size. The majority conclusion among the reviewers was that the demonstration repository would ultimately be sealed as built if lessons learned would only be of minor importance for safety.

At the same time, it was accorded as important for the credibility of the learning aspect of the demonstration that the repository design allows for retrieval and that retrieval is demonstrated as part of the effort.

There were some other critical reviewers who were favorable to the idea of a step-wise implementation, but they expressed distrust about SKB's motives. They believed that SKB had adopted the step-wise approach as a way to allay opposition against their work rather than as a way to learn and at the same time leave options open for the future.

There was also some concern about SKB's choice of disposal methods, not necessarily that the disposal method would be bad but that the decision, that kind of an irretrievable decision was made at this stage even if it only was for demonstration purposes. For instance, they wanted more studies of disposal in deep bore holes, and accordingly, of course, their recommendation was that SKB should not rush the demonstration step.

There were some comments about the container -- I haven't checked the time, perhaps I should leave them aside, they are not that important for the strategy. I would only read again what the government said about it, because that is important. The government decided on the program in December, and the government said that it shared the opinion expressed by the Swedish Nuclear Power Inspectorate and KASAM that the phased approach to a full disposal that SKB had described has considerable advantages even if the long-term properties of the repository cannot be demonstrated. The government emphasized that SKB should not commit itself to any specific management and disposal method until a thorough and coherent safety and radiation protection analysis had been presented, even if the KBS-3 concept would be a reasonable choice for demonstration deposition.

They decided that SKB shall complement the program with accounts of the criteria and methods on which a selection of sites for disposal can be based, a schedule for presentation of the design specifications for the encapsulation facility and the repository, a schedule for presentation of the performance and safety analysis that SKB prepares, and an analysis of how different methods and decisions taken by SKB, how they influence later decisions in the disposal program, and that SKB shall further give successive accounts to the Swedish Nuclear Power Inspectorate on changes in the time schedules which were presented the RD&D program. The time schedules were not good. The government is anxious that before they make kind of binding decisions the authorities will have a chance to have their say.

So it may seem like we lived in the very best of worlds. We have implemented part of the waste management facilities, and we have an accepted program. We have to continue with the demonstration step which everybody likes, and I would be glad to say it wasn't all that rosy because, you know, we still have a great hurdle ahead of us, and that is to find acceptance for a disposal site.

I have a quite recent experience on how that this can be difficult because my approach to the United States this time was also step-wise. I started with a taxi ride from my home to the bus stop for the airbus and during that trip we came to discuss the weather which has been very unstable in Sweden for many winters, and the taxi driver knew precisely why. He said, it is all this radiation from the nuclear power plants. I said he was wrong, but before I had managed to convince him that he was wrong, we had already reached my destination.

But, I mean, if that is our conceptions about hazards associated with nuclear in the public, then I don't know how to overcome them. If I had known, I would have continued, but since I don't know, I think it is just about time I stop now.

DR. BREWER: Thank you very much.

Questions from the board?

John Cantlon?

CHAIRMAN CANTLON: Nils, what is your prognosis for the site selection process now, how do you visualize that unfolding because, as you mentioned, that is clearly going to be where the tough part of your process really comes to the front.

MR. RYDELL: SKB has started with a blunt full approach, they have found two communities in the north of Sweden who are interested to make a joint prestudy of the possibilities for a disposal within their areas. That will go on. Actually, the bedrock up there isn't bad at all, so it is fairly lucky. But there is also position and what will come out of that in the long-range, I don't know.

I would have liked to see, and we have said that on the last three reviews, that SKB must hurry up with the container design and fabrication. I think it will be easier in this country to persuade people that this is not a hazard for them and the next generations if they can show the thing they are going to put down in their area rather than just describe it on paper. So I think they may have to face into the development of the container before they really succeed.

CHAIRMAN CANTLON: A follow-up question, when we were over there recently, the container research had some serious hurdles ahead of it, not the least of which is the welding of the copper. Is progress moving ahead in that area?

MR. RYDELL: Oh, yes. I haven't followed the recent programs, but they are aware now that they need to press ahead with that as fast as they can. I don't know the details.

DR. BREWER: Other questions for the board?

Warner North?

DR. NORTH: I would like to thank you for an excellent presentation, as always. In your review of the Swedish program there was one aspect that you didn't cover that I think might be useful for many who are with us today, and this is the size and scale of the Swedish program.

Could you give us a general idea of the number of people involved in SKB, SKI and any other agencies, the dollar expenditure over time and the extent of external review, both the number of times that a performance assessment has been out for external review and the number of people, both in the technical community and in other stakeholder groups who have provided comments back?

MR. RYDELL: I would like to elaborate but it takes time on organization because I like the way we go about it in a small country. As the essential crew at SKB is about 20 people who supervise the various contracts, they contract out and so on, I cannot say for sure what the number of consultants are that they have now. I would think they are on the order of three or four hundred, but I may be wrong on that. In the Nuclear Power Inspectorate, they are altogether 80 and they supervise nuclear reactors as well as waste, the waste group is around 10 persons, 12 persons. The Radiation Protection Institute has 200, but they also supervise, as you know, hospitals and industry and so on. I think those in the nuclear waste business are around quite a few.

The reviews, the program or the concept as such has been out for review and decision by government twice. That was back in '77 and in '83, I think. The program, the resource program was reviewed in '78 and '84, in '87, '90 and '93, so there have been four reviews, and involved are, I would say, on the order of -- note there have been international reviews twice, but in Sweden it is on the order of 50, and they include universities and technical institutes, the scientific academies we have, the agencies and authorities which are concerned like the planning authority and the natural resources authority. They include the communities where we have already nuclear facilities since they have some expertise in the area, and they include concerned citizens groups who are known, and then, of course, anyone is entitled to come in with comments.

That is about the program. The safety analysis has been approved for the KBS-1 and the KBS-3 and that was in '77 and in '83, I believe. The last one, SKB-91, as it was called, has not been formally reviewed, and it was in this review of their program, which did not exactly include the performance assessment except as a reference, there was heavy criticism about the way SKB had drawn conclusions from their performance assessment. So they will have to update and redo that. Obviously, I am not in a good shape there.

Was that about what you were asking?

DR. NORTH: Yes. Could I summarize accurately as, it would be difficult to find people within the Swedish scientific and technical community who have the scientific credentials and the relevant disciplines who have not been involved at some stage in reviewing the program.

MR. RYDELL: Right.

DR. NORTH: Is that accurate?

MR. RYDELL: Right.

DR. NORTH: Thank you.

DR. BREWER: Other questions from the board?

DR. DOMENICO: What would you expect to see in a human time frame that would suggest that the demonstration repository is failing and you would have to go to some retrievable system?

I suspect I can ask that same question of Tom because the concepts now appear to be very close together.

MR. RYDELL: I am sorry, I didn't quite get what you said.

DR. DOMENICO: I said, what would you expect to see, to observe in a human time frame that suggests that the demonstration repository is not working and you must retrieve the waste?

MR. RYDELL: It is a good question. So far, we have a fee system, as you know, and SKB has now made the calculation of what it causes to separate the disposal in the demonstration step and the second step. If they have done it there, it isn't very expensive, obviously, since they do it in the same amount. So far, they have not made proper, I would say, scenario analysis of untoward developments, we would have to request that by them. Before that was kind of illusory because if you didn't have a good plan it was difficult to think of different scenarios, but they would have to do that.

Of course, if there is something seriously wrong with the demonstration step then, for one thing, it has proven its measure. But for the other thing, of course, we will be in a very unpleasant situation and I really cannot say what it would. I don't think even the fee system would be sufficient in that case. I mean, the scenario on which you base your fee, I guess, would not include a catastrophic error.

I am sorry I am not being very specific.

DR. BREWER: Nils, let me thank you again for a fine presentation on behalf of the board and announce that we are taking a break and we will reconvene at 10:10 or as close thereto as we can.

Thank you very much.

[Recess.]

DR. BREWER: Ladies and gentlemen, would you please reconvene. Will everyone please come and take their seats.

It is my pleasure to introduce the next speaker, Todd LaPorte. Todd is a professor of political science at the University of California at Berkeley. He teaches and publishes in the areas of public administration, organization theory, technology, politics, and his particular emphasis over the last ten or more years has been on decisionmaking in large complex technologically intensive and hazardous organizations. In other words, he is the guy to be talking about this subject matter.

His service goes well beyond being an academic person at Berkeley, he has long-standing interests in the applications of technology and has provided good and faithful public service over the years. He served on the Secretary of Energy's Advisory Board, which will be the subject of his presentation today, the Committee and for the board that published in November of 1993 the report "Earning Public Trust and Confidence."

Todd has also served in a variety of posts for the National Academy of Sciences, for Oak Ridge, for the Radioactive Waste Management Board, a long list and a consistent list. It is a great pleasure to introduce to you Todd LaPorte commenting on the Secretary of Energy's Advisory Board report on Trust and Confidence.

TASK FORCE REPORT:

PUBLIC TRUST AND CONFIDENCE

DR. LaPORTE: Thank you, Garry, and it is nice to see the members of the board again, and to see many faces in the audience of people who have contributed toward the Task Force's activities and followed our work over the last two-and-a-half years, and I am encouraged that the Technical Review Board has found itself able to entertain issues linking technical and institutional matters.

As you can expect, the task force that I am going to be talking about found these aspects inexorably entangled, and your interest in these matters I think is strongly signaled by today's agenda and the fact that this is my second appearance before you. The task force has been grateful for your interests in what has been an extraordinary effort for DOE or, for that matter, any other government agency, that is a serious independent inquiry into its trust worthiness as a manager of an exceptionally demanding technology, both in an engineering and apolitical institutional sense.

The last time I was here, in the early summer of 1991, we reviewed the task force's charter, something of our initial perspective and the means by which we sought to carry out a process that would return both strong analytical results and high public credibility.

I think you have and I hope the members of the audience have received copies of the report's executive summary, our definitions of trust and confidence, and a summary of our activities, public meetings and data collection that we undertook.

As you know, the task force's charter became quite sweeping across both the DOE's civilian and defense waste programs, and due to the limited nature of systematic analyses on questions of public trust and confidence in democracies, we had to do a lot of this ourselves. You will find in the report a good deal of closely reasoned work setting out our general perspective, then its application to DOE's relationships with stakeholders and communities and its internal management and operations. The project's director, Dan Metlay, developed much of this himself and pulled all of it together in a most cogent way. We were graced with that kind of skill and appreciated it very, very much.

The report concludes with some 70 more often detailed recommendations and suggestions for initial implementing steps. Even a brief schematic overview of all of this would occupy more time than we have, and perhaps wouldn't be as helpful to the board given your charge of technical and operational review.

What I am going to do is concentrate or emphasize our views on internal DOE OCRWM operations after a cryptic summary of our findings and a comment on DOE's external relationships. I would be happy in the questioning period to take questions about our process, data gathering and analytical logic, but I am going to skip over that part of the report. I think you have copies of it for your own consideration.

What did we find? I am going to give you a kind of cryptic overview. First, the bad news that really wasn't news, as widespread lack of public trust and confidence in the Department and its programs stemming from direct public contact over many years, it was indicated repeatedly by representations in the various meetings that we held, more systematic studies that we commissioned ourselves, and those commissioned by the State of Nevada, I believe you have a summary of these as well.

The lack of public trust and confidence has and is resulting in an opposition not only to the present program activities but to initiatives for programmatic change as well. It reflects on other non-nuclear activities in the Department and it is sufficiently severe that it causes many outsiders to -- and this is an important context for the rest of my comments -- many outsiders to discount trust strengthening activities and amplify trust reducing incidents. We are clear at the extreme end now where whatever goes on is seen in a context of substantial suspicion.

This trust is likely to continue for some time. Restoration will require significant changes in activities throughout the Department and its programs for a number of years, and also require significant changes in contractor behavior as well. Often we forget that most of what DOE does is carried out through contractors who represent an important element in all of this. These changes can't be simply appended to ongoing activities, but must be an outgrowth of the agency-wide recognition that most programmatic choices, most technical programmatic choices have consequences for institutional trust worthiness.

In a sense, these changes would represent a major substantial change in the Department's operating culture. Many of the changes that I will outline in the recommendations wouldn't be necessary for an organization already enjoying public trust and confidence, and you will see later on, I will make a distinction between those things that are added on because of this context of suspicion.

Indeed, from a technical and managerial point of view, many of the things I will be listing will feel like overcompensation. That is, we are all honorable people. What I will be talking about are things that signal distrust of our activities and your activities as well as the activities of people in the field, and the task force believes that these are important to overcome. You might say history, the transaction costs of reducing suspicion, if you want to put it in those terms.

The behavior of organizations it the next general finding. The behavior of organizations responsible for radioactive waste management will be far more important in creating or inhibiting public trust and confidence than their organizational form or structure. Some of you will realize what we are responding to was a whole series of proposals for substantial institutional or organizational change of the relationships of those organizations in the Department managing radioactive waste and, indeed, the contractors as well. It has to do with whether the Department should be reorganized or not.

We have simply found no basis analytically for changing major structural relationships if you want to increase public trust and confidence. Other things have to happen much more important than the specific organizational form.

The inherent demands on the OCRWM program have seriously reduced its ability to take major steps that might strengthen public trust and confidence, but we would agree with Tom's assertion that it still retains sufficient discretion to take a number of others that are important.

However, OCRWM, during the time we were doing this, has had a relatively constricted view of what is required to actually restore trustworthiness. It rarely considers explicitly the consequences of its actions for public trust and confidence in terms of its program designs, the way it carries out its various activities.

Finally, let me end with a sort of a little bit of better news. It is not good news, but it is better news. There has been a modest improvement in the way the

Department has been perceived over the past four years. This has brought some benefit to the Environmental Restoration and Management, the ERM, Program where there is both a broader conception of what is required in this regard, and in an institutional context it provides more immediate opportunities to do the things which would speak to the question of distrust. In the report we list a number of things that have happened over the last four years that move in the direction and that lay a foundation for a more positive change.

Let me sort of step off to one side in the kind of conversation we have been having. The last several presentations, and many of the things that you have heard come out of the dialect of the technical world, and the context of that discussion implicitly suggests that the community that you are dealing with trusts the technical world, and we can go ahead and plan as if those plans would be carried out more or less straightforwardly.

Nils gave me a kind of transition to this point just in his last comments when he said, now they are getting into the point where the Swedish public isn't quite sure that even if the plans are well constructed they will be carried out -- let me put my language to it -- carried out the way they are presented, something will happen along the way that doesn't speak to integrity, or is not carried out the integrity of technical planning.

Carry that a little forward and say, now think of the technical world going into a highly suspicious environment where people have come not to trust the veracity of managers and sometimes technical people, and you begin to see the kinds of recommendations that are the reason that we have come to the kinds of recommendations that we have.

I want to turn to them now. In each case, we have had two large sets, as you know. We have derived these from a group of design principles. I would like to review them quickly for external relationships, and then I will go into detailed discussion about those having to do with internal operations. We begin each area with a premise, and I think they are in your handout, though I am not going to show the quite yet on a viewgraph.

The premise for external relationships was this, when agencies manage programs that could be seen as levying more potential harm than benefit on citizens and communities, agency leaders must give all groups of citizens and their representatives opportunities for involvement, sometimes empowerment, but let me use involvement -- empowerment is perhaps a more dramatic way of saying that -- and must demonstrate fairness in negotiating the terms of their immediate relationships. That is a kind of design principle.

Insofar as these are not or cannot be accomplished, grounds for suspicion remain, and you might use a biological metaphor, the nutrients of distrust are all around, so to say.

To realize this general condition, we hit on six different design outcomes.  As I review them, notice that we felt only the first one that I will list would be needed if there were already a history of public trust and confidence in the Department.  The other five requiring a good deal more effort and commitment are necessary to recover trust. So you need to hear what I am saying with this very important point, we are talking about the recovery rather than the establishment or maintenance of a trustful public relationship.

The first one, and I will go through them quickly, is pretty obvious, the early and continuous involvement of stakeholder advisory groups which are characterized by frequent contacts, complete candor, rapid and full response to questions.  You do this to maintain confidence.

Now the ones that you do to recover confidence, a timely carrying out of agreements unless they are modified through a process established in advance.  What is the process of reformulating plans established in advance?

Thirdly, consistent and respectful reaching out to State and community leaders and the general public to inform consult and collaborate with them in technical operational aspects of the activity. The emphasis here is on initiating contact rather than responding to complaints or opposition.

Active and periodic presence of very high agency leaders, visible and accessible to citizens out there in the field. The idea here is that citizens don't believe that their views will be forwarded to the center if they only have those field office leaders to speak with. They want to be able to talk to the top people.

Fifthly, unmistakable agency and program residential presence being there in the community that contributes to community affairs, some exchange, and pays through appropriate mechanisms its fair share of tax burdens.

Finally, assuring negotiated benefits to the community along with resources, and this is quite important, along with resources that might be needed to detect and respond to unexpected costs. Communities want some assurance that when surprises occur they are not going to get it in the ear.

I have gone through this quickly. While this board is not charged to be concerned with the ways the Department relates to the communities or stakeholders, it is our view that the conduct and context of technical work and operations is often affected by political conflict -- in a sense, that is why we are here -- and/or public suspicion in large system operations. This is a general condition in our society and it is certainly focused here.

In this case, I want to emphasize again that much of the operations are carried out mainly through contractors, and they keep coming up again. When DOE and its program officers or contractors behave in ways that inhibit trust or prompt conditions that feed suspicion, technical work suffers. Indirectly, so do the technical communities involved. That is, the communities of technical people, professionals, begin to draw after a while or begin to be, you might say, tarred with the brush of suspicion as well, and obviously in the long run it may lead to a situation of grievous public harm in addition.

Let me go now to what I think of as what I suppose you have the most interest in, and we think that you have the most area to contribute to, that is internal operations. Why did the task force devote so much of its energies to internal operations, wouldn't a thorough reform of the way DOE goes about its relationship with affected communities and other stakeholders be sufficient to recover public trust and confidence and allow good trustworthy technical work to go forward?

These are certainly necessary. We don't think they are sufficient in this case, and it is due, we believe, in part at least to the nature of the task, the technical task, and in part to a characteristic of our legal system.

First, the success or failure of a radioactive waste disposal program cannot be unequivocally determined for many, many years, far longer than the lifetimes of the program managerial or technical leadership. It is way out there.

This means that the quality of decisions taken now or operations carried out in the near future can't be judged very well on the basis of near-term feedback, it is going to be out there a long ways, nor will there be any chance to reward or punish leaders mostly responsible for these programs on the basis of its overall success or failure. When this happens, and it does in a growing number technical areas, those who believe they or their children could be at risk come to realize that our legal system has no way of holding present decisionmakers liable for failures they may put in train in the present but not discovered to be failures until well into the future. None of our accepted methods or processes of accountability can accommodate a situation where judgments cannot be based largely on timely program outcomes. In a sense, this form of trial and error learning is denied to us in this kind of a case. It is quite unusual for our political system.

What this does is, instead of responding to outcomes, failures, the way we normally do and saying that is a good thing or a bad thing, what this does is direct our attention internally to the quality of knowledge, technical operations and management in the present and into the operational future, particularly in programs that have a long operational horizon like this one. We are talking about 2010, that is a long institutional evolution. These are the conditions that led to the underlying premise of our design basis for internal operations.

Now let me ask Leon to put on the first viewgraph. I am going to become a little more detailed now in my presentation.

[Slide.]

DR. LaPORTE: What I have here is essentially the premise of -- our internal operations went something like this, if you put it in the form of a question: will the tasks to be carried out, will they be carried out in ways that when the public gains access to the program through improved relationships with external -- externally -- people want to get in and find out what is happening -- will they discover activities within the organization that increases institutional trustworthiness or decreases it?

You can put it a different way: the more you know about the organization, the more you should trust it. If you think about what usually happens, the more we know about organizations, the less we trust them. They are doing the things that we always wondered about. So this is a very interesting problem, you might say, in our organizational or bureaucratic relationships. The higher the potential hazard associated with whatever the program is, the more critical it is to carry out its activities in a proper trustworthy way.

What the task force then did was to hit on six conditions of internal operations, and then fill them out -- and you will see them up there -- a number of specific measures to effect them.

Again, let me note that most of these conditions -- the four that have the little red circles around them, what I've done is to have asterisks -- all of these are there due to the need to recover trust and confidence, rather than simply carry it out or maintain it.

The first two are pretty straightforward, "To maintain a high level of professional and managerial confidence," not surprised; secondly, "Establish and meet reasonable technical performance measures and schedule milestones," not a surprise.

Now, we come to the harder ones. "To pursue technical options and strategies whose consequences can be most easily demonstrated to a broad segment of the public."

One of the things that Nils didn't have the time to talk about was -- and the KBS talked to me about -- was the notion of ease of proof. To choose that technical option which you can demonstrate to able, interested people as a straightforward, more or less common sense conclusion.

As I understand it, they have chosen, among alternatives, in part, on those grounds, and we don't tend to do that here, but it is an interesting problem that is signaled by this particular point.

DR. BREWER: Tom? Tom, excuse me very much for interrupting, but there is an emergency to Paul D'Anjou. Please go to the back of the room and get on the telephone. Is he here?

DR. LaPORTE: Good luck, Paul. Let me then move on to the fourth point here, "To reward honest self-assessment that permits organizations to get ahead of problems by identifying them and airing them before they become discovered by outsiders." Again, initiating rather than responding.

Fifthly, "Develop tough internal processes that include stakeholders," importantly, "for reviewing operations and discovering potential and actual errors." And finally and importantly, "Institutionalize responsibilities for promoting and protecting internal viability of efforts to sustain public trust and confidence."

What I would like to do is to turn to the -- not quite each of these, but to return to them in terms of the measures, specific measures, that we have recommended to realize these more general conditions.

Let me, at this point, urge the board to consider the specifics here among their criteria -- the criteria that you employ to evaluate the quality of the -- of the Department's program operations and those of its contractors. Since I am proposing to you that you accept with us the importance of these and use them in your -- in your increasingly refined understanding of what is going on in the Department.

Go we go to the next set?

[Slide.]

DR. LaPORTE: We have now a set a five -- this is the first one -- of measures that we think should be adopted throughout the Department. Again, what I have done is to circle those that are there because of the need to recover trust, rather than to simply maintain it.

The first set has to do with maintaining your -- encouraging -- increasing their credibility of the scientific work done. I will -- there are a lot of these and I will just skip -- through the ones that I think might be of particular interest to you.

The first one is to expand to a maximum extent possible -- to the maximum extent possible the external review groups to include stakeholders and, particularly, other countries. Again and again we have heard this to go forward to -- to put forward technical and scientific work to everyone, and to work hard at that.

The next one I want to do is the third point, but I want to skip to this one. Now, listen to this in terms of its meaning now. It is a problem. It is almost always a problem for technical people to come to this kind of a situation. "To generally design and conduct experiments and share data at the earliest possible time with teams of stakeholders."

Skipping again: "Allow stakeholders to nominate, subject to prenegotiated -- negotiated preconditions, individuals who have participated in exercises as expert judgment -- in exercises having to do with a safety and risk analyses." That has not been happening, and there is a sort of sense of removal from that process. If you think about it this way, where would people become suspicious of altering or biasing the data?

And finally, "Clarify carefully and publicly the reasons when advice from technical overseers is not accepted." What you've got here is -- all these address a situation where there is a suspicious of the objectivity of technical work. It is a hard thing to come to a situation where you think, "I must take these up," because we don't -- we don't like to think of ourselves as engaging in work that violates some of the important principles of our own profession.

[Slide.]

DR. LaPORTE: Secondly -- you can go to the next one -- we are concerned that a new culture in the Department needs to be developed, and these several speak to that. To build a new culture within the Department it should: "Undertake assessment to determine to what degree current incentives reward those behaviors or people which are consistent with the objective of an emerging culture."

When I began to say some other things about the needs to change understandings of error, of relationships to stakeholders, we want to come back to this idea here of what is going on in the current patterns that rewards or doesn't reward attempts to engage with others in these sorts of ways.

Thirdly, "To disseminate on a systematic basis through the Agency experientially derived "best practices" for building and sustaining trust and confidence." What we found in our various meetings, we found a number of very interesting responses to the public trust and confidence at the local level, which no one else in the Department seemed to know about. There are isolated, good solutions to specific problems which had not -- there was not a way to disseminate them across the Department. So they already doing -- already know some things in the small to do in the large.

And finally to consider the deployment of "trust and confidence" team, that is, groups who have thought a lot about this -- not many people in the world have thought a lot about this, actually, as we discovered -- but one can. Groups like this would independently evaluate how different units are performing with regard to the public trust and confidence questions.

Again, an astonishing requirement that we would have to think about in general because of our wish and hope that our work is carried out in a general context of good faith.

Go to the next group.

[Slide.]

DR. LaPORTE: The next group has to do with ensuring that public trust and confidence implications of Departmental activities are properly weighted, that is, taken seriously within the organization itself.

Order that -- and we are essentially -- advice to the Secretary that she should order or specify any analysis of policy options considered by the Secretary in her office include explicit assessments of the impact on trust and confidence on various parts of the public.

It is a little bit like an environmental impact statement process; to be explicit about it, rather than implicit or hopeful.

Skipping to the next one, "Require a sound explanation for recommendations that appear to weaken the trust and confidence in any part of the public -- in a significant part of the public," that is, to say why it would be the case. Then, to publish an explanation along with a plan for mitigating those kinds of outcomes.

Finally, review the predicted effects -- this is sort of a scientific follow-up -- what actually happens with regard to public reactions when these things are carried forward.

I should say, as an aside, that this suggests a kind of analytical work that can be done, but is not known very much about. It is not usually done in organizations, but in this case we thought that the situation was extreme enough that if it is not done, it can be essentially shuffled off to one side and not cared for or not attended to very seriously.

Let me move to the next group. Pardon me for rushing along here, but you can see there are lots of -- we did a lot of things, and not that I want to subject you to them, but to give you a feeling for the range and sweep of what we were up to.

[Slide.]

DR. LaPORTE: The fourth set has to do with ensuring that organizational dysfunctions aren't responsible for problems that decrease institutional trustworthiness.

The first one has to do with essentially devolving greater authority and responsibility of the field offices, that is, reduce micro-management to manage issues that have significant trust and confidence implications at the local level. Remember, I said we found small -- at the small -- or in the small, very interesting solutions that weren't transferred across, but they were there, and should be enabled.

Skipping down to, "Maintain sufficient employee technical and managerial capacity to oversee at a rather detailed level contractor activities," in terms of public trust and confidence. What is going on that reduced the confidence of the public as they interact with contractors? We have stories that I could tell, but we don't have time for it, but it is a very important link.

And, "To establish overlapping self-regulatory processes." Why would you do that to yourselves? We already have enough internal investigations. One of the reasons you do it is because if outsiders are suspicious, they want to see something internally that tries to deal with bias, various kinds of bias.

In fact, it is not very different from what we do in the sciences by competing -- by competing views with the same kinds of hypotheses. It has its institutional expression. That is to say, internal groups that are seeing to it, that have responsibility to deal with regulatory processes internally.

Finally, "To reward the discovery and correction of error." What a strange thing. Don't we do that anyway? No. Most organizations punish the admission of error hard, and that is why we don't tell -- we don't tell people their mistakes. And so to be explicit about this, to say that one can be rewarded for the -- for the discovery and correction of error, even one's own, is an astonishing thing.

It also leads you to -- outsiders to understand that, ah ha, they have a way of discovering those kind of things that are often buried for too long until it is too late.

Let us go to number 5 very briefly. It returns back to the question of technical program and work, not so much the credibility of scientific work, but the quality of technical and programmatic performance. "To work with affected parties," that is, stakeholders, "in establishing both measures of quality and schedules. That is, don't do it all yourselves.

And, finally on this one, "To adopt technical design and development strategies that most easily demonstrate to an attentive public that uncertainties have been reliably bounded," something I have talked about before. The ease of proof idea that -- that language came to us from our discussions with the Swedes.

Let me move now to two sets of measures that are specific to OCRWM. That is, you will hear -- there is some overlap, but this is now focused more specifically on what --on many of the things you are concerned about.

There are two sets and they will have to do with, in a sense, acknowledging the situation that -- the special situation that OCRWM is in.

[Slide.]

DR. LaPORTE: To acknowledge, first, by deeds -- not only by documents -- that the first-of-a-kind nature of the activities are carried forward. A lot of what we have been talking about today speak to this. The whole notion of incrementalism is, essentially, very harmonic or has a resonance to what we have been doing here.

"Aim to design a repository system whose predictable performance exceed -- performance standards -- exceeds those that are laid on you by the regulators." To do better than you are forced to do is the message here. If you are doing better than you are forced to do, you must, in a sense, know -- almost know better than the regulators who have, in a sense, a kind of minimalist responsibility in this society.

Secondly, "To adopt a technical strategy that takes into account ways of making performance claims persuasive to a large segment of the public." Back to the demonstration to the public. And by the public, I should say, we don't mean "the public." We are talking about attentive opinion leaders who will and have taken the time to learn a good deal about what goes on. This might involve the use of multiple, redundant barriers including robust engineered solutions and so forth.

The next one would be, "To devise a process for characterizing and potential repository sites in an incremental way." We are very consonant with what Tom has talked about and what the Swedes are now beginning to do.

Finally, "Develop or foster a culture that will resolve uncertainties in a manner that places the highest priority on protecting health, safety and environment." What we don't do in the report, but in a sense is buried in this one, is to say many people out there really believe what OCRWM is doing is beyond the environmental safety question regarding radioactive waste.

It is really they are there, and sometimes it has been said informally they are there to make sure we a viable nuclear industry. It is a different kind of objective, and to be clear about the actual priorities that exist there.

[Slide.]

DR. LaPORTE: Finally, in terms of the last one -- you can turn to the last one now -- "To acknowledge that the barriers to trust and confidence that have arisen when the bargains contained in the Nuclear Waste Policy Act have collapsed" -- in the report, those of you who have had it -- and members of the board do -- you notice that we argue that there were four bargains made in 1980 -- in the early 1980s: ethical, economic, technical and political, and that subsequent to that these bargains have more or less collapsed. That is what we are referring to.

In light of those collapses, what should the OCRWM do in our view? "Support research and development in alternative technological approaches," something that Tom has already begun to talk about.

"Develop contingency plans should Yucca Mountain prove unsuitable for a repository," right now, rather than supposed that they wouldn't and then we will get to that later on. If you are suspicious about the situation, you want to see something like this occurring.

Third, "Revisit the issues of multiple sites and multiple repositories."

And finally in this list I will talk about or just mention, "Explore ways of responding to concerns of nuclear industry that derive from difficulties in the Department." To be able to provide central storage and so forth.

I should say now that the -- that you should take these not as solutions to the problems that DOE or OCRWM have with regard to public trust and confidence. What we are saying is that these are the -- if you want to achieve public trust and confidence in the context presented to us, these are the things you should think about. You might not be able to do them.

If you can't do them you will be, in our view, in a kind of deficit of trust and confidence. You may not be able to do some of them for other reasons, but if you don't then you have essentially risked that outcome.

Let me conclude by recalling several key points, and then a word about the implementation. The task force hold that internal changes, as well as changes in external relations are imperative both for recovering public trust and confidence and for enabling the Department to realize its promising role in shaping the U.S.'s technological future.

Other things need to be carried out by the Department. One -- and we begin to see it -- is those things are being tarred by this brush of distrust, and it is a shame.

Secondly, again, there are all these recommendations because the Department situation has sufficiently deteriorated that it requires not merely establishing and maintaining public trust and confidence, which is demanding enough, but the Department and its contractors are faced with recovering trust and confidence.

Much more difficult, calls for considerably greater efforts, dedication, and a sustained effort through many years and perhaps several Secretaries' tenures.

Recall -- the third point, recall that I -- when I reviewed the bases for design and the more detailed action items, that they weren't listed without indicating any kind of priority.

Now, usually you find in situations like this, 'here is the top part,' you know. We don't think about it this way at all. That -- absence of priority wasn't an oversight. We view these recommendations as a body, a set, a pattern, not as a menu from which several might be taken with significant amounts of gain in public trust and confidence.

The task force insists -- and we would argue this strongly -- that these action items or recommendations are all important, and should be seen more as a recipe. It is kind of a homely metaphor, but I think it is apt. Ignoring some of these is likely to result in sufficient grounds for suspicion that many of the rest of them will be discounted.

We believe that all of these are contribute -- will make an important contribution to enhancing public trust and confidence.

I should say that we don't know. We can't say for sure if realizing all of them will guarantee rapid or great improvement. There are too many things over which the Department has limited control like Congress, the White House, the economy, other sorts of things.

What we are saying is we believe that carrying these out in a thoroughgoing way will result in changes which make the Department worthy of trust, a very important objective.

Finally, there are some indications now that Secretary O'Leary and her senior administration have already begun the process, as Garry began to mention at the outset. You know that she has embraced the importance of securing trust and confidence as a key quality for public service, generally, and for the Department, specifically.

The Task Force has been encouraged by her leadership. Indeed, changes of the magnitude that we are suggesting could not be effected without it. It simply couldn't.

You also know the way to the last Appendix G, that OCRWM's initial response to our work from Acting Director

Lake Barrett was to concur with, say, about 80 percent of our recommendations right off the top.

Such a general assent was quite encouraging, though the matters that they have disputed are important and should not be ignored. However, the degree of cultural change we recommend is very difficult to effect without thorough institutionalization throughout the Program's offices and its contractors.

We hope the Technical Review Board will play an important part in increasing the incentives for management at all levels to proceed vigorously in these things and in the process perhaps to prove the Task Force wrong in its conclusion that a major change will take many years, over several secretary's tenure.

DR. BREWER: Todd, thank you very much.

Are there questions from the board? Staff? Warner?

DR. NORTH: Warner North. I cannot resist asking you about the 20 percent of your recommendations to which the program did not immediately concur. If you could, please give us a sense of what the general areas were in which this concurrence was not forthcoming and if there were any where you found the Department's objections persuasive.

DR. LaPORTE: I have to tell you I can't, partly because if you turn to the last bit of the Appendix, I have to say that I didn't refresh my memory in detail on this.

I can tell you that in terms of my -- as I recall, my response was that those things that the program would find, in a sense, most difficult to carry out in terms of its internal changes, needs to be a matter of discussion regarding how they could do that.

I am sorry I can't quickly turn to it, but I shouldn't do that right now, given the time. But it is something that we didn't feel that any of the recommendations that we suggested here were so terribly difficult to do individually. It is the whole pattern.

I am not surprised that any group confronted with that would say, "Gee, this means a thorough going change in the way we think about things, not just doing things, but how we think about things."

I would use this opportunity to say again that what we are proposing as a pattern is a hard thing for people who have worked hard and faithfully in the past. Almost to accept the validity of what we are saying is that people who have been involved for so many years, they are working very hard to say, "You know, somehow it turned out that I am not trusted."

That is a hard thing. I think we should recognize that. It is not easy to do. So, it is another way of saying to go through this is a process that needs to be done with respect on all sides.

DR. BREWER: Are there other questions from the board?

[No response.]

DR. BREWER: The Staff?

[No response.]

DR. BREWER: Todd, I would like to apologize for interrupting in the middle of the presentation, but I am sure that there was reason for it. Thank you very much for a thoughtful and provocative presentation to the board.

DR. LaPORTE: Thank you.

DR. BREWER: Our next guest is Dan Dreyfus, who is the Director of the Office of Civilian Radioactive Waste Management, and has been since October 1993.

In his position, Dan Dreyfus is responsible for just about everything that we are talking about here -- Development execution of the program, to accept, transport, store, dispose, the commercial and nuclear weapons' highly radioactive waste.

Dan has much experience in Government and out in the non-profit sector. A prime note in terms of his range of experience is time spent on the Hill as the Chief of Staff, as I recall, of the Energy and Natural Resources Committee in the Senate.

It is with great pleasure again to welcome Dan to the board. Thank you very much for coming. Please feel free to respond in general or specific to everything that has gone on this morning.

OCRWM UPDATE AND POTENTIAL USE OF DOE
TASK FORCE REPORTS

DR. DREYFUS: Thank you very much, Mr. Chairman, and members of the Committee. Here I am, seeking trust and confidence.

Secretary O'Leary asked me to thank you for your invitation to her. She regrets that she was unable to attend, but I am pleased to represent her and the Administration on behalf of the OCRWM program.

This is my first opportunity to appear before this body. I think the agenda is particularly a good one for the occasion. The alternative program, strategy report, and the SEAB report, which you have reviewed today and are reviewing, provide a good background to consider some of the fundamental policy issues confronting the program. The siting is indeed an important aspect of considering technology.

I will discuss today what the Department has done or is doing to respond to these reports and at your invitation, I will give you some general views on the program and its future.

I think it is appropriate to take this opportunity to tell you something of my personal philosophy concerning this Waste Management Program and how these two reports fit into a more comprehensive picture.

The United States and many other countries, I think, are beginning to realize that they are pretty much a wash in long-lived radioactive materials of many kinds. They have already been produced. At present we have no comprehensive approach to managing all of these materials over the generations that they are going to be around.

We have accepted and continue to accept the benefits that derive from the production of the materials. Civilian nuclear power is only one. The national defense missions from the conclusion of World War II through the conclusion of the cold war stalemate are another. There is nuclear medicine and there are numerous less pervasive benefits.

As a society, we have a responsibility to manage the presence of these materials on a day-to-day basis so that their threats to health, safety, and the environment are minimized.

In my view, we also have an obligation to embark upon a national strategy that will reduce the burden to future generations as a result of our management approach. This obligation ought to be clearer to us today as we confront the price we are paying for nuclear material management decisions that have been made over the years that precede us.

Some of those historical decisions probably were made with a little less than the kind of technical appreciation that we have today and can be excused on the basis of ignorance.

But I don't think that we can be excused on the basis of ignorance if we, in fact, refuse to take the hard decisions that we should be taking to manage nuclear waste from this point forward. We will create another immense burden for future generations if we lack the will to make hard choices now.

Now, I see the Civilian Radioactive Waste Management Program, the one that you review and that I am going to run, has a prototype activity with a mission of implementing a national strategy for the first fully-regulated long-term custody and ultimate isolation of radioactive materials.

The program, I believe, is simultaneously developing both the policy and the technology for that purpose. In both areas we have to learn from experience and we have to modify our strategies as we go along.

The Office of Civilian Radioactive Waste Management is only one agent of society's policy. We have, after all, the EPA and NRC, and a number of other participants that are specifically Federal agents in this regard, as well as a number of collaborators that are outside of the Federal establishment.

Our office cannot and should not be the architect of the policy, but implementing the policy also carries with it an obligation for responsible Government. I believe that our office has an obligation to evaluate and describe the situation we find ourselves in as we go forward, whether the facts of that situation are matters of geology, matters of the regulatory process that we have evolved, matters of the economic cost that we are finding, or scientific uncertainty.

When society becomes dissatisfied with the results of the policy, then it is up to society to change it in whatever legitimate venue that might require, whether again it be the decisions of the regulator or the decisions of the Congress.

The two reports that we are discussing today are, in a way, the result of clear societal displeasure with the current situation. They were commissioned by former Secretary Watkins to address perceived difficulties or inadequacies that are associated either with the policy, its implementation, or both.

External parties have criticized the Department's approach to a whole variety of technical, social, regulatory, and economic issues. The task forces were created to review the situation and to develop recommendations to help the Department address the criticisms. Secretary O'Leary has continued to address these same issues.

As a part of a program review, she recently commissioned an independent compilation of comments made by a number of external reviewers over the past five years to provide us a comprehensive understanding of concerns that have been raised. That compilation covers some 120 reports and comments, including these two that we are discussing today. As Tom Isaacs said, the program is not starved for external comment.

The draft report of the compilation was recently released by the author for review by the program stakeholders to ensure that his characterization of the compilation is correct. It will then be given to the Secretary. She intends to consider all of this material as she approaches further program redirection.

Now, in my statement I have reviewed my interpretation of these two reports, but I am not going to impose it upon you because the proponents, the spokesmen, for these two groups have already pretty well summarized it. I don't find any disagreement.

I would make one comment. As I read the trust and confidence report, it observes that the program confronts three discrete factors that undermines its ability to gain public trust and confidence. The first is a stigma which is a heritage of the historical behavior of the Department and its antecedents, notably the Atomic Energy Commission.

The second is the nature of the mission of the office itself which carries out inherently an authoritative governmental power. We cannot escape the fact that some of the interests simply do not accept the policy that we are charged with implementing.

The third is the observed behavior of the office itself, which as it goes about its task, and that is the internal operations that was cited by Professor LaPorte.

So the Task Force acknowledges that the Civilian Radioactive Waste Management Program is up against a -- and I quote -- "a legacy of distrust, created by the Department's history and culture."

I certainly do not intend to stand here today and defend the history of nuclear policy. I am well aware of the potency of that stigma and nothing that has happened over the last three or four weeks is going to make it easier to approach that part of the problem.

The Task Force also recognizes, as I do, that the policy we administer can have the consequences of distributing benefits and burdens unevenly. To quote from the report, "The Task Force understands that adopting many of these measures runs the risk of increasing the trust and confidence of one segment of the public at the price of decreasing trust and confidence of another."

Both reports, in my view, recognize that our current policy framework badly needs an overhaul. It is time for the office to evaluate the situation, to inform the policy process of its own intentions to reform, and perhaps to suggest a need for reconsideration of the policies governing the program themselves. I can tell you that we -- Secretary O'Leary and I -- intend to do so.

The concepts and conclusions presented in the Alternative Strategy Task Force Report are being considered in a program assessment that is currently underway. Although many of that report's recommendations appear promising as concepts, it is more difficult to apply them to the complex realities of the program.

As an example, simplifying site characterization is clearly an appealing goal. It becomes somewhat less clear when you approach which tasks can be eliminated. For the most part, the specific advice we get when we review it tends rather to suggest new tasks and new parts.

We are currently compiling a range of options to simplify and prioritize the approach to site characterization so that we can focus discussion among our collaborators. We will be asking advice from this board and from others to turn the general concepts into programmatic action.

With regard to the SEAB Task Force report, there are 74 specific recommendations. We are already addressing many of them. We have responded in writing to the others. Our response is bound in a formal report. Some of the rejections are, in fact, as Professor LaPorte stated, things that are seen to be beyond the capacity of our office to deal with. They are inherent in governmental restrictions.

The SEAB report also underscores the fact -- and Professor LaPorte did as well -- that previous program efforts have often been sporadic, and lacked follow-up. We will try to institutionalize stakeholder interaction and make it a part of the culture.

I have read both of these reports more than once, as I have been contemplating my own role in the future of this undertaking. I am taking all recommendations seriously from these reports as well as from other sources.

But I have to admit that I did not enjoy rereading the SEAB report which I did during the Christmas vacation. It portrays a hopelessness that is daunting. After all, I am at a moment assuming the responsibility for this problem.

Now considering my age and the actuarial outlook for my remaining years for conducting activity, if I took to heart the tone of the report, the rational course of action for me, at least, if not for the office, would be to refuse the assignment and turn to something else. This may be the capstone of my career.

But we cannot walk away from the radioactive waste situation. The policy has to be addressed, and certainly has to be addressed by government, and probably with the leadership with the currently responsible agencies, including my own. So where does this leave us?

I believe our current policy framework does have problems. I think it is time to reconsider it in the light of a decade of experience, not only with the technical problem, but also with the social and political evolution.

I commend to your attention the bargain, the structure of bargains, that is, in the SEAB report because it is an excellent way to characterize and evaluate where we are in the policy situation.

We need a discussion now about the annual funding profile that is going to be available to carry out this program. I think we are going to get that in the context of the next budget cycle. When we know what the policy is we have to replan this program accordingly.

Secondly, we need to admit to the realities of at-reactor storage and establish the social, technical, and regulatory and economic infrastructure that is going to be necessary to manage at-reactor storage in the new outlook.

Third, we need to articulate correctly the decisions that need to be made on repository site characterization. Now, there are three aspects to the activities at Yucca Mountain.

There is site characterization, which is essentially the science of determining the suitability of the site.

There is preparation for licensing, which is essentially the compilation of a wealth of information that we anticipate will be necessary to support an application for a license.

There is the environmental, or NEPA, study track which is the description of environmental consequences on the decision to proceed with licensing.

These three aspects are related and they do involve many of the same investigations, but they are not coincident and they have often been treated as if they were.

As an example, a site may be geologically suitable for a repository, but the one that we design may not be approved by the NRC. Similarly,, a particularly environmental impact of having a repository at the site may have nothing whatever to do with the unrelated nuclear licensing considerations.

Now, administratively and technically, the site characterization process and licensing considerations have become intertwined and somewhat indistinguishable. A recurrent theme of external review is that our preoccupation with scheduling -- which is primarily licensing scheduling -- is distorting our objective site characterization.

To some stakeholders, this focus appears to be a predetermination to find the site suitable in any eventuality. I believe there is merit in this criticism.

The target dates for licensing have come to be the sole measure of program progress. I find that, ironic as I read the comments, that delays in licensing dates -- and recently here in the last couple of weeks in a discussion between my own utterances and the Secretary's as cited in the trade press, delays in licensing dates are cited now as evidence of failure even by the critics who, at the same time, decry the program's obsession with licensing dates.

I think the key to restructuring the repository program will require returning the emphasis to site characterization. As the Alternative Strategy Report suggests, our priority should be early exploration of major qualifying and disqualifying site conditions.

There should be an appropriate score card with frequent public reports related to progress in exploring these conditions. Those reports should be the occasion for peer review, comment, and, I believe, debate.

The early identification -- and I want to stress this point because it is an obsession of mine that goes back to many years with R&D -- the early identification of a significant disqualifying factor, if there is one, is probably the most significant and useful finding that this program could have because it would be a critical input to policy and would signal the need for a whole new siting decision.

Now, to help us focus the site characterization activities, it would be particularly helpful to have this board's expert advice on the specific features and information that could potentially disqualify the Yucca Mountain site, then your recommended strategies to approach those issues with early and definitive evaluation.

License application preparation, I believe, should be a secondary measure of progress. Addressing the identified issues of licenseability, maintaining the standards of evidence that will be required to make the science admissible to licensing, and of course, our continued interaction with the Nuclear Regulatory Commission must remain high priorities, but should not be the metrics by which we measure progress.

Once the future budget profile for the program can be appraised, program activities will be recast so that we can use those resources efficiently. We simply cannot run a program that was intended to have a large budget at a small budget. Anyone in the business of doing field work of a construction nature knows that that will inherently waste money.

We are now considering alternative approaches to restructuring the program that are consistent with two budget assumptions, the first being a continued restraint of the sort we now have, and the other one being more reasonable access to the expected revenues in future years from the waste fund.

Once we have sufficiently articulated options, we will be seeking comments on those options -- broad public comments and certainly comments from the board.

We are also encouraging broad discussion among our constituents concerning issues of near-term management of spent fuel. I don't believe that the Department of Energy can unilaterally dictate that policy, but the Department must decide upon its own obligations. It must make them known, and it must participate in a broader policy process.

So to restate my initial thesis, my office, as I see it, is one participant in a collective effort to evolve and implement a national policy for the management of all radioactive materials. We are, in fact, the only show in town.

I expect to share that effort with the other participants, including this board. If we take the reports that we are reviewing today at heart, it is clear to me that there is sufficient challenge for us all.

I thank you for inviting me here today. I would be glad to participate however you want in the remainder of your morning.

DR. BREWER: Thank you, Dan, very, very much, for a full and very thoughtful presentation.

I think if there are some immediate questions from the board to follow-up, we can take one or two now and then we will go into the panel format as quickly as we can after that.

John?

CHAIRMAN CANTLON: Yes, Cantlon, board.

Dan, you comment on prioritizing site assessment as the focus that really needs attention. Of course, our board would agree with that.

The difficulty that I have is in making sure that that is not so narrowly construed as to lose sight of the fact that what one needs in order to assess the site is a look at the total waste management system because the thermal strategy very much dictates the site suitability issue.

In looking at the program, you don't yet have a thermal strategy chosen. So, you have a kind of chicken-and-egg problem here. I wanted really to sort of get your feeling of how you will proceed with site assessment in the absence of having the total waste management system really defined.

DR. DREYFUS: Well, obviously we have spent more than a few hours talking about that problem. I think it probably includes two ingredients. One ingredient is the simple question of scheduling of work and to what extent we need to be putting more emphasis on thermal strategy inputs at this point.

The other one, again, is a strategic question. Everything cannot be a variable up until the last day. I think the answer to the thermal strategy is to make some early cuts and then simply have to -- even though they will become constraints on future work.

If we try to keep everything variable and every option open until we get down to closing the repository, then we are going to have a very difficult time designing waste packages, designing multi-purpose containers, and designing the thermal loading of the repository.

So I think the answer there, first of all -- and I am not at this point sufficiently conversant with the details of the program to make judgements -- but I think it is basically to see whether we have, in fact, lagged in the fundamental work associated with thermal loading, or whether we are simply reluctant to make some cuts and start to approach it from a preferential point of view.

We are looking at that. We will look at that. We will value your critique when we start to prioritize here as to where that fits.

DR. BREWER: Is there any other quick question on point? Warner?

DR. NORTH: I would like to express a few points and encourage your comments on them. One of the slides that Tom Isaacs skipped through quickly included a quote from the transmittal letter of July 15th for the Alternative Strategies Report.

Secretary O'Leary has made clear that any alternative strategy that the program may eventually adopt will be the result of a thorough, formal, and public discussion with the program stakeholders.

There has been some activity of that kind -- the August 10th meeting -- and you described the summary of comments over the past five years.

Frankly, from the point of view of one who has participated on this board for the last five years, it strikes me that recently we have had less public involvement of the stakeholders rather than more.

Perhaps it is your intention to escalate this by a good deal in the coming months, but it hasn't happened yet.

We haven't heard about the plans for it.

DR. DREYFUS: Well, there is a need to articulate some options before people can rationally address them. There are a whole lot of things going on at once in the Department. As I have said, there is a substantial question of the expected funding track which dictates a great deal of how the program strategy can go forward.

Of course, we have more than the repository. We have at the same time the question of the waste acceptable at the other end.

There is a good deal of discussion going on. There has been, perhaps, not the structured kind of discussion where we make presentation to large groups about options for the future and ask for input. The reason for that is we have not formulated the options to have a structured dialogue.

We feel what we are doing at the moment essentially is arranging the basis for that kind of interaction. We are doing that by looking at the product of a whole lot of input that we already have, re-examining the premises that underlie the current program, and looking at things like these reports, and particularly the report that Tom Isaacs presented, which is, incidentally, out for comment at the moment.

There is a lot on the street. There is a lot going on. If you mean the formal kinds of meetings in which we make presentations to large groups and seek input, yes, when we have something to present, we will do that before we will adopt any new strategy. We haven't done our part of the work yet, in my mind.

DR. BREWER: Warner, did you want to ask a follow-up?

DR. NORTH: I will ask a follow-up on that. I get the impression both from your remarks today and from some of the other material I have heard second-hand, that the Department expects in the reasonably near term to try to have the restraints on the funding relaxed.

I wonder if you believe this is possible until the expanded dialogue with the stakeholders has taken place. In other words, can you get the consensus from the political process that will enable you to get the restrained funding escalated?

DR. DREYFUS: Well, we will certainly find out.

[Laughter.]

DR. DREYFUS: There again, one of the things that I think is important that is in the Trust and Confidence Report, incidentally, is that it points out that not all interaction is auditorium-sized, give a presentation, and listen to the rejoinders.

I don't think there is a lot of lack of

interaction between us and our stakeholders. At the local level, we are talking to people daily. I know that my day is full of discussing this with interested parties, both antagonistic and otherwise.

With regard to the budget situation, what we have is a window. Let me be very blunt about that. We are talking about the '95 budget. The '94 budget we have is badly constrained. As we discuss with you some of your most recent recommendations, it will be in the context of what we stop doing in order to do things.

We have a constrained budget. We are now at the point where we have heavy machinery working at the site which ought to work at full capacity and not part-time. There is insufficient funding to keep it all going in '94. The '94 budget was planned in the expectation in a budget profile of being almost twice what it is. We don't have it.

Now we are talking about '95. I will manage the program in '94 under a restricted budget. If I do not act now to try to get that funding, I will not have it through Calendar Year '95. We are not talking about tomorrow. We are talking about the next two years, which is too long to run the program the way it is being run.

So our options are either to seek the funding now, or alternatively to recast the program now because we can't occupy the site and watch static machinery for two more years.

So, to some extent the timing is important. Another thing is I have read the commentary of a good many reports. I have read over and over again that one fault of the Department is it has never sought to get the funding it needs, even though the collections are being made. This Secretary has sought to get the funding we need.

Now, I agree. People want to see management improvements. We will work on the management improvements. But if we do this sequentially by the time we see that budget, first of all, I will probably have exhausted most of my tenure, but secondly, we will have to change the program because I will not preside over a totally inefficient program for that many years.

So, you know, it is simply is a matter of when the time comes up -- we have a very long lead time in the Federal budget process. If we let it sit around a couple of more years -- the program really was not funding constrained until very recently. When we were occupying the site and we didn't have any sizeable activity, we were not constrained. We are now. We have to fix it now one way or another.

So, we will approach the process. We will make our best argument, which we have been doing inside the administration with, I expect, success. That is not an easy audience. We will approach the broader audience. Everybody has an opportunity to discuss this with the Congress. This certainly is not a closed process that the funding that will be discussed in.

DR. BREWER: Good. Thank you very much, Dan. I think what we have to do now is move to the panel format. If you would care to stay with us, the four speakers of the morning will stay. The board is going to move. Everyone please stay put.

ROUNDTABLE DISCUSSION

DR. BREWER: While musical chairs are being played with some winners and losers probably, let me quickly introduce the cast of characters and to remind everyone in the audience what we are trying to accomplish here and how.

In reverse order, basically this format of the round table has proven to be a very good way of eliciting comment and clarification of different points of view and to do it efficiently.

We have invited a number of individuals who have a long-time stake and interest in the Federal issue of trust, confidence, and institutional change.

We have asked them to make short opening statements in response to the reports and to what was anticipated from the morning session. We will go through that from the top as is noted in the agenda, although there are one or two modifications in terms of who actually is present.

At the conclusion of the presentations -- we will take them one after another -- there will be a discussion among the panelists. It is a free-for-all at that point. Anything is open. Any question is available, questions for the presenters and so forth. At the conclusion of that, we will have an opportunity for anyone in the audience to question anyone of the presenters or the panelists.

Okay. That is what we are about to do. I think to stay out of the cross-fire what I will do is be here and kind of direct traffic basically, and basically try to stay out of the way.

Now, let's get to the introductions. From the National Academy of Sciences' Board on Radioactive Waste Management, we have Chris Whipple. Chris, if you would, as we are going, just raise your hand.

John Linehan, the Deputy Director of High Level Waste Management at the National Research Council. John, did I get your name correct?

MR. LINEHAN: Linehan.

DR. BREWER: Linehan, pardon me. John is standing in for B.J. Youngblood. Linehan.

From the Nuclear Waste Negotiators Office, the negotiator was unable to attend. We have his deputy. That is Robert Mussler.

From the State of Nevada, we have Robert Loux, the Executive Director of the Nuclear Waste Projects Office. Robert, raise your hand. Okay.

From the Edison Electric Institute, we have Steve Kraft.

This is a challenge. Bear with me. It has probably been murdered before, your name. This is, from NARUC, Lynn Shishido-Topel.

MS. SHISHIDO-TOPEL: Very good.

DR. BREWER: All right. She also represents the State of Illinois as the head of its regulatory commission, as the chair.

MS. SHISHIDO-TOPEL: Just a commissioner.

DR. BREWER: Right. All right. We begin with a statement by Chris Whipple. Chris, would you take the lead?

STATEMENT BY CHRIS WHIPPLE

MR. WHIPPLE: Do you want me to do it from here?

DR. BREWER: You can do it from the mike. It is easier. Then there is not a lot of moving around.

MR. WHIPPLE: All right. If everyone can hear me. I feel strange facing away from the audience.

I want to compliment the TRB for co-locating the hot/dry repository concept test in this room.

[Laughter.]

DR. BREWER: I was wondering when we were talking about thermal loading and chicken and eggs if it was going to be boiled eggs or fried chickens.

MR. WHIPPLE: I think two birds with one stone is consistent with Dan's budget problems.

Well, let me dive back into the overall topic of thinking about an effective program strategy for OCRWM and what changes to the current strategy might be effective. Part of my experience in this, along with Clarence Allen from the TRB, was participating in the NAS study that gave rise to the rethinking report.

I have just a few brief statements about the concepts that tended to drive that report. One was that in comparison to the then-OCRWM program -- and we are talking the late '80s -- people on the board and guests of the board with significant mining experience basically said, "Gee, nobody ever did it this way before."

The way you do mining engineering is you make you mine, you find problems, and you fix them with a tool bag of tricks as you go. But you don't write a 6,000-page plan before you have dug a hole because you don't know what you are going to find until you dig the hole. That was a kind of simple observation.

Second, there were some things happening at that time in the program -- and perhaps the Szymanski Report and the ensuing reviews was one of them -- where the Department was in the awkward position of having laid out a very elaborate plan and then being uncomfortable every time something took the program off the plan. It was not tolerant to surprises and to unkind events of nature.

So, I think the working part of that report was why getting it right the first time won't work. It is going to have to be ad libbed. All right.

Finally, we had a management professor in for the review that gave rise who made a comment that stuck in my mind through six or eight years. Tom Isaacs is nodding. He said it is the tendency of large organizations when they get into trouble to do faster and more intensively that which did not work in the first place.

[Laughter.]

MR. WHIPPLE: Well, those were observations that I found fairly thoughtful. There was one more that we made in our report that I will come back to, and that is "Learn from WIPP," from the Waste Isolation Pilot Plant.

But let me jump into what I heard. There are a couple of interesting major fundamental premises on which I didn't hear agreement this morning. Tom Isaacs put up a list of old assumptions that gave rise to the Waste Policy Act and the current plan that may no longer suit the needs of the current program.

I agreed with many on that list. In fact, I think it was a broader list than the NAS considered back when it did the rethinking report. The rethinking report thought that the program was not going to work effectively even for the old assumptions.

But one of those issues that I heard a dichotomy on today was Tom's assertion that perhaps a more reasonable goal for the program is to create and preserve options for generations in the future, to create opportunities for them to decide whether to close repositories.

In talking with friends at EPA, I have heard great resistance to this view and I heard, I think, a similar idea from Dan Dryefus, the EPA view that I have heard is that it is our responsibility. We have the benefits from this activity. We created the wastes. It is our responsibility to dispose of and manage those, and to button it up and to solve the problem in the same generation as benefitted from it.

I think Dan's -- and maybe I am misreading him a little bit, but you made the comment that we now have a responsibility to make the hard decisions I see in that category.

Those are two very different points of view, and depending on which you adopt, you end up with a different program. All right.

The second dichotomy, and probably Bob Loux will comment on this, Todd mentioned in his talk the four bargains of the 1982 Nuclear Waste Policy Act that seemed to have gone out the window in '87, and certainly Nevada feels that the political process by which Yucca Mountain was selected for characterization was strongly unfair to the State.

Yet, DOE believes -- and I think has to believe -- that the 1987 Waste Act was an act of Congress that passed according to the democratic progress. It is an act that placed certain requirements upon the Department which it is endeavoring to carry out.

So, the question of whether the process has been democratic -- with a small "d" -- is a central point of disagreement. I think as long as that disagreement lingers, we are going to have continued discussion of trust and confidence in perhaps an unresolvable way.

A next to final observation before I get into the WIPP point, Tom Isaacs mentioned the fact that he had seven weeks to carry out his Alternative Program Strategy Study. I found myself saying, "This is something I have heard before."

Why is it in DOE that 40-year programs never have more than two months to do a major study to sit it on the tracks? Again, it just seems to be a mindset that we have to do it faster, we have to do it harder, even when it is not something that is notably urgent, which I would argue if there was a non-urgent national problem, it is the disposal of high-level waste.

It is something that we need to take lots of time, do right, do with all the participation. It is a complicated job. But fortunately it is not an urgent job.

All right. Back to the comment about the WIPP experience. I sit on the NAS Committee on WIPP. I have followed that for quite a long time. It is in time out in front of Yucca Mountain.

In many ways it is easier than Yucca Mountain. You have a more benign waste form. You have, say, a friendlier local political environment, and perhaps a somewhat simpler geology to characterize.

One of the things that has been done with great effectiveness in the WIPP program -- and with initial pain -- was to really push to make the performance assessment the definer of the technical program needs. There was great reluctance in the Department back in '89, I think it was, to publish the first preliminary performance assessment because in that report some of the results appeared to indicate possible cases of non-compliance with the standard.

That was seen in the Department by some as equivalent to shooting one's self in the head. In fact, that report was published. Life went on.

Work to refine the parts of the analyses that contributed to those high results, as always in risk assessments, identified very conservative assumptions that were made to bridge large uncertainties. They have helped it to retarget the technical program. What went from an unprioritized scientific shopping list has gone to a performance-driven scientific program. I think that is very much what is needed at Yucca Mountain.

It has been done iteratively and I think that is necessary. If I have a complaint about how it has been done, and to the extent that it has been done at Yucca Mountain, the complaint is that the work to use performance assessment as a program tool has been heavily focused on compliance and not so heavily focused on safety.

In fact, that has persisted even though the Energy Act a little over a year ago has put us in a state in which there is currently no standard for Yucca Mountain. Now, much of the performance assessment work was already in progress but for the Yucca Mountain site a lot of that performance assessment work was referenced against the 1985 version of the EPA standard.

Without going into the details, I will just argue that that is not a good reference point at all. What is a good reference point in terms of safety is difficult to define because there are many different measures of safety.

There are very long-term risks to individuals that have to be considered. There are shorter-term risks. There are operational risks during the front-end phase, as so on.

So I am not trying to tell you the right answer, but I think the general approach would be to define risk broadly, to use performance assessment as a tool, and to make the hard decisions to shut down those parts of site characterization and engineering work that don't appear capable of making any significant difference to the performance of the repository.

With that, I will quit.

DR. BREWER: Thank you, Chris.

John, would you like to respond with the NRC's point of view, or your own personal reactions, whatever.

STATEMENT BY JOHN LINEHAN, NRC

MR. LINEHAN: Yes, what I would like to focus on is some comments that we had made the end of last years on the Alternative Strategy Task Force Report.

In focusing on one of them, while we agreed with the Task Force Report, with many of the aspects that they were proposing -- in fact, we think many of them are in place, such as the existing issue resolution process we have agreed on with the Department of Energy -- we don't feel that the report adequately recognized exactly what we have in place.

It was unable for us to be able to determine the relationship of a lot of the concepts that were proposed in that report to the established program. We felt the report, in some cases, didn't adequately recognize some of the fundamental things we have in place, like a site characterization program, and talk in terms of what might be wrong with that particular site characterization program and what might need to be fixed.

The SCP that we reviewed, the Commission felt laid out a very good process for studying characterization of the site. It also had mechanisms in there that allowed quite a bit of flexibility, where you could readjust and change the program as the program progressed.

What we are concerned about is entering discussions where we just talk about general concepts and don't relate them to the existing processes we have in place that have been agreed on amongst the DOE, the NRC, and in some cases the State of Nevada, and the other parties.

We feel that while there is probably some need for change in the program, we want to participate in that and actively hear what the various parties have to bring to the table, we don't want to forget what we are already building upon. There is a baseline program there. We don't think that there is an indication at this point in time that that program should be thrown out.

DR. BREWER: Good. Thank you very much.

We have now Robert Mussler, the Deputy in the Office of the Nuclear Negotiator. Bob?

STATEMENT BY ROBERT MUSSLER

MR. MUSSLER: Thank you. Mr. Stallings appreciated your initiation for the opportunity to come by today. He expresses his regrets for having scheduling conflicts and not being able to be here. He looks forward to an opportunity in the future to addressing the board and discussing his ideas and where he is going to take the program over the next year.

I have a few comments very quickly about where the office is, to give people an update. Mr. Stallings was confirmed as negotiator on November 10th. He spent about two months working on restructuring the office and also redirecting the program in some new directions that he feels will potentially hold more chances for success.

The restructuring has focused primarily on enhancing the position of the Washington Office as the headquarters function. The redirection is still in process of development, and I think probably perhaps by the end of the month he will have a better handle on exactly where he wants to perhaps take the program and what changes he wants to make.

Very quickly, a few comments on the reports. The

Alternative Program Report -- the issue of the repository as the basis for acceptance contrasted with the interim storage issue of it becoming a de facto repository if you don't have a repository, I think any interim report, or any effort that further tries to thrash out that issue and develop it, we encourage. It is certainly one of the major issues that we face in discussing the opportunity of hosting an interim storage facility.

So, we are very encouraged by the fact that that at least opens up that issue, and also, the focus, or the recognition of the previous assumption, or old assumption I think it was called, of the urgent need to dispose of spent fuel rapidly. I think we also are encouraged by looking at that issue as well.

I think Chris mentioned the idea of creating an opportunity for options for future generations as you pointed out, as one of the objectives. I want to suggest that as part of Mr. Stallings' redirection of the program, that would be very much in line with some of the thoughts that he is having.

One of the issues that he is looking at is the assumption that waste, that this irradiated fuel, is really nothing more than waste and requires immediate and urgent disposal. That is one of the issues that he has found interesting. He is working on developing it, and the potential for that having some impact on the interim storage issue.

The trust and confidence report, I think our view is that perhaps it fits too easily on the shelf. Our sense is that it is a very, very good start. It puts a profile on an issue that certainly requires attention and resources to look at. But I think we are concerned that maybe there are issues that it doesn't go far enough and there are still things that need to be done to keep the intensity up on this question as opposed to allowing it to find its way onto the shelf.

Just quickly to identify one issue, would be the question of stakeholder involvement and the work on defining that. Well, let me digress.

One of the assumptions of the report appears to be that the Agency has no deference from outside parties and should operate under the assumption that it is going to move forward without deference and somehow ramp up and gain deference.

I think that is really a handicapped position to try to operate from if every action that you take in implementing and executing the responsibilities are subject to an assumption that you are going to operate without any deference with the outside world. That is a very difficult operational assumption. It certainly creates a number of the responsibilities that you have outlined.

But I am suggesting that a lot of those actions and responsibilities spring from the no deference assumption. I think that Mr. Dreyfus' discouragment at reading the report -- I would get discouraged also with the possibilities of overcoming that with using that as a base assumption.

The other thing is the definition of stakeholders. I think if we were to make a suggestion, that is an issue that for the future probably needs better thrashing out and understanding.

If you juxtaposition majoritarian democracy against Madisonian -- where the Madisonian would be systems that prevent the majority from getting their way, and the majoritarian would be systems that encourage the majority from succeeding -- the report appears to operate under a very Madisonian approach to the system that you are dealing with.

One of the things that I point out -- and I thought it was very telling -- was one of the digressions in Mr. LaPorte's presentation was he talked about the public. Then he digressed and said, he defined it as attentive opinion leaders which is a very Madisonian concept because exactly who they are. Are they the most intense? Are they the most vocal?

I think it gets down to identifying what the objective of the Agency is. I think that is really what, in terms of achieving a public good, or providing a public service, you start getting into a logic pattern of then: Who is the public? Who are you really trying to satisfy? Who are you working towards making a difference with? Who does it matter?

What I am concerned about is the emphasis on what I am characterizing as a Madisonian model, which is there are minorities. There are vocal minorities with agendas that seem to -- the reports suggests it seemed to be in need of DOE resources and attention for addressing and responding to.

So, I will get out of this right now. But that is just some very quick observations. I appreciate the opportunity to provide anything.

DR. BREWER: Thank you very much, Bob. It certainly won't be the last time we will see you or Mr. Stallings.

Bob Loux of the Nevada Projects Office. Would you like to respond and present your view on the morning's proceedings and anything else that comes to mind?

STATEMENT BY ROBERT LOUX,

STATE OF NEVADA

MR. LOUX: I had better be careful with that one.

DR. BREWER: The invitation is sincere.

MR. LOUX: I understand that. Thank you very much for the invite. I do appreciate being here and providing some comments. We appreciate the acknowledgement of the Nevada products that we provided to the board and hope that they are of value and use.

I have got I guess a couple comments.

One is what I want to do is try and talk about the two reports, maybe in contrast, and then make some kind of closing comments.

Let me indicate with the first report, the Task Force report, there are many aspects of the SEAB Report. Trust and confidence, of course, the State of Nevada feels particularly close to and akin to.

Those are things that we and our researchers have been telling the departments since '82 if not earlier than that related to not only this program but the way it's been doing business and not to belabor the point but, you know, all of our survey and other research indicates the very kinds of things that you were talking about.

There's better than a 4-to-1 view that the disadvantages in the program greatly outweigh the advantages. There has been no movement in public opinion about the overall program even as recently as instruments taken in the field just prior to the discussion of radiation exposure, which I suspect is going to elevate those numbers the other way to a great extent, so we couldn't agree more with your report.

There are aspects of it perhaps that we don't completely agree with but I find it in absolute contrast with the Isaacs report. Let me tell you, Tom, that I guess if you didn't glean it from our comments and you really say you haven't heard it before, Tom, that report really sucks.

[Laughter.]

MR. LOUX: It attempts to do two things that I think that you gleaned from our comments that we find somewhat objectionable.

The first is that it tries to impart the notion of a changing regulatory environment, whether it be siting guidelines, Part 60, whether it means removing MRS prohibition sitings and the like, at the same time not acknowledging, as I think John and others have indicated processes that are in law already.

For example, the siting guidelines and the determination of suitability is a process that is well-established and one that the Department simply refuses to enact, which would provide the kinds of things that you are talking about in terms of early indications of site suitability or unsuitability. That clearly was the intent when they were promulgated, clearly the intent that when the

NRC concurred that that is how they would be used, and of course the court in the Ninth Circuit has indicated that that is what their purpose is, yet the Department still refuses to acknowledge that and I think your report continues that by suggesting that some other process is in order when you have one already.

But I guess the other parts of the report I think we have commented on in detail.

Early waste emplacement serves absolutely no technical purpose, as I think the NRC is probably in agreement unless you plan to have this period in the order of 50 to 100 years.

The real, I guess, problem that we see is that every time the Department runs into problems the immediate solution is to either change the law or somehow modify the program that reflects current reality and in fact as it relates to how DOE is perceived it interacts in Nevada, on the one hand when it comes to why only Yucca Mountain, it's Congress has told us to do it, but when it comes to any other aspects, throwing out the siting guidelines, changing or throwing out the Environmental Protection Agency standards, DOE has no qualms about going on the Hill and making their presence known.

I think that the public perceives that as one of a very changing regulatory environment, one that contributes greatly the overall public distrust.

One of the differences I think I heard between your presentation and Dan's was in one of your comments you indicated if one aspect or one thing fails, we don't want the whole system to fall apart.

On the other hand, I hear Dan say let's go out and look for disqualifiers and that can be the one thing that causes the whole system to fall apart, and I think that you are not acknowledging that that is the purpose of the guidelines, that that is why you have disqualifiers. If they are there at the site they should be disqualified.

Again, you have had a hard and fast regulatory regime or at least had for some period of time and I think the continuing change of that regulatory scheme greatly undermines the whole public trust and confidence, even further than it is already.

Contrary I think to some view the historical culture that everyone is trying to put behind them is alive and well today. I think we even heard it this morning. The refusal by the Department and the Secretary to truly conduct an independent comprehensive review of the program, not a internal personal review or this financial management review, the review that the GAO, TRB and others are asking for as well as the State of Nevada, speaks volumes about the real intent of where the Department is headed.

With that, I will go ahead and close and happy to enter comments later.

DR. BREWER: Bob, thank you very much. Distinctive point of view.

Steve Kraft of the Edison Electric Institute, would you --

MR. KRAFT: Yes, thank you, Dr. Brewer.

STATEMENT BY STEVEN KRAFT,

EDISON ELECTRIC INSTITUTE

MR. KRAFT: I appreciate the invitation to be here. It is always fun to come to what has become the annual January gathering of the Radwaste Club of America.

[Laughter.]

MR. KRAFT: I think that Dan Dreyfus is beginning to discover an adage that has been learned by every Director before him in the program.

It is certainly true in my office as the Director of the industry's program that high-level nuclear waste is a 10,000 year problem that has a crisis every day.

You spend your days dealing with these crises and you begin to wonder what is going to happen if I just kind of ignore three crises in a row? Is it really going to affect the long-term outcome of the program? Probably not. Probably not, and I think maybe that is to some extent one way to look at the public trust and confidence report.

We think the report was a significant contribution to an understanding of the program. Yes, it is daunting. Yes, it is depressing. It is all that but that doesn't mean we can't deal with those problems and I think that I would endorse what I think I heard Dan Dreyfus say in his remarks earlier, that he seems to be taking the very pragmatic view of how you solve these problems. You have to solve them in the context of moving forward with the program. That is the essence of our message, that as you solve these problems you must move forward with this program.

It is not just the fact that the ratepayer, as Commissioner Shishido-Topel will remind us, has contributed untold sums of money not only to the DOE program but to utility programs for onsite spent fuel storage. There are actually bigger items, bigger things at stake. The need to deal in an environmentally responsible manner with the waste product during the current generation I think is one measure. It is certainly something this Administration is greatly concerned about, but closely allied to that is the future economic and energy of this nation in an environmental manner.

Whether you like it or not, whether you believe this is the way the country should be going or not, the fact of the matter is that country is electrifying. This has been a trend that has been going on for some decades now where the per capita use of energy itself is going down. The Btu component of the GNP is going down, but electricity use continues to rise. EEI studies show that that will continue for some time into the future. It will flatten as electricity technologies to some extent, as electricity technologies themselves become more efficient, but industries have found that they can save significant on their energy bill, overall energy bill, and meet environmental requirements by electrifying as opposed to other technologies.

There is a very, very urgent need for this program to move forward and have success if we are going to have a way to produce electricity in an economic and environmentally sound manner in the future.

Having said that we liked the report, we liked the direction of the trust and confidence report, there is one item that I do want to mention.

We have conducted nine reviews. We have almost annual reviews of the Yucca Mountain project and it's a record of review that you are welcome to peruse. If you care, we did supply the last five years of that record to the contractor doing the summation that Dan referred to, but I just thought I would point out that the amount of time that senior DOE officials spend responding to formal, informal, and public oversight groups, the amount of time now spent in stakeholders' meetings has gotten to the point where it is preventing their ability to manage the program. Now this is not a money issue. It is in some respect a money issue -- I mean DOE can calculate how much money it costs to respond to all these groups and Yucca Mountain has to some extent. They are very proud in telling us how much it costs to do the reviews that we ask them to review when we come for our meetings. But it is not necessarily a money issue. It is a management issue.

The problem is that the 15 or so bodies who feel as though they have some sort of oversight right on this program, be they statutory as this group is, or be they somehow some moral right as the ratepayers and we do because we are providing the money. Everyone wants to hear from the top three or four people. Everyone wants to hear from Dan [Dreyfus], Lake [Barrett], and Bob Nelson. The amount of time -- go out to the project and ask the key people by their calendars how much time they are spending preparing for or in meetings like this and responding to questions. It is well over 50 percent. I don't know where they have the time to manage the program, let alone sit back and think strategically about where the program should be going so there has to be a balancing as to how we go about incorporating the stakeholders and the public.

On to the Alternative Program Strategy Report that

Tom Isaacs discussed. Again, an excellent report we think that sets a good point of departure for something that is very well needed, very much needed in this program. I won't take too much more time but just to say that we don't think the report goes far enough.

In our discussions with Tom Isaacs and Max Blanchard and the others that were on that panel, it was our understanding that that panel as one of its requirements did not delve into changing regulations or changing statutes. They simply looked at what the current set of statutes and regulations are and how could they do better.

It is our view that left to its own devices this program without a regulatory and without a statutory change will probably end up doing what that report says anyway. Anyone who believes that this program is going to follow what is perhaps thought to be the program plan that is on the books right now for so many years of site characterization, three to four years of license application and hearings, and five years -- I mean is not paying attention and I think there is a broad understanding of that, so Tom lays down in his study what will probably be the outcome and our view is, okay, let's take it the next step.

What I find interesting in just picking one item in Dr. LaPorte's presentation that raises a question in my mind is that are we really going to improve public trust and confidence, which I fully agree is necessary for the program to operate and be successful, or are we simply going to trade one public trust problem for another public trust problem.

One of the measures that should be adopted by OCRWM in one of Dr. LaPorte's viewgraphs says "adopt the technical strategy that takes into account ways of making performance claims persuasive to broad segments of the public. This might involve the use of multiple redundant barriers including robust engineering barriers."

I can hear it now. You have changed the regulations. You have changed the statute. You can't meet what you have done before. Never mind that everyone is agreeing that what we had to do before is either irrelevant or unmeetable. The rethinking report that Chris referred to, a brilliant piece of work -- I don't know that I would adopt it 100 percent -- but it is a brilliant piece of work, taking all these things together and looking at a restrategizing for the program, I'm not quite sure how you go about doing this. I don't know that anyone really knows but I think we can stumble our way into simply creating more public trust problems in our attempt to solve public trust problems and I don't quite know how to get over that but I would caution that greater and more stakeholder meetings is not necessarily the answer.

Thank you.

DR. BREWER: Lynn, would you like to continue from the utilities' point of view.

STATEMENT BY LYNN SHISHIDO-TOPEL,

NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS

MS. SHISHIDO-TOPEL: Thank you. I hope today to provide some regulator and ratepayer perspective to today's discussion. The views I express today will largely be my own, however, as neither the NARUC nor the Illinois Commerce Commission has yet taken formal positions on the contents of the two reports.

For those of you who may be reading along with my prepared comments, please note that these delivered comments might be slightly different. Just a little background.

In general, state utility regulators are charged by state statute to promote economical energy subject to various considerations for environmental safety, economic development and public safety. The NARUC is a quasi-governmental nonprofit organization of these governmental agencies engaged in the regulation of public utilities.

The issues of nuclear waste disposal and interim storage are of deep concern to utility ratepayers and regulators for two main reasons.

First, ratepayers are the primary source of revenue for the nuclear waste disposal fund and therefore have great interest in the program's cost effectiveness.

Second, timely and successful waste disposal is important for minimizing the life cycle costs including decommissioning of existing nuclear plants, which comprise about 20 percent of energy produced in the United States.

Utility ratepayers have already paid or pledged over $7 billion into the nuclear waste fund in anticipation of a federal solution to the nuclear waste storage or disposal problem. Nevertheless, due to the current budget cap system that Dr. Dreyfus referred to, most of the funds cannot be used for their intended purpose today.

Meanwhile, as the permanent repository continues to recede into the future, approximately 30 percent of the nation's spent fuel pools will reach capacity by 1998 and approximately 80 percent of the nation's pools will reach capacity by the year 2010.

The importance to ratepayers and regulators of the task force reports is that there is clearly a negative relationship between a lack of trust and confidence and a timely and cost-effective resolution of nuclear waste issues. The siting of permanent disposal and interim storage facilities are prime examples.

I believe the report directed by Daniel Metlay correctly describes the problem. The Metlay report argues that agreements among affected parties cannot occur or be effective if, one, the value structure of the population is very diverse and there is great uncertainty about and around possible outcomes; and two, if the time horizons of an activity are long and feedback about success or failure is ambiguous.

Not surprisingly, those who feel most likely to be affected either try to stop the program or maximize only short-run benefits.

The Metlay report provides some very thoughtful recommendations that the DOE should seriously examine to enhance trust and confidence. These recommendations seem to be based, however, on the assumption that the characteristics of the problem are fixed. I don't think that they are or that therefore the picture is that dismal.

I think attention should also be focused on what can be done to reduce these barriers to productive agreements, not just to trust and confidence.

For example, uncertainty around potential events could be reduced if an acceptable response of the Government could be reasonably anticipated for each potential event. Certainly strong accountability in DOE management will go a long way in this regard. The management review that the Secretary has called for can therefore be very valuable to the program.

Alternatively, it may be productive to consider activities that could generate better understanding of the likely outcomes as well as to reduce the possibility of adverse events.

The report chaired by Tom Isaacs is compelling because it offers a coherent approach toward restructuring the characteristics of the program. Setting standards and milestones for project evaluation for example could provide more timely feedback, allow for more accountability, and slice up the uncertain future into more manageable pieces. Monitoring at the repository could provide valuable information regarding or help reduce a likelihood of problem occurrences.

These actions thus potentially could do double duty by enhancing the ability to reach agreement on nuclear waste issues as well as generating greater trust and confidence. I recognize that there are some upfront costs to this approach but given the current lack of regulatory standards and the first of a kind nature of the program, the phase approach with greater monitoring than is now anticipated may be able to effect overall cost reductions, all things considered.

In conclusion, I hope that DOE would consider strongly the suggestions of the two reports, especially those designed to enhance accountability, reduce uncertainty, and shorten time horizons. In all this however we must be mindful that the program has limited funding. Our goal should not be increased trust and confidence at any cost. Rather it is the timely and cost effective resolution of nuclear waste disposal issues and any action must be evaluated with respect to its cost and contribution to this goal. Thank you.

DR. BREWER: Good, Lynn. Thank you.

DISCUSSION

DR. BREWER: Now what I would like to do is to take the next ten minutes or so for a discussion among those who are around the table.

Who has the first question and for whom? Dan Dreyfus.

DR. DREYFUS: I have only one observation. I want to respond briefly to Chris Whipple, who interpreted my remark, my call for a sense of urgency, to mean closed repository. I don't assign a great deal of significance to closing the repository. What I intended to convey was this notion that we can't duck the hard decisions.

I am concerned that the threat, that the difficulties confronting the policy create a threat that either the program goes into some sort of a stagnation that sort of stops all action on all fronts about dealing with radioactive waste in this generation, or we decide that the problems are so difficult, so staggering, and so unapproachable that we just simply give up making any policy and we decide that some time 30 or 40 years down the road somebody can revisit this and see what they think.

In my view that is exactly how we got the Hanford tanks. Now understand that this is a much more high-tech world that we live in today and we are not going to recreate the Hanford tanks, but I think stopping thinking about the problem of managing nuclear waste for a couple of generations or even a couple of decades because the problem is too complicated can lead us into some bad byways.

I think it is important to have a program. I think it is important to keep refining the policy. I don't think we should have the arrogance to believe that we know what is going to happen to this stuff in the long run because the course we are on today doesn't get around to closing that repository even if it is found suitable for decades, 50 years, 60 years.

I am very conscious of the notion of unsuitability, which I think we have to adhere to and remind ourselves is a distinct possibility.

DR. BREWER: Chris, would you have anything in reply?

MR. WHIPPLE: No. I appreciate the clarification.

I certainly agree with Dan that -- in my comments I said this is not an urgent program. By that I mean perhaps that it doesn't need to have a crisis every day, but I agree completely with Dan that it is not something that you put on the shelf for 20 years and come back to. It's something that we should be working on now.

Bob's comment, if the experiments take 50 or 100 years I can't think of a national problem better suited for 50 year experiments. I happen to think, this is going off-track a little bit, that one of the things that is attractive about Yucca Mountain is the fact that it is above the water table and you can work in that mountain for presumably a long time without it being difficult.

As I say, I have spent a lot of time looking at the WIPP project. The WIPP project does not have that characteristic so steady progress even if slow is what is called for.

DR. BREWER: Thank you. Who is next? Bob?

MR. LOUX: Let me make a couple brief observations. I have a question for Dan.

I found it noteworthy and I meant to mention in my remarks that in Todd's report that in the final recommendations I found it noteworthy that the Department of Energy disagrees with eight out of the 14 recommendations that you made, at least in your published statements, but I guess to the point of the disqualifiers and the siting guidelines, I guess I am pleased to hear the recognition of the determination of suitability being the primary driver, not licensability, and that it is the siting guidelines that meets that.

However, on the other hand, we can find no one at the project office in Las Vegas or Nevada who can tell you even what a disqualifier might be under this program and I think that there needs to be a much greater recognition of what those guidelines are.

I think there needs to be some very upfront comments if the Department intends to make any sort of changes to those.

We do have, as I mentioned in my remarks, a court decision relative to them being the standard for site suitability and so I think we are all going to be greatly interested in what are those changes if the Department has any in mind. I know the Office has been openly talking about it.

Let me just finally make one comment that I wanted to make. I think that the recent and I don't want to belabor this point but the recent dialogue and revelations on radiation exposures I think has an important lesson for the Department that I hope is being learned, that as well as others, and that is that the primary objection in the popular press and other places is the lack of informed consent.

You well know that most Nevadans view this, Yucca Mountain, as the next radiation experiment, being done without their consent, and view that this is sort of a continuation of that.

We would look forward to some sort of dialogue about the whole issue of the forced facility siting that was brought up earlier and some resolution of that problem and its impacts on the overall system.

DR. BREWER: Anyone either care to follow that or to take up a new topic?

MR. RYDELL: I am missing one aspect of trustworthiness all through these papers and this report from Dr. LaPorte's group. He is very much with how shall the Department of Energy operate so that people get trust in their personnel, in their capabilities, and kind of in their ambitions.

If I had to deal with someone whom I -- well, he seems to be a trustworthy person and so on, I still wouldn't trust him until I knew fairly well what he intended to do to me.

[Laughter.]

MR. RYDELL: And wouldn't it be a good idea for Department of Energy to develop trust in their work? If they did -- could describe fairly well, precisely, what do they intend to do.

For instance, in Yucca Mountain. How is the waste packages going to look? How is the repository going to look? How big is it going to be? And perhaps have certainly some kind of negotiation with the state that this is the maximum we plan to do, and hope that that could stand up to any political action.

We would at least consider that in our country that it is hopeless to go to a community and say we are going to dispose of the spent fuel here, and not be able to tell them, rather well, how we are going to do it.

And I am afraid that we still lack an essential ingredient. As I said before, we should also be able to show them the waste packages -- cold, of course, and not hot -- so that they felt that, "These guys are going to do precisely these packages, they are going to bury so-and-so deep, and so on, and, after all, it seems not to harm me or my daughters."

DR. BREWER: Thank you. Steve?

MR. KRAFT: It would be great if we could do that. If you just take together what the LaPorte-Metlay work, the rethinking work of the NAS, Tom's, and numerous others. Every reviewer has been highly critical of DOE for attempting to determine, in advance, what the system will be before they get underground to understanding it.

I mean, were extremely critical in the early years of this program of DOE spending $50-$60 million a year developing waste packages without knowing what the geology and the geochemistry and all that stuff was underground.

Then DOE recognized that the -- their claim was that they had schedule concerns and needed to do everything in parallel, but eventually recognized that that was not -- that they could not pursue that, and that was a way to save some budget money in the early years.

It strikes me that we are on a very different path, and that the path that we have set ourselves on is one of understanding geology prior to determining things like waste package design.

Now, if what you mean is make commitments in a negotiated way with the state or in some -- in some forum work where you say that, you know, "We will allow for X corrosion and we will allow for Y lifetime and we will allow for Z capacity, and it will be no bigger than this, but no smaller than a bread box," and then -- but leave the design details until we learn what is going on underground. I think that that might very well be doable.

But to say that DOE has not explained to people what their -- you might not like what they have explained, and you might not like what they have done, and you may be critical of 6,200 pages of site characterization plans and 20,000 pages of study plans, and stakeholder meetings, and 100-people design reviews for drill pads out in Yucca Mountain, the fact of the matter is, DOE has told more people more things of what they are doing than any other government project, or any project at all, that I am familiar with.

I think the problem is that perhaps DOE is telling people in a way that they don't like to be told, and perhaps you are telling them things they don't like to hear.

MR. LOUX: The real problem, Steve, is that they are telling different stories to different people, and change the story the next day, i.e., these are the EPA standards one day, i.e., the next day they are not. That is the problem with the program.

And the other problem with expectations that, I think, he's alluded to is that we have people out here believing the best way to get performance out of DOE is to get a bigger whip. And this urgency that we've got to get this stuff off-site by some time certain only exacerbates the problem. That is the real problem.

DR. BREWER: Let's see. Tom LaPorte hasn't had a chance, then we will go to Chris.

DR. LaPORTE: Yes. First of all --

DR. BREWER: You have to get closer to the mic, Tom.

DR. LaPORTE: I think the degree to which our activities, our report, seems depressing comes strictly from the eyes of the beholder. We didn't think it was depressing. We thought the initial finding was verified. There is not -- it doesn't take a rocket scientist to know that in this society many large institutions aren't trusted by their clients or the public.

It turns out that when you ask the question specifically, "Well, how much?" related to this program, you find out, "A whole lot." That is not a surprise.

What -- what -- and the depressing part has to do with, I think -- and this is not a task force judgment here; it is my personal observation -- has to do with the degree to which what you expect with regard to when you open yourselves earlier in the process to public involvement; that you rightly said, Steve, that DOE has told them what they are going to do over and over and over again.

What we kept saying in the report was start the process of stakeholder involvement before you tell them what you are going to do so that they have a sense of participation and what the alternatives are.

We all know how to rig an agenda. You rig an agenda by providing the alternatives you want to talk about, not what the other guy wants to talk about. So that if you and I were in that situation, we would be suspicious of how the agenda got put together. It is not a hard problem. It is a hard problem to work out, but it is not a hard problem to diagnose.

So that what the alternatives are, if they leave the room -- if they leave adequate room for suspicious as to how they got -- what wasn't considered, then don't be surprised that smart people will be suspicious.

In terms of how to respond to our report, let me suggest you do the following. We didn't -- and I said before -- we were not in a position of solving the problem of public trust and confidence. We were trying to specify how critical it was, and the range of things that, if you did them, the public trust and confidence would be a whole lot different than it is now.

Now, it may be difficult to do some of these things. I don't find it very persuasive, frankly, Steve, that it takes a lot of time on the part of a senior executive. That is what a senior executive is supposed to do is deal with the public. You have other people internally that do good internal work, so that -- and, if particularly you are in a political -- let me put it in these terms -- political environment where you have -- and I think you are quite right that if you don't have public trust and confidence -- in our system, there are enough mechanisms to stall thing for years.

So who the public is -- and this relates to your question -- if you have to think about who the public is, it certainly just isn't Congress. It just isn't Congress, and it isn't, of course, everybody in the United States either, but we can pretty well define who the stakeholders wish to be. We have experienced who they want to be. We opened ourselves to anybody who wanted to talk to us and, you know, it sort of sorted itself out. It is not -- in a sense, it is not mysterious who the public is, if you think about it.

What is uncertain is what happens when you bring them in, if you are a technical person, because they start raising questions you either can't solve, can't pay for or something. What do you do? All right.

A process, insofar as you deny those wishes to be involved, you set up -- let me put it this way -- the nutrients for suspicion. If you have too much, well, we have ways in this society of putting a halt to it for a while.

If it is hard, that doesn't mean you don't do it. It means you understand if you don't do it, you are going to have some degree, and we can't specify yet because we don't know well enough in how to do this, what the residue of suspicion potential is in a situation where you don't address these kinds of concerns, and that -- so that -- I also think that once you begin to go on down the track of trying to increase your -- the respect you paid others, they will pay that respect back to you. We know that in other situations.

If you ignore it, you then have to ask the question -- let me put it in its baldest form: if you don't take more or less of a quasi-Madisonian approach, you move toward political power as your source of solution. You say, "I've got the votes; too bad about you." That is the extreme of the Hamiltonian approach.

Well, you have to ask the question in a totally different way than from the technical point of view. This is what this body is about: technical activities. How much trust and confidence, in this society, do you need to do good technical work? Can you do good technical work in a climate where you use political power -- let me put it in its baldest -- raw political power as a way of solving technical problems. What is the outcome with regard to the quality of technical work? That is what this group is concerned about, not other sources of work.

I think that is an important problem. We do have other societies that have used raw political power to solve technical problems, choices. We have forced them. All right.

There is a certain kind of a long-term societal cost to bear when that happens, so that a board like this and certainly those of us on SEAB need to ask that question with regard to the legitimacy of this technical activity in our society. It is almost completely unprecedented in history that this kind of a question has come up the way it does.

It doesn't say that we in the task force have solutions, but what we tried to say was think about the means of reducing distrust. What are the operational expressions of that internally to the organization? That is what we talked about today. And test the hypothesis, if you wish.

Don't do it, and see what happens. To some degree, it could be done experimentally, I suppose. Try it and see what happens. What is the downside? Besides another couple of executives that have to deal with the outside world, the downside of tackling the distrust question straightforwardly, rather than trying to finesse it. Because if you are trying to finesse it, we are going to have the situation that we have now. That there is a declining confidence, not only in the organization, but in the science, in the technical stuff. And that is terribly troubling in a society like our own.

DR. BREWER: Thank you. I am going to let Tom LaPorte's summary stand as the summary of much of what went on this morning. If there are public questions related to the panel and so on because of the press of my agenda, which is schedule-driven, we can consider taking them up, perhaps, this afternoon.

In the meantime, I am assured -- trust me -- that this hotel's coffee shop can feed us, if you take a buffet. We will take a vote afterwards to see how trustworthy the institution is.

Thanks to one and all who came today. Thanks to the panelists. Thanks to those who made presentation, for the time and the thoughtfulness, it was great.

[Whereupon, at 12:35 p.n., the meeting was recessed for lunch, to reconvene at 1:30 p.m., this same day.]

AFTERNOON SESSION

[1:30 p.m.]

SESSION INTRODUCTION

DR. PRICE: Let's gather around and begin. Good afternoon and welcome to the afternoon session.

I am Dennis Price, Chair of the Board's Panel on Transportation and Systems. We have a very full agenda and we will begin with an update on DOE's system studies, what these studies illuminate, how they relate to decisionmaking. This presentation will be given by a team led by Dwight Shelor, the Associate Director of Systems and Compliance at OCRWM. This discussion will be followed by an update on activities related to the multipurpose canister concept or MPC.

We held a meeting on November 1st and 2nd of last year in Dallas on the subject of interim storage and heard many of the details of the concept. This is a follow-up on a few of the specifics raised at that meeting and on the status and plans for the program. Ron Milner, the Associate Director for Storage and Transportation, will be giving that talk.

The third and final formal presentation of the afternoon will be on the focused repository waste package advanced conceptual design plan. That will be given by Dean Stucker of the Yucca Mountain Project. We will end this afternoon session by inviting comments from the audience.

I recently received and have not had a chance to read the system architecture study preliminary draft dated December 21st, 1993. I did have an opportunity to read the first opening paragraph and I will read that to you.

"Critical to the development of the CRWMS is an adequate understanding of the structure of the system and the relationship among the elements of the system as they relate to the generation of waste, its acceptance, management and disposal. This understanding requires evaluations that address the important interdependency of all elements of that system. These interdependencies need to be understood to ensure that development of one part of the system does not adversely affect the overall performance and operability of the system as a whole."

That is a good opening paragraph in this and I look forward to reading it, and it is a good opening statement that I trust will give an opportunity for our first speaker to tee-off on and that is Dwight Shelor.

So without anything further, Dwight, it is yours.

OVERVIEW OF SYSTEMS PRESENTATION

[Slide.]

MR. SHELOR: Thank you, Dr. Price.

Am I coming through okay? For the most part, okay. I am Dwight Shelor, Associate Director for Systems and Compliance.

[Slide.]

MR. SHELOR: Today we will give you a status report on strategic planning. We will describe a program decision process and we will describe and give you some results of a decision hierarchy methodology that we have implemented to begin assessing the impact that we would have on the program of implementing an MPC, and we will describe some of the results that are contained in the draft system architecture study report that Dr. Price alluded to, and, finally, I will end up the session again in describing to you what we did and what the preliminary results are, and where we are in the system architectural panel meeting.

[Slide.]

MR. SHELOR: Before I start, I won't spend a great deal of time on this, but I think it is important for us to examine and keep in mind what is the system that we are talking about, and I think that clearly we are talking about commercial spent fuel that is generated by nuclear utilities, and its associated onsite storage, potential storage off-site, whether it is an MRS or not, and a repository. In addition to that, there are other sources of high-level waste that could be disposed of in the same repository, a good example is that material that may result from the defense site clean-up and its associated processing.

[Slide.]

MR. SHELOR: I am going to switch over to the other side and leave that one there. The Office of Civilian Radioactive Waste Management is currently engaged in a process commonly known as strategic planning. The foundation or the framework for the strategic planning process derives from 10 or 12 years of experience in implementing the program. We have a great deal of information from oversight groups and other commentors, and we are reexamining in more or less a classical process what is our situation. We have done a situation analysis. We have begun to identify strategic issues that one would need to address, and we, at this time, have completed the process to the point where we now have a mission statement and we have a vision statement and we have strategic goals.

[Slide.]

MR. SHELOR: I will review those for you very quickly at this time and indicate that the process is not complete and it will not be complete until we have had an opportunity to seek input from others.

Our mission is to manage and dispose of the nation's spent nuclear fuel and high-level radioactive waste. One statement, very clear, very concise, and it covers the entire mission. In accomplishing our mission, we will provide leadership in developing and implementing strategies that assure public and worker health and safety, protect the environment, merit public confidence, and are economically viable.

[Slide.]

MR. SHELOR: Our vision, where are we going to be several years from now, what do we want to be known for having done. Our vision is that we will lead the nation to the achievement of environmentally sound disposal of high-level radioactive waste that will serve this and future generations. We will conduct the program in a collaborative manner with integrity, openness, technical excellence and responsiveness to social considerations. That is our vision, that is our mission and our vision as we approach our task.

[Slide.]

MR. SHELOR: We have now identified seven important obviously strategic goals. We will lead the collaborative development and implementation of national policy for the disposal of high-level radioactive waste. Clearly this goal is required to accomplish the mission. We will resolve the 1998 waste acceptance expectation issue. This is, again, a critical issue and our goal is to resolve that. We will provide for interim storage, timely waste acceptance and transportation of spent fuel compatible with disposal. We will determine site suitability for Yucca Mountain. We will provide for timely waste placement in a disposal facility. We will strengthen the fiscal and program management practices and we will participate actively in key deliberations which affect disposal of DOE nuclear materials. I think this is where we are in the process. I am very pleased to be able to present this to you today and to indicate that the next steps are to develop scenarios, if you will, that address the goals and the strategic issues and accomplishment of the mission.

As Dr. Dreyfus indicated earlier, after we complete the development of the strategies, then we will begin to seek and obviously receive comments and closure on the strategies.

[Slide.]

MR. SHELOR: All of this leads to change. How do we manage change? In a program of this magnitude, or for that matter in most programs that you want to consider, clearly what do you want to do from a program management perspective is managed through a baseline. What we are talking about is potential changes to the baseline.

When we talk about implementing an MPC into the system, we are contemplating changes to the baseline. A question then that comes up many times is, how is that done? What is the decision process that the Department goes through to implement change?

First of all a comment, this is not a schematic of the plumbing system in my house but this is a schematic of that decision process or that process that can be used and we do use to implement change. Obviously there can be a stakeholder input to identify issues. Once the issues have been identified, we have an organization that prepares issue papers. The issue papers then go to an executive committee in the Office of Civilian Radioactive Waste Management, and they make a decision on whether to study the issue and develop a resolution strategy.

This then activity takes place outside of the Executive Committee and then we come back to initiating the resolution process which many times involves consultation and collaboration with stakeholders.

This then would lead to further analysis and other resolution activities to develop a decision paper which then would be presented to the Executive Committee, and obviously then the director is the final decisionmaker.

The decision then will be supported by analysis and other inputs into that analysis before it is implemented. The implementation process then is actually a change process, it is a change to our baseline, and this is controlled through our program baseline change control procedure.

[Slide.]

MR. SHELOR: I wanted to use that to lead into what we are here about today. I want to talk about the interrelationship of analysis and the decision process. What I want to point out today is that we have program evaluations, we have top level analysis, more specific analysis, stakeholder interactions, all of this interacting and leading down to an underlying basis for a decision, and this then is related back to that decision process I just went through.

[Slide.]

MR. SHELOR: Today we will present to you three elements of this interactive process. First of all, we will discuss a decision hierarchy methodology that we have implemented to assist us in identifying risk and particularly schedule induced risk. This helps us in identifying the schedule induced risk that would lead to the need for further analysis. It will indicate to us when those analyses are needed, when the decision will be made so that we can conduct more specific system studies to give us the foundation and underlying basis for those decisions.

Also, we will talk today a little bit about a relatively recent innovation in stakeholder interactions, and I will describe for you later the system architecture panel meeting.

Without taking up too much more time, I would like to introduce Buzz Gibson who will -- I am sorry, Buzz Gibson is here anyway, but first of all we will hear from Jim Crane who will provide our presentation on the decision hierarchy.

DECISION HIERARCHY ACTIVITY

[Slide.]

MR. CRANE: Thank you, Dwight.

Once again, I am Jim Crane. I want to talk to you about the decision hierarchy activity that we have had going and what you will see as we proceed through each of these presentations is that we will try and keep track of where we are going. I am the first one, and then Buzz will talk to the system architecture study, and then Dwight will be back for the stakeholder panel meeting.

In general, what do we want to do as far as decision hierarchy activity is concerned? We really want to look at our program and say what decisions do we have to make and how can we plan for supporting those decisions, and do we have any problems with the way the decisions are set up.

[Slide.]

MR. CRANE: In order to do this, we wanted to talk about a specific program, so we are going to take a program as our baseline and add to it something that is coming at us right away, which is a decision about the multipurpose canister. So what I am going to address are the decisions for a program that includes the multipurpose canister.

[Slide.]

MR. CRANE: The overall activity had several parts of which I am just going to talk about one today. So what we did is, I went through this program and identified the decisions, then we decided their logical order and we identified their scheduling. Then we identified programmatic risks associated with those. I want to make sure there is no misunderstanding. We are looking at the risks to cost and schedule. It is a given that there are no changes in the safety requirements, so all the decisions we are talking about say, let's be safe, identify decisions, support data needs and identify the system analyses that are needed and when they are needed to support the decisions. So for today I would like to concentrate on the area of programmatic risks.

[Slide.]

MR. CRANE: There are a number of kinds of programmatic risks, and what we believe is the most interesting for today is the kind where you have to make assumptions about what is going to happen in the future. Just like what is happening today with the MPC, we have to anticipate what future decisions are with respect to the waste package and to the thermal loading. Be schedule sensitive, if we change the schedule of the program, the risk can change; it can be more severe, it can be less severe, or if you get rid of it you might bring risk up somewhere else.

Most programs have these sorts of things and the most obvious program that always has it is a test program where you have to set up the test program assuming what you want to build or what you want to use the results for, and if the results don't come out the way you want them, you have to redo the test program, meaning the results don't come out in the area that you need them, you have to redo the test program.

At the end of the briefing, I want to point at some system analysis needs engendered by these programmatic risks.

[Slide.]

MR. CRANE: What are the basic parts of this analysis that I looked at. I just want to set the stage so that you know. We picked one system. It is the system that historically we have been talking about. We call it the reference system or the baseline and we added to it the multipurpose canister, and we made a few schedule modifications consistent with the current project planning, and those are listed up here. So we had the multipurpose canister; we have Phase 2 truck casks, these are the innovative technology truck casks; monitored retrievable storage facility which of course can't start in 1998 now because we don't have a site, but it is projected for the purposes of this study to start in 2000, start receiving spent fuel in 2000; the standard repository starts in 2010 accepting and emplacing fuel; and we are including the exploratory studies facility where the testing that is really of interest to us, the thermal testing, starts in 1997.

We addressed decisions for each of the elements and the component levels. Pardon my jargon there, you will see in my example the levels that I go to, but I wanted you to be aware that we included considerations from the utilities right through to the geological disposal system, including the ESF. We established program level decisions and their schedule and went though each of the components and looked at the technological decisions that were going to be made and put them into a logical hierarchy.

We identified what the options would be if, going along this given program that has the MPC, a decisionmaker needs to say, wait a minute, something didn't work out, we didn't get our MRS, or the Phase 2 truck casks aren't working out or something like that, where do we go from here. So we identified those options. In other words, what do we have to worry about planning for contingencies.

Before I explain to you, I am going to give you an example of my results and I am going to turn to the overall results. I want you to see what came out of this.

[Slide.]

MR. CRANE: In looking at the program, we look at the program milestones and if we think of those in terms of a network, then the flow through that network are the decisions or the results of the decisions, so there are linkages and that is what I mean by linkages up here.

There were 128 of those linkages that are technologically related. They came about when decisions affect future options, when you have to make assumptions about future decisions, and I already said they are based on the technological hierarchy.

Of those, 24, these two categories of decisions, were the kind where you have to look forward and make assumptions about what will be decided in the future. I will show you what I mean by instances later on. 13 of those instances were cases related to the thermal load and the waste package. These are important because they depend on getting experimental data, and the effect of the uncertainties propagate through the whole system, the MPC, the MRS, the repository and the exploratory studies facility.

11 of the instances where you have to make

assumptions about what is going to happen in the future we judge to be fairly easy to take care of. You can change the schedule. You can get engineering solutions without any great penalty. So I am going to show you now first an example that is heavily oriented towards these important areas and then I am going to tell you about the whole analysis and what the categories of these risks are.

[Slide.]

MR. CRANE: I have used nomenclature and ideas that I didn't find to be standard and many people that I have explained this to didn't find to be standard. So I would like to tell you my approach so that you understand what I mean by some of these words and the steps I took, and then I would like to illustrate how we make linkages between milestones on the basis of technological hierarchy.

[Slide.]

MR. CRANE: I am going to put the approach on this side and leave it up throughout the example. There are four steps in the approach. The first one you have heard of, identify the decisions, their milestones and schedules, construct the technological logic that you go through and then integrate the two.

Let me expand on that a little bit. The program is broken up into a number of components or elements. Here I have illustrated with the MPC, the MRS, transportation and MGDS. Each one of those has a scheduled key milestones. Like let's start the safety analysis report design, let's start fabrication, and they are stretched out in time. Similarly, what you are really doing here at each one of these things is saying, number one, should we start something, how much money should we allocate to it, should we delay it or should we actually switch to a different kind of program.

But you are also doing a second thing, you are saying, what am I going to start, what am I going to do, what options am I going to carry forward, am I going to carry forward ten alternative designs for the MPC, or am I going to narrow it down.

So inherent in here are the technological decisions and options that you are developing. What this diagram means is that the logical precedents of the decisions are in the direction of the arrows, these lines in real fine print. That is a decision, and this is the second decision, the third decision, the fourth decision for the MPC. Similarly for the repository, ESF, these are decisions going in this direction.

But we are talking about a system where the decisions in one portion of the system, one component should precede the decisions in another portion, and that is the meaning of these arrows that go back and forth like this.

For example, the waste package capacity decision for the MGDS needs to be made before you select the waste package capacity for the MPC because you want the MPC to be part of the waste package.

So to integrate these two what we would really like to do is take the dates from up here and put them by each one of these decisions. I didn't find it quite that easy and I turned to a different way of doing it. My example is going to continue there, but basically if you follow my blue this MPC milestone is here, and these decisions then are made and finally decided on within this milestone. The MRS milestone out here is right here. These decisions are made at that milestone. Where a decision remembers a selection of options, it doesn't have to be the selection of one option, you can carry forward. This arrow says the decision in the MPC must precede an MRS decision and so I would hook an arrow like that.

What is really interesting about this diagram is in the case of this MGDS line, these are the MGDS. Here is an MGDS milestone, so you put these decisions in here, but this decision has to precede an MPC decision, then it comes backward like this. We have time going in this direction, this is the first milestone, this is scheduled later. That is impossible, you cannot -- you are saying, I am not going to do that. I am not going to make these decisions before I do this, and so I have a backwards arrow.

The meaning of the backwards arrow is this term I have coined "schedule induced risk." This says that when you make the assumptions here about what is going to be decided out here, you are incurring a risk in cost and schedule at this point.

[Slide.]

MR. CRANE: Now I would like to walk through, for the purpose of the example, first what these technological hierarchies look like, and then what it looks like when you take just a few of the milestones and look at the combination.

So the format for looking at the technological hierarchy is like such. We are going to talk about, once again, decision flow from top to bottom. We are really going from requirements, design, fabrication and finally operations. Then we are going to talk about each of a number of components of the system, across like that, so we will have decisions for the MPC coming down this way and we want to show the interaction between the subsystems, so you will see words going down this way, and you will see a junction box right here, which is going to say, at this point decision from another subsystem precedes the decision here.

In this case, the Decision 2 from the repository is going to precede Decision 3, and that is what is going to be on the next chart which has the actual words filled in, for example, that concentrates on the MPC and the thermal loading.

[Slide.]

MR. CRANE: Once again, just as these arrows are pointing through decisions, that is what these are, these little horizontal lines over there are these decisions. So for the MPC, for example, we take as a requirement the hook weight from the utilities and the MRS. Then we are going to have make the decision on the gross loaded weight for the MPC. We have to decide on different aspects of criticality control, and then we can determine this capacity. Then, finally, we can determine what materials we are going to use.

But these arrows indicate that I have a decision coming ahead of criticality control and ahead of capacity. It really comes from the waste package. The disposable MPC has to be part of the waste package, and so it has to meet the criticality control constraints of the waste package, the capacity constraints of the waste package, and the materials constraints of the waste package, but the waste package itself is driven by something else. It is driven by the thermal loading decision in the repository. Similarly, you go through the repository.

Finally on the right we have the exploratory studies facility where we want that facility to be consistent with the repository ramp geometry. We have to set up a thermal test configuration. We have a drift geometry based on the above, and other decision considerations. We are going to construct it, we are going to do our testing, and it is our testing that we are going to base our thermal loading decision on.

So now let's put this into the schedule of one particular program. Remember the program -- I don't want to use the word "program" incorrectly. I have taken a thing that one would almost call a baseline, but I don't want to imply that we are not changing that program. In other words, we are looking at the program and changing it accordingly. This presentation treats a program that is unchanged. This is the analysis that might lead to changes to the program.

[Slide.]

MR. CRANE: These are six milestones in the boxes. So this diagram now looks like this here. I have taken off six milestones. If you look at the whole system, that is what is on the board over there, and I will point to that later. That is all of the program level decisions and how they are hooked together by the decision hierarchy.

But I have MPC design and certification, that is coming up. That decision is really imminent. We are talking about letting the contracts for this program in December.

The thermal testing which is supposed to start, this is the abbreviated test, is supposed to start in '97. This is the institute testing.

Then we start MPC fabrication in '97, and in '99, just a little bit before the planned data freeze before performance assessment, we are going to have a thermal loading decision and a waste package capacity decision.

Then finally, when we get the data out of this test, we will make a confirmation once again that our thermal loading selection was okay, and there are other points and other tests that lead to further confirmation of our selection of thermal load.

I have just included a few of the decisions I showed you before. I think they are the most interesting. This says that when we decide about design, we are going to decide what options we are going to have designed, how many different canisters we are going to have designed.

When we go over, three years later, we may or may not decide to fabricate all of those options and the rate at which we fabricate is another portion of the decision. We do need, as we saw before, the results from the waste package capacity selection to do that, and we don't have those. Those are going to be done in the future, so we have to make an assumption. So there is schedule induced risk at this point. So the decision has to take into account the cost and schedule risk that you will incur out here.

Notice that I have incorporated the uncertainty in running a test. We have set up a thermal test configuration and thermal testing. We have in mind a design or broad spectrum of designs for the repository. When we actually get out and find out what the results are and select the thermal loading, we sure hope that our test was in the right configuration to support us. So we know as we are setting up our test that we are involved with risk that could occur out here. In other words, if we didn't have the right test configuration our test results would lead us to a design that we hadn't tested. That concludes my example.

[Slide.]

MR. CRANE: Now I would like to turn to the findings, summarize the findings in this area of programmatic risk. We will look first at the milestone diagram, which is that big board over there, and then I will show you specific areas of schedule induced risk that are important.

Please note, as I have been using the word "risk" over and over, I haven't said anything about the severity of the risk. That is really a subject that you will hear more about when we get to the MPC discussions later on in the afternoon. Please don't assume because I say the word "risk" that it is bad. It might not be very large at all.

[Slide.]

MR. CRANE: What I want to show you now is, in terms of results, the total analysis, one way of looking at the total analysis, and that is on this board. This board shows all the milestones, the program level decision milestones that were selected. Let me read a couple of them so that you get an idea.

These are at the start of the Phase 2 truck casks safety analysis reports. This says delay the Phase 2 rail barge cask design and that is because this program has the MPC in it, and if you had the MPC you don't need that rail cask. You can see, 12/94 start MPC design. Here is start transportation operations control center preliminary design. So you can see the variety of milestones that are in the decisions.

The 128 links that I talked to you about are these lines, both above and below the diagonal. These, of course, are the schedule-induced risks, and then what I would like show you is just what those risks are.

I know you might have trouble reading them and they will come on the next chart, so let me put those up so that you can refer here to them if you need to.

[Slide.]

MR. CRANE: These backward arrows say there is a risk. The earliest one is that the MRS design, and we have the MRS design starting fairly soon, must anticipate repository requirements for aging and blending. So we ar leaving open the question as to whether there is aging and blending at the repository. But because the MRS design is starting here, and the repository license application design starts out here. You can tell that decisions just aren't being made and you are going to have to make some assumptions. That is fairly easily taken care of because you are doing advanced conceptual design and you can coordinate.

The MRS design must anticipate MPC design and contingencies. This is a small backwards arrow because the way we set up the schedule, there is a couple of months out of phase. So you might say that is not important. Well, there is one other aspect of this that I believe is important. When you have an uncertainty in the MPC from the thermal loading, that is going to propagate forward even though you are moving out this way. So in this case, if you move the MRS design to the logically appropriate part, you still have to have an uncertainty that is driven by the uncertainties in the MPC. So I wanted to illustrate that, meaning I wanted to illustrate the propagation of uncertainty.

Our central risk is that the MPC design must anticipate waste packaging decisions, capacity decisions, materials decisions. It is 12/94, and this arrow goes all the way over here. At the same time we select the thermal load, this program also selects waste package capacity, the decision on waste package capacity.

I am going to skip this one for a minute because this is in the category that is easy to take care of, but in the category that is a little harder to take care of, as we all know, the repository and waste package license application design must anticipate the thermal decisions. We are starting LAD in '96 and we are selecting the thermal load in '99.

Now, of course, the program is set up to evolve to this selection, but with these decision points, when we size the license application design, we are going to have to make decisions about just what is going to be assumed about the thermal load.

The ESF, the exploratory studies facility, the thermal test configuration must anticipate thermal and waste package decisions. We are starting the design of the main test are at this point, and also at this point we are starting the tests.

Finally, a big cost decision is, given that we decide to go on with the MPC and this program, just what kind of MPC fabrication program are we going to have. The one that I have illustrated that is easier has to do with transportation cask design for the non-standard spent fuel and for the high-level waste. Right now the safety analysis design is quite far out, but we are starting the repository license application design back here.

So if the surface facilities are not designed appropriately, then we are risking having to add money or additional schedule slip out here to account for designs we decide on out here. This is fairly easy to anticipate, and it probably is also fairly easy to amend the schedule, too. So this is an example of one kind of schedule induced risk that is something that you really can deal with very easily.

Those same risks are here. MPC design and fabrication decisions must anticipate the waste package thermal criticality and material design and so on.

The point of this chart is, let's look at in general the relative uncertainty associated with these schedule induced risks, and I think it is highest for those that are associated with the waste package and thermal decisions and lowest for the last kind of decision that I was just talking about.

I believe that the ESF thermal test configuration considerations really lie somewhere in-between. It is not necessarily an easy problem, but it is not nearly as uncertain as the final design decisions for the waste package and the need to wait for -- let me restate that. I don't like what my sentence says.

What I just tried to say is, the reason that these have the highest uncertainty is that you have to wait for data to make decisions that you would like to make now. So we are making decisions ahead of getting the experimental data, and because it is experimental data you really can't know what it is going to be. You have some of that for the ESF thermal configuration, the same sort of uncertainty, but I don't believe it is quite as significant.

When you get down to talking about designing repository service facility decisions, you can literally make designs and look at cost sensitivity for different sized casks and you are really not affecting your future program very severely.

[Slide.]

MR. CRANE: I would like to conclude with two thoughts. For each of those areas of program risks, of course, we do need to have system analyses, and these are the same programmatic risks that I just briefed you on. The important thing is that they need to be in time, and some of these analyses have already been done for the MPC, and the results of those analyses that quantify the risks in schedule and cost I think you will hear about later on this afternoon.

In addition, I had analyzed one program which most probably won't be the program as time goes on. What we really have is an approach and a tool to follow the program as decisions are made to change the program to respond to contingencies, to look at changing the schedule to the program's advantage and to look at what you do when you want to change the program to use different kinds of components, different architectures.

That concludes my remarks.

DR. PRICE: Thank you. I think we will stop now and provide you some questions, and before I ask some of the board members for questions, I have one that I would like to offer.

How do you decide when a schedule-induced risk is a schedule-induced risk and not a need to change your milestone order, and what are your criteria, how do you wrestle with that particular question?

MR. CRANE: I have put them in two different kinds of boxes. The schedule-induced risk comes out the mechanistic approach as saying, what is the schedule, when are you going to make the decisions and when do you need the decisions. If there is a backward arrow with that mechanism, that is a schedule-induced risk. You are going to have to make assumptions about the future.

Should you change the program, that is data that comes out of the system analyses -- I am sorry, the data that comes out of the system analyses should support the decisionmaker in deciding whether the uncertainties are large enough to change the program.

DR. PRICE: For example, thermal loading obviously gave you some problems there because of the importance of that decision on other upstream elements, and how do you decide that therefore you will not wait on those other milestones until the thermal loading decision is made?

MR. CRANE: First, I am not telling you how to decide because I am not the decisionmaker, and I don't mean to be funny there. I don't really want to try and put words into the decisionmakers' mouths. The way I am thinking about is that the decisionmaker is going to say, all right, I want to pick an MPC design to go ahead, an MPC concept to go ahead and design, in December he wants to do that.

If I were that decisionmaker, I would say, first of all, what is it going to cost, is it going to be done on time. Second of all, what about thermal loading, what kind of thermal loadings can this MPC that I am going to design satisfy, what kind of materials compatibility issues are there that I may or may not have trouble with, what kind of criticality control issues are there, am I at risk with the

NRC for getting certification both for transportation -- I just skipped from thermal loading to transportation -- what kind of chances do I really have in the future of having the NRC license this.

Then what kind of costs are involved if I have to throw the thing away. Let's say I can use it for storage, let's say I can use it for transportation but I can't use it for disposal and what does that mean to me as far as cost for throwing it away and going to a different kind of waste package.

Underlying that whole explanation is the premise, the waste package design is the driver. When you get out to selecting a waste package design, the only MPC considerations are, is it more economical for me to make one that is compatible with the MPC or not, not whether the MPC works. If it doesn't work, you have to throw it away. If you make a waste package that does work, work means meet the requirements.

So I am saying, if the costs are large enough and the schedule is large enough, if the uncertainties are large enough, then I as the decisionmaker would say, wait, let's try something else. But bear in mind I, as the decisionmaker, have to look at the whole system and say, what is happening to the other parts of the system, what are happening to the utilities, what are happening to the other stakeholders?

DR. PRICE: So when you encounter a schedule-induced risk, does that now not require you to establish some list or hierarchy of analyses that further needs to be done to aid the decisionmaker to provide the necessary information, some of the things you talked about, for example, now I need to do a sensitivity analysis of this, or something like that?

MR. CRANE: Absolutely, and the overall decision hierarchy activity took that step and said, for each of the milestones that are coming up, what kind of data do we need and what kind of system analyses do we need.

DR. PRICE: This is kind of an introduction. With the MPC, for example, you have not done those kinds of analyses, nor do you have them listed. Is that correct?

MR. CRANE: A number of the analyses have been done for the MPC in preparation for the decision. I didn't list them in the briefing, in my briefing. They will be presented, I believe, by Ron Milner later.

MR. SHELOR: This is Dwight Shelor. I would just like to add there that in these instances of schedule-induced risk the fact that it is a risk then is a signal to us to come up with some type of a risk mitigation plan. This may be contingency plans that you carry along with that decision milestone as you go down the pike or a change in the schedule or some proactive action to mitigate the risk, or at least identify the risk and say yes that is acceptable to me.

Again, all of this is supplying the basis for the decisionmaker.

DR. PRICE: Is there a similar kind of philosophy for the propagation of risks or do the uncertainties propagate forward?

MR. SHELOR: I believe using this tool that Jim described that this will enable us to evaluate the propagation of the risk in the program. We intend to do that. That has not been done completely yet, but, yes, we will do it.

DR. PRICE: Are there board members with questions?

[No response.]

DR. PRICE: Staff?

[No response.]

DR. PRICE: All right.

Up next we have Donald Gibson, Buzz, it says on the cover, so we will get a Buzz from Donald Gibson.

SYSTEM ARCHITECTURE STUDY

[Slide.]

DR. GIBSON: I thought it interesting that almost everyone we talked to this morning spoke at the podium, and didn't come up front. It is a difference in preference as to whether you prefer to dodge or duck, I think.

[Laughter.]

CHAIRMAN CANTLON: This is the midwestern approach.

DR. GIBSON: I am here to talk about the System Architecture Study. As I get into that, I need to brief you a little bit on the full scope of the study to date, as I only have a certain number of results that I am going to present here in the interest of time.

So as I go through this, I'll give you a little bit of the methodology, talk about little bit about the alternatives that we looked at, some of the results, and tell you a little bit more about where we go from here.

As was indicated when Dr. Price read the opening paragraph of the System Architecture Study, a good system analysis or a complete system analysis is fairly extensive, and in an ongoing program that is relatively dynamic, it tends to also be a never-ending exercise as things change.

[Slide.]

DR. GIBSON: In general, the objectives of our study were to try and do some broad parametric analysis of a large number of alternatives or potential alternatives of the system, in particular, to make sure that we covered a lot of the different alternatives that were possible to ensure that we didn't preclude any desirable alternatives as the system progresses. In doing that, we spend a fair amount of time also examining the sensitivities of different alternatives to the system to both the constraints and different contingencies that are of interest. I will show you a little bit of what I mean by that.

In addition, the information we get by studying a wide range of alternatives under a wide range of circumstances helps us to identify and focus in on those particular areas that are of most interest, are most focused, the more detailed studies; that we will be evaluating a particular aspect of the system rather than looking at a lot of different elements of the system as a whole.

[Slide.]

DR. GIBSON: We had a number of specific alternatives that were key to the study at this point in time, one of which was the waste generation. We needed a source term to treat for the commercial high-level waste, and for that we used the No New Orders estimate that ends up with a total of about 86,000 metric tons equivalent of the uranium in the system -- at the end of the life of the system prior to closure.

We assumed disposal in a geologic repository or repositories -- we did not look at alternatives to geologic disposal -- and we assumed a steady-state throughput of 3,000 metric tons of uranium per year. That is, during the steady-state operation of the system, 3,000 metric tons equivalent will pass through the system from the reactor sites or a storage facility to the MRS.

Now, there has been a separate study that was done that looked at a wide range of variations of that 3,000 metric tons per year for a number of different system alternatives, and found, at least for risk and cost, that the system was fairly insensitive. That is the reason for this study. We fixed it at 3,000 MTU per year, and focused on alternative constructs for the system.

[Slide.]

DR. GIBSON: In terms of the alternatives, we looked at a number of alternatives for storage. We talked a little bit about that. We are principally looking, in this part of the study done to date, at the commercial high-level waste aspect. So we looked at storage, either at the utilities themselves, on-site storage; storage at some off-site facility, like an MRS; or shipment directly from the reactor sites to the repository.

Now, when we shipped off-site, to an off-site storage facility, we wanted to look at the impact of various permutations of that, so we buried both the number of off-site storage facilities as well as the capacity of those facilities.

The current Act constrains an off-site facility to 10,000 metric tons of uranium prior to the beginning of operations at a repository, and 15,000 metrics tons equivalent thereafter. We wanted to understand the sensitivity of the study to that particular constraint, so that was a particular interest.

In addition, we looked at several other parameters. We wanted to understand operationally what impact the date at which a storage facility might become available has, on the system, as well as the impact of a range of start dates for repository systems, so we varied that.

In addition, we know that there are a number of elements of the repository and the repository design that will flow back into the rest of the system. In particular, your choice of thermal strategy can impact the rest of the system through its constraints on the waste package and the waste flow to the repository, so we wanted to look at some variation of thermal loading strategy to see what impact that might have on the rest of the system.

[Slide.]

DR. GIBSON: In addition to the storage approach and the operational constraints shown here, we also needed to look at the technology necessary to transport and store that waste and emplace that waste, given any of the constructs I've just talked about, so we looked at several different alternatives to that.

One was a single-purpose cask or container system, which is similar to our reference system. For example, you would use a different technology for transportation, a different technology for storage, and a different technology for disposal. In this case, DVCC is dry vertical concrete cask, and we used mostly large in-drift emplacement for our calculations, but a different technology for each of the three functions.

We can also look at dual-purpose technologies. In this particular case, the example I give is a transportable storage cask where the same technology is used for both transportation and storage, then a separate technology is used for emplacement.

On a triple-purpose cask or container, which the most notable is the multi-purpose container system where the same basic container or cask is used for all three functions: transportation, storage, and disposal.

Finally, for completeness, we wanted to look at an alternative that used the same technology for both storage and disposal, but a different technology for transportation -- we call that an emplaceable storage cask -- to see if there was anything fundamentally different.

Now, the reason we looked at different technologies is we were trying to find out if under this wide range of different ways to flow waste through the system or different storage approaches and different operational approaches, whether there was anything fundamentally different between these different categories of technology.

The intent wasn't to determine whether a specific solution within each of these categories was better or worse than another, but to try and find out whether or not there was anything inherent about a single-purpose, dual-purpose or triple-purpose system.

[Slide.]

DR. GIBSON: Let me talk a little bit about some of the results. Particularly, I am going to start with the impact on system costs of alternative storage approaches.

One of the first things we looked at was to try and understand how system costs varied as the start date of the repository extended out in time or moved earlier in time.

[Slide.]

DR. GIBSON: So this curve will show you an estimate of the cost trend, system cost trend, for a system where storage is at the reactor sites prior to shipment to an operating repository, and it shows how the system cost increased as the start date for the repository is delayed in time, 2010 on out.

As you can see, as the repository start date delays, you incur larger and larger at reactor storage costs both due to the operating costs of those storage sites at the reactors, both pools and dry sites, as well as the fact that as you move out in time and delay the shipment off-site of the fuel, more and more has to go into dry storage because the pools are filling up. That is what gives you the slope of this line.

All these curves, by the way, that you are going to see today are in 1993 non-discounted dollars. Just for reference.

[Slide.]

DR. GIBSON: What becomes of interest is the question, what happens now if I introduce an off-site storage facility into the system, how does this change?

This is the case where I now move to an off-site storage facility, like an MRS, and in this particular case it is a constrained off-site storage facility. In this case, it is 15,000 metric tons of uranium equivalent. And you can see what happens is, initially, early on it would have a higher cost due to the capital cost associated with the building of an off-site storage facility.

But the slope of that line is much less than it is for at the reactor sites. The reason for that is your operating cost for ever year are effectively one site, an off-site storage facility; whereas, if you storage at the reactors, you have the operating cost associated with 70 plus sites. So that 70 times the operating cost every year as you delay is far greater than the operating cost associated with a single off-site facility.

Now, what happens in this is that your repository delays that MRS or off-site facility fills, once it is full you can't ship anything more to it, and now you are back to storing at the reactor sites again. Eventually, you are storing at all the reactor sites, and, as such, the recurring costs associated with that facility tend to drive the cost up as repository delays in exactly the same way it does at a reactor site.

The next question is, what will happen if I take that and I now eliminate that capacity constraint for the MRS or the off-site storage facility?

[Slide.]

DR. GIBSON: Now the curve looks like this. Instead of filling up and suddenly starting to follow the MR -- or the reactor storage curves trend, it stays relatively flat, and your only cost increases here are continual increases in the amount of spent fuel that you have to store at the site, and the operating costs associated with that one site.

[Slide.]

DR. GIBSON: Now, let me further complicate it and look at what now happens if I take a unconstrained off-site storage. In this case, this storage site is assumed to begin operations in 1998. Take a look at what happens if this site is delayed until the year 2008.

[Slide.]

DR. GIBSON: This is what happens. What happens is I have an increase in cost due to the fact that prior to beginning operations for an off-site storage facility, I have to store at all the reactor sites and have those operating costs in here.

After that, I begin shipping to that off-site storage facility, and the cost increases follow the same slope as the original one for exactly the same reasons.

And, finally, the last question that came up is, what happens if, instead of an off-site storage facility, I ship directly into lag storage at the MDGS.

[Slide.]

DR. GIBSON: Not surprisingly, it follows exactly the same slope as an off-site storage facility, only the cost is somewhat reduced due to commonality of capital expenditure facilities associated with the site.

[Slide.]

DR. GIBSON: The other piece that was of interest was to take a look at cost trends associated with different technologies. The example you saw was for a single-purpose technology. Here is the set of all those curves that I had up before.

What we found was that when you change technologies, the behavior of all of these curves, the relative magnitudes of the curves and where they cross remains unchanged. There was very little impact on choice of technology on the relative cost associated with alternative storage approaches or storage locations.

There is a key exception to that, and I will show you an example to that. If indeed you operate a system differently from one technology versus another technology, you can change some of the nature of these. So changing an operational approach will change the relationship between some of these curves, and that is the example I am going to show.

[Slide.]

DR. GIBSON: If I take and utilize a multi-purpose canister technology, and because of the multi-purpose canister technology or triple-purpose canister technology I allow sites, reactor sites, to off-load their pools into dry storage following -- roughly five years following site -- the time the reactor is shut down, what I can do is eliminate the total number of years I have to now operate that pool. This is called pool conservation.

So if I look at two cases, one is these sets of curves, which is representative of that reactor storage system, versus this set of curves, which is representative of the off-site storage system beginning in 1998, unconstrained, the upward curve shows the ones that I had before, which is the single-purpose system. In that case, I never empty the pools. The only thing that is in dry storage at a site, the reactor site, all the time here and some spill over to reactor site here, is that which is in excess of pool capacity.

On the lower curve, triple-purpose curve, what I have done is I convert everything from a pool into dry storage and eliminate the pool costs. Now, that assumes a technology that doesn't require you to then necessarily to back into the pool prior to transportation. As such, I have reduced that yearly operating cost at sites, and, as such, all it does is it changes the slope of the line.

[Slide.]

DR. GIBSON: Of a great deal of interest in this particular case and in the study was to take a look at the impact -- some of the system impacts of thermal loading on the system.

Now, we know that there are specific elements of thermal loading that do impact the design of the system, and, hence, the cost of the system. In particular, how you lay out your repository, drift spacing, package spacing, which is a key element in a thermal strategy that impacts cost and impacts the size of the repository.

The design of the waste package, the capacity of the waste package. That impacts the number of waste packages you need to have, impacts the design of the waste package. That clearly translates into an impact on cost.

And there is an impact or a potential impact on the storage subsystem back into the rest of the system. For example, if you choose in your thermal reposit -- in your thermal strategy to cool the waste prior to emplacement, you are required to have some kind of storage facility in which to cool it, so that impacts the system.

So let me give you one example that we calculated through. The example I am going to show you is a case where we have a thermal strategy at the repository which wants to maintain the temperature of the repository to less than 95 degrees C. The particular calculation you are going to see is a calculation of 95 C or below, four meters from the center line of a waste package.

Given that, it is possible to calculate the maximum package size for any given drift spacing as a function of the aerial mass loading that you emplace in the repository.

[Slide.]

DR. GIBSON: That is this set of curves. So for drift spacings from 10 to 50 meters, this shows the maximum waste package capacity in terms of MTU as a function of the aerial mass loading in the repository. Now, you see a particular behavior here that is fairly easy to explain.

As I go to lower and lower aerial mass loadings, I eventually reach the place where my waste packages are far enough apart that the local heating associated with one waste package is the dominant, limiting factor in terms of your overall temperature, and, as such, you can't get a higher waste package capacity simply by continuing to decrease the density of waste packages.

Also, if I get far enough out here, I get to a certain aerial mass loading even if I go to a single assembly per package, I will exceed my criteria of 95 degrees C, and so it drops off here.

DR. PRICE: Okay. Carrying that down to zero doesn't make any sense?

DR. GIBSON: No. In reality, there is no zero over here. It goes down to about the size of a single assembly. I have a couple of artifacts of the calculations or of the curves that I'll have to point out. I have some things going into infinity. It doesn't do that either.

[Slide.]

DR. GIBSON: So now what we did is we just looked at envelopes, and this is an envelope of all those curves you saw before. Each one of these, every point on this curve, represents a waste package size and aerial mass loading. From that I now have the requisite things I need to calculate given drift spacing and package spacing capacity. I can now calculate the system cost along that contour.

But I really want to get at the impact on the rest of the system in terms of the storage subsystem, so in addition to this case, which is the contour associated with a repository that begins operating in 2010, I want to know what would happen to that contour if I now cool the waste, which is the equivalent to delaying the start of the repository.

[Slide.]

DR. GIBSON: As I cool the waste -- and here are the curves for 15, 30 and 60 years' worth of cooling -- obviously, as it cools down I can get a larger waste package and I can pack them more densely, so those curves go out. So now I can calculate a system cost along each of these contours, and get a feeling for the trade-off of waste package capacity versus cooling.

[Slide.]

DR. GIBSON: I have two of those curves to show you. The first one here is the cost contours for a system where the storage facility where I cool it is constrained to 15,000 metric tons and the remainder of storage for cooling is at a reactor site.

These go off to infinity just because it hits the realm of infeasibility, and for your eye it is easier to see where these lines terminate.

As you can see, as I cool the waste longer and longer periods of time, the total system cost starts to go up rather dramatically.

[Slide.]

DR. GIBSON: That, however, changes if I now unconstrain the off-site storage facility to as much as the full 86,000 metric tons of uranium. And those all come back together, so you can see the trade-off between waste package capacity -- smaller capacity equally greater cost versus cooling waste for the thermal strategy of interest here -- is a wash.

So what you are seeing is, as you go to earlier and earlier emplacements, you pay for it by having to go to smaller packages and larger repository; and as you cool it, the money you save by going to larger packages and smaller repository, is offset by the storage cost.

[Slide.]

DR. GIBSON: In addition, we looked a number of health and safety trends, and found some interesting things. It turned out that -- well, just a comment. All the alternatives that we looked at we assumed had to meet all the applicable requirements. That was a given. We wanted to look and see if there were any inherent risk trends associated with the alternative storage approaches and alternatives technologies beyond those which are fairly straightforward.

[Slide.]

DR. GIBSON: As it turns out, we didn't find anything beyond those that are -- tend to be intuitively obvious. In particular, we found that for occupational risk the number of handlings of fuel was the dominant fact. If you reduce the number of operations, you reduce the risk.

There was nothing inherent about any of these storage approaches or any of the technologies beyond its ability to reduce operational handlings.

The other main piece of the retained risk was transportation risk, and, not unsurprisingly, it correlated directly with the number of transportation miles that you had. In general, most of the options we looked at were all relatively equivalent in terms of transportation mileage, so we didn't find anything outside of that.

[Slide.]

DR. GIBSON: This is an example which is in your handouts -- I am not going to dwell on it -- which shows an example of one aspect of this which is the occupational risk. In this case, it is radiological exposure broken up into two pieces.

One is at the utility site, and then added on to it here is the off-site, which includes at the repository. I have on here several different approaches. One is storage in an off-site facility like an MRS; one is shipment directly into lag storage at an MGDS. Then I have two other ones here which were just examples of what you might do to reduce the number of operations.

The JIT stands for just in time, and what that means is you try and pick up at the reactor site right before anything needs to go into dry storage. In other words, you try and eliminate any operations at the site that are a result of pool spill over, things that are in excess of pool capacity, so you eliminate that set of operations. This shows you what impact that can have on the system.

This is done for four different cases. One is the single-purpose technology, triple-purpose technology, and dual-purpose technology and, finally, the emplaceable storage cask, which turned out not to have much interest in terms of cost, but because it reduces operations, it drops down the risk number.

DR. PRICE: The apparent winner there is the single-purpose container, just in time, no MRS.

DR. GIBSON: Not necessarily. Here is the problem with drawing that conclusion. In this particular calculation, this came out higher and lower. The trouble is each operation, as with it -- associated with it some particular exposure, which is extraordinarily design-dependent and operation-dependent. You can, for any given operation, design that number up and down.

There is a difference in how you operate the SPC versus the TPC, so, therefore, you can't directly compare all of the operations one to another.

DR. PRICE: Is that, the TPC versus the SPC, largely a welding function?

DR. GIBSON: In this particular case, it is dominated by the welding exposure, down here in this piece, that utility. And you will see that breakdown in the MPC study. I believe they have the breakdown for the welding, and you'll see number equivalent to this.

We didn't find anything as we looked at this -- and this is just one piece of it -- anything inherent about any of those technologies that would argue one would always be higher or lower than the other. And the other thing we did not do: an iso-cost look; if I fixed costs, and did the best I could for risk, would one inherently be higher or lower?

[Slide.]

DR. GIBSON: As you've seen, there are some things that haven't been done yet. This isn't complete.

DR. PRICE: Let me just ask on that welding function, did you look at doing it in different ways in different places? Or what you showed there is on-site by the utility, is that correct?

DR. GIBSON: That one is on-site by the utilities.

DR. PRICE: Yes. Did you look at others?

DR. GIBSON: We did not. I will have to defer to the MPC guys. He is shaking his head back there.

DR. PRICE: Which way is he shaking it?

DR. GIBSON: I don't want to commit him.

MR. HOLLAWAY: I am Bill Hollaway. I am with the M&O, and I worked on the health and safety work that was done in conjunction with this, but focused on the MPC.

What we did was use current practice welding techniques as typified by what might be done at Oconee, sealing the casters at utilities, realizing that there is a lot of opportunity for improvement in those as we look to spending money for ALARA, et cetera.

But these numbers and the numbers we show are based on current practice, so you can think that there is probably some opportunity for improvement in those, and that is something that we are going to be looking closely at.

DR. GIBSON: A number of things have not been completed yet. One of which that is very important is looking at the rest of the high-level waste. What you have seen so far today in this study is the waste stream associated with commercial spent nuclear fuel. That is not all the high-level waste. When Dwight got up and talked, he pointed out there is a large amount of other waste from the defense complex that also has to be addressed.

The thermal loading strategy, the system trends associated with alternative thermal loading strategies, is not complete. You have seen a little piece of it here. There is quite a bit left to be done there, as well as what -- expanding our study of different attributes. All you have seen here, and what we have talked about, is system costs, and, by the way, those costs include both utility cost and waste fund cost -- we didn't discriminate between the two -- as well as various elements of risk, health and safety risks.

That doesn't necessarily make a complete set of relevant attributes, and those are going to be discussed a little bit in the next talk on the stakeholder panel meeting that Dwight will give.

That concludes my comments.

DR. PRICE: I just wanted to ask you another question. Your assumption was 86,000 MTU, and you just closed the talk with saying other DOE defense complex, high-level waste. One of the things that has been bothering me over a long period of time, and that perhaps is even a growing or nagging thing with me, and that is the feeling that I do not know -- maybe you know, and so I am going to ask you, maybe somebody knows -- how much waste that should go in a repository is actually out there, including defense waste, including waste from decommissioning, and whatever other sources of waste because I here things that Fernald thinks they are going to ship some waste to the repository.

DR. GIBSON: Yes.

DR. PRICE: And that we are going to buy some waste from a foreign country. I guess really at the heart of a waste system, since this has to do with waste, is waste and how much is there.

DR. GIBSON: Yes.

MR. SHELOR: Dr. Price, this is Dwight Shelor. Let me answer that. I cannot give you answer by memory, but I will be happy to send you a very short three-page document that summarizes our current state right now in all of the potential waste that we have identified that may need disposal in a repository. We have that information. I will be happy to send it to you.

But, you know, clearly, the point Buz is trying to make here is that we now need to expand this study to include those wastes even though they may be potential. Take this opportunity to say that -- you know, we have the best job in OCRWN because all of our work gets done on paper. We don't have to implement anything, so we can study a lot of things, and that is certainly the direction we are going.

DR. PRICE: Maybe I could even get you, though, to venture a little bit just because my curiosity is really piqued about this. Is it near 86,000 metric tons or is it far from 86,000 metric tons?

MR. SHELOR: I think we are going to have to invent a different metric. What it really amounts to is that if you collect all of the defense related and other waste and put them in one pile, and all of the civilian nuclear reactor waste in another pile, you will find that one has 90 percent of the curies, but only 20 percent of the volume, so it is a curies versus volume situation that we have. Clearly, the volume of the defense waste is large.

One of the critical issues that is going to be facing the Department, not just the Office of Civilian Radioactive Waste Management, is the investment trade-off in reducing the volume for the repository that now you are spending society's money in implementing technologies to reduce that volume, and then the subsequent trade-back to how much low-level waste do I generate in doing that. So that is what we are going to address.

DR. PRICE: I got you. I understand.

DR. GIBSON: To give you one example of the uncertainty associated with some of that -- and one of the reasons we need to address it in the system study is because we have to do a fair portion of that parametrically -- is the waste associated with the clean up of just the tanks at Hanford, and the vitrification of that waste.

There is a question as to how much of that waste or what level of processing will go into that waste, and whether or not it will all be vitrified, including the low-level waste.

The Hanford project, in the last review I was involved in of that, it was not clear, as far as they were concerned, whether or not all of that would end up going to a repository, or very little of that would go into a repository.

So there are parametrics there; there are some impacts associated with the repository itself on that waste form, including the thermal loading strategy, and all that needs to be reviewed and then linked up as well with all the studies going on in EM, Environmental Restoration and Waste Management, in DOE. It is an interesting study involved.

DR. PRICE: It has not gone unnoticed to me that the flow of the conversation has risen to a Lake.

[Laughter.]

MR. BARRETT: Okay. I am Lake Barrett. I'm the Acting Deputy Director. You mentioned the Fernald rumors. It is very interesting about how some of these things come around. Let me clarify what we are doing as it regards to Fernald.

One of the things Secretary O'Leary has emphasized is the teamwork within the Department of Energy. I think as we all know Tom Grumeley has an enormous task in front of him dealing with, basically, the legacy of winning of the cold war.

One of those legacies he has to deal with -- and I don't remember the numbers, but I think it is almost millions of tons, I think is the number, of depleted uranium within the DOE complex. This was uranium from the enrichment program for the last 40 years. That has to be dealt with. Much of that is at Fernald. Not all of it, not the majority, but some is at Fernald.

As they scope out there look ahead in the future, and the many billions of dollars that it is going to take to safety dispose of all that material, we are always looking for maybe better ways that we could work together to solve a problem.

There is a concept that is being considered by the

EM folks, and we are assisting them, is the potential use of depleted uranium in a disposal waste package concept where if you were to look at building a separate disposal facility for depleted uranium, you can easily start to talk about several billion dollars of materials to design, develop, site, and operate it.

If you look at our program to go and build depleted uranium shields, okay, for the material, from an economic point of view, it doesn't pay for us to do it, but if potentially we work together, and if they were to basically subsidize our program, maybe we could use that as a shield in our system.

Now, it is something we have not decided to do it. We haven't changed our baseline to it nor anything else, but it is the type of teamwork that we are working together to explore some of these, and the tools that Buz has aligned here -- and from my view -- is something that I believe the board has been pushing now for over a year, that we take a broader look and a systems look and a logical, systematic look at these issues, will serve the Department of Energy and the nation in the best to try to make the best decisions as we try to go through this. It is not just for the high-level waste program; for the entire society and all the waste.

DR. GIBSON: I should point out that when we first set off on the study, we spent a fair amount of time -- we spent a fair amount of time when we first set out on the study thinking about the high-level waste program, and that piece of it, as well as the commercial spent fuel.

One of the questions we had to ask ourselves was, what elements of the high-level waste stream would impact those aspects associated with commercial high-level waste?

One of the conclusions that we drew in those discussions was to -- first order, the elements prior to a repository would be relatively unimpacted by the high-level waste stream; they met at the repository. Now, that doesn't -- that doesn't work when you end up with primary storage being lag storage at a repository because if you have high-level waste coming in, you may have some problems in logistics there.

So, for that reason, we felt that we could pretty well understand the inter-dependencies of different alternatives to storages and different technologies of commercial high-level -- the commercial high-level waste aspects of the system prior of delving into the high-level waste system, then merging those two together a little bit later. So that was a conscious decision at the beginning of the study. You know, just subdividing to what we could conquer at the first part.

DR. PRICE: Pat?

DR. DOMENICO: I'm Domenico of the board. When you considered the cost associated with the thermal policy, the thermal loading, you did take into account the fact that the greater the spacing, the more repository required?

DR. GIBSON: Yes.

DR. DOMENICO: Did you -- did you have -- considering you have a finite mountain, do you have any constraints on the size of the repository to achieve those sorts of goals?

DR. GIBSON: Well, the answer to that is yes because the costs go sky high as you get much larger out. I guess I would ask --

DR. DOMENICO: Let me --

DR. GIBSON: I can tell you exactly --

DR. DOMENICO: Are there given constraints on the size of the repository?

DR. GIBSON: Yes.

DR. DOMENICO: So you do have those?

DR. GIBSON: Yes.

DR. DOMENICO: You do know those?

DR. GIBSON: Oh, yes.

DR. DOMENICO: Do you know what that constraint is offhand?

DR. GIBSON: Offhand, I can't tell you what that is. I can get that answer for you though.

DR. DOMENICO: The last question is, when you are looking at the off-site storage, unconstrained, did you in any way work out what might be an optimal volume for the 3,000 metric ton throughput? Is there such a thing as an optimal size? Depending on what condition you are looking at, of course.

DR. GIBSON: As best we can tell, the optimal size, if the broad minima that you get when you look at a range of throughputs can be believed, tends to be right around 3,000 MTU per year for a 2010 repository simply because you tend to empty out everything about the time the last reactors come off-line.

DR. DOMENICO: So the optimal size is a steady state, more or less?

DR. GIBSON: Sort of. For a 2010 repository, that is true. It turns out that your goal is to reduce the amount of operation years you have to store things at the reactor sites after decommissioning, so your optimal throughput is whatever it takes to empty out all of those sites roughly five years after the last discharge.

Now, for a 2010 repository, that tends to be around 3,000 MTU per year, and variance on that: some pick it up sooner, and then you wait; some delay a little bit, and you wait and it doesn't make all that much difference. But as the repository delays, again, whatever it takes to empty out those sites about the time they shut down.

If you start picking it up in 1998, that turns out to be 3,000 MTU per year. If you started picking it up later, you would want to pick it up at an accelerated rate.

DR. DOMENICO: Thank you.

DR. NORTH: Warner North, board. Let me pose a question that I have asked before. What happens to the results in terms of the total system cost if reactors are taken out of service faster than the current schedule?

DR. GIBSON: I can't tell you the exact relative numbers. You have a trade-off. As they come off-line earlier, you reduce the amount of waste that you have to dispose of so your repository costs drop due to size, and your capital costs associated with the rest of the system dropped if you had to have extended storage.

Without extended storage you buy a certain number of storage containers and a certain number of transportation containers. They don't change. You reduce the number of times you use them and that is not a huge cost.

On the other hand, if you keep picking it up at the same rate and they shut down earlier, or you slow down the rate, you run the risk of having to have those sites operate longer after they shut down than they might needed to. As such, the at-reactor storage costs passed reactor shutdown, can go up.

My guess is if we run that calculation at the rate we are picking it up, whether they shut down early or late, will end up just reducing the cost of the whole system a little bit. But it will draw all those curves down roughly the same amount. As long as the variation is small, about that 86,000 Mtu. If you cut it down in half, I don't know. It is not intuitively obvious to me. That is an easy enough thing to do in any event.

DR. NORTH: Would it seem accurate to speculate that you get more of a difference between the unconstrained and the constrained cases going back to the storage alternatives?

DR. GIBSON: No, I am not sure you would. If the repository delays a long time, yes.

DR. NORTH: What I am thinking of is basically: Are we going to get a significant escalation in storage if we now essentially make the utility have to maintain a pool longer than it would otherwise?

They would have to go to dry cask storage earlier than what they had planned to do if the reactor had stayed in operation. I would think that would tend to run your cost up a bit.

DR. GIBSON: Yes, if we stay in the pools and don't do the pool conversion case. Okay. The repository delays a long time. Yes, if you shut down earlier, it will increase the total number of pool operating years that you have in the system.

If I go to the pool conversion case and use a technology that allows pool conversions, you won't see any difference except the total costs will drop due to the lower amount of waste ultimately disposed.

Now, initially some of those curves will come down because of the lower amount of waste being ultimately disposed. You would anticipate -- what you would have to look at is the additional operating cost years that you add on as offset by the lower amount of waste and see which one beats the other. I don't have any feel for which of those is going to win that particular waste.

DR. PRICE: Your answer to Dr. Domenico's question about the optimum size somewhat related to Dr. North's question. You assumed that in that answer that everything is working as you expected it to, all parts of the system, if everything is working the way you would expect it to, including the operation of the utility power stations, including the transportation system, including the repository -- everything is going smoothly.

DR. GIBSON: Well, I have to be careful. It kind of assumes that however you built your system is capable of removing stuff from a reactor site at the average rate of 3,000 per year and disposing of it at a rate of 3,000 per year.

Now, depending on how the system is constructed, even the system as it is currently laid out, I think of it as having a large capacity in the system, to handle things coming off-line in various locations.  You obviously cannot assume, when you do full operational analysis, that everything is going to work.

You have to walk in and say, "What happens if this comes off-line?"  There is a standard failure analysis for all of that, that we have not done yet.

DR. PRICE:  You have not done that yet?

DR. GIBSON:  No.

DR. DOMENICO:  Is it safe to say that the whole element in this gives that you probably the most uncertainty is the uncertainty in the thermal loading strategy?  Is that a safe statement?  I mean, if you could nail that down, would it make your job easier?

DR. GIBSON:  Yes and no.  In terms of what we did, we found, for example, that the trade, if you have an unconstrained storage system, that you can now trade-off long-term storage against waste package size.

See, for us, the thermal loading strategy only translates into some waste stream constraint or waste package-size constraint.  We are not looking at different performance parameters within the mountain itself.  It turns out that the trade-off between cooling and that constraint for an unconstrained storage system is a wash.

DR. DOMENICO: Okay. Thank you.

MR. SHELOR: This is Dwight Shelor. Let me add to that.

It would begin to make the job a little easier, but if we go back and look at our decision hierarchy, there are still other things that would make life easier and one is the criticality control method and the materials compatibility.

DR. PRICE: On the last one you dropped your voice, Dwight. Would you say the last one?

MR. SHELOR: The materials compatibility

DR. GIBSON: If you take a look at the curves, you find an interesting thing. What you saw was an MRS start-date or an off-site storage start-date of 1998.

If you accept that the thermal loading strategy is constrained by the testing schedule as currently exists, which drives you out to roughly the Year 2000 for those results, and if you then shift the rest of the system past that time, you basically have a system that is looking at a MRS start-date sometime after that, or a technology date after that.

So you have cost escalation associated with that. So you have that trade. That is part of the on-going analysis. That is part of the understanding of the total risks for risk mitigation that was mentioned earlier.

CHAIRMAN CANTLON: Cantlon, board. In your cost estimates, are you looking at the total cost, including the indirect and the infrastructure costs?

DR. GIBSON: Yes.

CHAIRMAN CANTLON: So it is the total OCRWM budget?

DR. GIBSON: Including the utilities.

CHAIRMAN CANTLON: Plus the utilities.

DR. GIBSON: Yes.

CHAIRMAN CANTLON: Thank you.

DR. CHU: This is Woody Chu. I have a follow-up on that. That was a good lead-in. Are the cost numbers that you show discounted or not discounted?

DR. GIBSON: The curves I showed were not discounted. There were a number of costs that are not in those curves, such as the historical cost-to-date. Because we didn't address high-level waste, I don't have any high-level waste numbers in there. We were looking for the trends, so we wanted to look at the relative differences. Those numbers aren't discounted. We have discounted calculations.

DR. CHU: You would expect then, that not only would the magnitudes be different but the cross-over and some of the trends may change as you change from not discounting to discounting?

DR. GIBSON: To a certain extent, they change a little bit, but some of the relative nature didn't change very much. For example, the curves where you saw an at-reactor storage system versus a single off-site storage system, those two curves all drop down a little bit, came a little bit closer together, but the cross-over didn't change significantly.

DR. CHU: Are you assuming that you built the off-site storage --

DR. GIBSON: So that it is operating in 1998?

DR. CHU: Right.

DR. GIBSON: Yes.

DR. CHU: And discounting doesn't change that?

DR. GIBSON: It does lower all the costs. It took both of those curves and decreased the slope a little bit. But the cross-over point didn't change significantly, certainly not within the uncertainty in the calculations.

DR. CHU: So paying up-front doesn't change matters much at all under a discounted scheme?

DR. GIBSON: In what we looked at. Yes, in that case, it didn't change it much.

DR. CHU: Okay.

DR. GIBSON: But it did draw those two things closer together because the discounted cost for the off-site storage system drops it a little bit faster than the other one. But they cross over earlier, so that it turns out you don't see much difference.

DR. PRICE: You have given us an example of the MPC. We have been interested in the aspects of the stuff that you have just done.

But how do you see the methodology which you have now carrying forward and being developed to more fully represent the total system, especially incorporating the studies and analysis and so forth that would go along with your schedule-induced risks and this kind of thing? This is part of the picture that you have given to us. It is a methodology. Now, where do you go from here?

MR. SHELOR: Okay. This is Dwight Shelor. I would like to respond to that.

I think clearly we have developed the capability to do that. We have implemented it for a modification of the current baseline. As we have indicated earlier, I think there are some considerations in our strategic planning and other efforts to either reaffirm or implement some changes to that baseline.

We will continue this process, and we will continue to build on this experience now to go into more -- I shouldn't say formal -- but more detail on the risk mitigation when we identify schedule-induced risks and more information in the system studies on trades.

DR. PRICE: As I understand it, somebody somewhere takes your systems' work and looks at them and decides whether or not to go through the change control system with the data that you provide them to support the decision that they have made one way or another.

MR. SHELOR: That is correct. In general, if in our systems analysis and our systems engineering work, we were to identify a desirable change, I would support that through the Change Control Board process that I outlined earlier.

DR. PRICE: Okay. Any other questions from board members?

[No response.]

DR. PRICE: Staff?

MR. FEHRINGER: Dan Fehringer, staff. I have a question for Buz Gibson about the radiation exposure data that he presented. Your viewgraph was titled, "Radiation Exposure from Operations." Do I take that to mean normal operations and no contribution from accidents that might occur?

DR. GIBSON: Yes.

MR. FEHRINGER: One of the potential advantages of an infancy concept is a reduction in either the frequency or the severity of accident doses. Have you looked at whether that reduction would be significant, or if it would even occur at all?

DR. GIBSON: I will have to leave that to the MPC folks to talk about. In our calculations, we did not include any accident risk at all. You have a trade-off there to look at, one of which being, in a single-purpose case, most of your fuel handlings are bare-fuel handlings, but in a hot cell versus -- passing a canister back and forth outside of a hot cell.

One of the things that we found at least in the radiation numbers associated with operations, routine operations that we looked at, is that when you are operating within a hot cell, you have a great deal of shielding. So in the operation, the exposure is very low, whereas if you are moving a canister around, you are outside of a hot cell. You go to great lengths to shield that. But that is one of the differences of the operation.

But no, we didn't look at the accident piece of it. The MPC guys would have to address that.

DR. PRICE: Mr. Shelor, I understand you have a summary to bring. I didn't realize that, so I think perhaps now would be the time.

SYSTEM ARCHITECTURE PANEL MEETING

[Slide.]

MR. SHELOR: Actually, it is not a summary, but I want to take just a few moments to go through a third element.

I know we are running a little behind schedule. I will try to go through this very quickly. But again, we have talked about the program evaluations, top level systems analysis.

I would like to describe for you very briefly our activities that we initiated in terms of a stakeholder interaction relative to -- and again using the System Architecture Study as an input to it.

[Slide.]

MR. SHELOR: The purpose of the System Architecture Panel Meeting was to help us in developing a process for direct pre-decisional involvement by stakeholders in the basis and the underlying foundation for decisions in this program.

Our objective here again was to obtain input that we can use to orient our analysis and provide the input into the decision process through the identification of issues and concerns of stakeholders, how those issues and concerns can be evaluated relative to the alternatives, and identify attributes that could essentially capture the issues and concerns of the stakeholders, encouraging the stakeholders to give us some idea of the relative importance of the attributes that would be used to evaluate a given set of alternatives.

The focus of this was on a substantial dialogue between stakeholders and the program.

[Slide.]

MR. SHELOR: We conducted the first stakeholder, or System Architecture Panel Meeting, I should say, on December 8th and 9th here in Washington. We had 10 panel members. We had five panel members from invited participants outside of the program. Then we had five individuals from within the program.

Again, this was an initial effort to evaluate this as a process. Certainly I wouldn't consider this as representative of all stakeholders. We will address next steps as we go along.

[Slide.]

MR. SHELOR: What process were we involved in? This is basically a utilization of the multi-attribute utility analysis approach. In this panel meeting, first of all, we describe some potential system alternatives that we developed in the System Architecture Study. In this process, the participants or the panel members can add, modify, come up with different alternatives or suggestions for different alternatives.

Then we have described a set of attributes that we just threw on the table and said, "These are potential attributes that could be used to evaluate these system alternatives." Then we went through a process where the panel members, add, modify, and come up with a list of attributes that can, in fact, capture their issues and concerns.

Then the next step is to go through an elicitation process so that you can get the relative weights of the various attributes. Then we can do a draft ranking from, say, most desirable to least desirable alternatives, and feed that back through the process so that stakeholders or panel members can begin to get an idea of how their weighting of the attributes begin to affect the results.

Okay.

[Slide.]

MR. SHELOR: At the December 8th and 9th meeting, it was a very interesting experience. We didn't complete the process. We got right here. We had very good participation, in my view, of the panel members, significant dialogue. Where they were able to express their issues and concerns such that we could translate them and satisfy, at least, some of us, that we could identify an attribute that would capture their concern.

[Slide.]

MR. SHELOR: Let me give you an example. This is unreadable, but basically when we went to this panel meeting we said, "Okay, what are the attributes that one could conceivably use to evaluate system alternatives?"

I think there were 17 or 19 when you add up all the bubbles down here. But these are all in the areas of cost, public health and safety, occupational health and safety, flexibility, NRC approval, local acceptance, environment, energy options, equity -- you name it. An attribute should be able to capture an issue or a concern of a participant.

[Slide.]

MR. SHELOR: We spent a significant amount of time discussing the attributes that one could use. Just a few examples of the additions of attributes that came out of the meeting -- this is not all of them -- but one example is you should consider accidental radiation release. You should consider the need for legislative or regulatory action to implement in a socio-economic area, to just consider whether the effects on the infrastructure, the local areas, what happens to property values, what happens to water allocation.

These attributes, again, are designed to capture the issues and concerns of the participants. Again, the environmental impact statements -- generational equity, as an example.

[Slide.]

MR. SHELOR: I have kind of given myself away because I have already said it is a good meeting. But we did. We had a good start and a very constructive dialogue with this selected set, or invited set of participants. I thought we made excellent progress on the development of attributes.

One point I want to bring out is that as program managers, for all intents and purposes, if we were making the decision and we were not considering anyone else, we would probably look at cost schedule and performance as the only attributes that mattered.

The only way, in view, that we can begin to enter a dialogue with other interested parties and stakeholders is to translate their issues and concerns into attributes that can be used to provide input to our decision-making.

So far, half-way through, the comments were generally favorable from both the participants and the observers. The long-term assessment by the participants is going to be dependent upon completion of this process, steps taken to enhance it, more discussions on the data that we use as input. Everybody was concerned about how the program uses this information. Is it really going to make a difference?

[Slide.]

MR. SHELOR: It is going to be a challenge to do that and to follow through with it.

What are our next steps? Follow-on efforts. One serious mistake we made was not providing the draft study to all of the participants well before the meeting. We have done that now, except to Martin who hasn't received it, who will shortly.

We need to do now some further analyses coming up with the actual values for some of the attributes that have been talked about. We will plan and conduct the follow-on meeting. Right now we are looking at mid-March. Then the next steps will be dependent upon how that works, is to develop long-range plans for a broader interaction with more people. Obviously we want to incorporate the lessons learned as we go along.

DR. PRICE: Thank you. Are there any further questions, then?

[No response.]

DR. PRICE: If not, we will take a break. We will be back at the scheduled time, which is 3:35.

[Laughter.]

DR. PRICE: Well, that doesn't work. Let's take 10 minutes. All right.

[Recess.]

DR. PRICE: Let's gather around again. I'll ask you to break up your conversations because we want to squeeze something in here and give people an opportunity from the audience so, Ron, we are going to take a minute here, so if you would, please gather round and we're going to provide a little opportunity for comments from the audience because our comment period is so late and the meeting has been running long and we want to be sure that there is a little opportunity here for some comments in a more timely manner.

We are going to stop at this time and divert from our schedule just a little bit because we understand that there are some in the audience that want to make comments about the speakers and the content this morning as well as some of the things this afternoon and there was some concern about the late time for comments at 5:35, which our scheduled time, so we are going to give just maybe 10 to 15 minutes for comments right now.

If you have something that is really burning and especially because of not being able to stay later, and our comment time will still hold at the end of this session, perhaps you could come forward to the mike, identify yourself and direct your comment, if you want to, to an individual or question or whatever it is, so please do so.

[No response.]

DR. PRICE: What happened to these burning issues?

COMMENTS FROM THE AUDIENCE

MS. OLSON: My name is Mary Olson. I am with Nuclear Information and Resource Service on the Radioactive Waste Project.

I would just like to put in a comment on public participation and also the multipurpose canister proposal. i won't be here later, so thank you for this opportunity.

Last time I was in this room I was a stakeholder at an NRC gathering and I want to say that I think that there is value in that kind of a meeting so I don't want to be dismissing it, but I am beginning to develop quite a bit of concern about the fact that we seem to have an interchangeability between stakeholder and public without a little more definition and thought and feedback and comment on this.

Part of my concern is that while I was what you might call an attentive commenter or whatever at that stakeholder meeting here last May, I didn't feel that it was appropriate to say that the four to six people at the table who were, quote, "public stakeholders" were adequately representing the general public because there were three times as many other stakeholders, so when does a corporate stakeholder get to be a stakeholder and when does a public stakeholder get to be a stakeholder, and what is a stakeholder and who gets to invite them and what do you really do with what say anyway?

So I think we are at a starting point of something here but it certainly doesn't satisfy me yet as a full, comprehensive process that allows not only public input but accountability back from that input to the public, whereas we have a well-known and already well-defined process for such input that the department could just startle and shock and amaze us all by utilizing which is called and environmental impact statement or a programmatic environmental impact statement, and certainly there is nothing out there which could be pointed to as establishing already that work on the MPC concept of MPC proposal.

I am not trying to turn off the stakeholder concept but if you are out there doing what is mandated under the law for public participation through scoping and hearings and other processes that are already established then you are not doing your job.

We would rather be involved in it in a proactive and positive way than be involved in it in the only recourses available, which is the much more complicated adversarial approach, so I am just suggesting that you need to broaden your scope, look around and see what else we have already set  up in this society for having a good public process.

DR. PRICE:  Ms. Olson, I think you also said you wanted to say something about the MPC.

MS. OLSON: That was it.

DR. PRICE: That was it, okay, thank you.

MS. OLSON: The MPC is your big chance. You pass it over --

DR. PRICE: Okay, she says the MPC is the big chance, pass over it and we'll notice.

[Pause.]

MR. GELFAND: Good afternoon. My name is -- can you hear me? My name is Martin Gelfand. I am with the Safe Energy Communication Council. Thank you for the opportunity to make my comments.

I wanted to comment mainly on something that Daniel Dreyfus said this morning. He said that there were three issues that related to public trust and confidence, one being the stigma related to the history of the Department of Energy's programs in the past, a second being the DOE mission itself, which there is some disagreement about what that should be, and third the behavior of the Office itself.

I just wanted to comment briefly on that.

First of all, for the last month or so, there hasn't been a morning that I have woken up and didn't see an article in the Washington Post or the New York Times either on the front page or the front section itself that wasn't about the radiation testing, the secret radiation testing that the Department of Energy and the Atomic Energy Commission had been conducting.

Looking at the Office of Civilian Radioactive Waste Management I see a similarity if not in magnitude at least in -- perhaps in magnitude -- at least in the type of experiment that is going on against the will of the public and one of the things that strikes me is that there is always this overriding need to conduct these tests.

In the case of the radiation testing that started in the '50s, the '40s and '50s, the overriding need was national security and protection of our great democracy from the Soviet menace. Now the great overriding basis for the types of testing that are going on with radioactive waste is the need to generate more electricity. That was talked about by the representative at this table here this morning from the Edison Electric Institute, although he didn't say it quite in those words but he said more electricity generation is what this is about and that's true and that was articulated by the Bush Administration's Department of Energy posture statement when the Department said that moving ahead with the repository is going to remove a barrier to the development of nuclear energy.

That is the assumption that this is all based on and it may have been, the language may have been slightly modified when President Clinton took office but it certainly was apparent to me when I was at a stakeholders' meeting, the one that Dwight Shelor described, I was at that stakeholder meeting.  I was a participant.

One of the attributes that was described was the energy option and looking at the attribute, the idea was that as soon as a repository is implemented there would be new nuclear power generation within a range of zero to three years.

Well, you know, the law says that the High Level Radioactive Waste Program and the waste repository is to protect the environment and public health and safety, not about generating new nuclear power plants, and what we see is the same great overriding concern that drives this whole process, just like the whole great concern that drove the secret radiation testing years ago is it's something that, it's a policy that the public may or may not agree with and that goes to the second issue that Dan Dreyfus was talking about, the DOE mission itself.

Now what is the DOE mission?  Is it to protect public health and safety or is it to get new power plants built?  That is something that the DOE really needs to think about and the Nuclear Waste Technical Review Board really needs to look at.

As scientists you know that you arrive at great truths by asking the right questions and what is your question? Is the question how are we going to protect public health and safety or how are we going to get new nuclear plants going? And that is something that the public is thinking very much about, the public is thinking about when they read their newspaper every day and read about these tests and make that connection between the tests then and the tests now with regard to high level waste and also low level waste and that is why we need an independent review of this whole program, a review that is called on by the President of the United States and not an administrative review of the DOE by the DOE but a review that looks at the whole radioactive waste program.

I think this is very much consistent with the Department of Energy's new openness policy that they are working on.

We need to be taking a very close look and a hard look at the whole radioactive waste program. Are we stepping into new -- are we really looking at the program or are we simply justifying reasons for building new nuclear plants?

Then finally, Dan Dreyfus's third observation on the behavior of the Office itself, I think that the DOE is taking the right step by seeking greater public participation and I think that the report that was described this morning is certainly a step in the right direction. I hope that all levels of our government look at this very seriously and try to help bring greater public input into the process.

An example of where I see DOE not really doing as much as it can is when I received a letter that was dated December 17th asking for comments on the openness policy and requiring an answer by January 4th. Now two weeks is not a whole lot of time to respond, to make comments, on a policy, on a proposed policy but two weeks that include Christmas and New Year's is effectively a lot less. I did not receive this request until a few days before it was due and I think that the Department could do better in providing more time for the public to make comments and to spread out the net further, enabling more people to make comments.

One of the things that the Department really has to look at is the fact that while Edison Electric Institute and other corporate interests that have vested interests in the outcome of this program have whole departments with huge staffs that can make comments and be at these meetings every day of the year if they want to. The public does not have that opportunity because the public isn't funded to do it. the public does not have access to resources like Edison Electric Institute does and other interests that are under cooperative agreements with the Department.

The public needs to have greater effective access to the process, a greater effective role and not just lip service. Thank you.

DR. PRICE: Thank you. Now we'll have some time later on for additional comments. I think now we'll return to the program and our next -- yes?

DR. NORTH: I would like to respond to the comment that we just had from Mr. Gelfand.

DR. PRICE: This is Warner North.

DR. NORTH: Warner North, board.

I want to be sure that he understands that in our statute we are responsible for technical oversight of this program. The program is measured against various goals which include the suitability and the potential licensability of the repository.

These have to do with public health and safety, as defined through a process with EPA and NRC. Some of that process is under review with the National Academy at the moment, but as far as I know it has nothing to do with the building of nuclear power plants.

I want to assure the commenter that from the TRB's perspective our job has nothing to do with the future of the nuclear option in the sense of being a goal of what we do. Our job is to assure the scientific excellence of the program by giving our critical comments so that the DOE can make its program better.

I would also like to tell the commenter that we share the concern he raised with respect to the draft policy on public involvement, which I believe we received on the 23rd of December. The board as a whole responded through a letter from Paula Alford. I sent in one by myself and I saw to it that some other people in the community knew about this call for comment.

I will strongly urge the Department to extend the deadline and those of you who in the audience don't know about this and would like to find out, I am sure Alan Benson can provide you with a copy of the draft policy and I expect that he will welcome your written comments.

DR. PRICE: All right. Now Mr. Milner.

UPDATE ON THE MULTI-PURPOSE
CONTAINER CONCEPT

[Slide.]

MR. MILNER: Thank you, Dr. Price. I apologize to the board. Somebody once told me that a gentleman never makes a presentation and takes his coat off, so I guess this just confirms what my friends have known all along.

MPCs may be very compatible with a high thermal loading strategy, but I am not, I'm afraid.

[Laughter.]

[Slide.]

MR. MILNER: I will try to -- since we are a little bit behind -- I will try to go pretty quickly. I have got quite a few viewgraphs. Basically, my presentation is broken into five parts. I hope most of them are going to respond to requests either made at the December meeting in Dallas or subsequently.

I talk a little bit about the approach we used on the MPC evaluation, going into a little bit of detail on the assessment; the trade-offs that we did as to why an MPC is preferred, a little bit on current status; the few risks that we are taking and still certainly are taking, I think we have some approaches to at least mitigating those, we will cover those a little bit; and then, lastly, I talk a little bit about what might be considered a phased approach to MPC implementation.

[Slide.]

MR. MILNER: Okay. As far as the approach we use for the evaluation, first, really, what is the motivation? Why did we begin looking at MPCs to begin with? Basically, the program wasn't really working as the act envisioned when it was first passed. We have no facility ready to operate, and they are unlikely to have a facility to operate in '98. That gives rise, really, to a need for something other than single-purpose storage technology to decouple pool and dry storage.

There are a number of other reasons, but we think that the multi-purpose concept addresses these issues.

[Slide.]

MR. MILNER: I don't want to try to go through the schedule in any kind of detail, but, basically, I just kind of wanted to point out with this that we do, one, have a logic for developing the MPC. Secondly, really, the whole development process is based on a series of decisions that are made along the way, feedback loop that we will get into a little later.

For example, a very early decision, hopefully in the very, very near term, is going to be the decision whether or not we proceed with the MPC concept. If we decide to proceed with it, there are a whole series of other decision points in here. If we decide to proceed, we will begin an environmental assessment. We will have another decision point about the end of fiscal '94 where we evaluate the MPC material selection versus the preliminary waste package material report.

Some other ones: we evaluate MPC design versus the waste package updated materials report, and the preliminary thermal loading decision, a series of others, and other decision points, certainly, on once we finish design if we then decide to fabricate or not go any farther than the design.

A final decision point, once we have already fabricated some, but a small number of MPCs, would be to, again, evaluate that design based on the final loading -- thermal loading decision at the repository.

Also point out that, really, this set of decision points is really a subset of the overall decision hierarchy that Jim Crane talked about a little earlier.

[Slide.]

MR. MILNER: Certainly, moving forward in the MPC, you are taking some risks, since you don't know all there is to know about the repository, the waste package, and so forth, but what, really, I would like to point out with this chart is that, in essence, we have a developmental process which mitigates our -- not mitigates, but minimizes our risk as we go along, and in '99, while we've spent a large number, should that effort prove unworthwhile at that time, it's still only a very small fraction of what would have been the overall total cost of an MPC decision.

[Slide.]

MR. MILNER: Along with the conceptual design that we did for the MPC, there was a whole series of supporting studies that we had gone through. I won't try to run through all of them. I think we have given you all but two of these -- copies of all but two of these supporting studies at this point.

The two that we haven't given you are the Health and Safety Impact Analysis and the Alternative Cask/ Canister System Study. I will be talking a little bit about the latter a little bit later on, but both of those we should be getting to you very shortly.

[Slide.]

MR. MILNER: Getting into the assessment of the MPC itself. You saw this chart a little bit earlier. Essentially, I am going to be talking about the one particular section, the more specific analysis, in particular the Cask/Canister Study. It all ties into the overall system evaluation and the thinking process.

The other on that particular chart I should point out under more specific analysis might include the NEPA process and so forth.

[Slide.]

MR. MILNER: Okay. You saw this chart at the Dallas meeting in November. Lake Barrett presented this. I will go into a little bit more of the detail behind this chart.

[Slide.]

MR. MILNER: I'm going to start with the punch line. Looking at two of the evaluations of the comparisons that were done of the different alternatives: one on cost, one on health and safety.

Overall, you can see by those particular numbers, the MPC has got the lowest cost. All these cost, I should reiterate here, include utility costs; basically, the total system cost from the utility through disposal.

On the health and safety side -- we will go a little bit more about that later -- but what would appear to be a relatively high number, as we talked about earlier, is that particular number is based on current technology as far as welding/sealing techniques.

I would think that once we get into a good ALARA analysis on that those numbers should come down, but to put those particular numbers in perspective, which are in terms of person/rems across the entire occupational and public realm for the 40-year life of this program, if you translated that and looked at background radiation across the population over that same 40-year time span, the person/rem is about 3.5 billion. So while that may appear to be a high number, it is quite small actually.

[Slide.]

MR. MILNER: Getting into a little bit of how we compare the alternatives. First, they certainly were done as a part of the conceptual design. It took care of the entire waste management system from utility operations through emplacement in the repository.

We think we considered all of the relative cask/canister alternatives, but, more importantly, we wanted to point out that we did compare all the alternatives on a consistent basis. And when I say that I mean that we used the same assumptions in comparing all the alternatives.

For example, in the transportation area, we looked at the same modal split between truck and rail. We looked at the same emplacement mode in the repository, large waste package in there for emplacement, that type of thing.

[Slide.]

MR. MILNER: The evaluation process we went through was certainly an iterative process, lots of feedback loops. We don't show them all here by any means, but it, basically, began with the completion of the feasibility study which was completed a little bit over a year ago. That fed into development of a concept of operations, which really defined all of the assumptions for the system, which, in turn, led into the requirements, system requirements, into the design requirements which controlled the conceptual design.

That output plus the output -- the assumptions from the concept of operations were all used to do the evaluations that we undertook.

[Slide.]

MR. MILNER: On the life cycle cost evaluation, again, all costs reported as differentials to the reference system. Just to point out a couple of things: some of the unit costs, these unit costs, were developed as part of our conceptual design effort.

We say unit cost were used in all the different evaluations, that being a figure of $350,000 for the MPC, the canister itself, additional costs then for its overpacks. Transportable storage casks, a figure of $1.1 million, and then you would add the waste package cost to that one.

An MPU, in essence, a universal cask, something that would be used for storage, transport and disposal with no overpacks other than the neutron shield was also a $1.1, although that number does include the neutron shield.

[Slide.]

MR. MILNER: This is just a further breakout of where the bottom line numbers came from in that earlier chart. Obviously, the trend is that canister systems appear, at least, to be cheaper than cask systems, and multi-purpose, as would be intuitively obviously, is less expensive or saves more, however you want to look at it, than dual-purpose.

I don't know if we really need to go through and detail on that particular chart unless you have any particular questions on that.

[Slide.]

MR. MILNER: Health and safety impacts. We looked, again, at all the alternatives to the system, again, from utility operations through emplacement in the repository. We looked at both radiological and non-radiological. We did look at occupation and public exposure. We also looked at routine as well as incident situations. We really focused on the routine exposures because -- I don't have all the numbers in this briefing; you had asked a little bit earlier -- but the incident exposures were some percentage of, basically, a small number. Again, a much smaller number. I do not know if we have the details of that with us.

I think the bottom line of this is -- that there is not a real difference as far as using canisters or not using canisters in terms of exposure.

[Slide.]

MR. MILNER: That is just a further breakdown of the numbers there.

[Slide.]

MR. MILNER: Looking at some of the programmatic risk and contingency analysis, we looked at situations with an MRS, without an MRS, the impacts of MGDS delay. We went through a number of these things in the systems presentation a little bit earlier.

Probably, some of the things to take a look at, I guess, in terms of what our risk really is, if you used MPCs and you determined in 1998, for example, that you couldn't transport those canisters after storage, your cost savings --again, relative to the reference system -- is about this number.

If you didn't discover until the year 2010 that you couldn't transport them, in essence, what you would do at that point then, or this assumption is, that you would abandon the MPC system and go, essentially, to a single-purpose system. You would have increased your reference system cost by that amount.

Some similar kinds of things. If you determine or discover that the MPC is not emplaceable, this number represents discovering that in the year 2001; the $1.1 billion is in 2010. Essentially, what you have done in this case is -- or would do in this case is convert to a dual-purpose system.

I think the bottom line from all those numbers is that there is a wide range of number, and what the right number is is going to depend on what operating scenario you pick: do you abandon MPCs completely and go to a single-purpose system?; do you go to a dual-purpose system?; and, certainly, when you discover that that's the situation.

[Slide.]

MR. MILNER: Thus far, really, our evaluation has shown that we probably should proceed with development of the MPC. That decision has not been finally made yet, but so far the analysis and evaluation points in that direction.

Basically, it has shown that the MPC can have some significant systems advantages, and, again, with the range of numbers, I think it indicates, at least, that there's --at the very worst, there is not cost penalty to going to MPC, and, certainly, no health and safety penalties. Not significant benefits or penalties.

[Slide.]

MR. MILNER: Okay. A little bit about the current status and where we are at this point. I mentioned the decision to proceed has not been made at this point in time, although I expect that is going to be made in the very near future. We will proceed on.

Assuming that that decision is made, we will proceed on and issue an RFP sometime this spring. I think you've pretty much seen this schedule before. Certainly, we've heard your comments that this is perhaps an optimistic schedule. I would agree that it is probably an optimistic schedule. I think it is achievable, but certainly optimistic.

I think we will be in a better position if we decide to proceed, to reexamine and reevaluate that schedule at the time we receive proposals.

[Slide.]

MR. MILNER: Just a little bit about what is feeding into the decision which we are making -- in the process of making at this point in time: certainly, the Dewey Management Review of the conceptual design and all the supporting studies, some of the key studies that we still have to finalize, we will feed into that; some of the baseline considerations; and then pretty significant external interactions that we've had relative to the MPC with the board, with the industry, with the NRC, and a couple of stakeholder workshops we've held and so forth.

[Slide.]

MR. MILNER: As you know, we issued an information package in preparation, really, for finalizing an RFP if we decide to proceed. We released that back in early November. A number of comments we received on that at the November stakeholder workshop.

It had always been our intent that if we went forward with that RFP it would be a performance based specification. I think the information package led, perhaps, some people to think that that might not have been the case.

If we go forward with an RFP, it will be a performance-based specification, and we are looking at the areas that need to be improved in that regard.

[Slide.]

MR. MILNER: There are certainly some risks by making a decision to proceed at this point in time, so we will go over a couple of those and how we see mitigating those.

[Slide.]

MR. MILNER: First, is the thermal situation. Let me say that given schedules and so forth, and while we haven't made a decision to proceed, we are doing some preliminary work in preparation for issuing an RFP should we decide to proceed, so I am a little bit limited in some areas as to what I can say because that would be considered procurement-sensitive information, so I have to be a little careful in that regard.

Thermal criteria, in some areas, gets into a little bit of that. Let me suffice to say that basically what we did was define the interface specification between the MPC shell and the repository, and this chart and the next chart are some of those parameters that define the interface.

[Slide.]

MR. MILNER: Burn-up credit is still another issue to be resolved. I think burn-up credit is particularly important from a couple of standpoints. One, there is certainly some potentially significant cost savings in the storage and transportation area if we get burn-up credit. I think, also, burn-up credit is very likely to be important to long-term criticality control.

Just a couple things to mention. We have begun interactions with the NRC. We have had a few technical exchanges and so forth that the NRC -- our schedule, basically, is to submit a topical report to the NRC under Part 71 and 72 next October, and then follow in the late '95 with a topical report for Part 60.

[Slide.]

MR. MILNER: Long-term criticality control is certainly another issue to deal with in terms of a multi-purpose canister. Hopefully, burn-up credit would help in that regard. I think what is -- in the long run, what is really going to be needed -- I think as you are aware, our strategy is to, one, use burn-up credit, but also neutron absorbers -- but I think in the long run what is going to have to be done here is a probablistic base of performance assessment that is going to look at the likelihood of an event and the magnitude of that event in determining whether those situations are licensable and just what they are. That is yet to be done.

[Slide.]

MR. MILNER: A final consideration is materials, certainly. We pointed out some of the decision points that we are going to be going through looking at the MPC materials and its compatibility with the waste package. One coming up at the end of this fiscal year, as we get the preliminary waste package materials report, and then one further out in the development process.

[Slide.]

MR. MILNER: If you kind of look at the implementation of the MPC program in a phase manner, you can look at phase zero or the current phase or whatever, which is basically existing dry storage, single-purpose storage technology.

[Slide.]

MR. MILNER: Some of those technologies may ultimately end up being certified for transport. If they do, we have already said that we would take appropriate actions to incorporate them in the system, but just for a reference point, I kind of call that as phase zero, or the current phase.

[Slide.]

MR. MILNER: If you look at the initial phase, phase one, or whatever we want to call it, of the multi-purpose canister program, the goal is to have those canisters available to be deployed beginning in 1998. The goal is to meet the requirements for storage and transportation. We have a very high probability, to the extent we can, that they will meet the requirements for emplacement.

In essence, you could look at it that if we were successful in that goal with that initial phase of the MPC development, then we have a single-phase development program. If in 1998 or 1999 or 2000 we find that those canisters are not emplaceable, then you would go back and, quote, "fix" the MPC, adjust the design, go into the second phase, and you would have very little financial risk at that point in the program.

I would also point out there certainly may be reasons other than the failure of the first design to meet Part 60 requirements to go into a second phase. You may certainly choose to go into a second phase simply to optimize the design, to lower costs, improve system performance, and so forth.

It may not necessarily be adverse conditions that drive you into it a second generation of MPCs, but if those decisions and that information is made relatively early on, around the turn of the century, it is very limited financial risk, and that is only basically the type of risk we are talking about since there is no irreversible decision in terms of a particular design.

[Slide.]

MR. MILNER: If it becomes necessary to use several phases and transition through those phases, we would intend to do that in a very controlled process. We would maintain the physical interfaces, equipment facility compatibility and so forth, to ensure a smooth transition.

[Slide.]

MR. MILNER: Lastly, just kind of to summarize. I pointed out the decision points earlier. The kind of way to look at this things is while we are going along in time making various decisions at various points in time, the early would be the decision on whether or not to proceed. We are also going to be working on all the technical uncertainties, continuing to address those until we get them resolved, and that will go along in conjunction with the various decision points.

I have run very quickly through a bunch of slides, so I will be happy to answer any questions as this point.

DR. PRICE: Thank you. Dr. Cantlon of the board?

CHAIRMAN CANTLON: In slide 5 you have in FY '99, you said something about a final thermal loading decision. Since the thermal experiments are not even going to be in the repository level until sometime in '97, it is unlikely that we are going to get a final decision there. Do you mean final as an assumption?

MR. MILNER: Yes, as an assumption.

CHAIRMAN CANTLON: Okay.

MR. MILNER: That's a bad choice of words. I'm sorry.

CHAIRMAN CANTLON: I see.

DR. PRICE: Dr. Domenico?

DR. DOMENICO: Domenico. You mentioned putting out a request for proposal. Request for proposal to do what?

MR. MILNER: Okay.

DR. DOMENICO: Actually build one of these things?

MR. MILNER: Oh, no. I'm sorry. I guess I was couching a lot of my remarks in terms of follow-on to our December -- November meeting in Dallas. The request for proposal would be for design and certification of the multi-purpose canister and its transport overpack.

DR. PRICE: Ron, on that request for proposal, one of our concerns that -- we attended the workshop, as you know. One of our concerns had to do with the RFP being, as appeared to us, void of really any requirements with respect to disposal, and that even though there may be some uncertainties which give reason to why that might be, that the lack of anything with respect to the disposal was a point of concern. Do you have any comment?

MR. MILNER: Yes. Let me just say that the RFP we would be intending to issue this spring, if we go forward, will certainly not have all of the requirements that there are relative to disposal, but there are certainly a fair amount more than was in that information package.

The information -- one, that information is evolving and has evolved since that time. That is an area where we have centered most of our work on since that time. It was left out of the information package simply not to hold up the information package at that time.

DR. PRICE: Any other questions or comments?

[No response.]

DR. PRICE: If not, thank you very much.

Our next speaker, please, is Dean Stucker.

WASTE PACKAGE/REPOSITORY

FOCUSED DESIGN

[Slide.]

MR. STUCKER: Good afternoon. My name is Dean Stucker, and I recently transferred out to the Yucca Mountain project office as the Field Engineering Branch Chief.

Today, I want to review with you a little bit of what our focused mined geologic disposal system design is. Review a little bit of that with you.

[Slide.]

MR. STUCKER: My responsibilities are in the area of waste package and repository design. I would like to discuss a little bit, as I go through this today, of what our current approach is, some of the background of where our current design approach is, why there is a need for a change -- and it ties into some of the systems discussions earlier -- and what the new approach is that we are taking, especially focused on the advanced conceptual design for the mined geologic disposal system, and how we are planning to implement this new approach.

[Slide.]

MR. STUCKER: I just put these up here to talk a little bit about our current -- our key activities in the design, of course, are input/output, and this important circle down, the scientific basis.

It think under a normal underground mine or major underground construction project, the design, you look at the input/output. The scientific basis is really tied up into the input, but because of the health and safety aspects of our program in the licensing arena, the scientific basis needs to be established and validated before you really make and finalize your design.

[Slide.]

MR. STUCKER: The phase -- and I will review that -- of the current approach and of our focused approach will remain with an SCP conceptual design, the advanced conceptual design of which we have just started, a license application design, and a final procurement and construction design assuming the site is a suitable site. You can see where the scientific basis has a tie-in to the different phases.

[Slide.]

MR. STUCKER: We looked a little bit further about what our current approach is or what the previous approach has been.

As Tom Isaacs mentioned this morning, we assumed that all the needed resources were there, and that has not been the case over the last couple of years. The approach was based on the fact that we carry multiple concepts in parallel until the scientific basis is established and validated, and that allows for a low design risk because you are really not making any major architectural decisions until you have the scientific basis validated.

Of course, at the end of the advanced conceptual design we were looking for one major concept to carry forward into the license.

[Slide.]

MR. STUCKER: I've got a cartoon here I put together that shows a little bit of the current or previous approach. We have the requirements documents, which are really made up of the ten technical documents, technical requirement document hierarchy, then ten documents here for the dispose site. And there are numerous to-be-determined requirement and to-be-resolved requirements contained within here.

In fact, there are over 500 to-be-determined requirements, and to tie into the MPC, one of the reasons that we have been unable to better input into the MPC the dispose needs is the fact that there are so many TBDs.

Under the current approach or the previous approach, we had looked at carrying numerous concepts in parallel until we could substantiate or validate the scientific basis and then select one concept. So we take these numerous TBDs, for instance, substantial complete containment, emplacement modes, and we put them together.

We are carrying many families of concepts right now until we get the scientific -- I don't want to call it validation -- the scientific basis as validated. Then we will come out and we will select one concept that best meets that validation. That is kind of a good cartoon, I think, of the current approach.

[Slide.]

MR. STUCKER: I will talk to you a little bit about -- and I think it is kind of apparent -- the need for change. What is part of the need for a change is the fact that we have a pending change to our technical baseline, which is the MPC; and the other part, limited resources:

shortfalls in recent years, and possibly anticipated limitations in the future.

We have a need to update the Site Characterization Plan-Conceptual Design Report, especially if we make a technical baseline change, this needs to be updated to support key decision milestones at the Secretarial level; total systems life cycle costs; early site suitability or interim evaluations; EIS; and, of course, license application work.

[Slide.]

MR. STUCKER: A little more definition: if we look at -- under the current approach or the approach that we are taking with carrying multiple concepts along until we have the scientific basis, we had looked at a cost of in excess of $900 million to do this.

When I came on board that was unacceptable to me, and I think it is unacceptable to the program at this point in time. We have to look at an approach that will get us there, get us with a system that will meet the requirements at a somewhat lower design cost.

[Slide.]

MR. STUCKER: If you look at our current design budget for '94, you will see that we have heavy emphasis on the scientific basis. I am not saying that's is not right; we probably need a lot more emphasis on that, but this just shows the correlation between actual design, most of it being design input work and a scientific basis.

[Slide.]

MR. STUCKER: I will talk a little bit now about what the new approach is, and how that relates to the advanced conceptual design part of our current design phase.

[Slide.]

MR. STUCKER: This new approach looks at assuring that we develop a design concept which meets the requirements, both the technical and the programmatic requirements, but stressing that we meet the technical requirements. We don't want to spend a lot of effort on optimizing; we want to assure that we meet them and we can prove that we meet them.

We want to adopt an approach which uses assumptions, and you have heard all day today about assumptions. We want to make some management assumptions, and I want to clarify management assumptions. We want to make technical judgments using the best available information that we have now, and document those assumptions.

The key to this approach is we want to substantiate those assumptions as a design is developed. We want to separately from the design, develop work plans, scientific engineering work plans, that will validate the assumptions. And if anywhere along the process we start finding that an assumption might be incorrect in this validation process, we can go back to the design and start to fix the design.

This will lead to one concept at the end of ACD with a detailed cost estimate, again, to support those items. I will go into it a little bit further.

[Slide.]

MR. STUCKER: I have a cartoon here which is very similar to the last one. It just shows the difference. Again, we have the same set of requirements. We have to meet those requirements, we have to assure that we meet those requirements.

[Slide.]

MR. STUCKER: As I mentioned, we have over 500 TBDs listed within those documents now. What we want to do is make some technical judgment, document the rationale for making those technical judgments now which will lead into one concept, carry that one concept through, and come back and develop scientific and engineering work plans to validate those technical assumptions.

One of the keys to this, and it will come up here at the end of the discussion, is the fact that we want to carry one concept, but within that one concept, we want to carry alternative key features related to the waste isolation aspect. So we will carry alternative key features of the one concept.

[Slide.]

MR. STUCKER: As I mentioned, we have numerous TBDs, TBRs and TBVs. We will make the assumptions. We will document those assumptions as to-be-verified, and we will probably document them down in this document, the Basis for Design.

Well, right now we are looking at developing another document here, parallel to the Basis for Design, which would input the basis for design, and it would list these assumptions. It would list the operating plan that we have for repository, and once those assumptions start to be validated through these work plans, these scientific and engineering work plans, once they are validated, we put them back into the requirements document as to whatever the number comes out to be documented.

[Slide.]

MR. STUCKER: A little bit on how we're looking at implementing this approach.

[Slide.]

MR. STUCKER: We have been conducting briefings on what the focused approach is. Within the next two months, we will identify a list of the assumptions that we need in those three areas of the requirements.

[Slide.]

MR. STUCKER: We will list what area -- what assumptions need to be met here at the program level, what assumptions need to be developed here at the project level, and what assumptions need to be developed at the AE level.

We want to then look at what a new ACD schedule might look like with this focused approach, realizing that we are going to make a technical call on these assumptions.

We want to conduct some workshops for each of the assumptions to document the rationale, to come up with what the assumption is and document the rationale using program experts, experts that are in the program, to come up with what the assumption should be.

There are numerous studies that are on the table, have been on the table for years that we will draw from to make those assumptions, and we will document those assumptions in that document that I mentioned.

Separate from that, as I mentioned, we will develop scientific and engineering work plans to validate each one of those assumptions. The scientific plan would be related to the performance requirements. If we make an assumption on a performance requirement, we want to know exactly what the work plan is to validate that.

We are going to work with the regulatory folks to assure that we have enough information to say that we can validate it in a licensing arena, and for the engineering assumptions work plans, there will probably be trade-off studies that we will conduct to assure that, for the engineering assumptions that we are making, that we are correct.

We will then initiate a focused ACD utilizing the decisions, the assumptions, that were made in this process.

[Slide.]

MR. STUCKER: Along that process we are looking at a 30 and a 60 and a 90 percent design review of the advanced conceptual design. We are looking at requirement reviews to go back and review the TBV status to be the verified status of the assumptions, and peer reviews if needed.

[Slide.]

MR. STUCKER: Leaving this as peer review, I once asked a colleague to put together a viewgraph on what a peer review was, and it was a pelican reviewing a pier.

[Laughter.]

[Slide.]

MR. STUCKER: We looked at a schedule. We are looking at the possibility or the pending decision of an MPC which really starts a focused approach. After that, and if that happens, we are looking at then making some assumptions based on the best available technical basis that we have now, going forward and making the AE [architectural &

engineering] assumptions at the AE level, and we are shooting to rework, reschedule some of the design activities this year. We want to have a 30 percent design review of the ACD this year, sometime in August or September is what we are shooting for. We are looking at what budget we have for '94 to see if that can be done. We feel that we can do a 30 percent review.

At that point, we are looking at having a new reference. The SCP conceptual design report would be then updated with the results of this 30 percent review, and we would be able to lay on the table a new reference system, hopefully with this decision here, if that is the way we go, using an MPC concept.

If we go forward then, we would do requirement review statuses on the assumptions that we have made all along this process to assure that the assumptions are still valid and correct. We would look at a 60 percent review and a 90 percent review, and at the conclusion we would come up with an advanced conceptual design concept with a detailed cost estimate.

[Slide.]

MR. STUCKER: I have some examples. These are just examples of some of the assumptions that would need to be made looking at the number, size, weight for both spent nuclear fuel and high-level waste packages. We are looking at making some assumptions related to the thermal loading regime, emplacement load, retrievability strategy, of course the waste package performance objectives, and other things such as backfill, fuel rod consolidation. I think some of the assumptions are out there, but we want to document them and go forward then with a focused design.

[Slide.]

MR. STUCKER: This last viewgraph that I have just emphasizes the fact that with this approach we want to carry alternative major design features that are important to the waste isolation along with a single concept. We want to identify within the next couple of months what those features are and have discussions with the NRC and the technical review board to layout some of our ideas.

That pretty well concludes the discussion I had on this focused approach, and I am sure interested in fielding any questions you may have.

CHAIRMAN CANTLON: Cantlon, board.

You are planning to have a 30 percent update you said sometime in August or September of this year.

MR. STUCKER: That is my goal. We are trying very hard to see if we can come up with a new reference case by the end of September.

CHAIRMAN CANTLON: How is that going to be possible without having the experimental data for, say, the thermal studies, you are not going to have those in place until '97?

MR. STUCKER: Right. As I said, what we hope to do is assemble experts and make our best engineering scientific judgment on what process would meet the requirements, and then separate from that we would have a validation work plan to how we would validate the assumption, and then we would have checks along the way within that scientific workplan to assure that our assumptions have been correct. If we get indication that our assumption isn't correct, we would go back and start refocusing the design in a different direction.

CHAIRMAN CANTLON: So to follow that up, what one would have to do then would be to get some people in geoengineering and geochemistry and hydrology to try to examine the models that are presently available for each of these features which then would feed in?

MR. STUCKER: I think that is the approach. We are still looking at just exactly how we would put this together and make some of the hard assumptions.

Again, what we want to do is meet those requirements, especially the 10 CFR 60 requirements and when you really start looking at it, we may be able to meet those requirements under any thermal loading regime. It becomes a question of what is the cost to the program, but right now my own personal opinion is, we can meet the 10 CFR 60 requirements, the performance requirements, under any of the options that are laid on the table right now.

CHAIRMAN CANTLON: Presuming you have a robust enough waste container?

MR. STUCKER: It goes back to how much cost you want to put and what kind of robust container do you want. So we feel we can meet it, it just starts coming back now to some engineering tradeoffs.

CHAIRMAN CANTLON: Right, okay.

DR. CORDING: Ed Cording, board.

Would you be carrying forward the possibilities of alternatives or flexibility in, for example, the thermal loading such that you could change the loading with a given design or change the spacing, for example?

MR. STUCKER: Yes. In fact, that is one of the first things we want to evaluate. That might be a key alternative feature that we would carry. I am not sure what the outcome is going to be, but we may want to carry two concepts related to thermal loading. If it appears that there is some uncertainty in that area, we may carry two to comply with 10 CFR 60, and with the uncertainty that may be there. If we determine that one concept would basically cover several thermal loading regimes, we may just carry one concept.

DR. NORTH: Warner North, board.

Could you tell us a little bit more about your plans on retrievability strategy and when that will be available?

MR. STUCKER: Yes. That just happens to be one of the many assumptions that we want to be determining in the next several months. We need to lay out what our thermal strategy would be using the expertise that we have in-house now, and then putting together an engineering workplan on validating those assumptions related to the retrievability strategy, are they real and can we meet them and may even involve the planning for actual tests sometime in the near future to assure that those assumptions that we lay out to the retrieval can be met.

We plan to, as I mentioned, identify the list of assumptions that are needed by the end of February, the AE, the M&O is taking an action item now to develop the list of all the assumptions that are needed separately. Bill Semeca is establishing a steering group that will determine how we go about actually establishing each one of the assumptions from this list that we will have at the end of February, and we are looking at different options. We are looking at some of the more sensitive ones. We may actually conduct peer reviews to come up with what the assumptions should be at this point in time.

DR. DOMENICO: Domenico, board.

I am looking at your block diagram and the term "design" confuses me. Does design include -- well, the repository design requirement is the hole in the ground, does it include design of the engineered barriers?

MR. STUCKER: Yes, it does.

DR. DOMENICO: It includes the design of the ESF facility, design of the test requirements required for the engineered barriers, all of that is designed?

MR. STUCKER: Yes.

DR. DOMENICO: Does design also include designing or selecting a thermal load, or do you take that -- that has to follow part of the design criteria as well, design is everything?

MR. STUCKER: I look at design as the architecture needed to meet the requirements that we lay out. What I am saying is, we are going to make some assumptions, the best assumptions we can make at this point in time, what those requirements really mean, and then start conducting the architecture to meet those requirements, realizing that we are at risk. Separate to that, we will have these engineering and scientific workplans to start validating those assumptions.

DR. DOMENICO: This includes spacing of the canisters as part of the design?

MR. STUCKER: Yes.

DR. DOMENICO: So that is going to dictate the thermal load, in essence?

MR. STUCKER: That's right. In fact, what we hope to do is lay out what the thermal loading regime should be before we start, what the requirement is before we start making assumptions, separate to that start working out some detailed workplans on how we can validate that assumption related to the thermal loading regime.

DR. DOMENICO: Thank you.

DR. PRICE: Any other questions or comments?

DR. REITER: I wanted your personal opinion on a thermal loading issue. Last month there was a meeting of the National Academy of Science Panel on Technical Standards, and Tom Buscheck made a presentation on thermal loadings, and the committee was pressing him on what he thought would be the best thermal loading for the repository, and Tom refused to give an answer except one, essentially he said there were advantages to both the low thermal loading and the extended dry, but it looks like the current concept, the one where you keep it above-boiling for a thousand years combined some of the worst aspects of both and that clearly was the second choice.

Looking ahead a little at some of the stuff that may come out tomorrow, and at least I see in the one performance assessment that was done, that reflected also that the current concept, namely the current SCP concept, looks to be the worst. Maybe we will hear more about this tomorrow, but you talked about carrying one or two concepts along. Is it your feeling that the current concept would be probably last in that?

MR. STUCKER: I am not sure what the thermal loading regime would be, what assumption we would make. We just completed a study which really gets into the detail that will be released shortly. Probably based on that study and the scientific and engineering judgment of the team that we put together, we would pick a thermal loading regime that we think meets there requirements and then go forward from there.

Again, my own personal thought is that we can meet the requirements under any of the thermal loading regimes. I think we can meet those requirements. It becomes a question of what is the cost, what is the engineering cost tradeoff for meeting the requirements. So I think you need to back off and start looking at some of the engineering trade studies for the costs.

When I start looking at it, I start talking to Tom and other people, we are not trying to optimize the technical requirements, we have to assure that we meet them and that we meet them in a conservative basis and then look at optimizing the cost of the overall system. This is the strategy that we have laid out to try to get there.

DR. REITER: So you are not ready at this point to even venture any guesses?

MR. STUCKER: To venture any guesses, no. I think it probably will come back to what is the best overall from a cost perspective because I think we can meet it with a high thermal loading or a low thermal loading.

DR. REITER: So again, I am trying to press you on this, but in spite of what we hear tomorrow or maybe in support of what we hear tomorrow, you think that the thermal loading will be decided on a cost basis?

MR. STUCKER: Yes. My own personal judgment is that that is probably going to be the biggest driver because I still feel that you can meet the requirements, you can meet 10 CFR 60 under any of the three scenarios that are laid out there.

DR. REITER: Thank you.

DR. CORDING: In terms of the validation workplan for the assumptions, what scale of time are we talking about to validate the assumptions, is this really the whole scientific testing plan in the project?

MR. STUCKER: Yes.

DR. CORDING: Are you talking about the whole life leading up to the licensing?

MR. STUCKER: I will give you my own personal perspective. We have to lay out a workplan and buy into a workplan for each one of these assumptions. Let's take thermal loading, for instance. We will ask the labs to turn over and develop a good scientific workplan on how we could validate whatever the thermal loading regime that we pick. My own opinion is that we won't be able to validate it in a licensing arena come 1999.

I think if we have a good workplan on the table, we have lab tests feeding the assumption, we have small-scale and full-scale field tests starting to validate the assumption, that we can go forward to the licensing arena, probably present a good argument that we can get a construction authorization and even a license to operate with a good validation workplan and early indications from tests that are going on. But my own opinion is, we won't be able to validate that assumption until well into the repository operations, which I think is acceptable. Again, I am just talking about my own opinion.

I think that somewhere down the line, 10, 20, 30 years, you will have enough information to say, I can really validate this assumption now because I started to the load up the mountain and my assumption is correct. I have all the lab testing, I have the field testing, and now I have the performance confirmation testing from actually doing it. Now I can get that license to close if I need it.

So I think for some of the tests they become -- these validation workplans become possibly very long, timely things, but very workable within a license arena because you have the plan laid out and you have -- I call it the warm fuzzies coming back that meets the assumptions.

DR. CORDING: I can certainly see the fact that the heater tests and other thermal tests are going to take -- one can test for a few years, but certainly there is going to be much to be learned by testing over longer periods of time on thermal tests, and is it the present view that if one were to load with the actual canisters that those would provide thermal regimes in a period of time that would allow you to -- say in the 10 or 20-year period, that would allow you to evaluate that further, is there enough heat being generated at that point to be able to evaluate it?

MR. STUCKER: Clearly you have to back up and you have to come to some kind of understanding of what is needed to validate that assumption. I mean, if we are going to go forward to that assumptions, whatever that is, and possibly -- my own assumption is, you need the confirmation of actually loading up the mountain. That may not be what is needed, possibly lab tests and field tests are enough to validate that, but whatever that is then we will come to some kind of agreement working with the regulatory folks as to what that workplan should contain to be able to validate the assumptions. In some cases, it may be a very long period of time.

DR. PRICE: Let's take two final questions from Staff members first.

DR. FEHRINGER: Fehringer, Staff.

You mentioned the Part 60 requirement to consider alternatives to the preferred design and there will also be a need to evaluate alternatives when an EIS is prepared for this facility. Have you figured out how to determine the range of alternatives that will be necessary to satisfy those two criteria?

MR. STUCKER: We have started down that path. We are looking and evaluating what that range and what the alternatives should be. We hope within the next two months to be able to lay on the table what we feel is necessary in the alternative key concept areas for this approach, and then sit down and have some discussion with people to assure that we have encompassed what is really needed.

MR. McFARLAND: Russ McFarland, Staff.

You put a lot of reliance on peer review. There has been some question in the past as to how independent peer review is defined. In the last several years, the professional societies, the American Society of Mechanical Engineers, particularly the American Society of Civil

Engineers, had issued procedures and particularly definitions on peer review, and they are somewhat different from the practice of DOE that we have seen in the past.

Do you have any intent of looking beyond and adopting these industry practices, for example?

MR. STUCKER: Clearly for establishing what assumptions we want to use, we haven't made any determination at this time. We are looking at the possibility for the sensitive ones of actually doing peer reviews and doing peer reviews to the broader picture, but we haven't made any decisions on that at this point.

MR. McFARLAND: My question is, what would constitute an independent peer reviewer, is it still someone within the DOE family or would you go outside of the DOE family as the professional societies define independents?

MR. STUCKER: My own personal look at it would be go outside, whether that is possible or not, I don't know.

DR. PRICE: Dr. North has another questions.

DR. NORTH: I would like to follow this up, and perhaps one of the representatives of DOE, Lake Barrett for example, might address this. I can't make puns at the level of Dennis Price with regard to the Lake and the pier, but the general idea.

The innovation of the external review seems to us very important. There has been some of it in the last stage, but I think we would like to see a great deal more.

It would appear that you are going to be going rapidly, and the cost is, of course, a consideration, but it seems to me that it would be extraordinarily valuable to get out some of these issues about the comparative evaluation of the alternatives as part of the focused workshop and the peer review process and use this as a way of getting a good dialogue going early about these important design questions.

MR. STUCKER: I think Lake left.

DR. NORTH: Would anybody else from the program like to take that one?

MR. STUCKER: I will certainly agree. We are looking at different options at this point.

MR. SOLTZMAN: I am Jerry Soltzman, External Relations of DOE, OCRWM.

I would say that we are looking at all sorts of approaches for how we can broaden this out and get as much input as possible. As was described by Dwight earlier in the systems architecture, he looked to move out to public participation in that and I think we are encouraging the project office, and the project office on its own is moving out as early as possible to get input.

In a recent meeting that it had with the State and Counties, it described how it was going to open up its process more and more. So, yes, we take your words to heart and we will be doing it as often and in as many different approaches as we can.

DR. NORTH: Good. Thank you.

DR. PRICE: Dean, that is what you were going to say, right?

MR. STUCKER: That was it.

DR. PRICE: Okay.

Certainly make yourself comfortable. I think perhaps we can take just a few minutes and ask if any of the board members would like to make some summary comment or remark to this afternoon. Some will, some will not, so we will just open it up and any who would like to make a summary remark of some kind before we open it up for the audience participation?

Dr. North?

DR. NORTH: Warner North, board.

I am rather pleased with what we heard this afternoon. A year ago I was quite critical because I had been led to believe that there would be substantial progress in this general area of systems work. I think the program has a long way to go, but I am very encouraged by the progress that we have heard about this afternoon.

DR. PRICE: Any other comments?

[No response.]

DR. PRICE: I would like to say, my impression is the same, that I feel that progress has been made, especially with respect to the concept of the systems engineering. It is not being fully applied at this point. This is a start and I think that there are some areas in which it can be expanded and applied, but I did ask that question and the intent is to expand and apply into these areas, particularly how these things trigger studies and analysis, and how they fit in, both in regard to schedule-induced risks, and also with respect to uncertainties that are being carried forward, and to the whole system, to the entire system. One single example was given, and I think there is some fleshing out yet to be done, but I have a higher comfort level, myself, with respect to what we heard today.

If there are no other comments, I would like to now ask those in the audience if you would like to make comments, ask questions, this is your time. We did take about 15 minutes of that time beforehand, and we are doing pretty good on time finally now.

FURTHER COMMENTS FROM THE AUDIENCE

DR. SINCLAIR: I am Dr. Mary Sinclair from Midland, Michigan, and I want to commend the Department of Energy for recognizing that the lack of public trust and confidence is a very serious problem, and I want to commend this board for identifying this as an important problem and giving it the focus that they have at today's meeting. It was very gratifying to those of us who are in the public sector.

But the NRC should undergo the same kind of therapy process because, if anything, there is even more lack of public trust and confidence in the NRC. The reason is that the NRC is the agency that the public encounters most frequently in commercial reactor locations. So if the Department of Energy does exercise and begin to have improvements in gaining public trust and confidence, these will not be recognized by the public unless the NRC also makes these changes, because in the public view the NRC and the DOE are all a part of the nuclear fission problem.

Now I thought one of the significant observations was by Mr. Dreyfus who said that you should make every effort to identify early on any significant disqualifying factor, and I can only think how useful that would have been when the NRC and Consumers Power Company decided to put high level waste in untested concrete casks 150 yards from the shore of Lake Michigan, and it is in a situation where the whole plant is in storage only. There is no provision for transport off-site, and there was no environmental impact statement, and there was no public hearing. Now this whole project went forward by violating many of NRC's rules in order to make it happen in time to meet Consumers Power Company's fuel outage schedule.

So what you have here, you have a high-level nuclear waste disposal policy, ad hoc policy, going on behind everybody's back really because from Palisades on this was the first place where they implemented the generic rule that can allow a utility to use their general license to get dry cask storage onsite with no public hearing and no environmental impact statement. So you have, in effect, a high-level waste program going on without any of the very fine technical considerations that I have been listening to here all day, which I think you are exercising a great deal of care and that is gratifying, but this is what is happening in the real world.

If there had been an early identification of a serious disqualifying factor at Palisades, it would have been realized that they were putting those casks on a storage pad in an area characterized geologically as a high-risk erosion area, and it is on shifting sand dunes at Lake Michigan, and there are only four sites in the world that have this kind of particular character that you find there. If that had been identified early on, a great deal of time, energy and resources would have been saved. But as it is, we are in the grips of that particular issue in Michigan and in the Great Lakes area.

I think that you should also realize that citizens are very disgruntled that while they provide the money for all of this kind of activity through their taxes and their rate base that they are essentially locked out of the process because they do not have the resources to have the same kind of input as you people do, and yet their observations and their insight from their own history and what they study is very valuable. So I think you ought to address the fact that citizens need to have a means for getting their own independent technical experts that they trust to help them evaluate what our policy is in this very important issue of high-level waste disposal.

Finally, since my degree is in resource policy from the School of Natural Resources at the University of Michigan, I am very well grounded in the concept that you have to consider the total ecosystem in evaluating the impact of any technology, and if you stop to think about it, every reactor has to operate as part of the nuclear fuel cycle. If you think about all the fossil fuel energy that is used from mining and milling through transportation through enrichment through construction of the reactor and you think about all the energy and resources that are going to have to be used in disposing of this waste, then the fact is that there is no net energy from the nuclear technology and there are many competent engineers that I have heard discuss this, and that is another factor that you ought to be considering.

Thank you for this opportunity.

DR. PRICE: Thank you.

MS. JOHNSRUD: Gentlemen, my name is Judith Johnsrud. I hold a doctoral degree in the field of geography and have specialized in the geography of nuclear energy.

I would certainly begin by echoing Dr. Sinclair's comments with respect to ecosystem analysis, but also the analyses that relate to the ultimate concern which is that of the impact of ionizing radiation on human beings and other forms of life.

I have about half a dozen things I would like to say to you, and I will try to get them said as quickly as possible. We have endured one of the most outrageous wastages of energy in this room all day, and I am sure you are as tired and hot as I am.

I have served this past year as the Chair of the National Energy Committee of the Sierra Club, and currently for some time have been representing an environmental organization on Pennsylvania's Advisory Committee on Low-Level Radioactive Waste, and are struggling with all of those other reactor components apart from the spent fuel that you have focused on today.

My comments are a mixture here. I guess I ought to add that I have been the sole environmental representative, as far as I can tell, on a NARUC dialogue recently that is still to be completed on recommendations to Secretary O'Leary with respect to how to deal with spent fuel as of 1998, and am deeply sympathetic with the problems that you are facing here in advising the DOE.

I have to add, however, that the initial of those NARUC meetings was held out of the public view. Members of the public were not permitted to appear or rather to sit in the audience and observe and it was not until Secretary O'Leary's people, to my understanding, and some people in NARUC itself objected that that proceeding, vital certainly at reactor sites, and potential MRS, and repository sites, that that session was even opened up to the public. It certainly did not speak initially to an intent that must be carried through in all agencies associated with the nuclear industry.

I remember back in '86 when DOE tried for a second repository up in New England those thousand people who showed up at ten below zero. I remember some DOE staff people saying that they wouldn't take triple combat pay to go back to New England to look for a second repository. So I think that you do indeed and DOE has a very major problem ahead with respect to effecting a true cultural change within this and the other agencies of government, both at the State and Federal levels, but both, by the way, must be incorporated in those changes.

I should hope that the Technical Review Board will be one of those agencies to push the honest and truly open involvement of citizens, not necessarily having to wait until the end of the day, though I sympathize with your having a very large agenda to cover yourselves, not being cut off because it is time for lunch, not being relegated to a public relations manipulation that I detected in a good bit of Todd LaPorte's discussion, although he had many excellent recommendations.

Professor Rustum Roy at Penn State University up in the area where I live has spoken at length of late, material science, of the religion of technology, and I would like to urge upon you consideration of the faith that I think we all share in technological capability to resolve the technical problems that indeed we have created.

That takes me a related point but a somewhat different one. I find it interesting that I am addressing a panel with no women whatsoever. I cannot speak to all of your specializations, but I take it from your comments that few of you are trained in medicine, genetics, biology, perhaps some, or I should hope so. A broadening of what constitutes a technical review with respect to radioactive waste management I think is really vital, difficult. I know you are all modest enough, you would be willing to give up your seat to expand this board, but quite seriously there are considerations that I feel from what I have heard today and at previous meetings of this organization, and certainly in a quarter of a century of dealing with NRC and DOE and EPA is sorely lacking in our assessments of what is possible and what needs to be done.

It took Secretary O'Leary -- may I remind you, a woman -- to finally bring into the public realm with her extraordinary capability and flair for putting the point across to really bring forth some of the deepest -- I hate to use a word like deception, but I think we really must, of the public with respect to bomb tests and the other issues that have come to the fore of late. Please take that to heart because you are in a position to do something about it.

This brings me to the basic really underlying issue here, and that is indeed the issue of low dose ionizing radiation and chronic exposures, and I find that I am quite troubled at the acceptance of those standards that have been developed over a long period of time -- what, 13 years to do Part 20 at the NRC. The EPA has just issued it high-level waste 15 millirem standard for CED, but is that going to be set aside for another standard to be developed in the very near future?

I want to know, as I deal with the low-level waste issue on our advisory committee, what are we aiming at, what standard of protection must we meet, and it is in that realm that I urge upon you the research findings of just the last few years, indeed since NRC's publication of its Part 20, that indicate a far broader impact upon human health than is recognized in U.S. standards. I really wish we could bring to you the Russian and Bela Russian physicians and researchers or radiation biologists with whom I have been in touch and who have just published some four volumes of the impacts of chronic low dose exposures upon human health. There are very real cost factors to the public, to individuals and to taxpayers that result. I don't see those in any of the viewgraphs of costs that we have seen today. They are simply ignored and they should, must indeed be factored into the process.

There is much more to be said about the low dose and its impact, but I have taken up a great deal of your time. There are one or two final points, with your permission, that I would like to address.

Dr. Rydell, I believe, is the only person who has spoken today who actually addressed a limitation upon the amount of waste, and that I assure you with regard to public acceptance of the Department of Energy, of the waste programs, is absolutely critical. I don't know how much you hear of that concern from members of the public, but the sense that this process of waste disposal is an open-ended, bottomless pit, or what is the other analogy of the topless mountain perhaps is something that does indeed trouble the public and quite rightly so.

At a recent MIT conference on the future of advanced reactors, after we heard about the marvels of the advanced designs from nuclear engineers, someone from OMB said, our country is broke and we are deeply in debt, we can't afford you fellows anymore, and that very issue of the realities of cost limitation in our society are really beginning to impair the capability to do the job. So, therefore, we would like very much to see DOE in a leadership position and you pushing them there with respect to the limitation of production.

Finally, if you will bear just a moment more, the comment was made about the charge to TRB and the concern of this organization for health and safety, but gentlemen please bear in mind that the overriding law is the field of atomic energy is the 1954 Atomic Energy Act, and I suggest that you reread the National Nuclear Energy Policy that is clearly stated in that law.

In fact, if you will permit me, I will read it, it is a couple of paragraphs which says that atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the

United States that the development, use and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare -- but general welfare is not any where defined -- subject at all times to the paramount objective of making the maximum contribution to the common defense and security and the development, use and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living and strengthen free competition in private enterprise.

I submit to you that that policy statement makes no clear reference, no reference at all to the protection of health, safety or the quality of the environment, and I would urge you to join many in the public realm in insisting not only that we have a review of the total radioactive waste program in this country, it is overdue, but also after 40 years 1994 would be a fine time to bring the Atomic Energy Act up to date as well and make our paramount objective the protection of health and safety.

Thank you for your patience after this long day.

DR. PRICE: Warner North wants a couple of minutes to respond, and I might just comment just for information that the Chairman, John Cantlon, is an environmental biologist by reputation as well as actions.

Thank you.

DR. NORTH: I was going to start out my comments in response by noting that this board used to have a health physicist on it. He resigned. It has been a year-and-a-half, two-years-and-a-half -- yes, two-and-a-half years that we have been without somebody trained in the health physics of radiation. We have a member of our staff now, Dan Fehringer, who is very well trained in that area and joined us recently from the NRC.

As one whose original training was in physics, I guess I get a chance to respond on this issue because I think Ms. Johnsrud has raised some very good points about the health effects of chronic low-level radiation. But from what I learned in my physics classes, the radiation doesn't distinguish whether it came out of human activities, such as a nuclear power plant or waste associated with nuclear power or the weapons program, or whether it happens to be something that is naturally present in the environment, perhaps somewhat concentrated by human activities.

I was involved a few years ago in testifying before a Senate Subcommittee at a little town in Idaho whose streets, playgrounds, and in some cases basements are enriched in gamma radiation as the results of using a construction material, phosphate slag from making phosphoric acid. There are, in fact, lots of ways of getting enhanced low-level radiation that have nothing to do with nuclear power.

Another example is that I pick up somewhere around 5 millirems addition over background every time I fly from my home in California to attend one of these meetings on the East Coast. Now, if one goes ahead and calculates cancer risk for this, especially for all the folks who are travelling by air these days, it comes out to be a rather large number. Now there are things we can do about it, we can reduce that dose, but it costs a great deal of money to do that.

I would like to tie this to the point made by Mary Sinclair about the need for technical assistance by interested groups within the public. Many of us on the board are members of environmental organizations. I think if you added up the length of time that some of us have belonged to them, you would find it comes out to be an impressively large number. I will speak for myself, I have yet to be asked by any of the many environmental organizations to which I belong where they could find my name easily in their computer files to assist them technically in thinking about low-level radiation or a number of other issues.

I would like to extrapolate from that to urge those of you representing environmental and public interest groups go out and ask for help. If you want it, you can probably get quite a lot on a volunteer basis. Now I don't expect that I can answer any flood of requests, but I am certainly happy to talk to people. I am on this board because I believe deeply in the importance of science and engineers getting involved in public policy issues and being willing to provide peer review as public service. I think you will find a lot of scientists, engineers, doctors, health physicists, et cetera, within the organizations that you represent may be willing to give you a lot of help, and I would urge you to ask for it.

You might also continue to ask the various government agencies if they might not provide you with some resources with which to go out and hire such help. I think the Department of Energy would find it an excellent investment to provide you with some assistance in understanding, for example, some of the health physics issues of low-level radiation so that you can educate yourselves and your membership on these issues and we will all have a more enlightened and focused discussion on the public policy issues surrounding low-level radiation.

DR. PRICE: Any other comments from the audience?

MR. POLONSKY: I represent the not-yet-business-suit-wearing generation. Alex Polonsky.

I guess I am potentially missing something or just misunderstanding something. It seems everyone this morning was talking about accepting risk depending on how large or small it might be for not waiting until 1997 to determine thermal load which would then separate back to determine every other thing we are discussing, the canister size, if we are going to use a geologic repository if it will be Yucca Mountain, and it doesn't seem to me if NRC has already decided that there is no hazard to store this waste above ground that we are not just waiting until 1997 to do that. Is there a cost savings benefit beyond whatever risk we might assume by making those decisions now that couldn't wait until 1997?

and that deals into the trust and confidence, you know, here I am sitting in the audience saying, why the hell are they spending all this money when we potentially could be losing $500 million, why don't we just wait five years.

DR. PRICE: Would anyone like to respond to this, why given a schedule-induced risk on thermal loading do you not simply wait until the thermal loading issue is resolved since it does have reverse arrows back to several places?

MR. BARRETT: That is right. Lake Barrett, Department of Energy.

We do get 20 percent of our electricity from nuclear power, like it or not that is a fact. Right now fuel is being generated, spent fuel is being generated. The nation and society needs to do something with it. Many of the reactors -- five or so sites' pools are filled and they have to go into dry storage, and the number is increasing as every year goes by.

Given around the turn of the century, we may be able to solve exactly what is the optimum, and I look at this thing as an optimization of the thermal strategy type issues, meanwhile there will have been I don't know what the numbers are, but probably hundreds of canisters of spent fuel going into dry storage without any standardization whatsoever in this country. So we cannot really totally wait until that time. We need to make appropriate decisions as to what is the best thing for us to do given the uncertainties that we know about.

So we think we need to move forward and standardize this or we will be doing something that people who preceded us back in the '50s might have done as far as not knowing what to do and just leaving things for later on. So we need to make some decisions, we need to make them now, and making no decision, just saying hands off and walking away is making a default decision, and I think a default decision is worse than an educated one where you can quantify the risks, both economic, health and everything else and then making the best societal risk. That is as a public employee, I work for the nation, and that is what we are trying to do, and we will get assistance from any others as to, we go too fast, we go too slow, but that is what a democracy is all about.

DR. PRICE: Do you have an indication of the economic impact if you were to simply wait until that issue was resolved?

MR. BARRETT: What you have is, you can extrapolate. I don't have an actual number. If you extrapolate it off of Buzz's charts on the economics at different points, you can start to see that it gets to be a fairly large number and many millions of dollars. He could maybe quantify it a little better, but I will submit that if it is 1998 and a different group of people will be sitting around this table, probably more women at that time, they are going to probably go on, there will be a lively discussion about, do you really know enough to commit that money at this time. So I am not sure how much more certain we will be, that we really will know to what probabilities at that time.

DR. PRICE: Thank you.

Anyone else with a comment from the floor, please?

MS. TREICHEL: My name is Judy Treichel from the Nevada Nuclear Waste Task Force.

One thing that I wanted to mentioned was that there is always a call for assisting the public to understand what is going on when various groups make presentations, and it seems to me that possibly there is a need for some interpretation or assistance to the Department of Energy, their contractors, and other brother agencies that work through he government on some of this stuff because it seems to me that the public understand a whole lot of stuff, and there is a lot of public audience that I go to where you see people shaking their heads continually saying, they just don't get it, do they. I think some of it goes through the cracks.

One of the examples was this morning when Dr. Dreyfus was talking and he was talking about people being involved, the public being involved in selecting options and that that couldn't happen or wasn't happening yet because the possible options hadn't yet been selected. Well, that is not the way it works. Possibly the public should be involved in the selection of the options and then DOE and the public work together to select those that are acceptable to everybody.

I think it is also an interesting situation, particularly when you come from Nevada, right now we have -- and one of the buzz words that goes around is "convergence" and we have an interesting convergence going on out in Nevada right now, and it is going on in other parts of the country, too, but not quite as focused as it is there. You have the incredible revelations about radiation experiments.

We don't have to go into that, but it has something that is really shocking and amazing for people to deal with.

But in Nevada it is happening simultaneously with the court cases that are going on where the test site workers are suing the government, and they are still being very brutally hammered by government attorneys who are trying to convince them, the jury, and the general public that the only reason these people are sick is because they smoked and had bad diets and we are, on the other hand, hearing all of this talk about new accountability and about public trust and confidence.

I am not trying to make a case for anybody here, but I am just saying that it is a very difficult time, particularly in Nevada and possibly across the country to sell trust and confidence.

One of the things that have heard over and over and over and you are going to hear it any time you get to a meeting where the public is involved is this call for a review, and I refuse to use the word "review" any more because almost anybody in the room has their own definition of what a review means. The Secretary thinks she is doing one. The people of Nevada are convinced that she is not and probably never will. So let's call it an overall analysis, or possibly an examination of the entire policy, what we are talking about is figuring how much waste there is, what the waste actually is chemically, realistically what we have to deal with here, how to deal with it, if the country still feels that the commitment to deep geologic storage is the right one. So we are talking about an overall examination.

The point was brought up this morning that there is this dreadful belief out there, and possibly a misconception that people think that after so much time and money gets sunk into Yucca Mountain that nobody would be willing to abandon the site. Well, that is a very real fear that is going on out there, and one of the things that makes that fear real is the fact that we see people unwilling to even pause to do an analysis or to rethink the program. Now if they are not willing to pause, we find it hard to believe that they would be willing to stop or to turn around.

One of the things about making a change in direction is you have to stop first. So I think people probably make good point when they think that the program should slow down, should pause, should do something in order to be reexamined, reevaluated or reviewed, however.

Thank you.

DR. PRICE: Any other comment, please?

[No response.]

DR. PRICE: If not, I want to give a very special and strong thanks to DOE for the time they have put in to bring the presentations, to each presenter who provided us their talents this morning and this afternoon, and we will call this to a close for the day. Thank you very much.

[Whereupon, at 5:31 p.m., the meeting was recessed, to reconvene on Wednesday, January 12, 1994.]