UNITED STATES

NUCLEAR WASTE TECHNICAL REVIEW BOARD

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MEETING ON THE PANEL ON

TRANSPORTATION AND SYSTEMS

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Nuclear Waste Technical
Review Board Office
Suite 910
1100 Wilson Boulevard
Arlington, VA 22209

Tuesday, March 10, 1992

The above-entitled matter came on for hearing at 9:00 a.m. when were present:

PARTICIPANTS:

DENNIS PRICE, Chair, Panel on Transportation
D. WARNER NORTH, NWTRB Member
ELLIS D. VERINK, NWTRB Member
WILLIAM D. BARNARD, Executive Director, NWTRB
SHERWOOD C. CHU, Senior Professional Staff, NWTRB
RONALD A. MILNER, DOE/OCRWM
WILLIAM A. LEMESHEWSKY, DOE/OCRWM
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VICTOR W. TREBULES, DOE/OCRWM
JEFFREY R. WILLIAMS, DOE/OCRWM
JOE STRINGER, M&O

P R O C E E D I N G S [9

DR. PRICE: Good morning, and welcome to the meeting of the Panel on Transportation and Systems of the Nuclear Waste Technical Review Board. I'm Dennis Price, chairman of the panel. With me today are Dr. Ellis Verink, the other member of the panel, and board member Dr. Warner North.

Also with us today are Dr. William Barnard, our Executive Director, and Dr. Sherwood Chu of the board's Senior Personal Staff.

This day-and-a-half-long meeting will deal with two areas in the Department of Energy, or DOE's, Waste Management Program. One area will focus on transportation and systems issues which have been of interest and concern to the Board in the past. The other area will be on the conceptual design of the monitored retrieval storage, or MRS facility.

The first item on the agenda this morning is a discussion on the progress achieved by DOE to incorporate system safety and human factors engineering into the DOE safety management process. I recently asked a couple of my students to conduct an attitudinal survey on the transportation of spent fuel. We had a response of 634 persons who were in the categories of safety professionals,

employees of the nuclear industry, government employees, Native Americans, and a very few who were members of environmental organizations.

Fifty-two percent of those responding rated the likelihood of human error to be a very likely or highly likely cause of radioactive release in the transportation of spent fuel. That's to be compared with twelve percent of those responding thought it was very likely or highly likely that rupture of a cask would be the cause of a release of radioactive material.

This is to indicate, I think, even among those who are professionally involved, the concern that there is for the human role and human error.

From its inception, the Board has underscored the need to incorporate the precepts of system safety and human factors engineering into the waste management process. This has been the subject of recommendations in the very first Board report to the U.S. Congress and the U.S. Secretary of Energy.

The first steps by DOE in response to the Board's recommendations in this regard were, 1) having a consultant develop a draft system safety program plan and 2) adding specific human factors capabilities to its cask development program and beginning to incorporate human factors considerations into the design process.

We look forward to hearing more about these initial steps.

Another transportation topic that we have had discussions on in the past was transportation related capabilities and infrastructure located at and near the utility sites. Updates on studies dealing with this subject will be given tomorrow morning.

The briefing on MRS concept designs will begin after the break this morning. Until now, neither the Board nor any of its panels have had any briefings on the MRS or any public policy considerations relating to it.

The briefing that the panel has requested for this meeting is focused only on the concept design. We understand that this design effort is now coming to completion, and we wanted a preview of the key features of the concept and how they may affect the rest of the waste management system.

During and between speaker presentations, the panel and Board members may freely ask questions of those who are presenting. Opportunity will be given for those in the audience after this process is completed to participate and bring any questions that you might have for those who present and those who are at this table. If you do, we would ask that you would step to the mike, give your name and your affiliation, please.

Leading off for the DOE this morning is Ron Milner. Mr. Milner is the Associate Director for Storage and Transportation of the Office of Civilian Radioactive Waste Management at the DOE.

Ron.

[Slide.]

MR. MILNER: Good morning, Dr. Price. It's a pleasure to appear before you here again today to cover not only the transportation, which has been the focus of this panel, but also to provide, as you say, one of the first briefings that we've had an opportunity to do on the MRS program.

Before we get into that, I'd like to spend a little time talking about the schedules for the repository, the MRS and the transportation program, or, more particularly, the interrelationships between the two.

[Slide.]

MR. MILNER: The schedule that we're working toward is based on the schedule that the Secretary announced in his

60-day report to Congress on the reassessment of the waste program.

The primary points of that were a schedule that called for 1998 waste acceptance at an MRS facility, a 2001 license application submittal date for the repository and start of repository operations in 2010.

The critical path for the repository, 2010 or whatever the date, really goes through the tunnel boring machine procurement, the ESF construction, in-situ testing program, waste package design.

[Slide.]

MR. MILNER: Of course, the license application process and construction.

[Slide.]

MR. MILNER: The critical path for the MRS goes through the negotiated siting process, Congressional enactment of an agreement with a volunteer host, the environmental impact statement process, the license review process and, of course construction.

The critical path for the transportation area, quite simply, is procurement of the existing technology casks which we hope to be going out in the near future with an RFP.

[Slide.]

MR. MILNER: Looking at it graphically, we can see the critical path for the repository going through the ESF in-site testing, leading to a license application submittal in October of 2001; finally, a waste emplacement date in 2010.

On the MRS side, we're looking at the siting process, the EIS process, NRC review, the license application to NRC at the end of Fiscal '95, the start of waste operations in January of '98.

To point out one thing, as we've mentioned before, although this might appear to be a relatively short time frame for NRC review -- about an 18-month period -- in fact, we have agreement with the NRC to submit the SAR design and the SAR about a year in advance of the license application, and they would begin to review. So there's really about a two-and-a-half year period for NRC review. On the transportation side, development of the from-reactor casks, which we've, as you know, split into a two-phase program -- procurement of existing technology and then higher technology -- we're ready to support start of waste operations in '98.

[Slide.]

MR. MILNER: The MRS design, at least the final design, is going to span the time frame of about '94 to '96, and that's going to be completed even before the license application design for the repository is initiated, which is about 1997. So therefore, we're going to find that the MRS design is going to drive the interface specifications for the repository, or at least the surface facility interfaces.

[Slide.]

MR. MILNER: Looking at the design schedules in particular, the MRS SAR design is going to be completed somewhere around the end of '94, about midway through the advanced conceptual design for the repository, the final procurement construction design in about the end of '96, still before the advanced conceptual design for the repository is completed.

So certainly, not only is there going to be interface control all the way along the process, but particular areas at the completion of SAR and the procurement construction design for the MRS.

[Slide.]

MR. MILNER: On the waste package, the decision on the waste package material is not going to be made until probably about midway through the in-situ testing program. That's primarily because significant results from that testing phase are going to be needed to make a decision on waste package material.

So looking at that, that really -- of particular interest, I know, to this panel is the potential of the use of universal casks.

That kind of a schedule, and we'll look at it in a little more detail later, really prohibits an early decision on the use of a universal cask, and probably shortly after the start of MRS operations, you could begin to look at that.

In fact, we intend at about that time, once we have the requirements for the waste package material better identified, we would perform a system study which would look at optimizing the cask system.

[Slide.]

MR. MILNER: Looking at that, about the end of 1998, which is about the time the MRS will begin operation, about midway through that in-situ test program is when the decision can be made on the waste package material feeding into a license application design.

As you can see, that's well beyond the time when we would need to develop the from-reactor cask to support the MRS operations.

[Slide.]

MR. MILNER: Just a little bit to recoup on the cask development. As I mentioned, the Initiative 1 casks, which are the from-reactor casks, are split into two phases, Phase 1 being the existing technology casks. We hope to go out with a draft RFP in another couple of months on those casks. They would be the ones primarily to support start of waste acceptance in '98.

The higher capacity casks, the Phase 2 casks that we've been working on for some time, we anticipate would be available around the turn of the century to support MRS operations.

Some time shortly after start of MRS operations, we could begin to look at eventually higher capacity universal casks and so forth which could not only be from MRS casks, but also throughout the system could be used.

We would anticipate that we would begin receiving and accepting, not into the MRS, but into the repository, defense high level waste in about 2015, so we have a little more time to work on development of those types of casks.

[Slide.]

MR. MILNER: Just looking at that, the two-phase approach to the Initiative 1 casks support start of 1998 waste acceptance.

The point I guess I'd like to leave here is that in this kind of a time frame, the late '97, '98, '99 time frame, when we have enough information from the in-situ test program that we can make a decision on waste package materials, we could then perform and would perform a system study to look at the optimized casks, be it universal cask or whatever.

If, at that point in time, that study showed that we should head in a different direction for the casks, whether it be universal or whatever, we would still have time to develop those casks prior to -- hopefully, well prior -- to start of waste emplacement at a repository, recognizing certainly that some of the waste would be received at the MRS prior to that time.

If you really looked at it, since the MRS can only receive about 10,000 MTUs prior to start of repository operations, we're really looking at a relatively small amount of waste that would be received and handled at the MRS prior to repository operations -- about ten percent, a little over.

So if a system showed that, for example, a universal cask was the appropriate thing, that could be developed not only to handle from-MRS, but potentially, even if you decided to go back at the MRS and place the waste into a universal cask, it would still be only about ten percent of the total waste.

Beyond that, the other part of the cask development program would be the development of specialty casks, again starting at about the time of operation of the MRS. This would be to handle the unusual fuels, longer, shorter fuels, and so forth. Then sometime later, in about 2004, 2005, we could begin to work on the casks to handle defense high-level waste.

Those are my remarks. I'd be happy to answer any questions you have.

DR. PRICE: Warner, any questions?

DR. NORTH: No.

DR. PRICE: Let me ask you, if you would, please, expand just a little bit for the sake of everyone on the

issue of waiting for the in-site results to determine what the materials would be in comparison with selecting materi- als and then having some kind of view of the space between the host in-situ rock being used to buffer, condition or whatever is necessary to ensure compatibility.

Do you have any thoughts on the two different concepts, one being you select the materials and proceed, and you have a buffer zone that you work in some sort of way as part of a systems concept, and then you have the host; and the other is that you've got the host and you're going to wait on your materials to get the results.

MR. MILNER: Okay. I guess, first of all, we wouldn't really have the host in terms of a final selection until about -- actually, about the year 2004, a license application being submitted in 2001. Before that period of time, you could certainly hopefully make an educated guess as to what the host medium would be.

Given that we're just now beginning the site characterization program again at Yucca Mountain, once we get underground and get into the in-site test program, they'll know a little bit more about the characteristics that might tell them something on waste package material. I think it really goes beyond just the material. There's certainly the question, Is it going to be a robust package or not? I think you need to know those kinds of things before you really look at something like a universal cask.

Even beyond that, you wouldn't necessarily want to make a selection too much earlier than that since you certainly don't know or even have a good idea where that repository site might be, if Yucca Mountain is going to be suitable or not. I think you wouldn't want to go too far down that road until you had a better idea of its suitability.

DR. PRICE: To what extent do you think that the approach that you just presented tends to fix the design of the MRS and even the receiving facilities of the repository and so forth because you have to have a certain capability which is based upon Phase I casks to meet the 1991 date that you have. That -- I mean 1998, what did I say, '91? 1998 date --

MR. MILNER: We'd be working super-fast!

DR. PRICE: Well, I came to work in reverse this morning.

In order to meet that 1998 date that kind of looms very closely you're depending upon Phase I casks, conventional type casks which in turn determines the handling capabilities at the MRS and what you will have in the MRS, the hot cell, the rest of that sort of stuff.

To what extent is this approach tending to dictate design?

MR. MILNER: Certainly at some point we are going to have to fix the MRS design, as Vic and Jeff will go into a little bit more detail later. Where we are at in terms of MRS design now is trying to build in a maximum flexibility to handle a variety of casks at the MRS, anything from an existing type of cask to potentially a dual purpose cask, so we are trying to keep that flexibility at this point in type until we get a little farther down the road of cask procurement and so forth.

I think that you could design an MRS such that ultimately if you went to something like a universal cask it would still be capable of handling that.

As the MRS design relates to at least repository capabilities, surface facilities certainly you are going to some extent to drive those specifications. Again, what we are attempting to do is maximum flexibility there. We are very early in the design stage at this point certainly with the conceptual design.

DR. PRICE: In your conceptual ideas about the military side of things, are you working or have you had as any kind of goal the idea of commonality in means of handling the Defense waste along with the civilian waste? That is, there is going to be some kind of similar processes or similar handling or is that regarded as a special case of the operations?

MR. MILNER: At the repository that would be considered a special case but Defense waste won't go through the MRS so it is not a consideration there.

DR. PRICE: But is the Defense waste getting folded into the civilian waste handling ideas at all or is it just sort of, as I understand your answer, it's a special case?

MR. MILNER: It would certainly be handled differently at the repository. I guess I can't speak too much about it other than on the transportation side and we haven't even begun to work on those casks yet since, like I say, it does not affect the MRS facility.

DR. PRICE: Any questions from the audience?

[No response.]

DR. PRICE: The next topic is Systems Safety and Human Factors Planning. William Lemeshewsky and Gregory Smith will be the presenters.

[Slide.]

MR. LEMESHEWSKY: Good morning. Thank you for having me back. I guess it's about the third time.

I wanted to at least touch on the area as the Branch Chief for Systems Engineering, the branch itself is respon-sible for technical baseline documents, systems studies and modelling that we have presented in the past

before you all.

The Division itself covers on a broader range systems engine, management plan, safety, configuration management, changed control boards, requirement databases, et cetera. I'm here to talk about basically systems safety and human factors.

[Slide.]

MR. LEMESHEWSKY: As you know, you all have encouraged us to take a more program-wide look at systems safety and human factors aspects in the program and as we noted in the letter in sending some plans over to you all, we had tasked the M&O contractor to come up with a systems engineering approach to safety and human factors that would cover those activities from a system-wide aspect.

We have asked them to put together this plan and basically it would be here by the end of the summer and part of the fiscal year and we wanted go in and brief you on our thoughts on how this plan would be implemented.

Greg Smith will talk to you about it for focus on the systems safety and human factors side. As a human factors engineer he has over 15 years experience in DOD computer systems, communication and nuclear power and I think he is obviously in my feeling is well qualified to look at this program from a system-wide aspect and tie together those areas that you all have asked in the past.

Do you have any questions?

[No response.]

MR. LEMESHEWSKY: If not, I'll go on to Greg Smith.

DR. PRICE: All right.

[Slide.]

DR. SMITH: Dr. Price, panel, I have three primary messages I'd like to convey to you this morning. That is, the OCRWM M&O are in the process of developing the environmental safety and health plan. It's in this plan that the system safety activities will be described.

[Slide.]

DR. SMITH: The second point is that system safety and human factors engineering are part of the systems engineering process. The third point is that the human factors engineering requirements are being documented and being placed in the technical baseline.

[Slide.]

DR. SMITH: The Environmental Health and Safety Plan is broader than what I'm going to be briefing this morning. I'm not going to address aspects of it such as regulatory compliance. In particular, I'm focusing on those system safety activities that affect design.

[Slide.]

DR. SMITH: The plan will identify the system safety process, which is the second topic of today's briefing, and it will also describe organizational responsibilities and interfaces, particularly the interface with requirements and licensing. Requirements and licensing is helping us in writing our plan.

The plan is modeled after Military Standard 882(b) which is the System Safety Program Requirements Document. Let me note that DOE Order 5481 cites 882(b) as providing detailed information for organizing, developing and implementing system safety. Also, we will be compliant with the DOE orders.

Examples of major DOE orders and other regulations are found in the appendix to this briefing. As noted in the footnote, where there is dual DOE/NRC radiation protection regulations, there will be a transition from the DOE orders to the NRC regulations when these regulations are approved, in particular, referring to 10 CFR 830, 834, 835, which deals with the radiation protection of the public, the environment and the occupational workers.

Our plan is a program level plan and on the next chart, in a moment, I'll show you where it resides in the document hierarchy and the scope. We are going to look at all aspects of safety as it affects design. I'll discuss that two charts from now.

[Slide.]

DR. SMITH: This document hierarchy is in two parts. The top half above the dashed line represents the program level documentation, and below the dashed line are the project level or the system element or project documentation. Currently, our plan is annexed to the program management system manual and our plan will provide guidance in the development and implementation of the project level environmental health and safety plan which is down here.

Let me point out that the Requirements and Licensing people are writing the regulatory guidance document and in that document, they will describe their process for regulatory compliance. Part of their task is to look at all the regs, codes, borders and determine which are applicable to this system. Once those requirements have been identified, then they will be placed in this document, as well as put in the CRWMS Requirements -- overall requirements document, and then systems engineering then will allocate those requirements to the system elements.

[Slide.]

DR. SMITH: That chart shows the major federal regulators. This is one way of dividing the safety pie, if you will, into radiation, chemical and physical. Likewise, the regulators are responsible for onsite, others for offsite and public safety.

These are the major regulators. It's not meant to be exhaustive, and there are sometimes some overlap in areas of concern. Also not shown are the state and local regulators as they're site-specific and once the site has been selected, then we will address those regulators.

The onsite regulators include Nuclear Regulatory Commission, Department of Labor, OSHA, Department of Labor, Mine Safety and Health Agency, and, of course, the Department of Energy, offsite; NRC, Environmental Protection Agency, Federal Emergency Management Agency, Department of Transportation and DOE.

DR. PRICE: Could you tell me if Nevada has elected to have a Nevada OSHA?

DR. SMITH: I do not know that.

DR. PRICE: So they're under Federal OSHA? Do you know?

MR. LEMESHEWSKY: They have plenty of their own state regs that need to be covered. He does not show that on this chart.

DR. PRICE: I understand that, but I think under the Occupational Safety and Health Act, an individual state has the option of having their own administration, providing it is equal to or at least as equal to, in severity, the federal. I was wondering, did Nevada opt to have their own Occupational Safety and Health Administration?

DR. SMITH: I don't know the answer to that, but I'll get that answer for you.

DR. PRICE: All right.

[Slide.]

DR. SMITH: The second topic, system safety.

[Slide.]

DR. SMITH: This definition was adapted from Systems Safety Engineering and Management by Roland & Moriarty. And Mr. Moriarty is a TRW employee who is currently with us today.

First, let's define what a hazard is. A hazard are those conditions that can cause death, injury, occupational illness, added harm to the environment, as well as damage or loss of equipment or property. So, safety then would be a freedom from these hazards.

[Slide.]

DR. SMITH: The objectives, as taken from DOE order 5481 is that the potential hazards are systematically identified and the consequences are analyzed. And we take measures to eliminate, and if we cannot eliminate, then control or mitigate the hazards. Also, notice that the latter part of the third bullet -- that system safety, we have to be in compliance with whatever commitments are made in the environmental assessment and in the environmental impact statements.

[Slide.]

DR. SMITH: This chart indicates some of the activities at the program and the project level. And looking at the first three bullets, at the program level, I'd like to go to the next chart, and then we'll come back to this one.

[Slide.]

DR. SMITH: System safety, as I've mentioned, is part of the system engineering process. We will be integrating those requirements that are identified from the requirements and licensing's regulatory analysis. And we will be then allocating those requirements to the system elements or to the projects.

And its from those requirements that the project basis its design. And for reasons of systems safety, optimization or through analysis that shows there are problems with a design, it may be that the requirements have to change and we will feed that back to requirements.

Likewise, we're also involved in this loop that the hazard analysis can verify that the requirements are being met. And as we move from design through operations and de-commissioning, there's relatively less emphasis on deriving additional requirements and more emphasis on verifying that the requirements are being met.

[Slide.]

DR. SMITH: The project has to write their own environmental safety and health plan. It's the project level that perform the hazard analyses. And we will be establishing a systems safety working group. That group will be headed by the systems engineer -- safety engineer and it will involve project level safety engineers as well as OCRWM systems safety representatives.

The primary purpose of the working group is to address hazards that may exist at the interfaces of the subsystems. Also, if during tests and the start-up of operations, if there are already mishaps that seem to be due to the design, they can meet and discuss those and suggest changes so that they do not reoccur.

Project participants at the design level. And both the program and the project perform audits and reviews to ensure verification with the requirements.

DR. PRICE: Could I ask, before you go on to 12, on 11 and the small print under verification, you've got the software V&V -- could you say a little more about that? That's in 11.

DR. SMITH: Software Validation and Verification?

DR. PRICE: Yes.

DR. SMITH: As how we're going to do that?

DR. PRICE: Yes. You've got up there, as part of the systems engineering process, and I take it you're talking about systems safety software validation and verification, or is that not correct? That's just part of this?

DR. SMITH: This was just -- this was a general chart for all of systems engineering, not safety-specific.

DR. PRICE: Thank you.

[Slide.]

DR. SMITH: Hazard analysis. Again, we want to have a systematic study to identify and make recommendations for their elimination, if we can eliminate them or control them. And hazard analyses really take place from conceptual design all the way through operations. It lasts the life of the project or the program.

On several charts now, I'll talk about the types of hazard analysis that we'll be performing.

[Slide.]

DR. SMITH: Our process will be to identify the hazards, the causes. We'll determine the consequences. And the consequences can range from negligible to marginal, critical to catastrophic, and determine their probabilities, which would range from improbable to frequent. Recommend either design changes, or if we're not going to change the design and we want to mitigate, we can do that through a change -- through procedures, and change the procedures where we need to. And finally, we provide documentation to management, as necessary.

[Slide.]

DR. SMITH: For the hazard analysis, we'll be using probabilistic risk assessment techniques. For example, failure mode, effects analysis, liability analyses, fault tree. And to do that, we'll have to address human error, equipment failure, external events. And, therefore, that requires us to collect statistics on human error, natural events, deliberate events, accidents.

[Slide.]

DR. SMITH: This chart and the next chart go together. And let me point out a couple of things here. After we write our plan and we know the requirements that are applicable to the system, we begin our preliminary hazard analyses. And any of these activities here can result in changes or additions to the requirements database, though it's not shown on the chart. And each of these activities can provide information at reviews. And all of these activities can feed a hazard tracking and risk resolution database. At first, it will be mostly just a paper trail of the hazard. But once you get into operations support, operational areas, actually beginning with a test on into operations, the hazard tracking and risk resolution database can be used to identify any trends.

[Slide.]

DR. SMITH: On the next chart, this represents the typical applications of the hazard analysis here across system design. And preliminary hazard analysis, again, typically starts in the conceptual design phase. And in this hazard analysis, you're trying to identify the -- the high energy sources that could cause a hazard problem. Also you want to look at the big system picture to try to figure out where problems might exist, so you do your what-if scenarios.

Further, you would look at similarly operating systems, if such a system exists, and you could look at historical data to try to identify where you think some of the hazards may be occurring.

We move from there into the subsystem design, where the subsystem or the system element was really concerned about failure within a given subsystem, and once each of the subsystems becomes mature enough where you understand what the system -- how it's going to behave in particular system interfaces, you begin to look for hazards that exist at the interface, and you're concerned about, if you have failure in one subsystem, how does that failure in one subsystem affect another subsystem.

In the operating and support area, you're trying to identify the hazards that result from the actual operation of the system that you're building.

You would look at procedures. You would look at documentations. You would add warnings and cautions in the documentation, where appropriate.

Then, finally, when you go into the test phase and on into operations, if an accident or an incident occurs, perform an analysis to understand the root cause.

During all these phases, the human factors engineer and the systems safety person can work closely together to identify these hazards.

Back in the what-if category, if you have -- suppose you have fuel consolidation and a fuel assembly broke during a transfer. Then, that's a hazard. So, what are you going to do to mitigate that, and what role is man going to play?

If we're going to have a repository that's going to be over 100 degrees centigrade and we're going to have concurrent excavation and cask placement, then what role is man going to play, what role is automation going to play?

[Slide.]

DR. SMITH: I'll go to the next chart, and this chart and the next one -- it's really a two-page chart, couldn't get it all on here.

At the bottom are the milestones and the system phases that we go through, and this line here represents what I have just been talking about the last couple of

charts.

The requirements and licensing people do their analysis and find the applicable regulations and codes and put them into the high-level requirements database, and then that will feed -- they're allocated to the project level, and then we establish a system requirements baseline.

This is the design or the configuration baseline, and requirements and licensing then proceeds on with their environmental assessment --

[Slide.]

DR. SMITH: -- and their environmental impact statement, and our activities and their activities support the safety analysis report, and these are necessary for license application.

So, it gives you some feeling for the interface between us and requirements and licensing. The MRS, instead of following the Title I/Title II design, is following the SAR in their final design, procurement design.

DR. VERINK: What are "KD0" and "KD1"?

DR. SMITH: Key decisions.

DR. VERINK: I don't see any calendar dates on those. Are they 1998?

DR. SMITH: It depends upon which subsystem you're talking about. This was supposed to be just a generalized chart.

DR. VERINK: This is what's going to be done, rather than anything that has been done. Is that right?

DR. SMITH: Correct.

[Slide.]

DR. SMITH: This chart and the next one is simply stating what I have just said. So, we'll skip those and go to chart 21.

[Slide.]

DR. SMITH: We believe that system safety can bring a high degree of public health and safety and a high degree of occupational health and safety, as well as improved public acceptance, reduced claims, compensation, and increased availability of the system, since you're trying to eliminate accidents.

[Slide.]

DR. SMITH: The final topic, the human factors engineering --

DR. PRICE: Before we start, we might stop at this point and ask if there are questions from the Board members and staff about system safety, and that will enable us to divide these two.

DR. SMITH: Okay.

DR. PRICE: Any questions?

DR. VERINK: I am surprised at your answer that there is no key between the key decision points and the schedule that you're apparently on.

DR. SMITH: I'm sorry. Could you repeat that?

DR. VERINK: I am surprised that there isn't any correlation between these key decision points and the 1998 and the 2001 and so on.

MR. MILNER: Dr. Verink, if I could give that one a try, it does depend on which project you're talking about, MRS or transportation or repository. The MRS, for example, KD1 is the start of Title II design. It's part of the ESAAB process.

DR. VERINK: That's ahead of the 1998, isn't it?

MR. MILNER: Pardon me?

DR. VERINK: Is that ahead of the 1998 date?

MR. MILNER: Yes, well ahead of the 1998 date.

DR. VERINK: We don't know when that is yet, though.

MR. MILNER: Specifically, I'd have to look it up, but I think it's the '94 timeframe for MRS.

DR. VERINK: I'm a little surprised that those are unknown numbers at this point is all.

MR. MILNER: That's on schedule. I'll take a second and look at my schedule here on the exact date.

[Pause.]

MR. MILNER: For the MRS, for start of Title II design is March of '94.

DR. VERINK: So, we're talking about the budget already for that year.

MR. MILNER: Correct.

DR. VERINK: Is there money for it?

MR. MILNER: We're in the very early stages of planning now for the 1994 budget, and we're certainly going to have to look at those activities as to what we're going to be doing in that timeframe, but as we wind our way through the budget process, we'll see what transpires, but certainly we would plan to budget for that, yes.

DR. PRICE: I guess, without funding behind it, the presentation would not have any substance. Would that be true?

MR. MILNER: I probably should have prefaced, certainly, my talk on schedules by saying that, certainly for the MRS, it assumes success of a negotiated siting process, also assumes adequate resources throughout the project to keep to that schedule.

DR. PRICE: And that would include adequate resources for something like this that's just been presented to us.

MR. MILNER: Yes.

DR. PRICE: Warner?

DR. NORTH: I guess my summary of what I understand here is we have a form. I find the form very

attractive, but at this point I don't see substantive content.

In performance assessment, where my major responsibilities on this Board lie, we have continually made the point that performance assessment ought to be iterative. It seems to me that the same thing ought to hold for system safety, and I'm bothered that I don't see iteration one.

I see a plan for a plan, but I think it would be very useful to see what we have in the way of past experience and how past experience applies to the present situation, so that at least at the level of a sketch, we begin to see where are the areas that are going to require emphasis, where are the hard problems, what kind of effort are you going to need to implement this plan, what are the difficulties that you envision, and how are you going to overcome those difficulties, because it seems to me it's going to be very hard to plan the budgeting of this exercise unless you have some sense of that.

DR. SMITH: There will be more detailed information in the plan, as Mr. Lemeshewsky said, we'll be delivering late this summer. I think you will see some of that information in there.

DR. NORTH: Well, I would urge that you put in a strawman, a zero order system safety assessment on at least one major aspect, so that essentially you show a demonstration of what it is you propose to do and use that to support your resource requests.

DR. PRICE: Do you have a question?

DR. CHU: Just a specific question, following along these lines. You were mentioning the KD0s and the KD1s and the KD2s. You were mentioning the Title II design is going to start in 1994.

Do you plan to do some of the hazard analysis ahead of that, so that the outcome of those hazard analyses can be cranked into Title II design?

MR. MILNER: Yes. I hope that was the answer.

DR. PRICE: Let me ask -- as you know, you have supplied us with draft documents of the system safety program and system safety program plan, which provides a great deal more detail than was in this presentation, but it's in the draft stage. We understand that.

How, in general, is the development of that system safety program, the draft as we see it now? Does it look like it's what you expect things, in general, to appear, or is it going to be much smaller, or do you see it expanding? What is happening to it?

DR. SMITH: What I have presented is the framework. Well, that provided a framework for the program that we're going to put in place, and in the plan -- when we deliver our plan late this summer, as I mentioned, it will have a lot more detail.

I'm not quite sure what you're asking.

DR. PRICE: I'm wondering how is this standing up to your review at this time?

DR. SMITH: Well, that was also its starting point for Military Standard 882B. So, we are in sync with that plan.

DR. PRICE: Well, one area, when I read this and also notice from your presentation, that you don't show anything on is the Task 300 stuff in 882 on software safety.

There is a whole series of tasks, and over the recent years, software safety has gained a lot of attention in Mil Standard 882, and I know there's going to be some software involved in this program, and was that not included for a particular reason?

DR. SMITH: No. We plan to include it. It's just I was trying to give an overview of the approach that we're going to take, and we intend to do that.

DR. PRICE: I see, because I noticed it also was not in your draft of the system safety program, the Task 300 stuff. That's why I asked the question about software validation and verification, to see if that's where you were planning to bring that out.

DR. SMITH: Yes. That will be part of the process, yes.

DR. NORTH: These are details that would be very useful to see in terms of what it is that you need to do to implement this. How much software validation and verification is going to be required? How big are the codes?

To what extent have they been addressed in this fashion before, so you're updating validation and verification that somebody else has done for another purpose, or to what extent do you have to do it from a fresh start?

DR. SMITH: Well, the level of effort for those estimates are going to have to come from projects.

DR. NORTH: Yes. I think it would be good to get on with that process. If they have to come from the project, ask the project to provide you something you can work with.

DR. PRICE: You mentioned the hazard tracking, and that was good to see. I think that's a vital element in the feedback part of things, in order to get any kind of an iterative process.

Do you have any better view than actually you presented, which was just, you know, simply the statement that we have this function of hazard tracking after identification, as to the nature of the databases, the kind of thing you're going to do to be accomplishing this overall

function, or is that yet to be really determined?

DR. SMITH: That's yet to be really determined, but I assume that we would choose some kind of relational data-base, so that you can do the kind of queries on it that you'd like to perform, particularly to identify trends.

DR. PRICE: Particularly in this kind of an environment, in which we may be most concerned about the low-probability, high-risk -- or high-severity -- excuse me -- type of risk, I think that hazard tracking and what you track is a very vital thing, because if some of the things you're most interested in are not going to occur except very rarely, in which I think the system is intended to provide this kind of a scenario, then to get a handle on the control aspects of it, I think you've got to really have some good insight on what to track and what to have in your database and where to put your hazard action triggers as to when you're going to do something.

So, I think the development of that particular function, in order to feed back, make corrections, do things, and have a dynamic working system, one that just doesn't go dead, particularly in these high-severity, low-probability type of occurrences, I think you need to look at it very carefully.

DR. SMITH: We intend to.

DR. NORTH: I think you're going to have to meet the test, being able to convince the public that you can pick up subtle warning signals that something is wrong and needs to be fixed.

Just as a thought experiment that comes to mind, consider that the issue is transportation of oil on tankers instead of radioactive waste.

How could you assure people that you're going to pick up the events that led to the Valdez accident and make sure that those events don't occur, and there are a whole bunch of them. There's been a lot of study as to how those kinds of things might be anticipated.

I think you're going to have to convince a lot of skeptical people like us that you've really thought it through and that you have a system in place that is going to pick up those factors that could lead to a bad accident, not wait until the bad accident occurs.

DR. PRICE: I have been asked to please remind speakers to identify themselves for the record and speak directly into the mike.

In the area of hazard identification, basically the system safety techniques are inductive techniques and deductive techniques.

Have you thought specifically about how you might, in order to respond to a skeptical public, design the inquiries using these methods for hazard identification in such a way that you will really cover the waterfront and feel that you can defend almost any inquiry that you've done what is a reasonable, prudent, thorough, where there is an extraordinary hazard, the need to show extraordinary care, and you've done that?

DR. SMITH: We have not done that and we are just beginning our effort. We are just starting to write our plan. We're just not there yet.

DR. PRICE: What we are seeing is a lot more than we saw when we as a board started. Let me say that. We are seeing a lot more so don't misunderstand. We are pleased to see what we see, all right? We are looking to see more.

Any other questions here on this part of the topic and presentation?

[No response.]

DR. PRICE: How about from the audience?

[No response.]

DR. PRICE: Anyone want to give their name and then speak into the mike?

[No response.]

DR. PRICE: Let's go on to human factors. Thank you.

[Slide.]

DR. SMITH: The third topic, human factors engineering, we have two definitions here, one taken from

NRC's NUREG-0700: the science of optimizing the performance of human beings and we take that to mean both physical and cognitive performance.

The Electric Power Research Institute defines it as a disciplined concern with the systematic study and application of what's known about human behavior to system development decisions.

There's an awful lot of human performance data. It's been collected and it is available for design application and we intend to use it.

DR. PRICE: Let me just make a comment if I might interrupt on the definition.

I think the human factors profession itself has not been able to come up with a definition everyone agrees with but I think most definitions would really look and particularly engineering being the application of, it's a body or set of knowledge and it's more than human behavior, as I know you know, because it shows up in here further -- physiological aspects get into it, physical aspects into it and so that's rather limited but none of us exactly agree on anything anyway as to the definition.

DR. SMITH: I would include all that in behavior, whether it be physiological, cognitive, physical.

DR. PRICE: Okay.

[Slide.]

DR. SMITH: DOE 6430 states that human factors engineering principles shall be integrated into the design systems and the facilities that house and support these systems, and that is our objective, to include these principles in the baseline and see that it gets applied to the design.

We would like to incorporate these principles at the earliest possible moment, preferably at inception. As we have learned, if these principles are not applied from the inception or shortly thereafter, backfitting after a major accident, as occurred at Three Mile Island where they had to retrofit the nuclear power plant control room, it's a very, very expensive proposition.

By incorporating these principles we believe that we will reduce the probability of error. Dr. Price started off starting talking about human error this morning. Histori-cally by far and away human error is responsible for damage to equipment or system failure rather than equipment failure.

If we can reduce the probability of error then we reduce the risk to the public and workers will see increased productivity.

In general, what we want to do is we want to have designs that take advantage of human capabilities and avoid their limitations in order to improve systems safety. If you can avoid it, you don't want to make a human perform a vigilance task because they are terrible at it. They are good at pattern recognition. You don't want to have sets of controls and displays in one spot and then have a mirror image in another spot. You are just asking for human error, as a result of negative transfer training.

[Slide.]

DR. SMITH: As I have mentioned, we're going to be integrated into the system engineering process. We are placing the human factors engineering requirements -- we are documenting and placing them in the technical baseline and we'll be working closely with systems safety, the reliability, availability, maintainability organization and requirements and licensing and performing hazard analyses and whatever else needs to be done.

Of course we'll be participating in the design process, audits, reviews.

[Slide.]

DR. SMITH: This chart identifies some of the human factors engineering tasks. It's not exhaustive by any means.

At the program level, we will document the requirements. We will allocate those requirements to the projects.

The project then has to develop detailed

operational concepts, understanding what role man is going to play within that subsystem with that project and they have to allocate those requirements either to man or to machine.

The project will have to continuously perform tasks and skills analysis to determine what kind of skills are needed at what positions as well as task and error analyses to try to identify where the probability of error is greater than it could be.

They participate in design reviews. Those at the program and the project level will be doing tests, evaluation, audits, reviews.

The project will be developing the procedures and they will either be developing the training materials or developing source materials to hand over to the trainers.

[Slide.]

DR. SMITH: We do have some draft requirements. We referenced six documents and we have developed 21 categories of requirements.

[Slide.]

DR. SMITH: The next chart shows six documents we have thus far though we are continuing looking at others. Our primary one is NUREG-0700.

That's one which I was a principal developer, contributor.

It was developed specifically for the nuclear power plant control rooms but the principles, design principles, in there are rarely applicable to any system that requires instrumentation to control its process.

The second one, DOE, document for DOE for maintainability, ease of access and maintenance, so the maintenance worker doesn't get hurt or killed as well as we want the maintainer to have ease of maintainability in order to drive down the mean time to repair.

I think Mr. Jim Bongarra is the principal developer of this one. He is now over at NRC.

DOE Order 6430, the general design criteria, addresses among other things access to facilities.

The next bullet, the ANSI Human Factors Standard, is a standard for the development of computer workstations and mil standard 1472, the next one, addresses many areas in addition to those we have already mentioned and it addresses portability of equipment.

The last one we are using for guidelines for design of the user-computer interface.

[Slide.]

DR. SMITH: This chart and the next one lists the 21 categories we have developed, so, we have things from anthropometry that has to do with the sizing of people, to controlled display integration, maintainability. If you go to the next chart, it shows the rest of the categories.

[Slide.]

DR. SMITH: Panel layout using computer interface, so we have these 21 categories.

[Slide.]

DR. SMITH: As I mentioned, by incorporating the human factors engineering requirements, we have decreased probability of human error which will lead to the decrease in the probability of an accident, and therefore harm to workers and to the public.

We have an increase in productivity and availability and, in general, we're going to have a more usable design. This system that we're building is going to be human intensive. We've got to build it so that humans can use it.

[Slide.]

DR. SMITH: In summary, we are writing our plan of systems safety and human factors engineering both in the systems engineering process, and finally that the human factors engineering requirements will be in place in the baseline.

DR. PRICE: Questions? Dr. North?

DR. NORTH: I have the same reaction to this that I have to the system safety part of the presentation. You've got a plan for a plan. I like the form.

You have a lot of good ideas, but it's hard to judge without more sense of the contents. I'd love to see the zero order iteration on at least a few pieces.

I think, for example, of the plans that WIPP has developed for truck transportation of the waste, and the thought that they have put into the human factors area. I think it would be interesting for you to take some examples like that and ask the question; what has been learned?

What are key factors that were initially overlooked and then found to be important and what implications does that knowledge have for the development of a plan for this program? I'm not sure how much commonality there is between the hard issues in the design of a control room of a nuclear power plan, versus the hard issues that will confront the program for transportation and storage of high level nuclear waste and spent nuclear fuel.

I'd like to learn more about that. I would hope you would focus your efforts on acquiring that sort of knowledge between now and the fourth quarter of this fiscal year, and provide us with a report that really summarizes specific lessons learned that are applicable to this program, not a general treatise on human factors engineering.

DR. SMITH: Well, I believe that anthropometry question that the MRS and transportation, they were going to have to have some kind of control room to control that process, and I think that some of the principles in those 700 would be, indeed, applicable to that type of control room.

But, yes, lessons learned, we'll take a look at that.

DR. NORTH: As an example, the Board toured the Surrey nuclear power plant where there is, indeed a -- I'll call it a monitored retrievable storage facility out on a concrete pad. The control room -- the controls for this unit are absurdly simple. It's sort of the antithesis of the nuclear power plant control room.

On the other hand, there are some significant issues in terms of if something goes wrong, how fast is it going to be detected? How vigilant are the people? How well has the human factors aspect been worked out? But I would submit, having seen the control room on the same day of that tour, that it's about 180 degrees apart in terms of the issues that I would think to be important.

DR. SMITH: Dr. Price mentioned physiological areas in human factors and I think that that would be extremely important transportation when you have to manage the driver's circadian rhythm, that you don't want to put them going in the wrong direction because the probability of error goes up significantly if it's not managed correctly.

DR. NORTH: Well, that's the sort of issue -- this is Dr. North again -- that the WIPP program has, in fact, had to deal with. They have a rather elaborate plan for dealing with those aspects, and it would seem to me that there would be a lot of common elements.

DR. SMITH: Right, I agree.

DR. NORTH: And you might learn a great deal from what they have done, what they have learned, and maybe what mistakes they have made that they have had to correct.

DR. SMITH: Sure, and we intend to.

DR. NORTH: As a way of planning your budget allocation, it would seem to me extremely important for you to gather those lessons in one place so that you can assure those of us with oversight responsibility and the interested public, that you have, in fact, learned those lessons well, and you're prepared to use them as you proceed forward with your program.

DR. PRICE: Dennis Price. We received a copy of the system safety program draft. Do you have a similar document in human factors planning and program? I'm thinking of Mil H 6855, Amendment 2 type document. Are you working on something like that?

DR. SMITH: I'm not currently writing it. We just haven't had time to do that. We're not -- we're just not there yet again.

DR. PRICE: Since you were involved in the writing of the document on NRC's Human Factors Guidelines for Control Rooms, I take it you were previously with the NRC; is that correct?

DR. SMITH: No, I was not. That was done through Biotechnology and it was managed by Mr. Harold Price.

DR. PRICE: Oh, okay. Well, he's my namesake and I know him well. Do you have an opinion about the role that NRC might play in providing guidelines documents such as the NRC was behind the control room document and how about providing documents and statements of policy with respect to the civilian radioactive waste management and high level waste and so forth with respect to human factors and maybe system safety and other things? Do you have an opinion on it?

DR. SMITH: Well, I assume that whatever regulations they have, for example, that one as well as the development of emergency operating procedures, that they want to see adherence to those regulations.

DR. PRICE: But I think when it comes down to regulations with respect to human factors, for example, those are relatively thin and hard to find. That's what I suspect. The inv small.

But, at this point, you're kind of in a hard spot I guess, as far as rendering an opinion.

DR. SMITH: I do not know what they would expect from Human Factors with regard to granting the license application, if any.

DR. PRICE: Doesn't that make it difficult, when you're not sure what they expect?

DR. SMITH: Yes. It certainly does.

DR. PRICE: It would seem to me it would, if I were in that position.

I have a number of documents that maybe we can get together at a break time and I'll show you some of the list. If it is of any use to you, I would be happy to share it, as far as our resources go out of the DOD arena and the ANSI arena and the ASTM arena. Maybe we can get together and talk about some of those.

DR. SMITH: Okay.

DR. PRICE: So, basically, at this point though, looking forward to some time in the future, Ron, a Human Factors plan coming out, is that --

MR. LEMESHEWSKY: Yes.

DR. PRICE: Okay. All right. I need to ask a question for my own understanding. Where is the expertise in OCRWM? Who is the expert, or where is the expertise in OCRWM with regard to systems safety and with regard to human factors within OCRWM?

MR. LEMESHEWSKY: It's in parts of all organizations. This is Bill Lemeshewsky. RW30 Office of Systems and Compliance, has the lead, but, as the charts that Greg showed you, has project as well as program responsibility. So, the individual projects, repository of MRS will have their own subset of activities and hazards to investigate, as well as Greg and RW30, from the systems side.

DR. PRICE: Is there a name of a human factors special-ist you could give me, if we wanted to talk to, we could talk to in OCRWM?

MR. LEMESHEWSKY: I'm not aware that we have a person individually named for that.

DR. PRICE: How about systems safety?

MR. LEMESHEWSKY: It would reside just within RW32, as a functional activity. We don't have a person specifically assigned.

DR. PRICE: You don't have a person attached to the function?

MR. LEMESHEWSKY: No.

DR. PRICE: Or a person with the expertise in the function?

MR. LEMESHEWSKY: No, we don't.

DR. PRICE: What do you think of that posture or position? Do you feel it's defensible?

MR. LEMESHEWSKY: Limited.

DR. PRICE: Okay. Any other questions at the table?

[No response.]

DR. PRICE: How about questions from the audience, or comments, either way? Be sure and give your name and your affiliation.

MR. SERIG: Dennis Serig from the NRC, and I don't want to address Dennis Price's question, but I do have one of my own, Greg. We have already discussed the fact that Human Factors folks cannot define their own discipline very well, or argue about it. But now we have added a dimension called macroergonomics versus microergonomics. And earlier you talked about microergonomics, the "how to" deals with what a control display relationship looks like, what controls look like that kind of thing.

Is there some overall plan, macroergonomic plan, that has to do with selection of people, training of people, all those broader issues that are coming into play in human factors?

DR. SMITH: That is made more complicated by the fact that the MRS and the repositories -- when sites are not known and depending upon which sites are selected, the state and if we have an Indian tribe that has the MRS, may have a great deal to say about that. So, it may not be so much a matter of building a system with certain people in mind, as opposed to building a system and then training people to run that system.

MR. SERIG: But then you'd need to profile the available folks, at least, to determine what kind of training is necessary, that kind of thing?

DR. SMITH: Well, that will be part of our record will be to determine what kind of skills, what kind of training and teaching will be necessary to be able to operate the system.

MR. SERIG: Thank you.

DR. PRICE: Other questions?

[No response.]

DR. PRICE: I noticed you referenced MIL Standard 1472, which is design. And to a lot of us Human Factors, since it uses the word engineering, has to do with the application. And the greatest solution to many people is design solution. And you indicated that there would be participation in the design process. Are you, as well as coming out with a human factors program plan, coming out with a human factors criteria -- design criteria-type of document that, by both the plan and the criteria, you're able to pass on to your contractors the Human Factors requirements? Is that in the process?

DR. SMITH: Yes. We will be doing that.

DR. PRICE: Any other?

[No response.]

DR. PRICE: I think we might be just a tad ahead of schedule. Is that right?

MR. MILNER: A little bit.

DR. PRICE: That's amazing for us. And we'll take a break right now and come back in 15 minutes.

[Brief recess.]

DR. PRICE: Let's begin again. Our next speaker is Victor Trebules on MRS program status.

[Slide.]

MR. TREBULES: Thank you. My name is Victor Trebules. I'm currently the Director of the Storage Division in the Office of Civilian Radioactive Waste Management. This is my first appearance before the Board.

I am rather new to the MRS program, so I've been on a rather steep learning curve, but I've been with the OCRWM program for a number of years, almost since its beginning.

My prior job in OCRWM was to help bring on board the M&O contractor, and during the presentation, we'll talk a little bit about their role in this program.

[Slide.]

MR. TREBULES: We have highlighted a couple of subjects that we thought you might be interested in on the status of the MRS program. First is our view of the need for the MRS. We'll talk about the various organizations that are involved, including the Office of Civilian Radioactive Waste Management, the M&O contractor, and the Office of the Nuclear Waste Negotiator.

We'll show you how we have broken down the program into various sub-elements. We used a technique that the Department of Energy uses called the work breakdown structure.

We'll talk extensively about the voluntary siting process that we're through, which is perhaps the most interesting, and maybe because it's a unique process to site facilities such as this.

I'll introduce the status of the MRS design, and this afternoon, you're going to hear from Jeff Williams and the M&O contractor in detail on that activity, and just talk very briefly about some of the safety considerations for the MRS.

[Slide.]

MR. TREBULES: We are asked frequently by the potential host and various others, "Do we need an MRS?"

[Slide.]

MR. TREBULES: We have put together four points that we think help explain the role that the MRS plays and why it's an essential element of an integrated radioactive waste management system.

One important advantage that the MRS offers concerns a schedule. As you know, utilities are not responsible for storing spent nuclear fuel. The Congress directed that the Federal Government should take over that responsibility. Because an above-ground MRS can be developed, constructed, licensed, much sooner than an underground repository, the MRS would let us start accepting spent fuel from the utilities much sooner.

The schedule that we're going to discuss shows we think the MRS can be brought on line perhaps by 1998 as compared with the operation of the repository, 2010. So there's at least a ten- to twelve-year acceleration of that schedule. Early w sites. We project that perhaps as many as 60 utilities would have to expand or add additional storage capacity if we don't have an MRS.

With the MRS, we can provide that storage capacity at one central location. We feel that's a much more efficient way to provide that capacity and begin the operation of the waste management system.

Another advantage that the MRS provides is -- there are a number of advantages that pertain to the system benefits, one in particular to nuclear power plants that reach the end of their operating lifetimes. The MRS will permit spent fuel from the shut-down reactors to be transferred to the MRS so that those nuclear plants can complete their decommissioning.

Without the MRS, we'd have in effect a series of mini-MRS' or small MRS' around the country, and those facilities would need continued monitoring and security.

Then once the repository is operating, the MRS provides flexibility and reliability to the system. The MRS serves as essentially a storage buffer between the two shipping points of the system, the power plants and the repository. We feel that the shipments between these two points can be more smoothly coordinated.

Lastly, we feel that the MRS will signal significant progress toward what we consider to be an important environmental goal, and that's leading to the permanent disposal of waste in a geologic repository.

We recognize that there are various ways that you could begin and operate the integrated waste management system, but we feel that with an MRS, this is the best way to begin that process.

[Slide.]

MR. TREBULES: Just to show you where we fit in the overall organization -- next slide, please.

[Slide.]

MR. TREBULES: I work for Ron Milner, who is the Associate Director for Storage and Transportation. I'm in the Storage Division. That's the division that has respon- sibility for the MRS.

The sister division in that organization is under Jim Carlson. I think you'll hear from him later. He's got transportation and logistics.

The Storage Division is broken down into two branches, the Facilities Development Branch and the Project Management Branch. Jeff Williams, who will speak right after me, is the Branch Chief for the Facilities Development Branch. His primary responsibilities are engineering, design and siting for the MRS.

The other branch in that division is the Project Management Branch, and their responsibilities are obviously project management, and they have the leave for environmental and licensing activities.

We expect that once a site is identified, we will very quickly establish a site office at that location.

[Slide.]

MR. TREBULES: And I think you've heard before from Robby Robertson, who is the general manager for the M&O contractor. Most of the support for the MRS program comes from the M&O. We do have some additional support from Weston, our technical management support services contractor for headquarters.

The M&O organization has essentially two main components. The left side of that chart under Art Greenberg is the systems group. Their primary responsibility as it pertains to the MRS is to establish system requirements, and, as a first order for the MRS, that includes spent nuclear fuel receipt, transfer to storage and retrieval. They are also responsible for performing various system studies.

The right side of the organization, under Ray Godman, who is the assistant general manager for operations, has responsibility to implement the various aspects of the Civilian Radioactive Waste Management program, and including the MRS. They are the designers, developers and implementors for that system.

Glen Vawter is responsible for the Storage and Transportation Division, and the MRS is included under those activities.

The M&O, I think you know, is made up of a group of contractors. Most of the support that we get is primarily from TRW, from Duke Engineering and from Fluor.

[Slide.]

MR. TREBULES: The M&O's main responsibilities are to support our office in the negotiated siting process. Of course, the negotiated siting process is the process conducted by David Leroy, and we believe that this is the best path for siting the MRS facility.

Although DOE has the opportunity to conduct a survey in evaluation phase, we are not implementing that right now; we are supporting the negotiator.

If we do have to resort to that process, the M&O would support us on that, but it looks right now that the negotiated process is being highly successful, and we expect that we won't need to resort to DOE's role.

The M&O also is responsible for integrating the work of the various waste management program participants. This is more of a concern or a responsibility in the repository program, where you have a number of other prime contractors, a number of national labs and the U.S. Geological Survey working on the repository program.

As I said, in the case of the MRS, the M&O is our primary support, so they have all aspects under their control.

They have been assigned the responsibility to conduct the MRS design. They also coordinate, as it says here, recommended changes to the program baseline and interface with all affected participants in the development of that baseline. Later on, they will support us in the licensing and environmental compliance activities.

[Slide.]

MR. TREBULES: Some of their key assignments to date are the evaluation of the various storage technologies. They have issued a request for proposals from the vendors for different storage technologies that are already licensed or are near to being licensed, and they will be conducting evaluations of those technologies.

They assist us in outreach support. That includes things like preparing pamphlets, brochures, conducting meetings and various facility tours.

In the area of siting, the primary activity will be the development of the environmental assessment. On that activity so far, they have helped in the preparation of an annotated outline and a management plan, and they are now in the process of developing a technical writing guide that we would provide to the volunteer host through the Office of the Nuclear Waste Negotiator to help the host realize what activities are required in the preparation and completion of the environmental assessment and the depth of information that must be gathered and reported on.

The way we would expect that process to work, we hope, is that the host would play a substantial role in collecting site-specific data, provide that to us in the form of an environmental report, and then we, through the M&O, would complete the environmental assessment, provide that to the negotiator, who then submits that to Congress with the negotiated agreement.

The M&O is also performing various system studies and their impacts on the MRS. These include things like the through-put rate for the waste management system, the effect of a hot versus cold repository and the impacts of that on the MRS, and an examination of the various operating modes based on the different storage technologies that could be selected at the MRS.

They are also involved in various strategic and contin-gency planning. Right now, as I said, they're doing the conceptual design. Later on, they'll be doing the safety analysis report designs, followed by licensing activities. [Slide.

MR. TREBULES: The department uses a concept called a work breakdown structure. This is basically a management tool to assist in managing and integrating either programs or projects and controlling them.

Basically, the program or project is divided into smaller parts until you get down to an element to which you can assign cost, schedules and performance parameters.

[Slide.]

MR. TREBULES: For the MRS program, which in the department is called a major system acquisition, MSA, we have broken it down into these three subprograms or elements: the monitored retrievable storage facility; the transportation system; and waste acceptance.

The major system acquisition process in DOE is a formal process of review and approval by what's called the Energy System Acquisition Advisory Board in the department. It's chaired in our case by the Under Secretary of Energy. The acquisition proponent for our facility is John Bartlett, and the board is made up of the other senior members of the Department, and they will review and approve all subsequent stages of the program through to completion.

[Slide.]

MR. TREBULES: The next level of breakdown for the monitored retrievable storage facility is sort of complicated, but it looks like this. We are in the process of going through a change to more closely align it to the breakdown for the repository program. They are very similar. In some cases where we don't have corresponding elements, that's why you see the Reserved column.

Let me just quickly go through these and tell you what's included in these main elements.

Systems Engineering would include things like systems integration, development of design requirements, various systems analyses, various system studies, life cycle cost analyses and configuration management activities.

Dropping down to the third line there, Site Investigation, that includes site suitability work, site assessments, various site surveys, site characterization and land acquisition.

The MRS Facility includes the design activities, the conceptual design, the safety analysis report design, the final procurement design, construction support, construction of the facility and pre-operational testing.

Under Item 3.1.5, Regulatory, that would include things like performance assessment, requirements review, prelicense application activities and the license application submittal.

If you drop down to 3.1.7, Engineering Development, that's sort of a carry-over of various research and development projects that we've been conducting, and that examines things like a prototypical consolidation demonstration program, examination of non fuel bearing components, and behavior of spent nuclear fuel in long-term storage.

If you drop down to 3.1.9, project management, it includes things just like it says, management and integration activities and various project control

functions.

Under 3.1.10, Financial Assistance, one of the more active areas of the program right now -- that's where we have the feasibility grants to the host to study whether or not they want to host an MRS. Later on, under Negotiated Agreement, it would include the financial assistance provisions of an agreement.

Let's see. If I drop down to 3.1.12, Information Management includes things like records management for the program.

Environment Safety and Health, 3.1.13, includes activities like the development and completion of the environmental assessment, the environmental impact statement and permitting activities for the project.

Under Institutional, that includes communication and outreach activities.

Support Services includes things like training, equipment procurement, maintenance, and graphics support.

[Slide.]

MR. TREBULES: Since I've been on the program, most of my activities have been associated with supporting the Office of the Nuclear Waste Negotiator in this voluntary siting process. It's a new activity for us. It's probably a new activity for the country, and although we have the authority to conduct a survey and evaluation phase, as I said before, we believe that the best path of obtaining a site for the MRS is through the Office of the Nuclear Waste Negotiator.

To that end, we have developed a Memorandum of Agreement with the Office of the Negotiator and we are providing him information under the terms of that agreement, and we are also processing the feasibility grants to the prospective hosts.

[Slide.]

MR. TREBULES: There are a lot of different players. Again, we like to look at ourselves sometimes as the center of the universe, and that's not necessarily the case. As I said, we do get support from the M&O. We report to Congress on the status of the program and, of course, we try to obtain funding to continue it, from them.

The negotiator has the key activity during this stage of the process. He's the primary interaction with the grant applicant and the other interested parties. The utilities and vendors are also involved in these activities.

[Slide.]

MR. TREBULES: Just to highlight the role of the negotiator, I'm sure you all know that's David Leroy who is appointed by the President. He's got offices in Boise, Idaho and Washington, D.C. He was originally appointed late during his term in August of 1990, and the term was to expire, I think, in January of '93.

He has requested, and I think Congress -- or at least the Senate -- has acted to extend his term of office for one year to January of 1994.

[Slide.]

MR. TREBULES: His responsibilities sound simple, but it's become quite a challenge; to find a state or Indian tribe willing to host an MRS at a technically suitable site under reasonable terms. Again, use the primary contact with the grant applicants and other interested parties.

He's got to balance a lot of concerns and issues, sometimes competing between both us, the grant applicant, other interested parties. He's got to consider the desires of the host with the needs of the program and the regulatory and legislative aspects.

Ultimately, we hope he'll be successful in negotiating the terms and conditions of an agreement that he would submit to the Congress, and if that process is successful, he would submit that to the Congress with the accompanying environmental assessment.

[Slide.]

MR. TREBULES: He has conducted a number of activities to date. He has sent introductory letters describing the role of his office and the availability of feasibility grants. He's developed, besides a memorandum of understanding with us, one with NRC.

He has conducted numerous fact finding trips, both in this country and abroad, and he's provided much information to the prospective hosts, some of which we have developed and provided to him. Later on, we'll show you a table of the success he's had to date, and I think we're quite pleased at what's occurred so far.

[Slide.]

MR. TREBULES: Our role in the program: Of course, our long range goal is to develop and operate -- and that means the -- the development part, of course, means design, obtain the license for and construct the MRS and operate it, with the goal of waste acceptance at an MRS by 1998, disposal in a repository by the year 2010.

Besides the design work, we're actively engaged, as I said, in providing support to the Nuclear Waste Negotiator. Siting is probably the critical element for the program right now.

Obviously, we have to report to Congress on the progress of the program, on the expenditures of the program, and that's all geared to seeking additional funding to keep it going. We are actively engaged in administering the feasibility grants. We have conducted activities to facilitate the preparation of the environmental assessment.

Later on, if all this is successful, our role will be to implement the terms of the negotiated agreement with the host.

[Slide.]

MR. TREBULES: Some of the more recent accomplishments were the development of preliminary site requirements document that we made available to the negotiator that, in turn, was provided to the hosts; developed various technical background information describing the MRS, things like the number of people it would employ, the various technologies that could be used.

We developed aa variety of pamphlets, brochures, fact sheets, again, administering the grant program. We've initiated the conceptual design activity, again, through our agent, the M&O contractor. We've initiated development of the MRS license application and the environmental assessment.

[Slide.]

MR. TREBULES: Many of our staff have been on a number of nuclear station ISFSI or Independent Spent Fuel Storage Installation tours. I had the opportunity to go to the Oconee reactor in South Carolina, also to the Fort St. Vrain facility in Colorado.

As Dr. North mentioned, they are remarkably simple facilities, when you get to see them, compared to the operations of a nuclear power plant. I was really impressed, you know, in touring those facilities, when you see actually how clean and how simple the operations are.

We also have met with various groups from the prospective hosts. We had the opportunity to meet with the delegation from the Mescalero Apache Tribe who came to Washington as part of their tour of some of the nuclear spent fuel storage installation facilities.

And we have met with the Independent Citizens Investigation Committee from Grant County, North Dakota.

[Slide.]

MR. TREBULES: I think Congress anticipated the concerns, the reluctance on the part of the potential host to even consider hosting a facility of this nature, so they provided in the amendments act various potential benefits to the host to make it more attractive to do so.

[Slide.]

MR. TREBULES: I just thought we'd list some here and quickly go through these.

One option that the host can consider is in essence a review panel to participate, to oversee the operations of the MRS.

There are obviously various economic incentives for a host, including just the jobs created, and we have estimated depending upon the design of the facility and the way in which it will be operated the number of jobs for example during construction could be as many as 500, during operation of the facility, again depending upon the technology, it could be as many as 350.

There would be local expenditures for materials, construction materials, purchases of equipment, such things as desks and computers, various services. The influx of people to work at the facility would obviously impact the housing markets. There would be a corresponding inflow of money into local businesses.

[Slide.]

MR. TREBULES: The negotiated siting agreement could include things like direct financial assistance and if you are familiar with the provisions of the Nuclear Waste Policy Act, particularly those that pertain to the DOE survey and evaluation phase which provided $5 million to a host prior to receipt of spent fuel at the facility or $10 million once spent fuel did arrive at an MRS facility, that's sort of a consideration, maybe a baseline for direct financial assistance in a negotiated setting agreement.

There would be improvements to the infrastructure.

Basically, I think Congress intended that any impacts on the surrounding community would be paid for by the program. Anything that necessitated an upgrade of highways, railroads would be borne by the program. It wouldn't be a burden to the local community.

The agreement could include activities related to other environmental improvements, cleanup of existing air, water or waste problems. It could provide educational assistance. It could provide training assistance to the local work force, health care, various recreation programs.

Since this is a federal facility, and typically federal facilities do not pay local or state taxes, there is a provision whereby the MRS as with the repository would make payments equal to taxes to the host community and state.

[Slide.]

MR. TREBULES: Let's go on to the next slide.

[Slide.]

MR. TREBULES: The grant process that we have developed to assist the negotiator was broken up into two phases. Phase I of the grant process basically provides for up to $100,000 for six months of activities to allow the host to study waste issues, the role of the MRS at least so we understand the system that we are trying to develop and how the MRS fits into that system, and to determine whether or not they want to proceed with the process.

The original deadline for that was the end of last year. We understood that some additional hosts who hadn't had time to file their applications may need some additional time, so that was extended to March 31st, 1992.

[Slide.]

MR. TREBULES: This is the status of the Phase I grants.

The first grant request we received was from the Mescalero Apache tribe of New Mexico and that grant was awarded.

Second was from Grant County, North Dakota, and we awarded that. That was submitted by the three county commissioners from Grant County, North Dakota.

The grant request from Fremont County similarly submitted by the county commissioners was awarded.

We also acted on the Yakima Indian Nation request.

We are presently evaluating a request from the Prairie Island Indian Nation in Minnesota. We asked them for additional information on the uses and the size of their reservation and we received that and we're now processing that grant request.

We awarded grants also to the Sac and Fox and the Chickasaw Indians in Oklahoma.

One interesting aspect of this process for me was learning the differences in the types of jurisdiction that Indian tribes can have over land. There are reservations. There are lands held in trust. It gets to be a very complicated issue.

Oklahoma was particularly complicated. It's unique in all the nation. They don't have Indian reservations in Oklahoma. They have other provisions, and if you will look at a map of the Indian lands in Oklahoma there are probably more individual Indian tribes in Oklahoma than in any other state, so we spent quite a bit of time with the Bureau of Indian Affairs in the Department of Interior trying to sort that out. It's not an easy issue to address -- I guess that's the point here. Just thought I'd throw that in.

[Slide.]

MR. TREBULES: Phase II grants would provide additional money in two different subphases or two different parts.

The first part would be essentially a continuation of Phase I activities to conduct public information activities. That would an additional $200,000.

At that point we would request from the Governor of the state or the head of the Indian tribe a fairly firm commitment that they wanted to enter into what we called credible formal discussions which could lead to a siting agreement. We have not received any Phase II applications to date.

The application deadline for that process is June 30th, 1992.

[Slide.]

MR. TREBULES: To show you how this relates to the schedule, if we're to meet 1998 we have laid out these interim milestones for the target dates. The program has been characterized in the past as proposing I think the term is aggressive, success-oriented schedules. This may fall into that category. We think it is doable if a variety of things occur.

We would like to be able to initiate site specific development of the environmental assessment in August of '92 of this year, to have a site identified near the end of this year, the beginning of next year, complete the development of an environmental assessment or possibly more than one environmental assessment if we are fortunate enough to have several sites that go through that process, to receive Congressional approval in the middle to the end of next calendar year, to submit the safety analysis report to the Nuclear Regulatory Commission in 1994, to be followed a year later by the license application and hopefully receive NRC approval of that in '96, so we could begin operation of the MRS in 1998.

In support of meeting these target dates, we have developed a number of initiatives which we think give us a better chance of expediting the licensing process.

I have not been party to them, but our staff has been involved with discussions with NRC, a number of interactions designed to identify and resolve issues in the pre-licensing timeframe.

These interactions are modeled or based on actions that have been taken in the repository program, and they include things like management meetings, technical meetings, technical exchanges, and various site visits.

We are also using a technique that we have developed whereby we produce annotated outlines from the license application.

The annotated outline represents successive iterations of various material that would be contained in the Safety Analysis Report and the remainder of the license application.

The first iteration of the annotated outline has been provided to the NRC staff and to other affected parties.

[Slide.]

MR. TREBULES: On the environmental assessment, we have completed a draft management plan and an annotated outline, and we are currently in the process of developing what we call an environmental assessment technical guide.

The purpose of this technical guide would be to provide the prospective host with a better understanding of the kind of information and the level of detail of information that would be included in the environmental assessment, to help them in their activities to collect that data, which they would provide to us in the form of an environmental report that we would fold into the completion of the environmental assessment that goes to the negotiator.

Some of the site independent portions of that technical guide have already been completed in draft form, and the guide describes what would be included in the site-specific portions.

The next step, of course, is to wait until we have an actual site identified, and we're all hopeful that will be soon.

[Slide.]

MR. TREBULES: In the area of MRS design, which you'll be hearing much more about later this afternoon, we have initiated the conceptual design, and that's to be completed by the management and operating contractor in May of this year.

[Slide.]

MR. TREBULES: The conceptual design basically serves as the reference for the cost and schedule baseline. In parallel with the development of the conceptual design, we are developing requirements documents that serve as the technical baseline.

After the site is selected and we complete our evaluation of the various technologies, the later stages of the design process can be completed, and we anticipate this will be an iterative process leading to continuing optimization of the design throughout that whole stage.

[Slide.]

MR. TREBULES: A couple of features about the MRS and independent spent-fuel storage installations that we think essentially make our job somewhat easier:

The short-lived radionuclides not present in significant quantities in five-year-old fuel to some extent facilitate the design process. Obviously, the facility that we're talking about is rather benign. It's relatively low hazard potential compared to nuclear power plants.

There is essentially no mechanism, no high-energy process, no high-temperature processes that could cause a large release of radioactive material.

In terms of industrial safety, we are obviously looking at the experience of the nuclear power industry, conventional power plant industry, and we think that the working environment presents a relatively modest risk, and that basically completes my presentation, and I'd be happy to try to answer any of your questions or, if I could, to defer them to my superior and predecessor.

DR. PRICE: Thank you.

DR. CHU: Are the functions of the MRS to be negotiated?

MR. TREBULES: We have identified what we consider to be the essential functions.

That's to receive spent fuel, to transfer it to storage, essentially to leave it there until it would be retrieved for shipment to the repository, and of course, during that entire time, we would be monitoring the spent fuel to make sure there are no problems.

It's a very simple list. I don't know how much room there is for negotiation or what changes you could make to that. I think it's a fairly straightforward concept.

DR. CHU: Are you envisioning a channeling function in the sense that fuel will be coming in from various reactor sites and then they will be transferred, perhaps, into larger rail casks, as, once upon a time, was DOE's intention and plan?

MR. TREBULES: That's our reference design right now.

DR. CHU: That is still your reference design.

MR. TREBULES: Right.

DR. CHU: Is that subject to negotiations?

MR. TREBULES: I think the answer is yes. I think everything is subject to negotiations. Fortunately, we have a relatively simple system. We have a number of ways in which we could go.

We want to try to make sure we accommodate the concerns of the host, if they have any particular ideas or concerns that they want to address, and we'll try to be responsive to them.

DR. CHU: So, if the host would prefer a passive storage function with no channeling capabilities, that would be to be negotiated.

MR. TREBULES: I guess we'd have to evaluate that to make sure it fits into our concept of how the integrated waste-management system is supposed to operate and maybe look at the functions that could be deferred to the repository, but I think the answer is everything is negotiable, and we'll entertain whatever concerns that the host might have.

DR. CHU: That's why I'm asking. For example, a passive store-only configuration would not be part of your integrated concept.

MR. MILNER: If I could add a little bit to that, certainly the negotiator, in his dealings with the host, is going to operate as he sees appropriate, but I think, during that process, he is also going to be looking at the implications of desires, constraints, whatever, and how it impacts the utility of the MRS facility within the integrated system.

I know that's kind of an all-over-the-place answer, but there are a lot of things that have to balance through that process.

DR. PRICE: The 1998 date is based on the need to start operations by contractual arrangements which you already have with the utilities. Isn't that correct?

MR. TREBULES: Yes.

DR. PRICE: If the utilities agreed, would waste acceptance on-site constitute -- for example, if you were to accept waste on their site, would that constitute start of operations, or do you have any feel for that?

MR. MILNER: That's not currently the baseline for the program.

DR. PRICE: Yes, I understand that. I'm just asking whether you know the answer.

MR. MILNER: Hypothetically, that could -- if we took title on-site -- could be considered the start of operations, but I don't think it's something that we're really looking at very much at this point.

DR. PRICE: Sure. I understand it is probably not getting a close look, but I was curious to know whether or not, if that were an agreement you obtained with the utilities, that then that would be a satisfactory answer to the 1998 date from a contractual standpoint.

MR. MILNER: It certainly could, potentially, but for equity reasons and so forth, I'm not sure whether we'd build storage on-site, the utilities do and so forth. There would be a lot of issues to work out.

DR. PRICE: Sure.

DR. VERINK: As a followup on that, if I understood what you said, if any of the power plants are decommissioned, I understood you to say that the fuel stored on that site would become the property or would be turned over to DOE. Is that right?

MR. TREBULES: No. What I was suggesting is that one of the advantages of an MRS would be to allow decommissioned reactors to get rid of their spent fuel, to ship it to the MRS, which would allow them to decommission that plant earlier.

If they shut down the reactor and still had responsibility for spent fuel on the site, they'd have to maintain a staff to continue to monitor it and check the security aspects of it. The MRS would allow decommissioned reactors to fully decommission a site.

DR. VERINK: So, you wouldn't consider taking title to it on-site and using the decommissioned reactor site.

MR. TREBULES: It's not a question I could answer.

MR. MILNER: Certainly, one of the things you have to look at is the whole waste-acceptance process and the queue, so to speak, and where those shut-down reactors might be in the queue.

DR. PRICE: Is the Phase 2 funding you mentioned of $3 million compared with $100,000 Phase 1 funding for siting -- is the Phase 2 funding limited to those who have participated in Phase 1, or is there any such limitation?

MR. TREBULES: It's a two-part question.

The Phase 1 funding did not require a host to identify an area or a site for the MRS.

It basically said it allowed them to study whether or not they were interested in proceeding with the process, and it involved mostly public information, public education activities to assess the political environment.

During Phase 2, as we currently have identified, we would require, at the end of that process, to have a site identified. In fact, at the end of Phase 2, there should be a negotiated agreement that identifies the site to be submitted to Congress.

In answer to your second question, an applicant is not required to go through Phase 1 prior to going into Phase 2. An applicant could go directly to Phase 2 if they chose to do so.

DR. PRICE: Any other questions?

[No response.]

DR. PRICE: Any from the audience?

MR. STUART: My name is Ivan Stuart. I'm with Nuclear Assurance Corporation in Atlanta. I'm questioning you on behalf of the North Dakota potential MRS host.

As I look at your charts here, page 32, you talk about initiating site-specific EA development in August of this year with a site identification in December, and on 34 you're talking about developing a draft technical guide.

I was wondering what you might be able to say on what you expect of a host in terms of what he's done to identify his site by the December date.

That is, how much environmental kinds of information would he need that you would think that is a viable, realistic site to be considered?

[Slide.]

MR. TREBULES: Okay. Let me try to answer the question.

The plan that we have laid out requires or is targeted to having produced environmental assessment to accompany the negotiated agreement that goes to Congress.

During Phase 2, we would hope that the host would identify, maybe whittle down from specific areas to a specific site. I think the Nuclear Waste Policy Act directed that the environmental assessment just include available data.

In the writing guide that we are developing, we identify the kinds of information that is typically included in environmental assessment and we suggest the level of detail to which that data needs to be collected and incorporated into the environmental assessment.

MR. STUART: When do you think that that guide will be out so that a host could start looking at it?

MR. TREBULES: It's one of the things I worked on yesterday afternoon. We hope to make it available to the office of the nuclear waste negotiator in a very short time. I mean that's on the order of weeks.

MR. STUART: Thank you.

MR. HALSTEAD: Bob Halstead, State of Nevada.

I had a question that really is kind of a followup to the second one about the guidance for the transportation infrastructure data that will be considered in the EAs.

One of the things that's different about MRS siting this time as opposed to last time is because you're seeking volunteer sites.

We're not really, in an early-on phase, evaluating these sites on their transportation access, both for receiving spent fuel from reactors and for shipping it to a repository.

Those of us who are familiar with some of those sites that have been volunteered already know that they don't appear to meet the desireable access to mainline railroads, interstate highway, and inland waterway system that we looked at before.

I was just curious, could you give us kind of a general idea of how you're approaching the transportation issue and also whether you've given any thought to the kind of funding that might be needed for upgrades of transportation and the way that would be dealt with institutionally?

MR. TREBULES: I hate to defer, but I am in no way a transportation expert. I would rather not even try to address that for fear of saying the wrong thing.

Ron or Jim?

MR. HALSTEAD: Again, I do want to clarify, I'm thinking more in terms of the process that will be used for evaluating those issues for any sites that go forward and not just getting into route-specific or site-specific issues.

MR. CARLSON: This is Jim Carlson. I'm the Director of the Transportation and System Logistics Division, working for Ron Milner.

Specifically, the detailed planning on how it would be evaluated I don't think has been done. What we would do is look at, similar to what's been done in the State of Nevada, alternative routes to get to a mainline rail or to the interstate.

The specific cost analyses and studies to be done would probably be done by the -- probably the local folks. There hasn't been a lot of detail, but it would be evaluated in the preparation of the environmental assessment.

I'm not sure I'm getting to your process issue. Do you have --

MR. HALSTEAD: Well, I think you've picked a particularly bad example, Jim, to reference, because with Yucca Mountain, you know, the options are not very -- from a feasible and cost standpoint, they are pretty difficult, and I guess what I'm trying to get at is in terms of the evaluations you're planning to do even at this phase.

Let me rephrase the question. Are you doing any transportation analyses right now on the sites that we're in to help you determine what types of transportation analyses you're going to have to do for the EA?

It's pretty apparent, from looking at these sites on the maps, that a couple of them have maybe not-too-difficult transportation access, but most of those sites either have great distance from the current storage load center or they lack access to mainline railroads, interstate highways, and the inland waterways, and I was curious how you see those issues shaping up.

MR. TREBULES: Could I try that? In answer to your question, are doing any transportation analyses of the sites we are -- do you mean the sites that come forward during Phase One? I think the answer is no. Because we're not pre-judging whether or not any of those potential hosts are going to want to go into Phase Two.

They have the opportunity to drop out of the process with no obligation at any time during Phase One.

MR. HALSTEAD: Okay. So, you're not doing any preparatory analysis of those specific site to help you identify the transportation issues to be addressed in the EA?

MR. MILNER: No. Excuse me, Ron Milner. It's far too premature on all of those grantees. They're all in Phase I at this time. None of them have decided, at this point, that I'm aware of to go farther in the process. And it's just too premature.

MR. HALSTEAD: Okay. Thank you very much.

DR. PRICE: Any others? Dennis?

MR. SERIG: Dennis Serig from the NRC. You mentioned that during construction, you expected about 500 workers on the site and during operations about 350.

MR. TREBULES: Again, depending upon the particular technology that's involved. There's a rather wide range, but those are sort of nominal numbers.

MR. SERIG: Given those kinds of numbers, does that include all categories of workers: Administrative, actual operators of the facility, safeguards folks?

MR. TREBULES: The 350 number for operation?

MR. SERIG: Yes?

MR. TREBULES: I believe the answer is yes. It includes the management staff, the actual operators, the radiation physicists, the number of -- considering the number of shifts we anticipate to operate too.

MR. SERIG: Is there an expectation that most of those will come from the host site and surrounding communities?

MR. TREBULES: My preference is that most of them should come from the local region. I think that's one of the benefits that should be available to the host.

MR. SERIG: During the Phase Two operation, is there some kind of profiling of the folks available within a reasonable radius of the site, and looking at issues that might affect the reliability quality of the workforce? Is that foreseen as one thing that you will be working on?

MR. TREBULES: I would assume that would be one of the issues that the host would want to examine. We have laid out some very general requirements as to what goes into Phase Two. We don't know specifically what the host would want to study, but I would think that would be clearly be one of the things.

MR. SERIG: We might be looking at a very short time-frame, depending on the kind -- if there was some determination that the local workforce could eventually do the job, but needed to be upgraded in some way, we're really looking at a pretty short timeframe. I just wondered whether that's an integral part of your plans at this time?

MR. TREBULES: Well, for operation, even with our schedule, which admittedly, could be considered optimistic, 1998, I think there would be sufficient time, if everything goes according to plan, to provide a workforce six years from now.

The construction workforce, you may have to initially, at least, bring in some outside workers. But, I would think we would want to try to be responsive to the host community, and provide as many jobs in that region as we could, if that was one of their interests. I can't imagine that it wouldn't be. But, that's what we'll try to do.

MR. SERIG: Okay. Thank you very much.

DR. PRICE: Any other questions?

[No response.]

DR. PRICE: If not, I'm going to suggest, on our lunch break, that what we do is plan, instead of bring back here at 1:30, plan to be back here at 1:15. We're leaving earlier for the lunch break, and we'll try to get back earlier, and then, if we end up at the end of the day, we'll be earlier getting through at the end of the day.

[Whereupon, at 11:35 o'clock a.m., the above-entitled hearing was recessed for lunch, to reconvene at 1:15 o'clock p.m. this same day.]

A F T E R N O O N   S E S S I O N

[1:15 p.m.]

DR. PRICE: Let us begin. It's becoming quiet out there, so I took that as my cue. It's, by my watch, 1:15, and we'll continue with Jeffrey Williams on the MRS design approach.

[Slide.]

MR. WILLIAMS: Thank you, Dr. Price. I'm happy to be here for the first time before the Board. My name is Jeff Williams, and I've been working on MRS issues for about three and a half years. Although the MRS project was really only re-established about a year and a half ago. However, we had still been working on MRS issues prior to that.

Vic Trebules earlier explained my role in the organization, which is primarily the branch chief for the design and siting of an MRS. And as Vic explained, our role in siting is primarily to support what the negotiator is doing right now.

Sorry to disappoint you a bit, but I'm not going to provide a lot of details on the design, because we're still in the middle of the process right now. The design won't be delivered by the architectural engineer, which is Duke Engineering, until May 1st. They haven't gone through a technical review or a management review at DOE. However, I'll try and give you some insights as to what we're doing.

[Slide.]

MR. WILLIAMS: Basically, I want to give you some background on the MRS and how it's evolved through the last few years, talk a little bit about storage technologies. I just learned today that some of you attended the INMM meetings. So, this might be a little old for you. And then I'd also like to talk about how the storage technologies -- how we're going to incorporate existing technologies into our design through a bid process. Finally, I'll give you a little bit of information, what I can, on the MRS design.

[Slide.]

MR. WILLIAMS: The design was officially started in April of 1991 by Duke Engineering. However, that was mostly -- for the first six months or so, they were staffing up and becoming familiar with the storage technologies, and they really didn't get into the design until about October/November into some more details.

[Slide.]

MR. WILLIAMS: First, I'd like to go through some of the background and the history of the MRS.

As probably you know, prior to the passage of the Nuclear Waste Policy Act, the need for storage was recognized. The utilities, reactors were designed primarily with reprocessing in mind. Their spent fuel pools were small, they were planning to ship from their spent fuel pools to reprocessing facilities.

When this concept died, there was a recognized need for some sort of interim storage. As a result of that, when Congress passed the Nuclear Waste Policy Act, in 1982, they directed the department to report to Congress on the need and feasibility for an MRS, which the Department did in 1985.

In developing that need and feasibility study, we went through several evaluations of concepts for storage. PNL is Pacific Northwest Laboratories. They looked at various storage concepts, in the 1983 timeframe, the things that were, at that time mostly conceptual designs.

And then, in 1985, we finalized our report to Congress, and it was backed up by a Parsons conceptual design report. I'll give you a little bit more detail on that. It was a rather large facility, an integral MRS facility that had a lot of functions to it, consolidation, the ability to package, place a waste package on it.

And, subsequent to that, there was a lot of controversy. This was designed to a site in Tennessee. And, as a result of the redirection of the program in 1987, the Nuclear Waste Policy Amendments Act was passed which actually authorized an MRS. It invalidated the -- our report to Congress from 1985, and it authorized an MRS, however, it placed several constraints on the MRS. First, of all, it placed a capacity on the MRS, and then it linked the development of the MRS to the repository schedule.

As a result of that Act, DOE decided to reassess the need for an MRS, and we started the system studies of 1989. And in those system studies we, again, looked at the MRS design. We went back and looked at the 1985 design, and took another look at that. And then we also evaluated the storage concepts again.

Since -- between 1983 and 1989, there have been a lot of activity in terms of testing at DOE facilities, and also in the utility industry, that provided some important information we thought to the storage concepts.

Then in 1990, as a result of a schedule exercise, we, once again, modified the design of the spent fuel handling building and, lastly, now we've got Duke Engineering on board, and they're preparing a conceptual design report, based on the past information, based on the utility experience. And that's scheduled to be delivered to DOE in May of this year.

[Slide.]

MR. WILLIAMS: We go back a little bit and talk just briefly about the 1985 conceptual design which Parsons did, directed by Pacific Northwest Laboratory. And, basically, their concept was that all fuel would be handled at the MRS. It was an integral facility. There was a lot of discussion about a Western Strategy, which means that the western fuel could be shipped directly to a repository, however, a lot of those details hadn't been figured out exactly.

The concept would consolidate fuel and, at the same time, we initiated an R&D program for consolidation of fuel. We first started doing it on a single element at a time, single pin at a time, and then we moved to more of a mass production sort of demonstration to support that.

The design, at that time, could also, like I said before, place the waste package on at the MRS. The storage capacity was 15,000, which was a result of discussions with the state of Tennessee. And we would store the consolidated fuel in large concrete casks. These casks that we had designed at that time, were bigger than the concepts that are being considered now. This was also an unventilated concrete cask, which subsequent analysis showed may not have the thermal capabilities that are desired.

And then, lastly, we would ship to a repository in large transportation casks. This is larger than the transportation casks are being designed today, in what we call the Initiative One.

[Slide.]

MR. WILLIAMS: The next thing that happened, as I stated before, as a result of the passage of the Nuclear Waste Policy Amendments Act, was that we went back and we reevaluated that 1985 design after the MRS was authorized by Congress. We did these MRS system studies that took about a year and a half to complete.

They were very detailed. We evaluated. Actually, we laid out about 2500 alternative strategies in those studies, and we -- by varying what the MRS would do, we considered not having an MRS. We considered what we called Store-Only MRS, which is also a basic MRS which had no consolidation or waste packaging. We looked at an MRS that did do consolida-tion.

And we also updated the previous designs. We varied the start times of the MRS. It was actually a very complicated study. It had several different contractors involved, and the bottom line was, we evaluated it from a cost standpoint, primarily, and out of it, we came to the conclusion that we should not do consolidation at an MRS at this time, and that we would handle intact fuel, and that the system benefits are provided if we have an unlinked MRS, in other words, unlinked to the repository schedule.

[Slide.]

MR. WILLIAMS: Then in 1990, we were again evaluating the schedule. At this time, the repository was still scheduled to come online in 2003 and we did a bottoms-up look at the whole schedule, the repository and the MRS as well, and as a result of that, the earlier designs we had on an MRS, it took about three years to complete the building of an MRS.

So,what we did was, we established an objective to simplify the MRS to improve the schedule. So, in 1990, we asked Parsons again to take another look at the design and they built -- or, they designed a simplified MRS transfer capability which subsequently reduced the schedule from 30 months down to 15 months for construction.

The size of the facility was reduced, as well as the through-put. They maintained the concrete cask storage method.

[Slide.]

MR. WILLIAMS: Next, I want to talk about the existing storage technologies. The reason why I want to do that is that DOE has made a decision that we're going to use existing technologies to the extent practicable. Right now, all the reactors that are out there use the wet pool storage concept.

There's been four reactors that have licenses for dry storage and each one of those four uses a different dry storage concept. There are other reactors that are in various stages of licensing and they're considering even other types of dry storage.

The first one here, most people are fairly familiar with, and this is the wet, in-pool storage. This takes place at all the installations. We've got 35 years experience at nuclear reactor sites. Basically, you have a concrete pool with a stainless steel liner. The water is chemically treated and provides heat removal and radiation shielding.

Now most of the reactors have gone to storing their fuel in high density racks; in other words, they have re-racked to get as much spent fuel in the pool as possible. The PWR reactors have borated water. This is an active system. The water must be filtered and the chemistry of the water must be maintained.

There's been a few demonstrations of consolidation in the pools. I believe the last demonstration was in 1987 and it doesn't appear that there will be a whole lot more of that right now. It appears that the dry storage concepts are actually cheaper than consolidation, but that's up to the industry.

[Slide.]

MR. WILLIAMS: This is just a schematic of what a pool looks like. I's sure you're all pretty much familiar with it. The water level provides the shielding. You handle fuel above it from a crane on a handling bridge.

I'm going to have a couple pictures here to provide some color to the presentation of some spent fuel storage pools.

[Slide.]

MR. WILLIAMS: I think there's one more. Okay.

[Slide.]

MR. WILLIAMS: The next concept is what we call the horizontal concrete modular storage. It's also known as NUHOMS. This is at existing or planned installations. H. B. Robinson in South Carolina implemented this in a demonstration with the Department of Energy.

At this reactor, they store PWR spent fuel assemblies. They store 7 of them in a canister in a horizontal mode. I'll show you a picture in a minute.

It's also at the Oconee reactor in North Carolina, a Duke reactor, and at Calvert Cliffs, the ISFSI is under construction. Also, the Brunswick reactor is planning to use this concept.

Basically, the design features are, you have to load the canister in a pool. Then you transfer the canister via a transfer cask. You place the whole canister in a concrete module. There's an air channel that provides for heat removal. That's so there -- there's a requirement to maintain the spent fuel cladding at below 380 degrees Centigrade.

There's also a concern for the temperature of the concrete that surrounds the canister. So, the air passage allows for those temperatures to be maintained. The canister is not currently licensed to be transported.

However, I understand that Pacific Sierra Nuclear may be moving towards trying to license that canister so that you can remove the canister from the concrete module and go ahead and transport that as is, without taking it out of the canister. The alternative to that would be that you would have to remove the canister from the concrete module and remove the spent fuel assemblies in the pool and place them in a transport cask.

[Slide.]

MR. WILLIAMS: Here is a schematic of that where you can see the primary features. You can see the canister. Actually, this is the transfer cask. The canister is inside of that, which is pushed out into this concrete bunker here.

There's an air flow in, around the canister, and back out. They're really pretty simple systems. The canister is not really a shielded canister, so it has to be shielded through the concrete. It does have shield plugs on either end of it which facilitate the loading.

[Slide.]

MR. WILLIAMS: This is a picture at Oconee which -- this one here shows their first set of storage modules and now under construction is their second set. I think what's interesting about that is, if you have this sort of concept at an MRS, you can see that you can be storing spent fuel. These a to build while the spent fuel is stored there.

[Slide.]

MR. WILLIAMS: This shows what the -- this is the PWR canister which fits 24 elements in there, and this is what is loaded in the spent fuel pool.

[Slide.]

MR. WILLIAMS: Lastly, this is how they load it. This is the transfer cask that's taken into the reactor buildings over here where they place the canister inside the transfer cask. The cask is brought over here, it's lined up through a hydraulic system and then there's actually a ram that pushes the canister into the concrete module.

[Slide.]

MR. WILLIAMS: Metal casks are really the most mature storage concept. They've been around since 1984, and I think somebody here mentioned that they were -- that the Board went to Surrey. There are several types of them, the casks are cast, the Trans-Nuclear, Westinghouse and Nuclear Assurance Corporation, these have even been certified under what they call 10 CFR Subpart K, which -- what that means is that the reactor does not have to come in and get a separate license if they choose to use one of these certified metal storage casks.

At Prairie Island reactor, they also are planning to go to a metal storage cask. It's a little bit different. It's a 40-element cask which is larger and the design feature here is, again, you have to load them in a pool. Basically, you place them on a concrete pad, and the heat is removed by convection.

They're thick, metal-walled casks made of forged steel, nodular cast iron or lead and stainless steel. In addition, there's a dual purpose cask which is not licensed today, however, they're similar and Nuclear Assurance Corporation and a few other companies are in the process of trying to license a storage and transportation cask.

[Slide.]

MR. WILLIAMS: Here's a schematic of one which shows the spent fuel, the basket in the middle, a neutron shield around it, usually of a resin or polyethylene. It's got a lid which as a neutron shield and metal. It's got the trunnions down there on the bottom to help with the lifting. It's about 16 feet high and about 8 feet in diameter.

Typically, the arrangement, as you've seen at Surrey, is on a concrete pad.

[Slide.]

MR. WILLIAMS: Here is a picture at Surrey when they only had four casks there. You see that it's a pretty simple setup. This one is with some additional casks.

[Slide.]

MR. WILLIAMS: The next type, the vertical concrete storage cask, this is the type that our designs in the past have been based on. We tested one at Idaho National Engineering Lab, and Sierra Nuclear has -- well, they were the ones that did the design that we tested at Idaho, and they're presently constructing an Independent Spent Fuel Storage Installation at the Palisades reactor.

They have a topical report approved. They don't yet have a license from NRC. There's a different variation of a vertical concrete storage cask that's called the Constar by Babcock and Wilcox, and it has a different heat removal. It holds more assemblies and it's made out of a special type of concrete.

I don't know the details on that. They've submitted a topical report to NRC as well, and it's under review, and I don't know that they have any commitments from any reactors yet to purchase this.

It's very similar to the horizontal one. As a matter of fact, the person that designed this also designed the horizontal concept, however, it's handled vertically and you don't need to -- you're not sliding a canister across metal. You don't have that metal-to-metal contact.

[Slide.]

MR. WILLIAMS: Here is a drawing of it. It shows you the way the heat is removed. There is an air intake down here and air outlet. When we did the test at Idaho, it actually had four intakes and four outlets and we basically blocked them. We blocked two, then we blocked three, we blocked four and measured the temperature inside.

The objective is to keep the temperature below 380 degrees. You can see that it's got a large concrete cask lid similar to a metal cask, except they're using concrete for shielding. Probably it would turn out to be a little bit cheaper because you're using concrete.

[Slide.]

MR. WILLIAMS: This is the cask that we tested at Idaho.

It actually is a smaller version of the one that NRC has approved the topical report for. It -- you can see -- this is as they are constructing it here. This is the canister and the inside of it.

This is the rebar around the outside that they're going to pour the concrete around.

[Slide.]

MR. WILLIAMS: This is the outlet vent at the top of the cask up here.

[Slide.]

MR. WILLIAMS: This is showing the inlet vent to the bottom of the cask, before, again, the concrete has been poured.

[Slide.]

MR. WILLIAMS: This is the canister itself. There's the concrete cask with the -- they're removing the molding there after they poured the concrete. You can see how large they are compared to the man on the side.

[Slide.]

MR. WILLIAMS: Here is how it's loaded. This is in the hot shop at Test Area North at Idaho. They remove the lid.

[Slide.]

MR. WILLIAMS: Here's the lifting of the facility, lifting of the canister. This is a little bit different than the way the MRS would be designed. The MRS design will have the cask mated up to the bottom of the floor. The hot cell would be -- the transfer cell would be quite a bit smaller.

Also you can see that this fuel here is actually a canister. That's consolidated fuel there. There's two PWR assemblies in one canister.

[Slide.]

MR. WILLIAMS: The next item is the vault, which is currently licensed out of Fort St. Vrain. This has been designed by Foster-Wheeler. There is extensive European experience with this. It's licensed at Fort St. Vrain. This is and they can have this facility there under their NRC license.

The fuel that they store there is the graphite fuel which is different than a light water reactor fuel. It's the one different reactor in the country. However, Foster-Wheeler does have an approved topical with the NRC for light water reactor fuel.

At Fort St. Vrain, they use fuel that's in a canister. It's the graphite fuel, and it's placed in a canister. The canister fuel is transferred via a fuel handling machine.

There is no hot cell like I showed you in the last picture. You can actually be in the room close to the handling machine when it's in operation.

Then the canister with the fuel in it is placed in a storage tube which is in the modular vault dry storage. Again, heat transfer is by convection.

[Slide.]

MR. WILLIAMS: Here is a little schematic showing transportation cask would come in here. It would sit below this level here and this transfer machine can move back and forth across the vault. It would come over here. It would pick up the fuel out of the transportation cask -- at Fort St. Vrain, it's in a canister -- then it would just bring it over here and place it in each one of these different holes.

Air comes in through the bottom here, and they actually sit in a vault separately with the air circulating around them. The air would go through the vault and come back out the top.

They have actually done tests where if they would block all these off, the whole system would still work as well. On the top of the containers, there is a thick shield plug about that thick.

Okay. Go ahead.

[Slide.]

MR. WILLIAMS: This is a picture of the Fort St. Vrain facility, to show you what it looks like in real life. This is the transfer machine here that picks the spent fuel up. It would bring it over here, place it down in one of the storage tubes, and put a shield plug on top of it, another relatively simple concept.

[Slide.]

MR. WILLIAMS: This is what it looks like from the outside, the chimney coming up here. The air flow comes in the back side. The transportation cask comes in -- I think that trailer is blocking it. Anyway, air flows through here, back out the top again.

Okay.

[Slide.]

MR. WILLIAMS: This is what the canister looks like at Fort St. Vrain with the graphite fuel inside it.

[Slide.]

MR. WILLIAMS: Again, this is what they call the charge face. It's in the vertical position. In the facility itself, it's horizontal, and that's where the fuel goes down in each one of those things, each one of those holes.

[Slide.]

MR. WILLIAMS: This is just a model again to show you how the fuel is stored. The air comes in, runs through here, and back out the top. Okay.

[Slide.]

MR. WILLIAMS: Okay. Now, what we are doing, you see that there is a lot of existing technologies, and what we have decided to do is take advantage of the existing technologies.

When we started our process back in '83 and '84, there were no licensed dry storage technologies, so what we decided to do at this time now was to take advantage of those license technologies and incorporate those into the conceptual design that we were doing. So what we are trying to do is gather information from the industry to incorporate into our design.

[Slide.]

MR. WILLIAMS: So what we have set up is a process where we have gone out with a request for proposals for the different vendors to submit a proposal. We're actually paying companies to develop a proposal to sell us storage concepts.

It's a little bit different than what we normally do; however, we thought it was important to handle it this way because we may not pick the lowest price concept because of the involvement with the host, and so what we're doing is, actually, we're paying for some design information. The companies will need to submit a proposal, and in that proposal, they need to tell us what price they're going to charge for their storage concept in the year 1998.

Now, we have allowed them to propose some algorithms by which their price would change up through that time.

[Slide.]

MR. WILLIAMS: We're expecting to award multiple awards, and we have received multiple bids. We have received nine of them. We have evaluated the nine, and we plan to award several different contracts.

[Slide.]

MR. WILLIAMS: Okay. The types that we have received, we've received all the ones that I have just gone

through with you. We received three vaults; we received two concrete cask designs; we received two metal casks; one dual purpose cask; and a horizontal storage module.

So we have received all the different types that we have talked about, and we are going to make the design consistent with those technologies.

[Slide.]

MR. WILLIAMS: The schedule that we've been working on has been a little bit delayed. We wanted to get the information earlier into conceptual design. We don't have the information yet, so we have been -- we're going out and developing the cost based on what we know best, and then once we get the information, then we will reevaluate what we have done.

We issued the RFP in August of '91. The bids were due in September '91. We completed our technical evaluation towards the end of November. We had meetings with all the bidders through January. Then we requested their best and final offer, which was -- we completed an evaluation of that towards the end of January. The M&O completed their -- by the way, this is strictly M&O. The TRW is running this contract for us.

They completed their evaluation which they submitted to DOE March 13th. They are doing this in stages. That's when they will submit the final one. For each different bidder, they are submitting individual packages.

The schedule calls for final DOE approval April 1st. We plan to have all the contracts awarded then. We hope to start getting early information from them by May 1st.

This is something that's also a little different. If we weren't paying for this, we wouldn't expect to get early information from them, but since we will have them essentially under contract, we can work back and forth with them while they are developing their proposals.

[Slide.]

MR. WILLIAMS: Then their contracts should be completed by June and they will make oral presentations to us in July. We will be taking that information as it comes in and factoring it into our conceptual design. Okay.

[Slide.]

MR. WILLIAMS: Okay. The last thing I'd like to go through is the MRS design as it stands right now. As I said earlier, we're in the middle of this process. We have had a few meetings with the M&O and we understand what's been going on.

We've been giving them some direction, but we don't have anything from them final. It hasn't undergone a technical review, which is supposed to take place in April, and then it's supposed to undergo a DOE review in early May.

So what I'm giving you is some early information.

As I said before, all the technologies that we've just talked about, we plan to incorporate those into the MRS design.

[Slide.]

MR. WILLIAMS: Okay. So what we have set up here is basically three primary designs. One we're calling the reference design, and I want to distinguish that from the preference design, and it's not intended to be preference, but it's a reference.

The reason why it's a reference is for the DOE management system, where we need to go, as Vic explained, before our Energy Secretary Advisory Acquisition Board for major system acquisition projects and tell them what we think the costs are going to be. So we will have a reference design for that, and then we're going to also have alternatives.

The reference design basically has a dry transfer mechanism similar to the hot cell that I showed you at Idaho, but actually quite a bit smaller and more simplified, using the vertical concrete cask technology.

We also plan to evaluate at the same level of detail a pool storage concept and the dry vault concept. Then what we have here are Deltas, which are actually variations off of the reference. The reference design with dry transfer can be modified slightly to incorporate the metal cask storage technology, the horizontal storage technology, or dual-purpose cask.

What we are going to do there is we'll do pluses, plus ten percent for this facility or minus 20 percent. So it won't be looked at in as much detail.

A lot of people have asked why are we even considering pool storage. Basically, that's because when we made the decision early on to go to dry storage in the early '80s, we never did a thorough documentation, a thorough comparison of those, and we felt that it was important to do that since there are so many pool storage. It's licensed throughout the country.

As a matter of fact, they are using it in other countries for interim storage. We felt we needed a good comparison of the technologies which could also be incorporated into the environmental documents that we're doing.

Let's see. Okay. Also on the dual-purpose cask, we're also running a cooperative demonstration project with Sacramento Municipal Utility District outside of the design area. I thought I would mention that.

[Slide.]

MR. WILLIAMS: Okay. The first one, the dry transfer-vertical concrete cask technology, basically has a

dry transfer cell. What they have done down at Duke right now is they have three transfer cells that they will build simultaneously. Each transfer cell will have a small amount of lag storage. They are being designed to accept fuel from the existing cask fleet that's out there, plus the Initiative 1 casks.

We have had some concern over the IF-300, the GE designed cask that was originally built for pool storage, and they are looking at maybe designing one of the three transfer cells specifically to handle that. That issue hasn't been totally resolved yet.

We are also doing time and motion studies to better calculate what the through-put capability is of this design. So we're still early in the stage of putting this thing together.

Oh, yes. The site acreage right now has been calculated to be 460 acres, and it would have 1,300 storage casks to hold 15,000 metric tons of fuel.

[Slide.]

MR. WILLIAMS: The pool storage technology is similar to what's used at reactors. What we have designed right now is with 2,500 tons per pool with six different pools in it. It's a proven design, and you can see the acreage of a pool facility would be quite a bit smaller.

As I said before, we believe that this is important to have a good comparison with the dry technology.

One difference that we have with what we're doing here and what they are doing at the reactors is we don't have as large, as deep a water cover in this design, so that instead of being able -- once you're in the storage area, instead of being able to lift the assemblies up and move them, you'll have to move them horizontally to maintain the water coverage necessary to provide the shielding.

[Slide.]

MR. WILLIAMS: Okay. Our dry vault storage concept is pretty much as I showed you before, except that it's a little different than the Foster-Wheeler design in that we plan to use a transfer cell rather than a transfer machine. The transfer machine has all the shielding enclosed within that tube.

Now, as I explained, at Fort St. Vrain, they are using canistered fuel, and their design won't see the through-put that our MRS would. So we feel it's important to -- it would be a better way to do it, would be to use the a transfer cell and then go to the modular vault.

Again, you would have storage tubes. It's a modular design, and you can also see that it's -- to store the same amount of fuel, it would use a little bit less acreage.

[Slide.]

MR. WILLIAMS: Okay. And then finally, these are the variations to the references again. Again, what we're looking at here in these variations are metal casks, the horizontal concrete modular design, and the dual-purpose cask.

For each of these cases, the dry transfer system would be very similar to the vertical concrete casks, and so there wouldn't be any major change as to that transfer method. The site acreage would be very similar to what I showed, you, the 460 acres on the concrete cask.

Once again, we're not determining the cost to the same level of detail and we're not doing the same level of design detail on these as we did on the three reference cases.

[Slide.]

MR. WILLIAMS: I just wanted to show you a few artist's concepts. These were done prior to the Duke Engineering design, but it just gives you an idea here of what this would look like.

This design here is actually the Parsons transfer system, transfer facility design that they did in 1990, where the spent fuel would come in in transportation casks, it would be unloaded, and it would be transferred to the concrete storage casks that are then sent out to the storage facility.

This right here are support facilities to the MRS.

[Slide.]

MR. WILLIAMS: This is what the Parsons 1990 design looks like, the transfer facility. The transportation casks could come in here. The actual transfer would occur in this transfer cell up here, and then they would be placed into a storage cask here.

This is similar to what Duke is doing. However, they've got three of these right now in their design, rather than two, with the transportation coming in between them.

[Slide.]

MR. WILLIAMS: This is just another look at a concrete cask.

[Slide.]

MR. WILLIAMS: This is a vault concept, again a little bit different than the way Duke is doing their drawing right now on their vault concept but just to give you an artist's rendition.

This is also something that we've put out in some of the pamphlets and literature that we put out.

[Slide.]

MR. WILLIAMS: Again, another look at the vault, as I showed before. Transportation casks would come in, they would meet up, unload, go over here and be stored in the vault, with the airflow in through the bottom, out through the top.

[Slide.]

MR. WILLIAMS: Then, this one here is -- we've got the same transfer facility. However, what we would do is we could load the canisters -- this is the NUHOMS facility, the bunkers that they use at Oconee.

We could load canisters in here, or alternatively, we could also have a much simplified version, which is similar to what the Mescalero Indians are suggesting, is load the canisters directly, if they can get them to be transported.

However, today, out of the 84,000 tons of fuel we expect, there will only probably be a few thousand tons that will be in those kind of canisters.

[Slide.]

MR. WILLIAMS: Again, another look at the horizontal module.

[Slide.]

MR. WILLIAMS: I just wanted to briefly mention the review process that we're going through. Prior to the start of the conceptual design report, we went through a readiness review to determine that we were ready in accordance with our NRC-approved QA plan.

That took place not too long ago. We went through that.

Then, the conceptual design report review, we're going to do both a technical review, in accordance with the approved QA procedures, and then we will also do a design review.

Throughout this process, the reviews will be made up of teams of DOE people and people outside of the Duke organization that are within the M&O. We would also take people from any of the volunteer host states, if they were ready at that time, to participate in the reviews.

Next, this SAR design, that's the Safety Analysis Report design, which is similar -- you hear people talk about Title I.

We have modified the name to -- Title I is similar to the Safety Analysis Report design, and we'll have a design review prior to the start of that, and then we'll have design reviews throughout that process, as well.

[Slide.]

MR. WILLIAMS: Lastly, a schedule. You've seen some of the other schedules. This one here is just more specific to the design process. I think somebody else asked about the KD1 decision, and key decision 1 -- there's also a key decision KD0.

These are actually decision points that are internal to DOE that -- I think Vic explained it pretty well, that the senior management in DOE needs to approve the next expenditure of funds for the next phase of the project.

So, we plan to have a KD1 process taking place towards the end of conceptual design to get approval to start the next detailed design phase.

Then we'll have a KD2 process prior to the final procurement and construction design, and then there will be a KD3 prior to start of construction.

Down at the bottom, we have the SAR being prepared throughout here, the SAR outline, the Safety Analysis Report outline, coincident with the Safety Analysis Report design.

That's submitted to the NRC prior to the final designs, while we're doing -- NRC is reviewing the SAR design and the SAR itself prior to the NRC license application review, and then, hopefully, we will start construction in 1996, and all this depends on the success of the negotiator in agreement, and we could accept fuel at an MRS in 1998 with completion of facility construction -- what we mean there is, when we're building the three transfer cells, we could build all three of them at once and then outfit them one at a time to get fuel acceptance first at one transfer cell and then work around until we get all three of them ready to go, and basically, that's about all I have, and Joe Stringer will follow up with some more detailed information about what they're doing down at Charlotte for Duke Engineering.

I'll be pleased to answer any questions.

DR. PRICE: Let's just go on to the next one.

MR. WILLIAMS: Okay.

Joe is going to do this instead of Alden Segrest. Alden Segrest had to stay at home because his wife is getting out of the hospital today.

MR. STUART: Mr. Chairman, you didn't ask if there was any public questions. Could I ask one?

DR. PRICE: Surely.

MR. STUART: Thank you.

My name, again, is Ivan Stuart. I wanted to ask Jeff a question.

Jeff, when the independent citizens group from North Dakota were here to talk with you, I understand they get rather confused about the subject of dual-purpose casks, which, as you know, they are considering because someone suggested that to them.

[Laughter.]

MR. STUART: They were particularly confused about your feeling that the MRS facility doesn't look any different, although it has all these fairly complicated, they thought, facilities, such as the transfer and so forth, but isn't it a fact that the MRS would be quite simple and there wouldn't necessarily be all those transfer facilities?

MR. WILLIAMS: Yes, Ivan, you're right, it would be quite a bit different, and you know, we really didn't have as much time as we would have liked to have had with them, and we could have explained that a little clearer.

As a matter of fact, we had a model there on the table where we did show quite a bit of difference in the transfer, the handling capability in the dual-purpose cask case, but like I said, we were running out of time.

They had to run to go up to the Hill, and we really didn't have time to pursue it, and I do feel that they walked away with a little bit of confusion, but the transfer cell that -- if you use dual-purpose casks and you use dual-purpose casks for everything, yes, you wouldn't need to do that routine handling.

However, we do believe that it would be a wise move to have a handling capability on-site as well, although it wouldn't need to be three hot cells, necessarily, to handle that sort of throughput.

[Slide.]

MR. STRINGER: My name is Joe Stringer. I'm not Alden, as Jeff explained. He sends his apologies. He very much wanted to be here to talk to the Board. It didn't work out. I think we'll be able to get through the material adequately.

In some areas, I think you'll find I probably can answer questions that Alden couldn't, and in other areas, I might be a little soft on some of the responses to questions, but it shouldn't be a problem.

[Slide.]

MR. STRINGER: I want to talk about -- the whole presentation is the process, as Jeff explained. We really haven't completed the conceptual design.

So, it's more appropriate to go through the process and step back and focus in on the things that influence the design: Where do the requirements come from? How do we formulate those requirements and apply them to the architecture, to the design process itself, and to the design?

So, we're going to go over systems engineering approach, something you're probably familiar with. We've been talking about it some today already. We'll talk about allocation of functions, flow-down of requirements. I heard some mention of some questions about that already.

And then we'll go right into configuration items and look at -- give some examples of the configuration items, which is really the heart of the design. We focus right in on particular groups of components and system and formulate configuration items.

And we'll talk about interfaces. We're not out there by ourself. We have to consider the other elements in the program, talk about that a little bit, and of course,

design criteria.

There's a lot of different folks out there, a lot of different documents that affect our design criteria. We'll get into that, and finally, we'll go over the status of where we are with the conceptual design report.

[Slide.]

MR. STRINGER: Systems engineering approach: We've been working with the folks in Vienna, the M&O folks, our brothers and sisters up there, very closely for quite a while now, probably six or eight months, and getting together and making sure that we're much coordinated in working out this systems engineering approach to the design.

As I already mentioned, we have to remember that MRS is just one of several elements.

The systems engineering approach ensures the integration of the MRS with the other elements, like careful definition of the overall system requirements, and of course, more specifically, the allocation of functions.

The system engineering approach ensures that we reach up and look at the higher-level documents that are there, which I'll talk about in a bit and show you where some of these requirements come from, make sure that these requirements are allocated properly to the specific systems and subsystems.

Now, those systems and subsystems are contained in configuration items, and I'll explain that a little bit more as we go along.

The systems engineering approach therefore provides interfaces with the elements through the design process, and we'll talk about that a little bit more as we look at the other elements in the program.

[Slide.]

MR. STRINGER: Requirement hierarchy: I know you've seen some slides on this already in some of the earlier presentations. I'm not going to spend a lot of time on the two at the top, Nuclear Waste Policy Act and the OCRWM mission plan.

You've probably heard enough about them; you're familiar with them.

The key point here is, though, in getting more specific to the MRS and to our requirements, those two documents formulate the basic requirements that then flow down into the physical systems requirements, Store Waste.

That is a Rev 0 that has been published last November, I believe, and it forms the technical basis for the MRS. It is our guiding document.

We reach up and grab all our requirements, all the functions -- we talked about functions a little bit earlier -- and bring them down into our design.

Coincident with that, we're developing, in the M&O MRS requirements document -- you've heard about that a little bit. It will be the technical baseline for the SAR design. SAR design follows conceptual design. That will be next September or October timeframe.

Now, the two documents, conceptual design report and the MRS requirements document, have been developed together. The requirements document needs information from the MRS design in order to complete and describe, if you will, the architecture, the systems in the MRS.

They can't just use functions which we do have in the Store Waste document. They look to us to interpret the functions, to develop a design, and then provide that to them and include it in the requirements document.

So, we work very closely with them, as I mentioned earlier, and get into design requirements a little bit later on, some specific examples, and you'll see how that kind of fits together.

Conceptual design report will be the cost and schedule baseline. Jeff already talked about that a little bit, talked about the schedule, and as we have already discussed, CDR and the requirements document will be developed in parallel.

Again, the whole purpose in the slide is to stress that we are coordinating. With the system engineering approach, we're very much coordinated with the other elements and with the other people in the M&O.

[Slide.]

MR. STRINGER: Allocation of Functions. We mentioned store waste. We refer to store waste directly in the writeups, in this conceptual design report. We provide the functions directly from store waste. We actually provide a reference to the paragraph and page going back to store waste. That of course is to ensure traceability of requirements and functions back to our hierarchy, our technical basis, store waste.

With each function it also pulls down certain requirements for each function. We interpret those and put them within our configuration items. It's a good bit different than what you see in store waste. If you were to read store waste document, it lists all the functions and all the things that are to be accomplished at the conceptual -- at the MRS.

Then in our conceptual design report we answer to that by describing the facilities and showing at which facility we accomplish each function.

We talked about functions. Requirements come along with the functions and along with the requirements we have different codes and standards.

NRC regulations also come down with those requirements and we answer to those of course in our design.

[Slide.]

MR. STRINGER: I would much rather be able to put up here a section of the building and go through a typical building or some of the design information and describe all the CIs.

We really can't do that but we want to try to give you a flavor for what we have and what we will see in the conceptual design report.

A Configuration Item is no more than a logical grouping of structures, systems, components, or activities and our entire conceptual design will be described within the 22 configuration items that we have decided to use in allocating all those functions and requirements.

A typical configuration item is the transfer facility.

Jeff talked about how we'll transfer fuel for some of the different technologies. That's accomplished within what we refer to as the transfer facility. Within the transfer facility there is a subsystem, the transfer cell, sometimes referred to as a hot cell.

Again, most of the major functions having to do with handling fuel flow down into that configuration item along with all the proper regulatory codes and requirements, DOE requirement 6430, 1(a) or whatever it might be.

Okay, next slide.

[Slide.]

MR. STRINGER: Interfaces. As we already mentioned we have to consider transportation, one of the other elements, MGDS and waste acceptance. In the case of transportation we have to consider what type of casks we're going to receive at the MRS. That type of interface would be worked out with them.

Of course Jeff mentioned we're designing a very broad-based, at this time very flexible design. All our designs at this time, the six different cases, would be very flexible to receive the existing cask fleet, which is pretty much, you know, very well defined.

In the IF-300 we are taking a look at we will have something in the conceptual design to address that. It can be handled.

Also they tell us about future casks -- the OCRWM 1, Initiative 1, Initiative 2, the bigger casks that are being planned, and also in addition to that for MGDS and shipments to MGDS there's an OCRWM Phase 1 Initiative 2, a rail cask, very specific cask that is kind of out there. It may be used at MRS to MGDS so we make sure our design will not preclude the use of any of these different types of casks, a bit difficult but we seem to be successful so far.

Waste acceptance, of course the big influence there on the design, I'll get into what type of fuel we receive, when we receive it, how old is the fuel -- is it five year old, is it right out of the reactor, ten year old, twenty year old, that sort of thing.

A lot of interfaces that we have to look out for. We have interface meetings, again working with systems integration folks, working with MGDS, and transportation where we sit down and discuss these interfaces, come up with requirements, coordinate those and then they go into the requirements document.

Next slide.

[Slide.]

MR. STRINGER: Design criteria -- one or two. I'll give you an idea of how we try to formulate, how we do formulate the different requirements and come up with our design criteria for the MRS.

There is a lot of stuff out there, human factors, NRC regulations of course -- NRC regulatory guides, overall waste system requirements, ISFSI operating experience, go back and talk to the county people, other operators of the ISFSIs, their licensing experience, OSHA, QA requirements -- a lot of different things we have to kind of focus in on.

[Slide.]

MR. STRINGER: We are trying to step back and try to focus in on those heavy hitters, looking at the existing criteria -- NRC regulations, DOE requirements, analytical study results. We work with some of the national labs and pulling up some of the results of their work.

Sandia is a good example, ORNL -- really we have gone out to most all of the labs that have been working in the nuclear field. Sandia for example, a requirement that we have been working on with them involves releases to the environment and site boundary type information during certain design events.

So with that in mind, then we start into our interpretation of these requirements, these criteria using our operating experience, our licensing experience at the existing ISFSIs and our nuclear design experience. We have got folks on board at the MRS design project from B&W and Fluor Daniel and of course Duke Power people with extensive background in the design of nuclear power plants.

All of that then gets formulated into our design criteria.

[Slide.]

MR. STRINGER: The heavy hitters, again, and I will give you an example of a few requirements. Certainly, this isn't all of them. And these aren't specific just to MRS, except the one at the very bottom. Nuclear Reg Guide 0800 for Fire Protection, Regulatory Guide 1.143 on Rad Waste. And, of course, seismic design criteria. In that particular case on -- and talk just a minute about how we're handling the different sites.

We've come up with a kind of generic site description. Seismic design criteria is a good example. We're assuming a kind of middle of the road ground response specter or requirement for seismic design. And then, once we get a site, we'll go back and take a look at that to see how it holds up and adjust the design as necessary. Hopefully, we've enveloped, and we think we have, most of the areas -- geographical areas that were going to be involved.

Then, of course, the IFSIS, 10 CFR 72, that have applied to them have been used, the Regulatory Guides associated with that, dry storage. There are very specific requirements, 3.60 for dry storage, and wet storage, 3.49.

And then, the one that is very specific to MRS is parts of 10 CFR 72.

[Slide.]

MR. STRINGER: Requirements from the higher level nuclear waste policy act. Of course, we pull down the 15,000 MTU capacity. That's our capacity after our initial operation of the MGDS by law, the way it's written now. That's 10,000, until MGDS goes into operation. Of course, MRS right now is being designed to handle spent nuclear fuel assemblies and their components only. We're not receiving DOD-type of materials just from reactor-type of fuel.

The main requirement and retrievability. Of course, our design must consider that, after it's in storage, we must be able to retrieve the fuel assemblies from the storage mode and, of course, ship it to MGDS.

[Slide.]

MR. STRINGER: Overall waste system requirements. We must receive the fuel, we must repackage it and put it into a storage mode and, of course, interact with other system elements. We've talked about that already a little bit. And retrievability, we've highlighted that some. Retrieve from storage and ship to the repository. Right now that's planned to be rail casks, dedicated rail shipments.

Jeff talked bout some of the studies that we've seen in the past. And we wanted to kind of highlight some of the issues that might come up in the future. Right now, the MRS is not considering fuel rod consolidation, we're basically a processing, in that we receive the fuel, transfer it into some type of storage mode, pull it back out of the storage mode and ship it to MGDS. So, things that are kind of out there in the future that are issues that might influence our design at some point in time is fuel rod consolidation. And, again, our design wouldn't preclude adding some type of requirement at a future date. It could be in 10 years, in 15 years, we could add another building for doing some of that type of operation.

Another issue that comes up quite often you might be familiar with, designer heat loading at repository. What we're referring to there is whether or not we would have to have a very specific selection of which fuel assemblies at what time we ship to the MGDS.

Again, reaching up into the store waste document, which is our basic technical guidance. We do not have that requirement in our design. So, the present MRS that we complete the CDR on in the next couple of months, will not have that type of requirement. But, at a later date, we have space at the site, and the acreage that Jeff mentioned, where we could add a building and include a requirement like that -- another function.

And there's others. But, again, the point of the slide, the last bullets, are to point out that we want to remain flexible in everything we do with the conceptual design and the MRS, to take care of future needs.

[Slide.]

MR. STRINGER: Design events. One of the more critical things we do is to look at design events in our design process, even in the conceptual design. We have to, in order to take an initial cut at classification of equipment, apply QA requirements, identify equipment and items that we refer to as IRS, Important to Radiological Safety. This is a requirement of the 10 CFR. And we've, again, taken a pretty good cut at doing that in our conceptual design. And we identify IRS QA1 components in our report.

Again, this is just to kind of give you a little flavor for the different design events we're considering. And we are obviously designing for, even in the conceptual design phase, of course, this will go into much much more detail as we get into the SAR design phase. But, we have to look at it even in conceptual design.

Design Event I is a normal operation-type event. An example of that is fuel transfer. Another example would be a process for RAD waste, handling RAD waste or decon of a shipping cask, things that happen every day -- happen several times a day.

And, of course, we would design the facility to handle those events, protecting the health and safety of the public and the workers, in accordance with the proper regulatory codes and requirements. That's true for every one of these.

Design Event II, something that could occur once a year. An example would be a miner transfer machine malfunction. Another example might be a failure of a motor, some type of kind of normal maintenance event.

Okay. Design Event III, getting more critical, once in a lifetime. This might occur due to a tornado event, hurricane, something like that. A good example is loss of external power for an extended length of time, and we have to design for that.

Then design basis accidents. Everything we do in the design is to preclude the last event. We assume -- we do that and then we turn around and assume that it will occur and then we take a look at the effects of that and make sure they're acceptable and, again, meet the 10 CFR guidelines.

It's kind of a Catch 22.

[Slide.]

MR. STRINGER: Taking a look at natural phenomena that would be included in the design events, this type of event could generate the one design event three. Earthquakes, tornadoes, floods, hurricanes, tsunamis, seiches, you may be familiar with those, you may not.

DR. PRICE: What is a seiche?

MR. STRINGER: That's a good question. Now, Alden would know the answer to that. It's particular to the West Coast, isn't it, Jeff?

MR. WILLIAMS: A seiche?

MR. STRINGER: Yes?

MR. WILLIAMS: I think it's a tidal wave in a lake.

MR. STRINGER: The reason we wanted to put this up here again is to give you a flavor for site-specific type of requirements. We will make sure in the SAR design, when we have a site, that we will take into account proper design criteria and phenomena.

DR. PRICE: Do you have a potential MRS site beside a lake or on an island in a lake?

MR. STRINGER: Not yet. But you never know.

MR. WILLIAMS: Prairie Island is.

MR. STRINGER: Okay. Next slide.

[Slide.]

MR. STRINGER: Safety considerations. What types of things do we look at? Environmental conditions and natural phenomena, we touched on that a little bit. Fire protection and prevent, very specific requirements on this. In the Store Waste document that we bring right down into our configuration items and that we make sure we design to. Critica

ALARA and personnel exposure control, they both kind of go hand-in-hand.

Radiation monitoring, this gets into storage mode and handling activities.

Waste minimization, very important, in that we don't want to create waste. We're trying to store waste and send it to MGDS for final disposal. So, obviously, we need to be good stewards and not generate a lot of low-level waste. And, of course, SNF characteristics. When we go in and look at the design of a hot cell, and we look at how much heat will come out of lag storage within the hot cell, we need to pay close attention to what the folks in the other elements, what the from reactor fuel will look like, to make sure we've identified the worst case condition and make sure we design for that.

[Slide.]

MR. STRINGER: A very important consideration, prevent damage to SNF. And, of course, we have to meet the limits of 10 CFR 72.104. And, as we already talked about with the design events, we have to mitigate the consequences of potential damage, meet accident limits of 10 CFR 72 106. Again, this would be an event that we ensure will not occur from our design, but an event that would be so catastrophic that we should look at it and make sure it meets the requirements in the 10 CFR.

An example of an event like that would be dropping a fuel assembly onto other assemblies, dropping something onto a cask that's open and has fuel assemblies exposed. If that were to occur in the hot cell, for example, we'd take a look at the particulate release into the hot cell, which then would go into the HVAC system. We'd take a look at emis- sions. The particulate then would not be caught in the HEPA filters, and would go out into the environment. And, of course, under that condition, there are very specific guidelines that we have to meet on personnel exposure.

DR. PRICE: Excuse me for interrupting. Dennis Price. You've been listing a number of hazards and indicating the considerations that you should, and these are exemplary, as you've given them to us. The question is do you have a document that shows how you generated these hazard, that is, how you identified them, what methodology that you used? I think we saw earlier a slide which indicated, at this conceptual stage, that preliminary hazard analysis should have been accomplished. Do you have a preliminary hazard analysis-type document? Do you have a human error criticality analysis kind of document and so forth?

MR. STRINGER: Let me back up a little bit and focus in on what we've been tasked to do in the conceptual design. We're to look at feasibility of different technologies, and we're to come up with a cost estimate, based on those different technologies. In order to do that, we certainly have to look at, if you will, the heavy hitters in some of those areas you mentioned.

Obviously, this is a good example, where we have to go in and look at design events and look at what happens if we were to have an accident and what the consequences to the public and to the workers at the plant would be. And

then, in a conceptual design fashion, we address that. We address that in the Conceptual Design Report, and we cite, in some cases, specifically the requirement and how we meet it.

And also, we initiate certain specifications that aren't published, aren't baseline, in conceptual design. Keep in mind that we're just laying the groundwork for the SAR design. That's really where I think you would see a lot of the paperwork that you're probably looking for. But we can't ignore it now in conceptual design, but we can identify it and hit it and hit the high spots.

DR. PRICE: That's the preliminary side of things. And just as you're describing it, it's preliminary.

MR. STRINGER: It's preliminary. Yes.

DR. PRICE: But you still go about it in a systematic sort of a way.

MR. STRINGER: Oh, certainly.

DR. PRICE: And so how did you systematically identify which are the heavy hitters and which are not? And are there lists of things that you came up with, and then how did you come up with them?

MR. STRINGER: Well, there is in the report, but not specifically labeled safety and hazard analysis, it's just part of the evolution of the design process. It's included in descriptions of -- going back to configuration items. An example of configuration item is fire protection. Obviously, we need to include requirements for fire protection throughout the whole MRS facility. We talk about fire protection in the requirements in each of the configuration items.

Is that what you mean? Would that satisfy what you're looking for?

DR. PRICE: No, it would not.

MR. STRINGER: Okay. That's what we're doing. To us, being designers of nuclear power plants and other type -- you know, fossils, it's kind of -- what I'm describing is kind of the standard approach. It's refined quite a bit, using the system engineering approach, but I don't know if it's exactly what you're looking for. It's there, but I don't know if it's as specific as what you might be looking for.

[Slide.]

MR. STRINGER: All right, design features; again, we design to mitigate consequences of design basis events. We've talked about that. We've given some examples. Of course, we have instrumentation and control features. A lot of this would be related to the transfer of the assemblies within the transfer cell, and also, in the case of metal casks, we would be monitoring certain activities in the storage mode.

Associated with all of that, we would have alarms for the monitoring. We, of course, look at post-accident IRS systems, systems that must function during one of those different design basis events. That's included.

We used conservative radionuclide release parameters in the design, and we have IRS control room habitability. We look at what we have to do in the -- again, going back to the design basis, if we were to get into an accident condition, what functions must be able to be maintained within the control room, and take a look at the folks, the operators that would have to be in there, in their environment.

Accident releases limits, 10 CFR 72-106 again. That's certainly is a major design feature, and human factors engineering, one that we're just kind of getting our hands around that we expect to see more specific requirements in this systems engineering approach in the design requirements document, again, keeping in mind that right now we're just in the conceptual design phase.

[Slide.]

MR. STRINGER: Step back now, having gone through all of that, and take a look at where we think we are with the design, kind of highlight what all this means. Some of this you've already heard from Jeff and others.

Postulated accidents are much less severe than they are with the nuclear power plants. We don't have active components. We don't have LOCAs and that sort of thing. Therefore, the accident consequences are much less severe.

We are designing a facility. We're not in research. The technology is there. We know it's there. We're using available technology and we will come up with a design that will meet the requirements and that will be licensable. We can do and we know we can do it and we will do it.

[Slide.]

MR. STRINGER: Okay, where are we? We've done a lot of analytical work. Again, it goes back to some of the releases to the environment and how it affects the public and meeting the requirements. We've done a good bit of shielding and effluent analysis shielding. How thick should the walls of the hot cells be in order to protect the workers and that sort of thing.

We've evaluated worst case release and then determined where the site boundaries should be. Again, the heavy hitter here is where we lose an assembly. We somehow break a number of assemblies open; that's pretty much our worst case accident scenario.

We've done scoping studies and evaluation on the sensitivity of our analysis to fuel age and burnup. In other words, if the trend continues and the burnup rate increases, how would that affect the thickness of the walls of the hot cell, if, all of a sudden, the requirement were to change?

Site layouts; we have a site layout in our conceptual design report for each of the different technologies. Jeff mentioned those, which ones they are. There are six of them. That's coming together real nice. It's very definitive type information that you'll see in the conceptual design report that we will include in the conceptual design report.

Of course, along with that, for each of the technologies, we have general arrangement drawings. This gets into the specifics of each of the configuration items, transfer facility, admin building, warehouses, whatever.

Flow diagrams would include mechanical flow diagrams showing the handling process of the spent nuclear fuel assemblies throughout the MRS from receipt until storage, bring them back in and then to MGDS. It would also include what's typically referred to as P&ID, process type flow diagrams, mechanical type flow diagrams for the different support systems.

On the electrical side, this would include one-line diagrams, again, typical type design details. In our conceptual design, we will get to that level of detail, first cut, conceptually, for the conceptual design report.

[Slide.]

MR. STRINGER: The technical document plan was completed and approved a number of months ago, and, moving along, towards completion of the conceptual design, we've held a number of -- well, one review session with DOE and M&O. What we do is kind of give them a preview and kind of bounce off our work in progress.

On 2/20/92 we presented the wet transfer and storage configuration items to them and received comments from them, and we're going to use that in finalizing our conceptual design. Similarly, at the end of this week, we're going to do the dry transfer facility and the vault transfer facility.

Keep in mind that we've got the six technologies. For the three main technologies, the dry transfer vertical concrete; for the wet and the vault, we fully describe all 22 configuration items within the conceptual design report.

Okay, section submitted for M&O review is, they developed, talked about that a little bit, really hit it on the bullet above. At the end of March -- we're very busy this month and we're going to submit the conceptual design report to the M&O which will initiate the quality assurance procedural review 3.2 per QAP 3.2 procedure.

Right now, we're still on schedule and we intend on meeting the March 31st date. Okay, then we go through the review. It takes two week to go through the QA P.3.2 review, and about two weeks in order to incorporate comments, resolve comments and submit the report to DOE. That's our schedule.

[Slide.]

MR. STRINGER: I will quickly go through the CDR basis for cost and schedule. You have heard about WBS work breakdown structures. I won't spend a lot of time on that. That extends to the contract work breakdown instruction, our MRS CWBS. We write detailed descriptions of each of those elements in the dictionary, and then we have engineering and construction. We develop cost and develop schedules.

This goes back to the configuration item and the set up, the way we're managing all that work. Within each configuration item, there are subsystems, and we develop equipment lists, whether it be mechanical, electrical, and building material take-offs for each of those items within the configuration item.

That leads, of course, to pulling all that up in order to have costs for each configuration item, and then pull it up at a higher level and have cost for that technology and for the MRS.

We have to be integrated. We have to look at what other costs are associated with the MRS. So we look at project level costs and schedules and cost and schedule at the total M&O level.

What we mean here is there is a lot of other folks besides just the MRS design team that are involved with the MRS, that are involved with licensing as a good example at Vienna and the licensing group, and we have to consider their costs and their schedules. All of that wraps up into the conceptual design report, so that we have a total program cost and schedule.

[Slide.]

MR. STRINGER: Okay. Quickly, a flow chart breaking open the develop estimates box, if you will, taking a look at the basis for the estimates. We have to establish our assumptions and conditions for each of the cost elements, and we have to establish task descriptions and take-offs. We talked about some of those.

This would include concrete rebar, piping, whatever was appropriate for that particular configuration item and element, of course pricing for the construction part of it, labor and materials, subcontractor costs. All that has to be considered. There are some guidelines. We have people that are very familiar with whether we use different labor costs from Charlotte or whether it's going to be from Washington or Nevada, contract labor. There's a lot of attention to that right now as we try to bring all this together.

Vendor pricing. A good example of vendor pricing would be the storage mode in the vertical concrete cask. We would have, of course, a price in there for the storage mode. Although we don't have the proposal information that Jeff mentioned, with all the experience that's out there and with the vendors and our contacts, we feel we're going to be able to come up with pretty reliable information on the pricing.

In addition to just the storage mode, then you have the list of many mechanical electrical civil items within the design, and all of that has to be priced out. Escalation -- another consideration; time phased schedule; and risk analysis.

Okay. What we will do within the conceptual design report is present a schedule that will meet the '98 date, and then we'll step back and we will assess the risks involved with meeting that schedule. Do we think we can meet it? What could influence it? How feasible is the construction schedule? How many rain days do we have in there? What type of labor? If we go to a particular region in the United States, would it change. All that influences the risk assessment.

We will present results of that analysis in the conceptual design report. For instance, is there a 90 percent probability we'll meet the '98 date? Fifty percent? That sort of measuring tool. I can't tell you the results; I don't know. They are working on it.

Next slide.

[Slide.]

MR. STRINGER: Okay. Quickly going through parallel paths here, we received the statement of work, CWBS and specifications, and we can in parallel develop the CWBS into estimates, and the schedule with milestones, develop configuration items. We've talked about configuration items for each of the storage modes. Then we focus all that down into an estimate, how are we going to come up with our estimates, our cost estimates. In parallel with that, we look at the development of the mechanical, electrical and civil work, flow diagrams, site layouts.

The cost folks, our estimators, pull all this information together and, working with the different designers, the engineers, they start making all their take-offs and building materials and lists. All that flows down into the development of the estimates.

Moving across at the bottom, we of course have to develop an engineering schedule, construction schedule, and finally focus in on the document, summarized in the CDR.

There is a lot on here. Alden is more familiar with this process, quite frankly, than I am. We've got a fellow in Charlotte, of course, that's very familiar with it. I'm involved in one portion of it. I'm sure Alden could explain it a little bit better, but I think you probably get the idea of where we're going.

That's it. Questions.

DR. PRICE: Board? While they are waiting for a moment, let me ask -- in the six site layouts that you referred to that, as I understand, you're delivering to DOE for their consideration, is that correct?

MR. STRINGER: That's correct.

DR. PRICE: A decision about somewhere along the line, someone is going to decide one out of the six, or maybe some changes and then one out of the six.

MR. STRINGER: Yes. Or even -- it could be a combination of them. Again, we're trying to concentrate on feasibility and come up with a realistic cost estimate.

DR. PRICE: Do all six involve hot cells?

MR. STRINGER: No. All the dry storage modes do. The only storage mode that doesn't involve a hot cell would be the wet design, and that's wet transfer and wet storage. The dual-purpose design, as Jeff spoke to a little bit earlier, is kind of a variation of, for instance, the dry transfer vertical concrete cask.

On the dual-purpose design using the dual-purpose cask, of course you don't have to process near as many of the casks at the MRS. So if you received a dual-purpose cask, it would simply go right into the storage yard.

But in looking at the requirements and in looking at the interfaces with our transportation folks from reactor requirements, it doesn't appear that, right now with the information that we have, that all the casks could come in in dual-purpose cask. Only -- I think Jeff mentioned maybe 50 percent. So we have to handle other shipments.

If a reactor site cannot handle a dual-purpose cask, they have to ship in a conventional shipping cask, and then we would have to transfer it to the preferred storage mode at MRS, i.e, dual-purpose cask. That would have to be done in a hot cell. That is our design basis.

DR. PRICE: So basically, it appears that you don't see a viable MRS without a hot cell.

MR. STRINGER: Again, stepping back and looking at what we have for the design criteria and all the requirements, looking at store waste, which is our technical basis, it would appear that in order to have a licensable facility, you would have to have some type of hot cell on site, at least for recovery.

In the case of the NAC, the dual purpose, a number of shipments would have to be processed in a hot cell because they can't be received in the dual-purpose cask. That's my opinion.

Comments, DOE folks? Have I stated it to your satisfaction, Jeff?

MR. WILLIAMS: Yes. I think that's pretty clear. I guess our feeling is, like Joe said, is that you would have to have some sort of capability to recover on site from any sort of seal leak or whatever. We feel that that's the wise licensing approach.

Regarding the capability of all reactors to handle dual-purpose cask, I know there's some variation as to what that number is. I don't think it's 100 percent of the reactors. I've heard it vary from 50 up to 95 percent. I'm not sure exactly what that number is, but that's with the large dual-purpose cask that's presently being developed.

DR. PRICE: 50 to 95 percent what?

MR. WILLIAMS: Of the reactors that can handle dual-purpose casks. What I'm saying is I'm not sure exactly what that number is. I've heard variations.

DR. PRICE: I have, too, and I'm beginning to really wonder here what is the -- will the true number stand up?

MR. WILLIAMS: I think Ivan will tell you 95 percent, 98 percent. But out of the FICA report, I don't think it's quite out yet. I think that's got some details. You might know some more.

DR. PRICE: We expect to hear something more about that, I guess.

MR. MILNER: Yes. I think once we get -- Ron Milner -- once we get a little more perhaps detail from the FICA report, we might be able to refine that number a little bit. But beyond that, there are other things that you may or may not be able to do. Do you look at, for example, heavy hauling or something that might mitigate some of that? Do you look at requiring reactors to make modifications, be it to their license or physically to their plant to increase their capability to handle a larger cask?

So that's part of the reason, in fact, a large part of the reason, for why you hear a various range of numbers on how many reactors can handle those casks. It depends on whether you are assuming the reactor as it currently sits, whether a modification to their license, whether it's a physical modification of the plant. As you go, you keep increasing the percentage.

DR. PRICE: So somewhere along the line, will we have the fog lift with some kind of presentation that will give us, "If you do it this way, it's this percent, this way, it's this percent" so we really know what you're talking about?

MR. MILNER: Well, pretty much where we stand at this point is that we would not want to require reactors to modify their facility or modify their license to be able to service them. So on that basis, I think we're looking somewhere around the 50 to 60 percent range, and that's what we're going on the basis of.

MR. STRINGER: If I could comment on that, 50 or 60 percent received by truck has a profound impact on sizing of the transfer facility from a design standpoint. I know that's the case because what drives the design is how many casks you receive. So you have to be careful too when you look at those numbers as to what it does to the MRS facili-ty.

DR. PRICE: Does DOE now have these concepts of these six variations?

MR. WILLIAMS: In the office?

DR. PRICE: Yes. Has it been delivered to you?

MR. WILLIAMS: No, it has not.

DR. PRICE: All right.

MR. WILLIAMS: The process is that they will have a draft done in a few weeks, and then it'll go through a technical review and won't be delivered to DOE until May the 1st.

DR. PRICE: And at this conceptual stage, let me ask you a series of questions just to try to understand something.

MR. STRINGER: Sure.

DR. PRICE: It's really one question, but I have to go into a series to get it out.

MR. STRINGER: Okay.

DR. PRICE: I take it from what you told me earlier that in the material you worked on, as such, you do not have a preliminary hazard analysis.

MR. STRINGER: We don't have anything in the conceptual design in our schedule that's termed "preliminary hazard analysis."

DR. PRICE: Do you have anything similar to a HAZOP, or are you familiar with that term for process hazard evaluation?

MR. STRINGER: No. What drives our design right now is looking at the different design events and the NRC requirements, the 10 CFR 72. That's the biggest hitter in determining cost and feasibility and licensability, and that's why we're focusing in on that.

DR. PRICE: But if you're making a trade-off, I take it from that, then, you can just quickly buzz down the rest because --

MR. STRINGER: Sure.

DR. PRICE: -- you've indicated it's a no. There are no preliminary fault tree analysis, no things like change analysis, no things like energy barrier analysis, no things like human error criticality analysis, or failure modes in effect criticality analysis as it applies to safety.

MR. STRINGER: Not in conceptual design, no. That's beyond conceptual design.

DR. PRICE: Some of those are.

MR. STRINGER: And that's in my opinion.

DR. PRICE: Yes. I was trying to see where or how, and I think you told me. What you did with regard to hazards is look at the hazards that came to you through regulation requirements.

MR. STRINGER: It's broader than that. I think this is where the M&O and the design team really contribute significantly. We had an operator on staff in our group, the MRS Design Team, from Oconee. We have folks that have been intimately involved with ISFSI's design at the Oconee facility. We have folks from Fluor Daniel that have years and years of experience in the nuclear field, plus Duke people.

We have put together a team and we are relying more right now in the conceptual design on their ability and their background and their engineering judgment. So they would be very upset if I didn't put in a good pitch for just good experience and engineering judgment at this stage.

DR. PRICE: Certainly good experience and engineering judgment is very, very important in hazard identification. I mean, there is no question in our mind about it.

How in the presentation of these options, though, do the different hazards -- and they can't be the same from concept to concept. They are not all the same from concept to concept. There is going to be some hazards present in one concept even at the preliminary conceptual design stage that are not in the others.

How is this presented to DOE so they can look at, from a preliminary or a gross hazard analysis kind of idea, which one might be the safer type operation?

MR. STRINGER: We will present information in the conceptual design report on exposure to workers and to the public, comparisons for the different technologies. That would be one area that obviously goes to safety. But again -- I have to back up because each of the technologies we will present a feasible design. We will meet the design requirements from Store Waste for each of those designs. All we can do is cite specific differences having to do with costs, acreage, having to do with exposure, if there is one. But again, in the design, the reason that there are differences in the acreage is because of how we handle those releases and what is going on.

There is a number of things that we are going to present in the report. Again, I don't know that one of them explicitly is how is one safer than another? As a designer involved in the process, I wouldn't feel comfortable really with commenting on that. I am supposed to design a system that will be safe and that will protect the public health and the environment for all of them, and they all can do that.

Probably the biggest difference you get into is with the wet. Probably all the dry storage modes are so similar that you are not going to find any major differences as far as safety. All the drys involve some kind of transfer in a transfer cell. And so the big accident condition -- I shouldn't have said it that way -- the accident condition that we're designing to the event is where we break open an assembly. That is our Design Event IV.

Each of the dry concepts has that built into the design process. We look at that and then we back up and we look at how it affects the public, we like at the site boundaries, we look at design conditions for our HEPA filters, thickness of the concrete, all of that. And there is not a whole lot of difference in the dry. Wet, completely different design. It has more active components. It probably has more scenarios where you can kind of get into a few more problems. It is a little bit closer to some of the things that you see at the nuclear power plants.

We are going to design a safe facility no matter which technology it is.

DR. PRICE: If you had a concept in which the only thing the MRS saw was a universal cask, your MRS design would change quite dramatically with respect to -- you said all the dry concepts that you looked at require transfer and so forth. This one would not?

MR. STRINGER: That is not one that's been proposed to us to evaluate.

DR. PRICE: I understand.

MR. STRINGER: Anything else? Any other questions?

DR. PRICE: Let me ask the board if they have other questions.

DR. NAQVI: Syed Naqvi from Ontario Hydro, Canada.

In your design requirement in the six facilities design we are looking at, are you looking also at the damaged fuel management? If there is effective fuel damage, how would you take care of it?

MR. STRINGER: That goes back to the interface with the other system elements. If we have failed fuel at the reactor and a very specific can or canister that is placed into, in our RFP we have a requirement that that canister can be placed into the storage mode, it can be handled in the design in the normal design for any of the technologies.

Is that what you meant?

MR. NAQVI: Well, I meant if you could monitor any news of damaged fuel it would be the same. Is there a different method of handling that fuel or destroying it?

MR. STRINGER: No, not based on what I know. Again, I'm not a nuclear engineer. We have those folks that look at that. Based on what they told me, a gaseous release isn't a problem. The problem is containing and making sure that you have all of the material. That is why if you have a failed fuel assembly you put it in a can and a canister and then it becomes just like another fuel assembly in the process.

MR. NAQVI: Just a comment. You said dry mode is defective fuel that is oxidized. There is no gaseous release that you are looking at. Anyway, that is just a comment.

The other question is, in design requirement are you also looking at security and safeguards? Is one design more amenable to security and safeguard and the other is not?

MR. STRINGER: Security and safeguard. I guess probably the biggest difference there would be with the wet. But again in conceptual design the only thing that I can fall back on is what I have already stated, that we will meet the requirements that are there that have been proposed

to us, that are in Store Waste, all the technologies.

MR. NAQVI: If you seal the cask, how do you verify the content of the fuel?

MR. STRINGER: Well, if we put it in a storage mode at MRS we verify the contents before we put it in there or as we put it in there; okay? And then it goes out to --

MR. NAQVI: With seals on them?

MR. STRINGER: Well, you are talking particulars. I could go into that design, but I don't know if it is appropriate until we get the conceptual design report. It depends on the storage mode.

Let me go back to the ISFSIS. At Oconee, the NUHOMS, it has a seal weld on the container and then the container is put into the concrete module. So, before they do the seal weld, of course, they account for exactly what they put in that container.

MR. NAQVI: So, the seal weld is a signature of your-self; is that what you are saying?

MR. STRINGER: A signature? After you threw the seal weld then you purge it and put inert gas in the canister so that it is just not just oxygen and air, it is in an inert gas environment during its storage. That is true of all of the dry storage modes.

MR. NAQVI: Perhaps DOE has already availed, you know, the International Atomic Agency for difficult to exit areas of putting up different kinds of requirements for verifiability of, you know, especially dry --

MR. STRINGER: Oh, yes, yes, yes, I know what you mean, yes. We are aware of those. Folks in the M&O are following those requirements. Our System Integration folks are following those requirements. I know exactly what you mean. There is a possibility that the functions and the require-ments will change. Right now we haven't looked at whether we would open up each of those containers, like if it was a dual purpose. That would change a lot of things in our design. I understand.

MR. NAQVI: The last question on your cost estimate. Are you also including the commissioning of the facility?

MR. STRINGER: Yes.

DR. PRICE: Next.

MR. HALSTEAD: Bob Halstead, State of Nevada.

Mr. Chairman, if it's all right since we're at the end, I would like to make about five minutes of comments on the relationship between the MRS and the repository and the conceptual design and siting.

DR. PRICE: Be our guest. We won't time you.

MR. HALSTEAD: Okay.

DR. PRICE: Maybe I'll wish that I didn't say that.

MR. HALSTEAD: Let me say that since the State of Nevada has no official position on the MRS other than not wanting to host one, these comments are my own personal comments based not only on my work on the repository, but on my experience with the State of Tennessee's Advisory Panel on the original Oak Ridge MRS proposal.

I would like to make some comments in three areas. First, the experience of the siting in Oak Ridge and the way that that might be considered in the development of the conceptual design. Secondly, the relationship -- my largest body of comments are on the relationship between the MRS and the repository and the way that that needs to be addressed in the conceptual design and systems planning. Finally, there are a couple of other siting issues which relate to things like who owns and operates the MRS, how many there are and where they should be sited.

Common area No. 1, the Oak Ridge, Tennessee siting effort should be very thoroughly studied. I don't know how this is being handled by the design team, but certainly all of the issues of risk or perceived risk, whichever you will, that came up during that experience, if they have not already been evaluated need to be evaluated and considered here. Without giving you hours of testimony on this, let me pick two examples.

I know Jim Carlson and I were in the same auditorium in Knoxville, Tennessee when a representative from the State Department of Health stood up in the middle of a presentation and said with some bewilderment after the discussion of hot cell operations, you mean this isn't going to be a zero release facility? Now, even though either the routine releases would be very small or even though the calculations of off-site releases from an accident, a fuel handling accident or handling of defective fuel were calculated to produce very small health effects, nonetheless, at that point I had that sick feeling that the larger issues involved in MRS siting were not likely to be considered because of the perceived risk of those hot cell operations.

Now, admittedly, that particular version of the MRS was one in which there were many operations performed at the MRS and it might be different than the one we have here. But I think it is worth considering from that experience that any conceptual design that involves hot cell work may trigger this kind of perceived risk in the siting process, and it could possibly in and of itself make it impossible to site an MRS somewhere.

I think you'll find more concern, perhaps in the area of worse case accident analysis. And one of the examples that was brought up in the Tennessee case was the proximity of the proposed site to an air base that routinely handled large aircraft, including C5A's. And the issue of scenarios involving, say, a C5A crash into the storage area are the kinds of site specific worse case accidents that you need to be preparing to handle.

Second area, the relationship between the MRS and the repository in the development of the conceptual design. I must say as a person who works for the state that is currently under consideration for a repository, I am disappointed by the extent to which the discussion today does not reflect a systems analysis in which the linkage between the MRS and the repository is considered equally with the linkage between the MRS and the reactors. I understand the pressure on the Department to show some progress in meeting the 1988 acceptance date, and I would also assume that the experience of your design team in civilian nuclear power applications, which I will appreci- ate, would lead them to focus on the backward linkage where the fuel comes to the MRS. It is very important that you look at the forward linkage of what happens between the MRS and the repository. Perhaps on another occasion we will hear more about that, but I had hoped to hear more about it today.

Let me say that I think that is important not only from the standpoint of Nevada, but it is going to be very important when you actually start getting into serious siting negotiations with a potential host community, if for no other reason than that their uncertainty about whether the MRS is going to be a de facto repository may well hinge on whether they are confident in the way in which you've integrated the MRS into the system, including the repository.

Specifically, my own feelings on this, if I get them down to about four principles, are that I think it's self-evident as well as a matter of good systems engineering, that the MRS functions should be integrated with the repository functions as well as the reactor functions.

Secondly, the MRS should make it easier to site, license, construct and operate and possibly decommission the repository. And we could go into that in detail on some other occasion, but in each of those areas there are significant opportunities to use the MRS to facilitate the design and construction of the larger system. I don't see any evidence today of what you're doing in those areas, although I saw your time lines which tell me that work will bee forthcoming.

Third point, I think the MRS must facilitate the transportation of spent fuel to the repository or it almost certainly will not be cost effective. And, again, that leads us into a variety of system issues, including cask design.

And the fourth point I'd say here, there are many different ways to integrate the MRS and the repository. They can go back to the original integrated MRS proposal in which all or most of the nasty functions were performed at the MRS, and in Roger Hilley's words, the MRS made the repository a hole in the ground at the end of a railroad track. Or you can have exactly the opposite, the kind of an MRS that Nuclear Assurance has proposed, which is basically an MRS that performs certain warehousing and logistic functions for dual purpose casks on the way to the reposito-ry. I think those are probably the bounding cases. And again, I appreciate that you're working on a variety of different options. The important thing is that in each of those cases you consider, you give equal weight to the functional integration of the MRS in the repository as well as the repository and the reactors.

My third area, some miscellaneous siting issues, which I think need to be considered on their own merits, but also in relation to the development of the conceptual design. The first issue is regional equity in siting. Anybody who isn't paying attention to this issue is kidding themselves. The Western Governors Association has already taken a pretty firm stand against having an MRS in the west along with the proposed repository at Yucca Mountain and the WIPP site in New Mexico. I don't have a particularly easy resolution to this, except to tell you that the concern over regional equity in siting of the major components of the waste management system is real. And it cannot be ignored in siting. And the fact that you have some volunteer counties and Indian tribe reservations and tribal land sites in the west does not mean that you're ultimately going to be able to get a site in the west, not only on technical considerations, but because of the very deeply felt feeling in the west that the benefits of nuclear power accrue to the east and the garbage goes to the west.

The second issue is the number of MRS's which could or should be considered. I missed some of the earlier discussion, so perhaps I missed this, but given the essentially modular configuration of many of the different MRS options here, the possibility of having more than one MRS site should be considered, not only because this might offer some efficiencies in terms of reducing transportation costs and perhaps specializing the function of a particular MRS, which served particular reactors which are using particular storage systems, but it also gives you another opportunity to address that regional equity issue.

And finally, a third point that I would make here is that there are some alternatives regarding the ownership and operation, the institutional issues, if you will, associated with the MRS that perhaps should be considered at the same time that we're developing the conceptual design. Again, difficulties in WIPP facility and the fact that the Department of Energy has come up with what I think is a fairly innovative and possibly a successful approach of using the request for proposals route to solicit private proposals for interim storage of in this case transuranic waste, admittedly the technical difficulties in siting an MRS for spent fuel are probably somewhat greater, although I am not sure they are so much greater than handling transuranics that the approach would be precluded.

Nonetheless, this is an approach in which private parties would be responsible not only for submitting technical plans which comply with the Department's needs but also those parties would be responsible for finding sites. So I think there are a number of siting issues here that perhaps deserve greater consideration as we work on the conceptual design.

Thank you for the opportunity to make these comments, Mr. Chairman.

DR. PRICE: Thank you. All right -- I don't think you need a response. As a matter of fact, if you'd like you can sit down.

MR. STRINGER: Thank you.

DR. PRICE: Mr. Stuart.

MR. STUART: Ivan Stuart, NAC.

First of all, Dr. Price, regarding the fog about the capability of the reactors, one of my associates will be here tomorrow and he was the project manager for both the FICA and NSTI studies and I know he'd be pleased to tell you what we concluded, if you would like to hear it.

DR. PRICE: We would and we're looking forward to it.

MR. STUART: All right. My question for Joe is, first of all, the design basis events that you talk about, looking at it from the potential host's point of view again, are you suggesting that all the design basis that we have over the years developed by the NRC for each of the storage systems and for the fuel-handling in the reactors, that you would be adding something to that for the design basis for the MRS? Or can we assume that those design bases will be sufficient for each of the technologies?

MR. STRINGER: I think it is our responsibility as the designers to define the design basis for the MRS. That's not to say we wouldn't utilize the information that's there and experience that's there.

We have folks again from the power company, from

Duke Power. They worked on licensing, SAR design for the nuclear power plants.

But we have to develop that for our SAR for the MRS.

Did that answer your question?

MR. STUART: Not exactly. I would still like to see what your report says. I just have the feeling that there's nothing that is going to be done at an MRS that hasn't already been done at a reactor or --

MR. STRINGER: I don't disagree.

MR. STUART: -- or whatever, and so --

MR. STRINGER: But there's different requirements and very particular, as you well know, 10 CFR requirements, particular just to MRS. They are different than they are for the nuclear power plants.

MR. STUART: Okay. On page 21, you refer to your total program costs and schedule.

Would it be reasonable to assume that this is an updating of what used to be called "total system life cycle cost" -- is that what you are going to do here, or is that different?

[Slide.]

MR. STRINGER: I don't know.

MR. WILLIAMS: That is different.

MR. STRINGER: I think it is.

MR. WILLIAMS: The total system life cycle cost is done at a different level and includes repository, transportation, MRS and several other things that are out of the scope of work of the people at Duke.

MR. STUART: So it is not really integration like it says of the total cycle under the super heading there of those last three bullets.

MR. STRINGER: I think it is meant to be for the M&O.

MR. WILLIAMS: That's right. This will feed into total system life cycle costs. That's the way we work it up there.

MR. STUART: If that is the case then I'd like to follow up then Dr. Price's question about as you look at the different technologies and you are looking at the total program cost and schedule, apparently you believe there can be a case of total dual purpose cask type MRS, that there will always be something different than a dual purpose cask MRS, am I correct?

MR. STRINGER: State it one more time. Be specific.

MR. STUART: I guess what I am asking you is will you be conducting one case which is a total program cost and schedule, assuming that everything is done by dual purpose casks?

MR. STRINGER: Everything at the MRS.

MR. STUART: At the MRS.

MR. STRINGER: To the storage mode but not that they all come to MRS in dual purpose casks.

Yes, one of the deltas is utilizing dual purpose casks for the storage mode. In that technology we assume if a reactor site could ship by rail then we'd receive his SNFs in a rail cask, dual purpose cask, put it in the yard.

Then the other amount would have to come as we already talked about from the truck shipments and be processed in the transfer facility.

MR. STUART: My next question is on page 12 you talk about the MRS receiving and then packaging and then sort of unpackaging, if you will, retrieving, and then shipping to the repository.

MR. STRINGER: Right.

MR. STUART: Again looking at it from the host's point of view, is it reasonable to assume that whatever form it came into the MRS is going to be the same form that it goes to the repository?

[Slide.]

MR. STRINGER: Yes, that is an assumption we talked about. Right now there is no reprocessing at all.

MR. STUART: And it is not another series of kinds of different casks that's going to the repository as was envisioned in the early design?

MR. STRINGER: Again, the MRS right now is flexible design. Our basic design that we can kind of put our hands around and look at and see how many shipments there would be to MGDS assumes the OCRWM Initiative 1, Phase 2, rail cask, the BR-100, so most of our work, our detail work is based on shipments.

Except for the dual-purpose scenario, it's based on shipments of the BR-100 to MGDS with the caveat that we will not preclude using a different cask, i.e., Initiative 1, Phase 2, Phase 3 later one, whatever comes off.

Does that answer your question?

MR. STUART: Yes, it did. Thank you.

MR. STRINGER: Any other questions for me?

[No response.]

MR. STRINGER: Thank you.

DR. PRICE: I think we're at the end of the line but I just thought I'd better check and make sure here that all speakers scheduled for today have completed.

Maybe some other on the panel and the board and staff might care to make some kind of wrap-up impressions but let me kick off some impressions that I got for whatever value they might be.

First of all, I think I should preface it by saying as we will tomorrow at the end of all things that we appreciate the amount of work and the time and care it takes to provide this kind of information to the board.

I think Mr. Halstead took a little bit of what I wanted to say about a disappointment in relationship with the entire system as the MRS fits in to the functions of the entire system, both the impact of issues at the repository and in the repository and so forth, with respect to the MRS and then transportation and issues related to the utilities. Sometimes I felt like we get a little bit of information about that feed into the MRS, but I think more of it's going to come perhaps tomorrow when we get into the near site and some of this other information.

So, we can kind of hold off a little bit on the front end disappointment, but I felt, anyway, myself, a little feeling of kinship there with Mr. Halstead and his comment about getting the entire system. Of course, the Board has been emphasizing for a long time, this desire to not have everything in a box; that the utilities are not on their side of the fence only, that the MRS isn't a box by itself, that the repository is not a box by itself, that the transportation system is not an entity unto itself, but that there are a lot of interface and even, if you want, beyond interface, issues that just tangle the system together, and this tangle needs to always be kept in mind.

I don't think that's news to any of you on the other side of the table with respect to maybe the Board's view on this. Flexibility is one of the features, I think, that you've presented to us today, and certainly that is a magic word with respect to the repository, and maybe even the Academy of Sciences report that made that a good buzzword. Flexibility, I wonder to the extent that real creativity has been applied to how can you meet the variety of functions?

I know maybe in one way, you've had an inflexible task placed upon you; that is, it was a one-site kind of a view of things that you had. Flexibility might be able to be attained differently -- I don't know -- with a creative view of the issue of the functions of the MRS and where do they belong and where can they occur and how can you get this flexibility that you may feel you need? Although some parts of it were alluded to in the answers about changes at the utilities.

We mentioned the utilities here a couple of times because we feel the utilities are part of the system. You know, DOE's work and the utilities' work in regard to a total systems view has to be together. Then on the shinier side, the human factors and system safety presentations provided to us a skeleton and we're glad to see the skeleton and we look for the meat and the function and the heartbeat to come.

I think it was evident that the heart was not beating, for example, here in the conceptual presentations as we looked for certain things, but we feel like it's going to come, because we think that's the direction you're going. That's something we're glad to see, so we'd say, keep it up or at least I would, but not at the same pace.

So, I had to throw a little twist in there to that kudo because perhaps what we see at this point is something we might have looked for at one of the previous meetings, but we did get it at this meeting and we're glad to get it, and look for more along those lines. Now, are there any other comments or summary of any sort from the staff or Board members?

DR. NORTH: I think you've summarized very well, Dr. Price.

DR. PRICE: Thank you. Okay, now, we were scheduled to adjourn at 4:00. Now, I don't know that we've ever ad- journed early in one of our meetings. I can't remember. Maybe we did sometime, but I don't ever remember adjourning early, and I don't want to break precedent, so I'll hang around until 4:00, and the rest of you, you can do what you want.

[Whereupon, at 3:20 p.m., the meeting was adjourned, to be reconvened on Wednesday, March 11, 1992.]