UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
***
BRIEFING ON THE HIGH LEVEL
WASTE PROGRAM VIABILITY ASSESSMENT
***
PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North,
Room 1F-16
11555 Rockville Pike
Rockville, Maryland
Monday, February 8, 1999

The Commission met in open session, pursuant to notice, at 2:05 p.m., Shirley A. Jackson, Chairman, presiding.

COMMISSIONERS PRESENT:

SHIRLEY A. JACKSON, Chairman of the Commission
NILS J. DIAZ, Member of the Commission
EDWARD McGAFFIGAN, JR., Member of the Commission
GRETA J. DICUS, Member of the Commission
JEFFREY S. MERRIFIELD, Member of the Commission

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STAFF PRESENT:

JOHN C. HOYLE, Secretary
KAREN D. CYR, General Counsel
ANNETTE L. VIETTI-COOK, Assistant Secretary

PRESENTERS:

LAKE H. BARRETT, Acting Director, Office of Civilian Radioactive Waste Management
STEPHAN BROCOUM, Yucca Mountain Site Characterization, Office, Department of Energy

P R O C E E D I N G S

[2:15 p.m.]

CHAIRMAN JACKSON: Good afternoon. ladies and gentlemen. Today the Department of Energy will provide the Commission with a briefing on its viability assessment of a repository at the Yucca Mountain, Nevada site.

DOE last briefed the Commission on the High Level Waste Program on May 15th, 1997. Over the past 15 years,

the Department of Energy has been studying the site at Yucca Mountain to determine if it is a suitable place to build a geologic repository for the nation's spent nuclear fuel and high level radioactive waste. In response to Congressional direction in the FY 1997 Energy and Water Development Appropriations Act, on December 18th, 1998, DOE issued a viability assessment. The purpose of it is to provide the President, the Congress and the public with information on the progress -- see, I am taking some of your words, Lake, probably -- at the Yucca Mountain site and to identify the critical issues that need additional study before a decision can be made on whether to recommend the site for development as a repository.

Although there is no specific requirement for the NRC review of the viability assessment, the NRC Staff presently is doing so as part of its responsibility for prelicensing consultation required by the Nuclear Waste

Policy Act of 1992. This is consultation with the DOE.

The objectives of the NRC staff review are, first, to identify DOE progress in developing information necessary for complete license application; second, to determine the potential for licensing vulnerabilities that could preclude or pose a major risk to licensing; and third, to determine if there are any major concerns that if not resolved by DOE would result in an unacceptable license application.

On March 16th and 17th the NRC Staff, the State of Nevada, the affected local governments, the Advisory Committee on Nuclear Waste, and the Nuclear Waste Technical Review Board are all scheduled to brief the Commission on the viability assessment, but we welcome today Mr. Lake Barrett, DOE's Acting Director of the Office of Civilian Radioactive Waste Management, to the briefing. If DOE does not object, Mr. Barrett in particular, we may interrupt your presentation from time to time to ask pertinent questions, and then at the close of the presentation I will open the discussion to any additional general questions from the Commission. We will try to let you get through, however, your presentation.

Now I understand that copies of the viewgraphs and the viability assessment overview are available at the entrances to the room, so unless my colleagues have anything to add, Mr. Barrett, Please proceed.

MR. BARRETT: Thank you very much, Chairman Jackson, members of the Commission.

Since I last appeared before you, the Civilian Radioactive Waste Management Program has continued to make substantial progress in carrying out its responsibilities under the Nuclear Waste Policy Act. Despite reduced FY 1998 and 1999 appropriations, we have maintained and often exceeded our schedules by achieving efficiencies and re-prioritizing work activities while maintaining the safety and integrity of the scientific work.

When I spoke to you last, the program was focused on preparation of the Yucca Mountain viability assessment. On December 18th the Secretary submitted the viability assessment and its companion documents to the President, the Congress, and released it to the public.

The viability assessment serves as an important management tool for the program to guide the completion of the site characterization by identifying the critical issues

that need to be addressed before the Secretary of Energy decides whether to recommend the Yucca Mountain site to the President for development as a repository.

While the viability assessment is not one of the decision points defined in the Nuclear Waste Policy Act, its completion is significant because it gives policymakers like the Commission key information regarding the prospects for

geologic disposal at Yucca Mountain.

Based on the viability assessment, we believe the work should proceed to support a decision by the Secretary in 2001 on whether to recommend the site. While the viability assessment reveals no show-stoppers, it does identify areas where additional work is required before suitability can be determined and the Secretary can decide whether to recommend the site.

We hope the VA will provide our respective staffs with a frame of reference to conduct the prelicensing interactions necessary to facilitate the timely submittal and review of a high quality license application if the site is found suitable. We expect that the information contained in the viability assessment and the performance assessment components will provide an adequate technical basis for a license application when combined with the additional information that will be obtained as a result of the work described in the License Application Plan.

The Commission's views regarding the acceptability of our approach will be important to forming a mutual understanding of what will be expected of this program during the licensing process.

We are now refining our licensing approach and obtaining the necessary scientific and technical information to support our safety analyses. Central to this work is

refinement of our safety case, which supports the evaluation of the site and the key design decisions that are forthcoming.

In addition, we will continue to focus on improving the implementation of our quality assurance requirements. Today I will provide you with an overview of the program and focus on the program elements that in combination with an updated regulatory framework will be essential to licensing a repository at Yucca Mountain should the site be recommended and approved.

For our budget in FY 1999 Congress appropriated $358 million -- $22 million less than President Clinton's budget request. Congress further directed that $4 million of that $358,000,000 be used for the study related to accelerated transportation of waste, thus leaving $354 million available to the program at Yucca Mountain.

The President's request was intended to maintain our schedule for completing necessary site activities for a site suitability determination, issuing environmental impact statements, and submitting a repository license application if the site is recommended. Congress endorsed this work but reduced the appropriation. The FY 1999 funding is adequate to continue implementing the revised program approach as refined in the viability assessment.

We plan to publish a draft Environmental Impact

Statement this coming summer. We have made the necessary programmatic adjustments to maintain our schedule and conduct additional studies of issues identified in the viability assessment.

The cumulative effect of the budget reductions over the last three years, however, coupled with the additional studies needed to address key scientific issues, is stretching the program's resources. Our FY 2000 budget request, which has a significant increase for Yucca Mountain, supports the funding requirements identified in the viability assessment. As the program continues to build on the momentum achieved over the last five years, our budget request supports the activities necessary to determine the suitability of the site and to develop the documentation needed for a Secretarial decision on the site recommendation in 2001.

Specifically in 2000 we will issue a final Environmental Impact Statement. The Nuclear Waste Policy Act requires a final Environmental Impact Statement accompany the site recommendation and to the extent practicable be adopted by the Commission in connection with the issuance of a construction authorization and a license if we are successful in our licensing endeavor.

CHAIRMAN JACKSON: Mr. Barrett, let me -- can I ask you a question?

MR. BARRETT: Sure.

CHAIRMAN JACKSON: You mentioned about having the program's resources stretched. Have you had to postpone other aspects of the program like canister design to maintain the schedule to complete these additional studies of issues identified in the viability assessment?

MR. BARRETT: Unfortunately, we have had to do that. We have in the national transportation program, we have pretty much had to defer most of our activities in any transportation hardware development, the multipurpose canister initiatives. We are basically not doing any Federal work in that area, working on the institutional issues of national transportation -- which are very important -- we have had to unfortunately defer those until a national decision is made on siting, so we have had to basically focus almost exclusively on the scientific aspects of Yucca Mountain that lead toward its suitability and license application.

CHAIRMAN JACKSON: Okay. Thank you.

MR. BARRETT: In addition, we will begin evaluating the site for compliance with the repository siting guidelines, that's DOE 10 CFR 960, and we will complete the internal review of a working draft LA and will initiate development of an acceptance draft LA which we will make available to your Staff starting next year.

CHAIRMAN JACKSON: LA being license application.

MR. BARRETT: Thank you very much, Madam Chairman.

The viability assessment, as the Chairman mentioned in the beginning, does contain four primary components.

First, it describes the preliminary design concept for the critical elements of a repository and the waste package. Second, it contains the total system performance assessment based on the design concept and the scientific data analyses available at this time and describes the

probably behavior of the repository in the Yucca Mountain geologic setting. Third, it presents a plan and cost estimate for the remaining work to complete -- to submit the license application. Fourth, it lays out an estimate of the cost to construct and operate the repository consistent with the reference repository design concept.

The VA as published also contains an introduction and a detailed description of the characteristics of the site. In front of each of the Commissioners is a copy of the overview. One thing I will mention we did in the viability assessment is an attempt to make this widely disseminated to interested members of the public. We have put this entire document on our Internet site, which we have had tens of thousands of hits or visits to by members of the public and also in this is a CD ROM that has the entire

viability assessment document in it as well.

The viability assessment identifies the inherent advantages of the Yucca Mountain as a potential repository site, including its remote location, semi-arid climate and deep groundwater table. Less than half an inch of water reaches the level of the repository per year. Based on the viability assessment, we believe Yucca Mountain remains a promising site for a geologic repository and the work should proceed to support a decision in 2001 whether to recommend the site as the nation's first repository.

We understand that the uncertainties remain about the key natural processes, the preliminary design, and how the site and the design would interact and we recognize that our assumptions and analyses have yet to be challenged in a rigorous licensing proceeding. To address these uncertainties, we will focus on improving our understanding of the key natural processes as well as improving the repository and waste package design.

The primary objective of our licensing approach is to integrate the rationale and plans for the remaining technical work with the statutory and regulatory framework within which the work must be done and the decisions must be made.

We support your efforts to create a site-specific Part 63 that would apply exclusively to Yucca Mountain. To

revise 10 CFR Part 63 will address our need to understand the key licensing requirements for a repository site at Yucca Mountain.

Our current License Application Plan describes our overall approach to completing the site characterization and is contained in Volume 4 of the viability assessment. The License Application Plan presents the activities we believe should be completed prior to determining the suitability of the site and preparing a license application. Your review is essential to forming a mutual understanding of what is expected from the program in the licensing process.

We fully expect our approach to licensing will continue to evolve as we work toward understanding and resolving potential licensing issues.

Several years ago your Staff refocused your program around 10 key technical issues deemed most important to repository performance. We are continuing to focus on resolving these key technical issues. The LA Plan contains a crosswalk that indicates where each of your key technical

issues is addressed in our viability assessment.

Of the remaining additional technical work identified in the License Application Plan, the postclosure safety case is clearly the highest priority. Our postclosure safety case must provide reasonable assurance that a repository at Yucca Mountain will protect the public

health and safety and the environment after a repository is closed and sealed. The safety case is a set of arguments that will be made to show that the repository system will contain and isolate waste sufficiently.

Underpinning the set of arguments is an understanding of the performance of the repository system. The repository safety strategy is the framework for integrating the performance assessment, site information and exploration, and the repository design to develop the postclosure safety case. Our safety strategy is based upon demonstrating that a Yucca Mountain repository with four key attributes would protect the public health and safety and the environment for thousands of years.

The four attributes are limited water contact with the waste packages, long waste package lifetime, slow release of the radionuclides from the breached waste packages, and reduction in the concentration of radionuclides as they are transported from the breached waste packages to the environment.

Evaluations of these attributes are guided by summarizing current knowledge and developing testifiable hypotheses to address the issues. Each attribute is influenced by natural processes and the placement of the engineered components -- in other words, multiple natural and engineered barrier, iteration among the site

exploration, design, and performance assessment teams produces an evolving picture of what site information and design features are important to the performance of the repository system.

The major thrust of the remaining technical work is to select the design which will be carried through licensing. Selecting the design will include comparisons of the options and alternatives. It will require a sequence of decisions regarding criticality issues, approaches to repository sealing and closure and evaluation of design alternatives.

The viability assessment reference design was developed to define a workable repository concept for Yucca Mountain and to provide a consistent basis for evaluating the significance of natural processes and engineered features. The design is not fixed and enhancements will continue to be included throughout the repository design process evolution.

Our design approach balances the need to develop and maintain a coherent working concept with the recognition that the design concept will invariably evolve throughout the process of suitability, licensing, and construction. Our design process has and will continue to consider the potential advantages of alternative design features, concepts, and options.

For example, on the same day that I last briefed the Commission Nye County presented its views on ventilation

and extended monitoring of the repository. We listened to this exchange and agreed that future generations should make the ultimate decision on whether it is appropriate to continue to maintain a repository in an open, monitored condition or to seal and close the repository if they are comfortable with the risks involved.

To ensure the flexibility for these future decision-makers, the viability assessment reference design allows the repository to be closed as early as 50 years or as late as 300 years from the initiation of waste emplacement. An extended monitoring period also provides the flexibility needed to allow the project to move forward and obtain an improved understanding of the remaining uncertainties.

As I stated earlier, the viability assessment and License Application Plan guide the completion of a site characterization and the design by identifying the critical issues that need to be addressed and by laying out our technical work plans that will support the resolution of these issues.

I am pleased to report that since I last briefed you we have made significant progress in the site exploration, site characterization, science, design, and

performance assessment areas. The progress has permitted us to evaluate the degree to which the viability assessment reference design exhibits the four key attributes outlined in the repository safety strategy.

At this time I would like to point the Commission to the monitors and I would like to go through a few of the experiments that have been going on since we last addressed the Commission.

This is the sketch of the underground area of exploratory facilities.

The dark is the main five-mile loop that we completed some time ago. The new red is the cross-drift that is a little over three kilometers long, which goes to the west side of the block, about 20 meters above the actual repository emplacement horizon.

There are two experiments that I will show in the next slides, but the upper section is the Alcove Number 1 where we have done an experiment, and the large heater test down at the lower corner here. Next slide, please.

This is the start of the cross-drift. This is the small, 16 foot diameter tunnel bar machine being placed into the starter tunnel for the cross-drift.

This is the cross-drift after it has been completed at the intersection with the main 25 foot tunnel. This is where you see the conveyers from the two systems

converging.

This is the infiltration experiment that is over Alcove 1. This is where we sprinkled tens of thousands of gallons of water on the surface and below this, directly below this is the Alcove Number 1, where we put in catchers to try to determine our models and calibrate our models on the infiltration rates and seepage into tunnels.

This is the sketch of the large heater test. Here the heater test is in the section on your right. It is a 160 foot long tunnel. Part of it is concrete-lined, part is not, for emplacement. We put heaters in there. We drilled

over three kilometers of instrumented bore holes around this with over 3,000 channels of information for temperature, water, chemistry, rock strain, and we applied heat to the mountain -- and the next slide, please.

This is looking in through some of the insulated windows into the tunnel. We are up to over 300 degrees Fahrenheit inside the tunnel. The way -- we can actually track the water fronts as the water steams and recondenses as we go through. Again, this is where we are comparing this against our models for the thermal zone and the interaction between the engineered aspects of the repository with the natural. Here you see the predicted on the top and the measured on the bottom, and you can see over the last year how this has grown and basically our measured

results -- we are very encouraged -- track very nicely with our predicted results in this area, so this is an eight-year test that the Staff, the NRC Staff, follows very carefully.

The next area I would like to turn to is our Busted Butte facility which is located nine kilometers south of the tunnel -- the Yucca Mountain tunnel area. Here there is a section of the Calico Hills formation, which is the rock strata below the repository has been thrust up.

We have dug into the Busted Butte area and we have exposed areas of the Calico Hills formation and we are doing chemical tests here to determine what the behavior of the liquids would be in the strata below. This is an experiment where we have put in the Fluorescein Disodium salt tracer material to determine what kind of flow conditions we have here in the Calico Hills, which would be below the repository. We have been encouraged at some of the initial results. It looks like the flow in this area is dominated by matrix flow as opposed to fracture flow, which will be important in the overall performance, but again, a lot of work continues in this next period there. Next slide.

Also we have a very active drilling program on the surface. Nye County is doing some of the drilling in the saturated zone, south of Yucca Mountain toward Lathrup Wells. They are drilling 22 different wells and they have been drilling around the clock in several locations. I am

very pleased with the results that we are doing in the drilling in the saturated zone by Nye County. Next slide, please.

There has also been work on the engineering aspects. This is a quarter-scale model of the tunnel actually where we are looking at different backfill -- set up a Richards barrier where we could sort of look for potential design alternatives where we could diffuse the water away from the heated waste package if we were to backfill in the tunnels. Backfill is not the reference design, but we have evaluated that as an option to try to improve the performance of a repository in the geologic setting of Yucca Mountain.

I think that should be the last of the slides.

Now our work is being performed and we believe we have been completing world class science. We also know that world class science is necessary but insufficient for a license application. As I know each of you is aware, your Staff has expressed serious concerns about the implementation of our quality assurance program. These concerns have been expressed in the reports by your on-site

representatives, letters from your Staff, and face-to-face interactions. Although your Staff acknowledges that most of the QA issues have been self-identified by the Department, I want to make it perfectly clear that as we move towards

licensing a quality assurance program that is capable of identifying issues but is ineffective at preventing and resolving them in a timely manner is unacceptable to the Department of Energy.

Let me begin by stating unequivocally that we do not disagree with the conclusions of your Staff regarding the implementation of what is structurally a sound quality assurance program. This program's management team is absolutely committed to making the improvements that are required to become that of a licensee.

To date, in the viability assessment we did focus on the world class science and we recognized that that is not going to be sufficient. It must also be performed under an NRC-approved quality assurance program with the necessary processes and documentation that are required. We are working hard to bring that dimension into every scientist, engineer, and administrator's daily routine.

During the last fiscal year we completed the consolidation of our multiple quality assurance programs into one overall DOE QA program and have made significant progress in integrating the quality assurance functions of the Office of Quality Assurance with those of the Management and Operating Contractor, TRW.

Our QA audit function has been retained solely by DOE and remains independent of TRW. Having one quality

assurance organization reporting to the Director of the Office of Quality Assurance, who reports directly to me, provides the support to all the program participants and allows a more consistent approach to the implementation and interpretation of the QA program requirements.

At our December 9th, 1998 and January 26th, 1999 meetings with your Staff to discuss quality assurance issues, we identified actions necessary to address the quality assurance deficiencies, many of which are related to technical data, procurement, software, and model development and use. We recognize the need to adopt an integrated approach to resolution as well as prevention of similar deficiencies in the future. To that end, the program has developed and is implementing our corrective action request management plan and response to corrective action requests, which identifies the actions already taken as well as those actions planned to effect the needed improvements in our QA implementation.

As you recall, we faced a similar quality assurance program implementation issue in 1994 when we began to design and then construct the Exploratory Studies Facility. In that case we also needed to improve the performance in the mining and engineering workforce that was unfamiliar with the nuclear culture and unpracticed in quality assurance processes.

We were successful in that transition and we are now taking many of the same steps to effect change in the natural system and performance assessment activities. We

recognize the need for comprehensive change in a limited time period, but we have the confidence that we can again do it successfully.

We believe that the implementation of the corrective action report management plan will permit us to employ effective corrective actions that will have a high probability of preventing reoccurrence of the deficiencies. The program is planning to devote adequate resources to this issue.

Accordingly, our Corrective Action Board will provide additional management oversight of the corrective action processes. Their objectives are to decrease the overall time for completed corrective actions, to decrease the number of rejected deficiency responses and verifications, and to decrease the overall number of open deficiencies and the ensure the integration of corrective actions for similar deficiencies in the future.

The Board charter was approved this January and the Board members have been selected. The formulation and implementation of the management plan and establishment of the Corrective Action Board illustrate our ongoing commitment to achieving full compliance with nuclear quality

assurance requirements. We will apply the appropriate level of resources and the highest level of management attention to ensure that performance meets management's expectations as well as the NRC's requirements.

In addition to the actions mandated by our management plan and as overseen by the Corrective Action Board, it is often appropriate to implement some corrective actions in advance of the identification of root causes. For example, the Yucca Mountain Project began providing regulatory and licensing training that portrays quality assurance as an integral part of the nuclear culture and a necessary underpinning of the licensing process.

Our four national laboratories are supporting our program and are being trained in the control and use of scientific notebooks by our program. The training is being conducted to promote a better understanding of the purpose and objectives of scientific notebooks in our program and the rigor of scientific notebook documentation to ensure traceability of our work in any future licensing proceeding.

With regard to data qualification, we are verifying the documentation supporting the status of qualified data and identifying existing nonqualified data that will be directly relied on in the license application, and must therefore be qualified.

Our ongoing process validation and re-engineering

initiative will permit us to develop and implement an interdependent project infrastructure that conforms to project requirements, provides defensibility, traceability, reproduceability, and retrievability for products and information used in the Environmental Impact Statement, the site suitability, the site recommendation and the license application.

Once the process validation and re-engineering initiative is complete, the program will have reviewed and verified work processes, developed a set of integrated work procedures, established an integrated training curriculum supporting the procedures, and create an implementation plan specifying our approach as well as individual roles and

responsibilities.

DOE considers the improvements and implementation of the quality assurance program to be of paramount importance. As our program moves beyond just world class science, and our quality assurance performance improves, the project expects to enhance its ability to respond to deficiencies and promptly identify root causes and implement the appropriate corrective actions to prevent reoccurrences.

We intend to routinely communicate our progress to the NRC Staff and are looking forward to briefing the Staff on the status of our management plan and results achieved to date when we meet this coming April.

The program is reaching a conclusion of our site characterization efforts. The viability assessment clarified the remaining work required and identified those technical issues that should be addressed prior to determining the suitability of the site.

We are addressing those issues and have commenced work on assembling the information required to support national decisions on geologic disposal at Yucca Mountain.

In closing I would also like to note that since I last addressed the Commissions, our respective organizations have interacted frequently and have made progress in a number of areas. The valuable efforts of your Staff have resulted in tough but fair critique an have stimulated positive change within our team. I hope that we can continue to build on this progress as we move forward.

We intend to keep you and your Staff apprised of our progress and look forward to a constructive dialogue as we carry out our mutual responsibilities.

Thank you for the opportunity to brief the Commission and I would be pleased to try to answer any questions that the Commission may have.

CHAIRMAN JACKSON: Thank you. I have a couple of questions. Let me ask one question about your QA program.

Will you revalidate the aspects of your program, meaning data models and samples, that already comprise your

basis for the viability assessment against or, you know, the standards of your improved QA program?

MR. BARRETT: Some of the data has already -- is satisfactory and has met the requirements. Some of the data has not. What we will do as we proceed now toward a license application, we will go back and qualify the data that needs to be, and as the budget permits, go back and get that data.

We will have to wait and see how the 2000 budget turns out but we have had basically a 20 percent increase for the Yucca Mountain science activity in 2000 and want to pick that up for one integrated science program that serves all the needs, of which the most restrictive and demanding program is the one the NRC would require for a license application.

CHAIRMAN JACKSON: Will your Environmental Impact Statement address the transportation aspects of high level waste disposal?

MR. BARRETT: Yes, it will. It will also -- it will look at the inter-Nevada transportation among multiple routes and multiple methods of transport as well as it will look at the national transportation from reactors or the high level waste sites to a possible Yucca Mountain

repository.
CHAIRMAN JACKSON: Okay. These are a couple of questions about remaining technical work and then evaluating

the design against the four key attributes you mentioned.
You know, the review of the design for the waste packages as well as the repository itself are going to be a critical factor in terms of time and resources needed by the NRC to review. Does your schedule take into account the effect of delaying the finalization of the design by you, the effect that that would have on NRC's completion of the review of the License Application?
MR. BARRETT: Yes. In the License Application Plan in the viability assessment and in supporting management schedules that we have, and as we have explained, your Staff is aware of those, we have plans on that. Our desire in the concentrated activity currently underway on the design alternatives is our goal is this June to basically select the reference design that we would use for site suitability and for licensing that would allow your staffs as well as my staffs to be able to focus on a specific reference design we would wish to carry through the process so it would be an integrated system.
CHAIRMAN JACKSON: When do you actually plant to have the waste packages designed for all the waste forms projected for Yucca Mountain?
MR. BARRETT: Well, the key is the majority of the material, which would be the commercial fuel as well as the generic high level waste packages for the Savannah River and

the West Valley borosilicate glass. Also, the Navy is pursuing fairly rapidly their package for the Navy spent fuel.
Regarding the many different -- tens of types of DOE's own spent fuel, those are coming along on various schedules as our environmental management colleagues work on that, so that has a various schedule but the main central focus is for the classical commercial spent fuel and the DOE borosilicate glass in the Navy.
CHAIRMAN JACKSON: Glass in the Navy, and those are -- so what kind of schedule are they on?
MR. BARRETT: The commercial fuel, the waste package design basically would be -- we'd hope to have that pretty well -- the reference design advanced enough for the design, the reference design --
CHAIRMAN JACKSON: To cover those three things --
MR. BARRETT: For those, this summer.
CHAIRMAN JACKSON: And are you planning on disposing of greater than Class C waste at Yucca Mountain?
MR. BARRETT: That is not in our reference design. the greater than Class C waste is one of the modules that will be discussed in the Environmental Impact Statement for Yucca Mountain, but that is not presently part of our License Application design.
CHAIRMAN JACKSON: And how will you address failed

spent fuel in terms of credit for cladding and so forth? Have you worked that out?
MR. BARRETT: As in the models in the viability assessment, it depends upon the fuel. The algorithm is, for example, stainless fuel, which is about 1 percent of the

inventory of the commercial fuel that we have, we do not -- that is not of the higher integrity of the zircalloy fuel, so there it is a higher fraction, assumed to be failed basically we have assumed at 10,000 years. It does not provide a barrier at all so it depends upon the fuel.

CHAIRMAN JACKSON: So you are taking a graded approach based on what fraction of the fuel you think has what degree of failed cladding, is that basically --

MR. BARRETT: That is correct.

CHAIRMAN JACKSON: -- basically correct.

MR. BARRETT: And as we refine the models more, we may take into account burnups and different aspects as we basically develop the sophistication in the models for modelling the different source material as it relates to the system.

CHAIRMAN JACKSON: Commissioner Dicus?

COMMISSIONER DICUS: Yes. One of the conclusions of the U.S. Geological Survey report from this past November states that in view of the enormous technical complexity of the total system performance assessment that as they called

it a semi-quantitative assessment -- in other words, a plain English with simple calculations assessments -- of Yucca Mountain would be valuable.

It went on to state that such an analysis is likely to be more readily comprehended by the public, by legislators and by intervenors.

Do you have any plans to do such an assessment?

MR. BARRETT: We have worked on that and it becomes a very difficult balance between oversimplification and looking at the true risk-informed -- I think this body has dealt with risk-informed regulation -- so we have done some deterministic. We intend to do more deterministic as together with your Staff we work on a defense-in-depth aspect of your regulation that we suspect will be there in your regulation -- it is in your existing -- in your future. That will involve some deterministic as we look at different barriers, but we want to keep the main thrust on the probabilistic risk informed, but we will also be doing some deterministic, but we are very careful with the deterministic that people don't make sound bites out of deterministic calculations that can mischaracterize the situation.

COMMISSIONER DICUS: Okay, thank you.

CHAIRMAN JACKSON: Okay, Commissioner Diaz.

COMMISSIONER DIAZ: Yes. This is mostly -- it

might be a qualitative question, but what is the sensitivity of the design of the engineered barriers as a function of protection standards? Is it -- will changes in protection standards of a factor of two will change your engineered barriers by an order of magnitude in cost or complexity? Have you done sensitivity analyses of the potential impact of protection standards?

MR. BARRETT: We have done that. We have done some of those. In the viability assessment, we looked at two options past the reference design, which basically were some advanced technology that we could try to put in.

We cannot change -- Yucca Mountain is what God made and we really cannot change the natural mountain. The only thing we can control are man-made things and engineered

system, so we looked at three.

We looked at backfill, which is one of the experiments we showed where you could put like a Richards barrier to diffuse water droplets away from the waste package. We looked at advanced material, ceramic material, which has come from commercial advances over the last several decades as well as classified defense work on ceramic barriers.

We have looked at ceramics and also drip shields that you could put to try to shed any drips away from the waste package out of various types of material.

So we have looked at some of these that in theory could basically give you 100 percent containment in theory for 10,000 years -- at least that is what our models would say. I am not sure those would be sustainable in a rigorous licensing environment based on what science and technology could tell you.

Part of the reason we did some of these options studies was we do not know what the final requirements will be for Yucca Mountain repository until the standards by EPA are issued and the NRC regulations that we will follow are issued, so we are trying to be flexible. We are trying to explore other engineering ways and some of the design alternatives work looks at 26 different options in different cases of different thermal loads, different tunnel diameters, and different things to try to be exploring best available technologies, where we are basically at the state-of-the-art and pushing the state-of-the-art in technologies to try go toward a goal of basically zero release, if one can get there, but I don't believe we could ever sustain it for 10,000 years or more, as the case may be.

COMMISSIONER DIAZ: Who will pay for it?

MR. BARRETT: Pardon?

COMMISSIONER DIAZ: Who will pay for it?

MR. BARRETT: Cost is one of the lesser issues we

looked at. We did evaluate the cost of the advanced, say the ceramic coatings. I mean we are looking at different costs of around a billion dollars added on. The cost was not a major driver. We were really looking at the performance and the sustainability of those performance claims in a licensing process.

Then there is also the national debate, I would predict, in the EPA standards as to at what cost for what benefit. If one were, say, to change by a fraction of a millirem or something 10,000 years in the future, what is that cost worth relative to today's dollars in a billion dollars, so we wanted to have that information available for organizations and policymakers like the Commission, like the Congress to look at that in the future.

CHAIRMAN JACKSON: Thank you. Commissioner McGaffigan?

COMMISSIONER McGAFFIGAN: Commissioner Dicus has already referred to this USGS report that was sent to the Director of USGS back in November and if there is a thrust to it, and I am sure you saw it at the time, it's that there's a lot of overly conservative, from their perspective, design features and assumptions in your viability assessment.

Perhaps from a regulator's perspective that is a

good thing but they claim at times in here that it can lead

to perverse results in terms of you are optimized for one thing and you actually end up having an adverse result somewhere else.

I could go through bit by bit but have you all analyzed the USGS critique and is there a document that has been prepared to sort of deal with the comments, or do you agree with some of them? What is the situation -- because they are ahead of us. We are still at least a month away probably from giving you a response to the viability assessment.

MR. BARRETT: Well, the USGS Director's Review Team is valuable input to us as the Commission's views, I am going from the Staff, and in the future from the Commission is valuable. The Nuclear Waste Technical Review Board input has been valuable, so we are factoring all of these in, basically to our ongoing dynamic work plans which, you know, are spelled out in general in the viability assessment and more and more detail as they go on.

We will look at some of those issue, but for every -- as you mentioned, these are all inter-related. For every place that may look like it's an advantage there is also an uncertainty on the other side, so on water flow and a lot of these issues on future climate, we are looking to have expert elicitations on future climate but then again, you know, who knows what future climate is going to be and

is that really where we can put our resources on some of these when we have near-term engineering issues. We have got quality assurance issues which are a major time and cost thing for us to do is to get our earth scientists to basically do what they need to do as far as the documentation and process and maybe not go on to the absolute best piece to it, so we are evaluating our work plans in light of that and in light of all the input to try to get the right balance to get the best progress that we can as far as the scientific aspects of Yucca Mountain, how it does perform in the future, balancing the resources.

We try to avoid excess pieces of paper. We are not planning a specific response to the USGS but we will fold that into our work plans of which the USGS is part of the team.

COMMISSIONER McGAFFIGAN: You said that you plan to select your reference design for the site suitability determination by June. Somewhere in your testimony -- I couldn't find it exactly -- you also suggested that this is a design that will change again perhaps all through this what will undoubtedly be a very long process.

How do you build flexibility in and to allow for those changes? I assume that the site suitability reference design will be different from the viability assessment reference design, depending on the sort of comments you get

and your reaction to them, and then there could be other design changes just as more science comes in or more analysis comes in.

Is there enough flexibility in the process to allow that?

MR. BARRETT: This is a constant balance we make

as we go forward. Design never, never stops. It is never stagnant. It is always trying to do as good as or better than your reference, and when you start looking at things, is this design concept better? -- you have to look "better" from what perspective.

One of the things, for example, we have had a lot of internal debates about is the placement tunnel diameters. Here you are trading off one design aspect from another. From a tunnel stability point of view, if you make the tunnel smaller, they are more stable than a larger emplacement tunnel, but then if you line up 100 waste packages down the tunnel if for some reason you want to take one out from the center you would have to take, you know, 49 to get to that. Now you have an operational concern versus a 100,000 year performance concern, and you try to balance these two.

So we are looking at these and we are very careful about decisions that will sort of preclude another decision. For example, some of the basic concepts of tunnel diameter,

heat load, and some of those kinds of things we are very careful about, so we put most of our focus on the issues that given us less flexibility in the future.

We have deferred much of our preclosure surface design work and left that very conceptual, focusing on the postclosure aspect, so we constantly go at this. There is no right single answer, and then as the natural system information becomes more refined and more specific, we want to make sure that we can accommodate that, those situations, in the design.

You find out that maybe a higher water infiltration design is not so good for a drier and vice versa, so we are trying to balance these things and it is not a simple answer to how to do it.

COMMISSIONER McGAFFIGAN: And this may be a question more fair to address to our own Staff than to you, but in our licensing process, how will this be handled? Will there be license conditions, do you envision that will allow flexibility or how does it get built into the license application and then our license which if granted, you know, how do they deal with the uncertainty as to what the final design will look like?

MR. BARRETT: In the existing 10 CFR 60 -- I don't recall, I think it is still 10 CFR 63, is the Staff requires that we evaluate alternatives and provide information of

these types of things for the Staff to look at.

Now I think when it comes to specific license conditions I think we are far away from that level of detail, you know, until we come up with a design that would go into the license application phase, and then it becomes a reference design, and as we go through the licensing process, through construction, it is always as good as or better than, and we do hope to be able to advance the designs as technology advances hopefully over the next many decades, that we can do it better, better quality assurance, better fabricability, better QC issues as well as maybe lower costs we could hope too that we could achieve.

CHAIRMAN JACKSON: Commissioner Merrifield.

COMMISSIONER MERRIFIELD: I just have one brief question.

There has been a lot of notoriety in the news

lately about some of the seismic activity that has been present near the site, within 10 miles of the site. I was wondering if you could comment on that -- any of the information that you received from out at the site, information related to how that has affected the site itself.

MR. BARRETT: We know we are in a seismically active area in Nevada. The whole state of Nevada is seismically activity -- not a seismically active as

California but seismically active.

We have had earth tremors and earthquakes there and these are constantly ongoing. The underground postclosure, which is our main focus, is not heavily influenced by earthquakes because the earthquake energy goes through the ground and dissipates at the surface much like a wave at the beach will dissipate its energy when the wave hits the shore, so in the cases of the recent events, we had people in the tunnels -- didn't feel a thing -- whereas you could actually feel the ground shake at the surface over near the test site, so we are looking at this.

We are not surprised by these tremors. They are expected. We believe that we can design surface facilities that can withstand it. That's a matter of concrete and steel.

The Commission, as you said, we have submitted two topical reports to the Staff over the last several years concerning seismic design criteria and we have another topical report that is scheduled I think it is later this year or next for the Staff, so we believe that through design we can deal with the seismic risks and it is not going to be a major determinant regarding the site.

COMMISSIONER MERRIFIELD: Okay.

CHAIRMAN JACKSON: You had some concerns that you had expressed relative to the prescriptive performance

confirmation requirements that were in the draft, 10 CFR Part 63. Could you elaborate upon those a bit?

MR. BARRETT: I will ask Dr. Stephan Brocoum, who is our Assistant Manager of Licensing and Regulatory, to come and assist me on that one.

CHAIRMAN JACKSON: Okay. Welcome, Mr. Brocoum.

MR. BROCOUM: I am not sure what -- we haven't formally to my knowledge --

CHAIRMAN JACKSON: -- responded --

MR. BROCOUM: -- responded on 63, okay --

CHAIRMAN JACKSON: Okay.

MR. BROCOUM: -- so we have had informal discussions with your Staff --

CHAIRMAN JACKSON: Right.

MR. BROCOUM: -- and offhand I don't know what the concerns were --

CHAIRMAN JACKSON: Okay.

MR. BROCOUM: -- on the performance confirmation.

CHAIRMAN JACKSON: All right. This may be something that is too sensitive for you to answer because of litigation, but --

MR. BROCOUM: No -- let me ask Mr. Jack Bailey here.

CHAIRMAN JACKSON: Okay, while he is coming forward, let's do this one.

Are you looking at alternative funding, like funding dry storage facilities at licensee sites, that kind of thing?

MR. BARRETT: That answer is no. We are not.

We are executing the law as it is presently written.

CHAIRMAN JACKSON: Okay.

MR. BARRETT: There are discussions about changing the statute. You know, those would be a matter of administration record. Regarding the Act said specifically that we are to prepare a repository for the waste, the eventual disposition of the waste, regarding paying for onsite storage through our inability, Secretary Pena had a proposal to utilities, a deferred payment option, to try to resolve some of the lawsuits. That was not accepted by the contract-holders. We are in 100 different lawsuits in different courts at this time, but that will run its own course, but as far as the program, he's not planning --

CHAIRMAN JACKSON: -- following the existing nuclear waste policy?

MR. BARRETT: Yes, ma'am.

CHAIRMAN JACKSON: Did you have --

MR. BROCOUM: No. We don't have any issues with the current 63 as you have published it on the Internet.

CHAIRMAN JACKSON: Right. If you anticipate the

need for the use of advanced materials or engineered barriers, have you folded that in? Are you going to be able to complete the testing and demonstration of these materials on a schedule to support the license application?

MR. BARRETT: It depends on what that is.

The reference design is with C-22, or commercially known years ago as hastalloy, for those of us who used to do valve work. That -- there is material, 50 years' worth of data on that material and the A516 outer is well-known material to the engineering field for 100 years.

Here -- for that case we feel that we could make a case on the schedule we have. If we were to drastically change designs, we would not submit a license application until we felt it was one that was sustainable and would be accepted by the Commission, so it depends upon what it is.

CHAIRMAN JACKSON: Okay, and one last question. You have the Busted Butte tracer tests -- you know, the large migration study. Will those results be available in time to support a licensing application or are you planning to use that information as part of a performance confirmation?

MR. BARRETT: No, that will be, much of that information will be available for the license application part of our license application case.

We will also probably continue to do some

performance confirmation work indefinitely at that facility.

CHAIRMAN JACKSON: Okay.

MR. BARRETT: Funding permitting.

CHAIRMAN JACKSON: Funding permitting. Any other comments, Commissioners?

[No response.]

CHAIRMAN JACKSON: Well, let me thank you, Mr. Barrett and Dr. Brocoum and the Department for today's

briefing. Obviously you have made substantial progress in the repository program since our last meeting.

I think we will be meeting a little more frequently than every two years. The Commission and the NRC Staff will benefit from the clarity of your presentation that you have given of the DOE viability assessment process considerations and conclusions.

It helps us. It helps to facilitate the NRC's ongoing review of the viability assessment and it will be useful, I believe, to the Staff's general review of the issues with regard to your continuing efforts -- and so, if there is nothing more, then I thank you and the meeting is adjourned.

MR. BARRETT: Thank you.

[Whereupon, at 3:10 p.m., the briefing was concluded.]