UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

***

BRIEFING ON PERFORMANCE ASSESSMENT PROGRESS

IN HLW, LLW, AND SDMP

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PUBLIC MEETING

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Nuclear Regulatory Commission

One White Flint North

Rockville, Maryland

Tuesday, June 30, 1998

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

GRETA J. DICUS, Commissioner

NILS J. DIAZ, Commissioner

EDWARD McGAFFIGAN, JR., Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

JOHN C. HOYLE, Secretary

KAREN D. CYR, General Counsel

L. JOSEPH CALLAN

MALCOLM KNAPP

NORMAN EISENBERG

MICHAEL BELL

WILLIAM OTT

P R O C E E D I N G S

[2:05 p.m.]

CHAIRMAN JACKSON: Good afternoon, ladies and gentlemen.

Today the Commission will be briefed by the NRC staff on its performance assessment program which covers three technical areas that are of treat interest and importance to the Commission. These are low-level radioactive waste disposal, high-level radioactive waste disposal, and site decommissioning.

The staff briefs the Commission annually on the topic of performance assessment. The Commission was last briefed by the staff on this subject on May 15th of last year.

The staff made it clear at last year's Commission briefing that developing a performance assessment model in any one of these three technical areas is a complex and challenging task.

However, the development of high quality performance assessment models for low- and high-level waste and site decommissioning would enable the Commission to obtain significant quantitative and qualitative input for making risk-informed, performance-based regulatory decisions on these matters.

So we look forward to hearing about the new

developments that have occurred in the past year in the performance assessment program particularly as it relates to radioactive waste disposal and the decommissioning of sites.

Unless my colleagues have anything to add, Mr. Callan, are you leading off?

MR. CALLAN: Yes, Chairman. Thank you, and good afternoon, Commissioners.

Present at the table with me today are Mal Knapp, to my right, the acting director of NMSS; Mike Bell, to my far left, who is the chief of the Performance Assessment and High-Level Waste Integration Branch, NMSS; to my far right is Bill Ott, the acting chief of the Waste Management Branch in Research; and the primary briefer this afternoon will be Norm Eisenberg, just like he was last year. He set a high standard last year.

CHAIRMAN JACKSON: That's his reward.

[Laughter.]

MR. CALLAN: He's the senior advisor for performance assessments in the Division of Waste Management, NMSS.

Norm.

[Slide.]

MR. EISENBERG: Thank you very much. Good afternoon.

CHAIRMAN JACKSON: Good afternoon.

MR. EISENBERG: If I could have slide 2, which is an outline of the presentation.

[Slide.]

MR. EISENBERG: I will begin as usual by defining performance assessment to set a context for this briefing.

Second, I will discuss three current issues in performance assessment, and for each issue I will describe the issue and the staff's approach to resolving the issue.

For two of the issues I will describe examples to illustrate both the issue and the approach that the staff has to resolving it.

Third, for each of the Division of Waste Management program areas I will describe the performance assessment program, including recent accomplishments and planned activities.

As I have mentioned in the past, Division of Waste Management has performance assessment activities in high-level waste, low-level waste, and decommissioning.

Then I will briefly touch on support for performance assessment from the Office of Nuclear Regulatory Research, and finally, I will summarize.

[Slide.]

MR. CALLAN: Performance assessment is a type of systematic analysis that explores three questions for a waste facility:

What can happen?

How likely is it?

What are the consequences of the occurrence?

Performance assessment integrates information across a wide variety of disciplines that are required to analyze the performance of a waste facility. These could include such diverse fields as corrosion science, geochemistry, hydrology, heat transfer, rock mechanics.

In addition, performance assessment integrates information across different program areas. For example, design, site characterization, and the analysis used to examine safety.

The term "performance assessment" as used in the Division of Waste Management encompasses a broad range of quantitative analyses that are applied to waste disposal facilities. The analyses are attempted to be matched to the need. We go from deterministic bounding analyses, which are used most often, to probabilistic analyses, which are used on the most complex facilities and issues.

CHAIRMAN JACKSON: I've asked you this kind of question before, but now I will put a twist. How does performance assessment compare with dynamic PRA?

MR. EISENBERG: To the degree that I understand dynamic PRA, there are many similarities. The dynamic PRA is trying to look at components and subsystems that are

normally not included in a standard PRA and look at their response to the damages states that are produced by a given fault or initiating event. This is where the focus is primarily in performance assessment, looking, if you will, at the level 3 aspect of a PRA rather than the level 1 and level 2.

Our analysis of scenarios is really quite simplistic compared to the complex logic trees and diagrams that you have in PRAs because we don't have a complex piece of machinery; we have a different kind of system.

Our focus is primarily on what I believe the dynamic PRAs are attempting to focus on.

CHAIRMAN JACKSON: Thank you.

One other question. Maybe you can speak to this as you go through because I think I know the answer in the high-level waste program. Is there a role for expert panels, or are they necessary once you get away from high-level waste kind of issues?

MR. EISENBERG: When you say get away from high-level waste, do you mean other kinds of waste or other areas?

CHAIRMAN JACKSON: When we talk about low-level waste disposal and site decommissioning.

MR. EISENBERG: I am sure there is room for the use of expert elicitation and informal expert judgment

throughout the waste programs because the information is often soft; there is not a large amount of data in a lot of the areas; and you need to evaluate it.

CHAIRMAN JACKSON: Thank you.

Commissioner.

COMMISSIONER McGAFFIGAN: The output of a performance assessment and high-level waste or

decommissioning, or whatever, is a number for total effective dose to an average number of a critical group. Is that what we are trying to get?

MR. EISENBERG: It certainly is the focus on high-level waste in our current code efforts. I think I have to hastily add that we fully intend to look at intermediate outputs from different parts of the system. If other measures of performance might be of interest, even if they are not strictly speaking required for regulatory judgment, we might want to look at those also. You always design the tool to fit the need, and if the regulatory need is to get the total effective dose, then that is how we design.

COMMISSIONER McGAFFIGAN: What other intermediate outputs do you have in mind that might not be regulatory but might be of interest?

MR. EISENBERG: We might be interested, for example, in the time that the waste packages start to fail.

We might be interested in the time for certain radionuclides to traverse the saturated zone, for example.

COMMISSIONER McGAFFIGAN: If you took the TEDE over a period to the average number critical group and plotted it over time, these would be intermediate results to getting a resonance at some date.

MR. EISENBERG: These certainly are all incorporated in the end result but they give us an idea of how the system works and how the different parts contribute, which is an important part of making a regulatory judgment.

COMMISSIONER McGAFFIGAN: To the extent you are doing deterministic bounding analyses for most issues, does that lead to conservatism, and how much conservatism does that lead to?

MR. EISENBERG: There is a lot of discussion later in the briefing about conservatism. Maybe we could wait. Certainly conservatism is a way to simplify the analysis and to do bounding when it's appropriate.

COMMISSIONER McGAFFIGAN: Is vulcanism something that is deterministic or probabilistic?

MR. EISENBERG: We are treating it probabilistically.

COMMISSIONER DIAZ: Since the time domain came into question, looking at your definition of dynamic PRA, it seems to me that the definition that you are using does not

really consider putting time as an independent variable, which some of the new PRAs do. You are still keeping time as a dependent variable; is that correct?

MR. EISENBERG: I would say no. We track the evolution of the repository through time. So we look at the behavior of each component in the system as a function of time. One of the things that we have to do is to roll up or convolve, for example, the output of the various waste packages into the transport and the geosphere to look at the effect of the geosphere. That is very much a time dynamic situation.

COMMISSIONER DIAZ: Right. But it has two independent variables at any one time. You can do it like we do a point time analysis. The other one you have two independent variables. I think that is the key difference in what some people are calling dynamic PRA.

MR. EISENBERG: I'm not sure I could answer the question.

COMMISSIONER DIAZ: All right. Let it go.

CHAIRMAN JACKSON: Why don't we go on.

[Slide.]

MR. EISENBERG: We thought we would articulate three current issues in performance assessment. I will discuss the staff's approach to resolving these issues and in two cases, as I said, provide examples of the staff's

approach. The issues are:

How can the optimize its efficiency by choosing the most appropriate analytical tool for the regulatory task at hand?

Second, how can the staff eliminate or greatly reduce unnecessary conservatism in regulatory analyses while simultaneously assuring adequate protection of public health and safety.

Issue three is, how can the staff employe a risk-informed, performance-based approach in framing regulations, guidance and procedures so that flexibility is provided to licensees?

Now I would like to go ahead and describe the staff's approaches to these three issues.

[Slide.]

MR. EISENBERG: The first issue is how to optimize efficiency by choosing analytic tools most appropriate to the task.

We tailor our tools to the requirements of the performance assessment. First, we have different kinds and types of tools for each of the programmatic areas.

For high-level waste we have what I would think is the most complex and detailed level of modeling.

For low-level waste, because the regulatory structure is different and the problem is different, we have

less complexity -- for example, there is no substantial heat generation by the waste -- with more flexibility in treating aspects of modeling and in treating uncertainty.

For decommissioning there is a divers range of contamination, complexity and site conditions. For example, it can go from a very complex site involving several radionuclides to a very simple site involving a single radionuclide.

In addition, within each program area we vary the level of detail and complexity in the modeling approach so that it's commensurate with the importance of the aspect being modeled.

As an example, in high-level waste groundwater flow is given a lot of attention because it has such a pervasive influence on the performance of the repository. The migration of gaseous radionuclides is given relatively less attention because the dose potential for those nuclides is small.

[Slide.]

MR. EISENBERG: Moving along to the second issue, how do we assure adequate protection of public health and safety while eliminating unnecessary conservatism in regulatory analyses?

We first define, evaluate and consider uncertainties in the regulatory decisions.

We first identify the uncertainties. Some of the uncertainties are quantified; others are evaluated qualitatively.

Finally, we factor uncertainties in the decision,

and we need to consider the degree and type of uncertainties and the impact of the uncertainty and also the facility's operation on public safety.

CHAIRMAN JACKSON: Is your approach consistent with the approach outlined in the generic reg guide on PRA, Reg Guide 1.174?

MR. EISENBERG: I can't answer that.

[Slide.]

MR. EISENBERG: To move along and talk about how we treat conservatism, we first need to say a little bit about uncertainty in performance assessment. There are five different kinds of uncertainties described in this slide. These are not necessarily mutually exclusive sets, but let me say a few words about each one.

Parameter uncertainty relates to the parameters used in models to describe consequences. Examples include corrosion rate, solubility limit, flux of water into the waste package, porosity; all the dose parameters such as foodstuff intake and irrigation rate factor into these kinds of parametric uncertainties.

Disruptive scenario uncertainty relates to the

inability to determine whether a disruptive event will or will not occur. Usually one determines a fixed set of scenarios for consideration and each scenario has an associated probability of occurrence.

I will say that one of the things we do in our high-level waste performance assessment is that the time of occurrence of the particular event is taken as a random variable, and therefore in that sense we do not have a fixed time evolution, but from one realization to another it will change.

Exposure scenario uncertainty relates to the inability to predict accurately the behavior of humans in the future. Often a stylized set of exposure scenarios are established by the regulator. For example, an intruder is a stylized scenario in low-level waste. The license termination rule is another example that permits development of site-specific exposure scenarios.

Model uncertainty. In this context I mean alternative conceptual model uncertainty. It relates to the uncertainty in the choice of a model to describe the performance of the waste facility. Often different models may have different degrees of support but they will produce different estimates of performance. So that is a measure of uncertainty.

Another way to try to quantify the uncertainties

is to attach subjective probability or credibility to each alternative conceptual model if one wants to.

Finally, there are programmatic factors that produce uncertainties, things such as QA, management effectiveness, and adequacy of recordkeeping. These all have an influence on safety but are very difficult to quantify.

COMMISSIONER DIAZ: Excuse me. I am trying to understand the role of risk information in your performance assessment. You are going to use risk information to develop a risk-informed regulatory framework or to set levels for performance thresholds, or both?

MR. EISENBERG: Both.

COMMISSIONER McGAFFIGAN: The Environmental Protection Agency just went through the waste isolation pilot plant certification. Did they use performance

assessment type capabilities?

In that case, I think it was 15 millirem TED. They didn't have a groundwater issue because there was no potable groundwater, but they had to figure out whether it met a 15 millirem TED. The intruder scenario, was that legislated away?

MR. EISENBERG: They had scenarios like drilling into a brine pocket that spurted waste and brine out of the repository.

COMMISSIONER McGAFFIGAN: Did they use techniques similar to what you use?

MR. EISENBERG: Yes, I would say so.

COMMISSIONER McGAFFIGAN: Do you talk to EPA about how their performance assessment worked in that case?

MR. EISENBERG: Yes. As a matter of fact we commented on the criteria that they published for evaluating the performance assessment. We talk to them frequently about it. We have observed their activities. Several staff members have been involved in observing the WIPP activities for a long time.

COMMISSIONER McGAFFIGAN: When you deal with parameters do you use a range of values with a probability assigned, or do you use a single value and do sensitivity analysis on whether if you vary off of that point you get significantly different results?

MR. EISENBERG: We use a variety of techniques. For the things which we think are quite important we prefer to use a probability distribution and examine through a formal type of sensitivity analysis what the impact is. However, most of these models have more variables than you would ever want to have to deal with. So the ones that are either not very important or that are judged to be relatively easy to fix we go ahead and fix those. We don't want to do things like do sensitivity analyses to see how

the variation of gravitational constant is going to --

COMMISSIONER McGAFFIGAN: I wouldn't advise that either.

MR. EISENBERG: There are some that are quite important that we want to focus on and others that for a variety of reasons we may decide to just fix.

COMMISSIONER McGAFFIGAN: If the gravitational constant changes we've got bigger problems.

CHAIRMAN JACKSON: It depends on which planet you are on.

[Laughter.]

[Slide.]

MR. EISENBERG: To further the discussion on page 8, I'd like to say what I mean by conservatism. As far as I'm concerned it's the choice for any area of the various types of uncertainties that I have previously mentioned that would produce numerical results that underestimate the good performance of a facility. For most of our cases this means that the calculated doses are higher for greater conservatism.

Often the analysis is simplified by making conservative assumptions. For example, by choosing a bounding value for a parameter rather than dealing with the full range of variability. This can save time and money.

Some uncertainties are expressed quantitatively in

the analysis. As we just discussed, parameter uncertainty

can be propagated through change of models. Other uncertainties are not quantified but a conservative approach to their treatment should be factored into decisions because those uncertainties and those conservatisms are there.

Different stakeholders may have a different view of how much conservatism might be in a particular analysis and that may not correspond to the staff's view. This is just par for the course, I think.

So the question is, how should the staff balance the cost in terms of the analysis and the results of the conservatisms against public safety and the confidence in the decisions?

I would like to now go to the next slide and see how it comes out.

[Slide.]

MR. EISENBERG: Unfortunately, I chose to draw two of these lines. One is green and one is blue, but I can't tell the difference looking at the monitor.

There are at least two points to be made from these figures.

Number one, these analyses involved quantified an unquantified uncertainties. Both should be considered in the decision making.

Secondly, the manner in which the decisions

incorporate the various kinds of uncertainties can have a substantial effect on the cost of regulation both to the licensee community and also to the staff.

Those are the two points I'm trying to get across. I have to state a couple of caveats. Number one, this is a schematic drawing which is not based on an actual analysis. This is just one portrayal of what might occur. The relationship between the screening analysis and the site-specific analysis could be completely different in a specific case.

The upper graph represents the dose distribution obtained from a screening analysis in which less data are available. So you will see the spread in the dose calculated is much broader than in the lower figure.

The dose limit is in red.

If the decision is made on the mean dose, which is the green line, the decision on this particular site would be to release the site. If the decision were made on the 95th percentile dose, it would exceed the dose limit, and the decision would be to do more analysis or perhaps go ahead and take out some of the contamination or take contaminated concrete away, to actually move material.

The lower graph represents the dose distribution obtained from a site-specific analysis in which more data presumably are available. So the spread in the calculated

dose is narrow.

Note that for this hypothetical example both the mean dose and the 95th percentile dose are both below the dose limit. So in this case we would definitely release the site.

Also note that the mean dose is put on as being smaller than in the screening case. This is because we presume that because you have site-specific data you can reduce some of your modeling conservatisms and have a more realistic, less conservative model. So the whole analysis shifts downward.

CHAIRMAN JACKSON: Commissioner.

COMMISSIONER McGAFFIGAN: This isn't quite as

theoretical as you lay out. I think it probably describes some of the discussion that we've had in recent months about the D&D; code with the staff. The D&D; code, which is this new Sandia code that has been developed for decommissioning purposes, as I understand it, it builds in sort of 95th percentile parameter values. You plug in and you get a number. You don't get a range under D&D;, right? You get a number. Not quite 95th percentile.

MR. EISENBERG: The code as currently configured operates with some default parameters. For a full range of parameter distributions characteristic of the U.S. it will yield a 90th percentile of dose. Let me hastily add that

you could --

COMMISSIONER McGAFFIGAN: Do a site specific.

MR. EISENBERG: You could change any or all of the parameters, number one. This would be the case only if you chose to use the default parameters. Or, as the staff is planning to investigate, we could put a Monte Carlo driver ahead of the code and do the full distributions on whatever parameters we wanted to explore.

CHAIRMAN JACKSON: Right.

COMMISSIONER McGAFFIGAN: This is something that is going to have to happen over a period of time. At the moment D&D; produces a 90th percentile result with the default parameters on what is probably a fairly broad distribution. If you then do a site-specific analysis, and in many cases you will want to, you can narrow the parameters.

As I understand it, the staff is saying a screening tool should be more conservative than a tool that is used for a final regulatory decision. If the screening tool produces a curve that is way over on the left with 95th percentile and indeed the 99th percentile way below the dose limit, then okay, not to bother. That one is decommissioned. But if it is producing a curve like the one you show at the top, you are saying you want to have the licensee do a more detailed analysis with more information.

You'll have a lot of dialogue the next couple of years. I'm not trying to do it today. The question is how expensive that is and how frequently it has to be done and are we overdoing it. I think that's a dialogue that is occurring. I am just highlighting that it is occurring.

MR. EISENBERG: That's correct. That in fact was my punch line for this slide. The staff is currently grappling with how to balance these factors and how to make the appropriate decisions, for example, for choosing default parameter sets when you are considering only a parameter uncertainty, when in fact we know that we have other kinds of uncertainties involved in making the regulatory decision.

CHAIRMAN JACKSON: How would the Monte Carlo driver help you here?

MR. EISENBERG: For example, if we replaced a few variables on a site-specific basis, we could then do a Monte Carlo analysis and generate a distribution such as here and compare it with the dose standard rather than relying on a predetermined limit, that is, a 90th percentile type dose limit. Actually those parameters don't any longer guarantee you that the resulting distribution will give you the 90th percentile if you did a full Monte Carlo analysis.

CHAIRMAN JACKSON: That's right.

MR. EISENBERG: It's really a tool that would

enable us to understand more about how the system worked at

a particular site.

COMMISSIONER DIAZ: In practicality, if you ever get your 95th percentile below the dose limit in any case, whatever the distribution is, you will then have reason to say we don't need to do any further analysis; is that correct?

MR. EISENBERG: Right.

CHAIRMAN JACKSON: You were going to say something, Dr. Knapp?

MR. KNAPP: I was just going to note that as we move towards more site-specific information on the Dandy code, some of these could be very inexpensive, because some of these things, for example, are variables such as distance to water table or soil type, which can be determined by a call to your local county agent or by a quick measurement of the depth to groundwater. There could be, if you like, pencil sharpening that could be very inexpensive. So it does not imply a great deal of resources would be needed if in fact it did not necessarily meet the standard at the first screening evaluation. But it's quite correct to say that these are things we will wrestle with over the next two years.

CHAIRMAN JACKSON: Is it feasible to expect the licensees to be capable of utilizing these performance assessment codes in decommissioning of sites given the site

complexities and the complexity of the codes?

MR. KNAPP: I'll offer an answer and then perhaps Norm may wish to correct me.

CHAIRMAN JACKSON: Mr. Greeves wants to answer also.

MR. KNAPP: Okay.

MR. GREEVES: There's a lot of meat on this slide. I will point out that there is a range of licensees out there; there is a set of licensees. We are talking to the regions in terms of the payoff in this because they have the large majority of cases to deal with.

There is a set out there that want the simple number. They want the 5 picocurie per gram number. They don't want to fool with this code business. So that set of licensees would like that criteria. For that nuclide they want to know how many picocuries per gram I can leave on this site; I want to be out of here.

By the way, if they are little bit above that number, they aren't going to want to run this code. They are going to say get another shovel out; let me get out of here; I don't want to argue with the NRC over 5 versus 10 picocuries per gram; I'll take another 100 cubic feet out of here and be done with this.

There is that set of licensees. Then there is another set who want to take advantage of this because they

aren't talking about a few cubic yards; they are talking about large amounts of material or large buildings to decontaminate. They're going to want to come in and have this conversation with Norm, the staff you see here behind the table about, okay, I didn't pass the screening criteria, but I'm going to use D&D; or I'm going to use RESRAD, and here is what I did; will you accept that?

So there is a set of licensees that can do that.

Then there is probably another set that are much more complex, and there are a handful of entities out there

that can do that. So it's a spectrum of activities out there.

I think over the next two years, working with the licensee community, Research and the Decommissioning Board that I think you have either seen in one of our papers or you will hear about, we want to set that process up. This was the paper that was sent up to you in March, I believe. That's what we want to achieve over the next couple of years. And it's needed. The full range of these licensees need an answer, and that is what the staff you see in front of you are working towards.

I hope I have answered part of your question.

CHAIRMAN JACKSON: Thank you.

MR. EISENBERG: I think we can move on to slide 10.

[Slide.]

MR. EISENBERG: The third issue is, how can the staff employ a risk-informed, performance-based approach in framing regulations, guidance and procedures so that flexibility is provided to the licensee?

In general we will follow a three-step process.

One, we will reduce or eliminate prescriptive requirements.

Second, we will use the results of PA to provide risk information.

Third, and quite specifically, we will use PA to compare calculated system performance to the objective regulatory criteria.

[Slide.]

MR. EISENBERG: As an example, we look to the high-level waste arena and our approach to drafting a new regulation for high-level waste.

First, we are removing the quantitative subsystem performance requirements.

Second, we are evaluating various quantitative methods to demonstrate implementation of a multiple barrier concept.

We have developed and proposed importance measures for the repository system pursuant to a recommendation of the ACNW.

A measure of importance is indicated by the change in system performance if the functions of a barrier are neutralized.

Finally, we intend to be flexible and allow DOE to propose its own quantitative measures for demonstrating an effective implementation of multiple barriers.

CHAIRMAN JACKSON: Can you give us a qualitative statement about how many differences there are between NRC codes and DOE and with EPA? Are we all on different planets in terms of how these computations are done?

MR. EISENBERG: Are you speaking strictly in terms of high-level waste?

CHAIRMAN JACKSON: With high-level waste I'm interested in DOE; in the others I'm interested in EPA.

MR. EISENBERG: No, I don't think we are on different planes at all. Certainly DOE and we are taking a very similar approaches to modeling repository performance. We generally model the same components. We may have differences about their capability to perform. An example might be DOE wants to take credit for the cladding of the spent fuel. We have incorporated that into our modeling in

a very limited way because we have more doubts about its survivability.

Similarly, DOE has been taking credit, as you will see later, for something called matrix diffusion, which is

the communication between flow in fractures and flow in the matrix of the rock. We think this is a process that maybe won't buy them very much. So we are not modeling things quite the same way.

So there are differences, but I think there are more differences in the treatment of topics rather than in the overall approach.

In decommissioning of low-level waste I think everybody is pretty much looking at things the same way. The bottom line is dose. The question is which pathways do you include in a particular code and analysis and how do you treat various processes, but they are very similar.

CHAIRMAN JACKSON: Commissioner.

COMMISSIONER McGAFFIGAN: The performance assessment you have been developing for purposes of looking at Yucca Mountain and what DOE did with WIPP, is WIPP easier to model than Yucca Mountain because it's salt? Are there differences? I know you have been following it, but you haven't done it. Is a large salt formation easier to model and does it reduce uncertainties compared to rock formations?

MR. EISENBERG: I would say just off the top of my head that salt is probably easier to model. I turns out that unsaturated flow is a very complicated flow system and it is difficult to model all the processes that can occur.

Salt by comparison, I think, is relatively simple.

MR. KNAPP: I can throw in some very old information. When we started in this business nearly 20 years ago we did a lot of work in salt. By comparison to unsaturated flow in fractured media salt was much simpler.

MR. EISENBERG: Let me add one more thing on page 11. One of the things that the Nuclear Waste Technical Review Board is urging DOE to consider is alternative design features. An approach such as outlined here would allow evaluation of the merit of these different design features.

[Slide.]

MR. EISENBERG: Now begins the status update of performance assessment in the three Division of Waste Management program areas. For each area I will describe the progress and plans that have occurred over the past year.

The first one is for decommissioning. We have a framework and methodology that has been developed. It is being tested and enhanced by the Office of Research.

We are developing a standard review plan to implement the licence termination rule. This is where we are working out the details of what codes to use and how to use them and what distributions and what the appropriate approach to screening is.

Dose modeling is obviously a key aspect of that particular activity.

We are coordinating the guidance with the ongoing casework to minimize any changes in the future.

The casework is another thing that we are involved in. It is either proceeding or awaiting submittals by licensees.

A Decommissioning Management Board has been formed which provides oversight and coordination for activities in

a decommissioning area, and it involves membership from NMSS, the Office of Research, NRR, and the regions also are participating.

CHAIRMAN JACKSON: Commissioner McGaffigan has a question.

COMMISSIONER McGAFFIGAN: How is this all coming together? You have the casework. In individual cases that were previously working in the SDMP, which uses these figures that John Greeves talked about, 5 picocuries per gram, or whatever, are we looking at that from the point of view -- even if they are in SDMP as is allowed by our rule, using SDMP criteria, how would it work under the Subpart E criteria? We probably can't require it of licensees if it's not a regulatory requirement.

MR. EISENBERG: You mean ones that have already been --

COMMISSIONER McGAFFIGAN: Ones that are casework that is ongoing, that are going to be cleaned up to SDMP

criteria, as is allowed if they submit their plan by October of this year. How do you learn from those sites so that's a benefit to the longer term program which is going to be all done under Subpart E and yet devote the resources honorably to get them to decommission?

MR. EISENBERG: One of the approaches is to have the project managers for these areas come in and brief this dose modeling group on the kind of activities that are ongoing and the decisions that are being made so that there will be a two-way communication; they can be warned if it looks like there is going to be something that would be in gross disagreement with a decommissioning under the new rule and at the same time, so that the guidance for implementing the new rule can be crafted, taking advantage of the lessons learned, if you will, from the ongoing cases.

COMMISSIONER McGAFFIGAN: One of the later documents says you are going to have this standard review plan by FY-2000, which is about the time they will have two years experience with the document we are about to put out. I think it's already out there on the Web, the various guidance, the reg guides.

You are also talking about interim guidance sooner. How soon will that interim guidance be available?

MR. EISENBERG: For example, one piece of guidance that we expect to get out is for building contamination, to

come out with, if you will, very simple surface contamination criteria for release of buildings. We expect to come out with that in the late summer or early fall. As pieces are completed by the dose modeling group or other parts of the standard review plan development, we expect to put out those pieces.

There is a whole suite of guidance that is kind of out there. There are pieces of the manual chapter; there are handbooks; there are NUREG BRs; there are NUREGs; there are branch technical positions. Many of these will have to be updated, revised or discarded. I believe there is a Commission paper that you've asked for that is in the works. It is coming to you soon. I can't answer all the questions right now, but I'm sure that will answer a lot of them.

CHAIRMAN JACKSON: Commissioner.

COMMISSIONER DIAZ: I guess in this slide you are referring to SDMPs practically exclusively, right? This refers to site decommissioning?

MR. EISENBERG: That's correct, site decommissioning; materials licensees.

COMMISSIONER DIAZ: Have you considered the issue of clearance of materials and how it would impact site decommissioning at all?

MR. GREEVES: I think you have a paper on clearance of materials.

CHAIRMAN JACKSON: Right.

MR. GREEVES: You have that paper separately. They are related. I think a lot more energy needs to go into the clearance paper. These are mostly focused on the license termination rule issues, which actually in some ways is a little simpler to deal with. It gives us a cleaner target to look at.

Let me add. You asked the question, is it only SDMP? First, we owe you a paper. You are going to get it shortly. I would say what you see in front of you is the SDMP-like sites, and there are a few more complicated sites that this apply to other than the SDMP. So it's basically the complicated site.

Norm mentioned to you that we are trying to consolidate the guidance. One of the things that we need are these screening tables that the regions could use to release sites. If you come up with a 5 picocurie per gram table, the licensee can see that number, the regional staff can see that number, and they can disposition sites quickly. So it's the full set of those issues.

[Slide.]

MR. EISENBERG: Slide 13 talks about low-level waste. We had few resources in this area this year.

We did participate in an IMPEP review.

Also we were able to respond to specific requests

from Illinois and Nebraska. Not mentioned on the slide is that we commented to the Department of Interior on a sampling protocol for Ward Valley.

The main operation for the future is to revise the draft technical position on low-level waste performance assessment based on the input from Agreement States and the public in FY99.

[Slide.]

MR. EISENBERG: Next is high-level waste.

A major focus of activity and achievement this year has been the development and use of a total system performance assessment code which we call a TPA code. We have performed sensitivity analyses at a total system and subsystem level, which has helped to reprioritize KTIs and sub-issues. It has been a major factor in integrating performance assessment with other high-level waste activities. For example, a PA staffer was assigned to each KTI team to work with them and integrate their other activities with the involvement with the code.

It has proved to be a basis for interactions with DOE on their total system performance assessment code and results that they are using for the viability assessment.

This is a user friendly code with a large interdisciplinary users group, ten to 15 NRC staff members and about the equivalent number at the Center for Nuclear

Waste Regulatory Analysis.

We are currently revising the code for the TSPA-VA review. Some of the things that we are looking at are some design features that DOE has thrown into the mix. We are

always in an ongoing evaluation to reduce excess conservatism.

In the future we plan to improve the code for the license application review.

[Slide.]

MR. EISENBERG: Another major activity this year has been development towards a draft rule for high-level waste disposal at Yucca Mountain, the site-specific rule.

The strategy was formulated and it was accepted by the Commission.

The staff is employing a risk-informed, performance-based approach.

ACNW has endorsed the approach for multiple barriers.

Currently we are preparing a draft rule package as directed in the Commission's SRM.

[Slide.]

MR. EISENBERG: The main purpose of this next slide is to show the hierarchical nature of the rule and other guidance planned for development in high-level waste.

At the top you have the total system performance

standard.

Then you have in a tier below that the subsystems and a tier below that components of the subsystems, and below that very detailed phenomenon processes and related technical issues.

Guidance could be developed up and down the diagram. The main point here is that the main and central feature of the rule is the use of overall risk criteria. The other requirements would be treated in subsidiary guidance, not in the main rule.

[Slide.]

MR. EISENBERG: Another important area of accomplishment in the past year in high-level waste has been our interactions with DOE on their performance assessment for the viability assessment.

We have had three technical exchanges on the dates that are indicated.

There are several positive aspects of DOE's approach.

If I could just point out a couple. One was the increased use of performance assessment to focus site characterization activities. NRC has long advocated that DOE adopt such an approach, and it looks like they are moving strongly in that direction.

Another positive aspect is that they have

recognized as a key issue the support they can muster for claims of longevity for the C-22 material proposed as the corrosion resistant material in their waste package.

There are a few questions that remain:

There is consistency in transparency of the analysis.

Credit for new and enhanced engineering features, and as I mentioned before, credit for matrix diffusion.

And a longstanding issue has been the weighting of alternative conceptual models.

CHAIRMAN JACKSON: Last year I asked you about the use of site-specific data from Yucca Mountain in your performance assessment models. Are you able to have that data for the development of your own models?

MR. EISENBERG: We are using the data that DOE has

published. They have a whole protocol where they gather the data and compile in QA and they don't let us have that much access to it until they have gone through part of the process. But by and large I believe we are getting good access to their data and we are using it.

COMMISSIONER DIAZ: Going back to the issue of the difference between NRC and DOE, I remember that we had some numbers last year in the dose assessment that were two orders of magnitude higher than DOE. We got 23 millirems and DOE had .4. That seems to be a significant difference.

Are those being reconciled? You said we are in the same plane. The same plane is the same order of magnitude, a factor of two difference?

MR. EISENBERG: I think you are still likely to see some significant differences because of the extremely long lifetime that DOE is presuming that their waste packages will survive. In our analysis we are not as optimistic.

COMMISSIONER DIAZ: Two orders of magnitude different?

MR. EISENBERG: I wouldn't want to say right now. Their results are in flux and our results are in flux. Rather than trying to guess the difference between two moving targets, I'd rather pass.

CHAIRMAN JACKSON: Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: When will the targets quit moving? Is the viability assessment going to be submitted later this year, on schedule?

MR. EISENBERG: Sometime this fall as far as we know.

COMMISSIONER McGAFFIGAN: It will be submitted to the Congress or to the President? Remind me how the process works.

CHAIRMAN JACKSON: The viability assessment is a congressional request.

COMMISSIONER McGAFFIGAN: Will we have seen it in advance or will we see it only as it goes to the Congress, and if we are asked to comment on it, how quickly would we be able to comment on it?

MR. BELL: We have arrangements with the Department of Energy that we will be able to review drafts as it is being prepared. As a matter of fact, the whole chapter on their TSPA they have committed to provide us in draft form at the same time they provide it to their peer review panel, which actually should happen next month. We think we are getting good visibility.

On the schedule, they continue to tell us that the DOE staff will get it to whoever is acting as secretary of energy on schedule at the end of the fiscal year but that it's essentially a political decision by that person as to whether it will be released immediately or whether some other process will take place.

One of the department's concerns is they have received a letter from the state requesting that the department go through some sort of a public process before they transmit it to Congress.

CHAIRMAN JACKSON: Okay.

[Slide.]

MR. EISENBERG: On the next slide there are just two smaller items.

We have completed the first version of the issue

resolution status report for the performance assessment methodology. This brings together performance assessment considerations from a wide variety of disciplines.

We have also developed some proposed importance measures for the geologic repository system. There are several that have been proposed. They are undergoing peer review and we are evaluating how to use them in a regulatory context, especially for evaluating the implementation of a multiple barrier approach.

[Slide.]

MR. EISENBERG: Research support for performance assessment. One of the great contributions that the Office of Research made was to develop the high-level waste performance methodology. If I could say, I was involved in that work when I worked in the Office of Research.

CHAIRMAN JACKSON: You can say that.

[Laughter.]

MR. EISENBERG: Their current focus is on generic radionuclide transport which has a focus on decommissioning of material sites. They are developing a flexible user friendly framework to implement a performance assessment methodology and they are trying to insert in that some enhanced process models.

If I could speak to two of the enhancements. One

is to add a mechanistic treatment of sorption and the other is to look specifically at radioactive slag as a source term in decommissioning. It is a not infrequent source term which is not that easy to treat.

[Slide.]

MR. EISENBERG: To close things up, a few generic points.

The applications of performance assessment are tailored to fit the problem. This includes the magnitude of the hazard, the complexity of the safety issues, the availability of data, and the capabilities of the licensees.

We want to allow appropriate flexibility while ensuring safety through a risk-informed, performance-based regulation. Again, PA is the waste program's equivalent of PRA.

Declining resources is a continuing challenge and it is being addressed by the use of more advanced computing tools, both hardware and software, enhanced staff training, and a focus on what we consider to be the most important issues.

[Slide.]

MR. EISENBERG: To summarize what is coming up in the three program areas.

For decommissioning, development of the standard review plan as guidance for implementing the license

termination rule is a key item expected by fiscal year 2000. As I mentioned before, interim guidance would be issued sooner, as available, and we are coordinating that with the ongoing casework.

For low-level, as I said before, we will revise the draft BTP on the low-level waste performance assessment methodology.

[Slide.]

MR. EISENBERG: High-level waste is likely to be a large focus for our activities. In the performance assessment in high-level waste we are using it to identify vulnerabilities of the repository. It helps us structure

the flow of information into our decision making; it helps to prioritize the key technical issues and therefore provides assistance to management; and it provides insights into the development of the site-specific Yucca Mountain rule.

We are striving for appropriate improvements in the capability.

The near-term focus will be to use technical insights for the rule, to provide timely feedback to DOE, and to prepare for the TSPA-VA review. If we get it, we understand we have two months after the formal receipt to give our comments to the Commission. So we are trying very hard to get in a state of readiness for that endeavor.

CHAIRMAN JACKSON: Thank you.

Commissioner McGaffigan.

COMMISSIONER McGAFFIGAN: I want to go back to Commissioner Diaz' question about the two orders of magnitude. You mentioned the difference in the lifetime of the waste packages. You and DOE must have been talking about that issue for a couple of years now. Is it that you think that the waste package lifetime distribution that they have is incredible or that a waste package might be able to be designed to that but it isn't designed yet? Is it a matter of cost, how much they want to invest in the waste package, or do you think that any amount of cost they will not get as long a lifetime as they are projecting?

MR. EISENBERG: I guess there are two aspects of it as far as I'm concerned. We have some of the other staff here. They might want to contribute.

One aspect is that we feel strongly that they have to consider all possible environments in the future appropriately weighted by their probability to evaluate the performance of the waste packages.

We are not sure that they have taken enough account on these long-lived waste packages the effects of the ongoing seismicity in the Yucca Mountain region and the kinds of environments produced by rock fall or the casing for the tunnel falling in and how those might damage the

waste packages.

For a not so long-lived waste package this doesn't turn out to be a very important feature, but the longer the waste package is around the more subject it is to some of these destructive environments.

That is one area where we think we would like to see a slightly different approach on the part of DOE.

The other is, and this is a very difficult issue, we have very limited data on the performance of these materials when we are trying to project it. In some cases DOE is claiming 60,000-year lifetimes, but even for the 10,000-year performance period these are extraordinary periods of time for engineered materials. I certainly would question the ability to project that far into the future and know that things will perform that way.

I think there is a question about whether all the uncertainties have been incorporated into their projections of waste package performance.

CHAIRMAN JACKSON: The Commission would like to thank the staff for an excellent and very informative briefing. Mr. Eisenberg, you do such a wonderful job, we will look for you same station, same time next year.

[Laughter.]

CHAIRMAN JACKSON: As I said earlier, the

technical areas that this performance assessment program

cover are of great importance to the Commission as you can tell by the degree of the discussion.

The evaluation of the long-term performance of low-level waste disposal, high-level waste disposal, and site decommissioning is not simple. Each time we hear from you we have a better sense of the complexities.

It would appear that based on today's briefing the staff is making excellent progress on developing models that should allow us to characterize site performance in the long term.

I am particularly struck by the synergy that now appears to be working between the low-level waste program and the SDMP program, and that is the kind of synergy we like to see, and that appears to be an excellent approach. It's useful in both areas and one can play off of the other.

I also was encouraged to hear about the involvement of Research in developing usable models. I think that is very useful.

So the Commission encourages you to continue to develop the performance assessment program, to interact, and to share the knowledge gained in this program with others in the NRC who are developing PRA models. Maybe you could almost claim that you helped the people doing dynamic PRA to make it dynamic. These types of interactions among our technical staff can only improve the final products for all

that are involved.

Commissioner Dicus didn't want me to say anything, but we are going to miss her for a short time. I think we should thank her for the service she has given us to this point.

[Applause.]

CHAIRMAN JACKSON: But you better hurry up and come back.

With that, we are adjourned.

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