

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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MEETING WITH THE ADVISORY COMMITTEE ON
NUCLEAR WASTE (ACNW)

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PUBLIC MEETING

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WEDNESDAY

JULY 21, 2004

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

The Commission met in open session, pursuant to notice, Chairman Nils J. Diaz, presiding.

COMMISSIONERS PRESENT:

NILS J. DIAZ, Chairman of the Commission
EDWARD MCGAFFIGAN, JR., Member of the Commission

PRESENTERS SEATED AT OR NEAR THE COMMISSION TABLE:

DR. B. JOHN GARRICK, ACNW CHAIRMAN

MR. ALLEN CROFF

DR. GEORGE M. HORNBERGER

DR. MICHAEL T. RYAN

DR. RUTH F. WEINER

ACNW CONSULTANTS:

JIM CLARK, VANDERBILT UNIVERSITY
BRUCE MARSH, JOHN HOPKINS

P R O C E E D I N G S

CHAIRMAN DIAZ: Good morning, Mr. Garrick, members of the Committee. We meet with you today to look at the recent activities of the Advisory Committee on Nuclear Waste. This, of course, is one of our periodic briefings, and we look forward to the Committee's insights and report.

We know that you have a very wide plate in which many things of interest to the Commission are in it but zeroing in on nuclear waste. That, of course, is of extreme interest these days. We will focus today I understand on the risk insights that you have seen in the materials and waste regulation, as well as the decommissioning of complex sites, in addition to the normal high level waste focus that we are always looking at.

Before I turn to Commissioner McGaffigan, Commissioner Merrifield is on travel. I would like to welcome Dr. Allen Croff, the newest member of the committee. In addition, I would like to acknowledge the reappointment of Dr. Hornberger, who we hope will be with us for a few years. We need some continuity in here. Commissioner McGaffigan, at this time, I turn the meeting over to Dr. Garrick.

DR. GARRICK: Thank you, Chairman. The committee very much appreciates the opportunity to have these meeting and to be given a chance to discuss some of the topics that are before us at this time. We have a full complement of the committee with us today, which is kind of a rare event, and we are very happy to have added to the committee, Allen Croff. One of the requirements the committee has felt that would really enhance our effectiveness would be a distinguished expert in the fuel cycle, and Allen certainly serves that. We also wish to recognize two of our distinguished consultants that are in the audience today, Jim Clarke from Vanderbilt University and Bruce Marsh from John Hopkins.

Today, we are going to cover a number of topics as you have already highlighted. We are going to first talk about the activities that are going on with respect to risk insights and the risk insights initiative. That is on Slide 2.

We will be sharing with you some of our reactions and experience with the working group meetings that we have held, an activity of the committee that has become very important in establishing source material for our advice.

On Slide 3, we will be talking about other committee activities and mainly the research program. We will just be very simply highlighting some of the activities. We will also be highlighting some of the work that is going on with respect to the West Valley site, which is a complex site, and has just about all of the activities that we worry about going on there from decommissioning to remediation. Then we will close our presentation with some discussion about our action plan and future activities. So with that, we will go to Slide 5.

With respect to the NMSS risk insights activities, we want to focus on a couple of areas. One is the NMSS Task Force on PRA and the other is the Yucca Mountain Risk Baseline Report.

Speaking first to the task force and its activities, the task force was developed, as you know, for the purpose of coming up with a proposed framework and draft guidance for risk-informed decision-making for nuclear material applications. The primary use of the guidelines is hopefully to provide a basis for consistency of application of the risk-informing process; to provide a basis for justifying not to have to do, to take regulatory action where, and in keeping with, the goals of the PRA policy statement of trying to use the risk insights to reduce regulatory burden. Also, the purpose of the task

force was to develop a decision-making process that would provide thresholds for making changes in activities to aid the decision-making process.

Now, it should be noted that the guidelines are not a requirement of the licensees. If it follows the pattern of the reactor risk activities, in most cases, the licensees will take advantage of the methods and techniques.

The accomplishments to date as far as the task force is concerned is the development of draft guidance; development of draft accident risk guidelines for the public and workers related to nuclear materials and waste activities; the completion of two pilots studies, one having to do with dry storage and the other having to do with chemical agent monitoring systems and the sealed sources associated with those; and the identification of key issues related to the use of the risk guidelines.

As far as the Yucca Mountain Risk Baseline Report, which I will get to in a little while, this is simply an integrated synopsis report developed by the NRC staff that describes its understanding of the key contributors to performance of the Yucca Mountain repository.

Going to Slide No. 6, as far as the activities of the committee are concerned and what we have observed, we strongly favor the use of such risk measures as reasonably maximally exposed individual. We believe that radiation dose is an effective indicator of health and safety risk. And we believe that sometimes if you try to combine health effects models with dose calculation models, you obscure some of the important information of the dose calculation, which has been something that has been a useful surrogate for health effects for a good long time. And dose calculations are reasonably well developed and tend to reveal the soft spots of the analysis quite explicitly.

The committee believes that the key to testing risk-informed regulation concepts on the basis of the information received from the task force is experience. The NRC staff has recognized this with their pilot studies. The committee believes more experience is necessary, preferably on applications that are more typical of nuclear material issues, such as remediation and decommissioning complex sites. We will come more to this in a little while.

Another important observation of the committee with respect to the task force has to do with collective dose. Population collective dose is limited as an indicator of risk for nuclear materials scenarios that involve small, long term releases or small exposures to many people. In those cases, the collective doses tend to obscure the risk, rather would make it more transparent and visible.

On Slide 8, therefore, we make the following recommendations. We recommend that the risk guidelines be linked to radiation dose rather than health effects. Of course, health effects have to be calculated, but they should be done in such a way as to not obscure the accuracy of the dose calculations. Therefore, we believe the staff should move away from collective dose as a major risk in view of the fact that in many situations, collective dose is not a good tool for determining risk as it deals only with populations not individuals. Okay, that's all we want to say at this time as far as the task force is concerned. Let's come back to the risk baseline report.

On Slide 10, the committee was very much impressed with the baseline report effort as it was presented and believes it provides another very important resource for regulating the safety and environmental impacts of a high level waste repository. The report provides details on the way that risk considerations are incorporated into the NRC

staff's review of the 14 integrated sub-issues that have been identified in the Yucca Mountain review plan.

A result of the review of the integrated sub-issues is, of course, progress on resolving the key technical issues and the attendant agreements with the DOE as the agreements fall under one of the 14 sub-issues and are part of the risk significance evaluation.

The risk insights that are developed through the risk baseline report may be used to screen issues and prioritize the scope and effort of safety reviews and analysis. And with proper implementation, that report can be a major contributor to risk informing the issue resolution and license review process.

Slide 11. The 14 integrated sub-issues from the degradation of the engineered barriers to radionuclide transport in the geosphere to the biosphere characteristics are all related to assessing the waste isolation capability of the repository. The pre-licensing evaluation involves classifying the issues into three significant categories: high, medium, and low. Generally, high risk is associated with failures, events, and processes that could affect first the integrity and longevity of a number of waste packages; second, affects the release of radionuclides from the waste form and waste package; or third, affect the transport of radionuclides through the geosphere and biosphere. And medium risk significance --

COMMISSIONER MCGAFFIGAN: Mr. Chairman, your slides are better than -- I think the staff -- as a result of conversations we have had in the past and I think maybe with you all as well, are trying to get away from the word "risk" because these are not high, medium risk. They are significant to waste isolation, but they are not really risk because

even the highest risk ones may have very modest effects in terms of millirems to reasonably maximum exposed individuals at 10,000 years or whatever terms.

So, we are trying to stay away from the word risk because it is risk in a different sense. It is regulatory risk for approving a case or something, but it is not risk. As I said, I appreciated your slide did not use the word risk, but I see you using it in your oral presentation. So, I urge you to stay away from it.

DR. GARRICK: Right. I think the context we been using it is risk significance as opposed to risk, but you are right. It is --

COMMISSIONER MCGAFFIGAN: A significant to waste isolation.

DR. GARRICK: Right. A significance to waste isolation in low significances associated with no negligible affect. So our recommendations with respect to the risk baseline report is to use the risk insights to focus on the most important KTI agreements, to translate the risk insights into specific guidance on prioritizing issue resolution. The committee is convinced that the risk baseline report together with the Yucca Mountain review plan and the Integrated Issue Resolution Status Report form an important foundation for a comprehensive issue resolution and licensing review process.

One of the cautions that we offer with respect to these reports and the expressions and terms that they use is that we -- and we think where there is more important work to be done is to sort of clarify some of the terms. We talk about KTIs. We talk about sub-issues of KTIs. We talk about integrated sub-issues. And, of course, we talk about the KTIs themselves. In the end, what we are really looking for, of course, is some sort of rank order importance rating of the issues as it relates to our ability to isolate the waste. The NRC staff has done a very good job of the trying to map between these

different descriptors, between the KTIs and the sub-issues of the KTIs, for example, and the integrated sub-issues that are defined in the Yucca Mountain review plan. But I think as we move forward, it would be very helpful to translate this into a single list that is more focused with respect to what is contributing to performance.

We also would kind of like to see more guidance to the licensee on priorities for issue resolution. That is what we are really talking about there is a stronger push for resolution of the high risk or the high safety issues first.

And that's about where we are as far as the risk insights are concerned. We are generally satisfied that there is lots of progress. The documentation is falling into place, and the foundation seems to be there to do the licensing review.

I would like to move into the next part of our presentation, namely, on the working group meetings. We will start with Mike Ryan.

DR. RYAN: Good morning, Chairman Diaz and Commissioner McGaffigan. I would like to report to you this morning on one of the two recent working group meetings that were held. Dr. Hornberger will talk about the second one. The purposes of our working group meetings are focused on Yucca Mountain technical issues, learn about staff and DOE activities and plans, to identify technical issues that may warrant further study, and to offer a vehicle for further participation.

Previously, we reported to you on working group meetings on transportation, performance confirmation, the Total System Performance Assessment (TSPA). The two recent working group sessions that we are reporting to you this morning are the Biosphere Dose Assessment Working Group meeting and Geosphere Transport Working Group meeting. I will begin with the Biosphere Dose Assessment Working Group. The goal is to

focus on metabolic models and environmental pathways and analysis that are all part of the biosphere dose calculation. By their nature they are complicated, involving a number of models and a number of parameters.

We held a session in February of 2004 with a panel of six invited experts from national laboratories, academia, and the private sector. Our discussions focused on the technical basis necessary for biosphere dose assessments including model selection, and parameter choices and, of course, being mindful of the reasonably maximally exposed individual requirements.

The role of risk insights in the development of the technical basis for these calculations was also part of our consideration.

Our observations from this working group session were that the predicted doses are small, near background levels. There are no -- and I will correct this word that's on the slide -- a high significance performance issue for the base case. And the base case, of course, is the hypothesized slow release over long periods of time from the repository.

The working group panel and participants know that there are several conservatisms present in the models, and there was a lot of discussion on realism of calculations and how they could be improved. I think it is important to point out that this realism was not related to making regulatory decisions but was viewed to be in the view of the panel to be things that could increase confidence in the calculations. So, there are many particular items in the various models and parameters, but those discussions were not focused at a level where it was important to compliance but important to improving

confidence in the scientific calculations and confidence of others reviewing that information.

The disruptive igneous event could have some significance with regard to the performance. This igneous event is not something that was unknown, but we focused on the dosimetry aspects of the igneous event. And research, we believe, should continue to focus on inhalation intake parameters and aerosol re-suspension. These parameters result in large differences in calculated doses based on what you assume. Dr. Weiner, a little later on, we will report on research that is going on at the center in San Antonio on this very question.

I will turn now to Dr. Hornberger and ask him to pick up on the Geosphere Transport Working Group.

DR. HORNBERGER: Thank you, Mike. We will move to Slide 21. As you see, we conducted this working group meeting in June of 2004. Basically, the purpose was to investigate whether the evidence base that has been accumulated, that is the results of experiment, conceptual models, mathematical implementations, and site data provide confidence that the geosphere is an effective barrier for retarding the movement of radionuclides away from the proposed repository at Yucca Mountain. As you know, Part 63 has a multiple barrier requirement. In fact, it is quite important that the geosphere be known to be an effective barrier.

In particular, we addressed questions, such as what is known about saturated zone pathways to the compliance boundaries? What is the state of knowledge of radionuclide sorption in tuffs and alluvium? We had a panel of four invited experts. They were people from the U.S. Geological Survey, representing the State of Nevada,

Pennsylvania State University, and somebody from a DOE Laboratory. We also had presentations from experts from Nye County, Nevada, and also from the Electric Power and Research Institute.

Next slide please.

We found it very useful to use as a framework for setting up our meeting work by the NRC staff on basically taking apart the results from the performance assessment to really illustrate what the key aspects of it were in a transparent way. There were several of these insights that the staff had developed that I think really helped us focus our meeting. Some of these are listed here on this slide and that is that the Technetium and Iodine-129 make up a very small fraction of the inventory in the proposed repository. And all through they are mobile, the small amounts in the inventory and also dilution in ground water make calculated doses quite small from these radionuclides.

Neptunium is again, as we all know, important in the dose calculations. It is clear that retardation, that is, the effect of sorption of the radionuclides onto mineral surfaces affects the calculated results significantly. And we focus then on flow paths, travel times, matrix diffusion, and retardation.

Next slide please.

Other insights from the staff's work: 75 percent of the inventory in terms of curies at a thousand years' post-closure is in Plutonium and Americium. And these radionuclides are so strongly retarded by the geosphere that essentially, they take very, very long times and essentially just never migrate away from the repository.

COMMISSIONER MCGAFFIGAN: Could you clarify the word "never" in context other than the 10,000-year compliance period. At the period of peak dose,

hundreds of thousands of years in the future, the ground water pathway, I believe, according to DOE calculations is the dominant pathway and I think their mean is 150 millirems. In their 95th percent confidence interval, it goes up to like 680 millirems. Which radionuclides at hundreds of thousands of years are --

DR. HORNBERGER: Plutonium and Americium -- Plutonium shows up in some of the calculations at some late times, but --

COMMISSIONER MCGAFFIGAN: Does uranium itself, does the uranium never get out? Really truly never?

DR. HORNBERGER: Never is a really long time.

COMMISSIONER MCGAFFIGAN: Yeah. Well, about 400,000 years is a really long time.

DR. HORNBERGER: But if we look at things like natural analogs, then we really are talking about very long times, geological time frames. And so, no.

COMMISSIONER MCGAFFIGAN: In the hundreds of thousands of years?

DR. HORNBERGER: Yeah. I mean.

COMMISSIONER MCGAFFIGAN: So, at peak dose, which radionuclides in addition to the three are contributing to the ground water pathway where they are getting 150 millirem mean and 600 millirem 95 percent --

DR. HORNBERGER: Of the Plutonium and Americium, only Plutonium but not in the --

COMMISSIONER MCGAFFIGAN: So, Plutonium would be added to the other three at hundreds of thousands of years?

DR. HORNBERGER: Well, Technetium and Iodine-129 do not really contribute very much. So, it is Neptunium, and some of the other longer lived --

COMMISSIONER MCGAFFIGAN: Iodine-129 has a million year half life.

DR. HORNBERGER: Yes, it does.

COMMISSIONER MCGAFFIGAN: It is still around unless it's already all been --

DR. HORNBERGER: It's all gone.

COMMISSIONER MCGAFFIGAN: It's been washed out?

DR. HORNBERGER: Yeah.

COMMISSIONER MCGAFFIGAN: By peak does its been washed out?

DR. HORNBERGER: Pretty much.

COMMISSIONER MCGAFFIGAN: Okay.

DR. HORNBERGER: It is certainly not a dominant contributor at the peak does.

COMMISSIONER MCGAFFIGAN: Okay.

DR. HORNBERGER: The point here, however, was not that I wanted to focus on the ones that do contribute to peak dose but rather the point is that 75 percent of the inventory, which is -- that is a big fraction of the radioactivity essentially is held up by the geosphere. So the geosphere provides a very strong barrier for a large fraction of the inventory.

COMMISSIONER MCGAFFIGAN: Okay.

DR. HORNBERGER: And of course, again the calculated travel times are just as Commission McGaffigan indicated.

If we go do the next slide.

The discussion at the working group meeting basically confirmed what we had believed going in and that is that the natural system does in fact act as an effective barrier. This is really illustrated by work by NRC, DOE, and others who have done work. Therefore, a lot of the discussion at the working group meeting focused on the question of how additional work, let's say in a performance confirmation period, could be accomplished to build confidence in the results of calculations or to reduce uncertainties. And that really was a lot of the focus.

So we go to Slide 25.

The main things here listed for which additional information was thought by the panelists and participants that could be brought out in a performance confirmation period that would enhance this confidence would be ground water discharge because even the regional flow rates in the aquifers are quite uncertain; matrix diffusion in both the unsaturated zones and saturated zone; sorption coefficients we already talked about, for Neptunium in particular; and water chemistry and I will say a little bit more about the water chemistry on the next slide because it was highlighted at the working group meeting.

So, Slide 26.

The keynote presentation at our meeting highlighted some work that had been done at a site of uranium mill tailings and showed that the water chemistry was an important determinant of how uranium absorbed onto the material surfaces. In fact, the variability in water chemistry turned out to be quite important. And the analog with

Neptunium sorption is a reasonable analog. And the suggestion was made that Neptunium sorption might be better understood if we did have a better handle on water chemistry and on the processes of sorption. And, this, of course, could lead to a key reduction in uncertainty because even small amounts of sorption are important in retarding Neptunium.

I guess the main conclusion if you will, that the AC&W came to, or one of them as a result of this meeting, is that we were really impressed with how effective the staff analysis had been to provide this framework for understanding the performance of the geosphere. We recommend that, in fact, the staff continue this effort to the engineered barrier system because these insights were actually so revealing.

I will turn it back to John, or Ruth is next.

DR. WEINER: Thank you Dr. Hornberger, and thank you, Commissioners, for having us appear.

I'm going to discuss our oversight of the work of the Center for Nuclear Waste Regulatory Analysis.

If I could go to Slide 28, please.

Two members of the committee, Dr. Ryan and I, visited the center and received in our couple of days there a very thorough briefing on the center's work. Overall, their work is on target. It is focused to the appropriate subjects and is of extremely high quality. We were very impressed. We toured the laboratories and were very impressed with the way that their laboratories are organized and run. The visit gave us a chance to look a little bit more in depth at the work that the center does. The committee has written two letters describing this work and our recommendations, two letters to the Commission

on March 4th and on May 5th. Our letter on March 4th was a review, largely a review, of our visit and the May 5th letter focused on drift stability.

If I could go to Slide 29.

The programs that we particularly focused on in our visit to the center and our review of their work were the program on igneous activity, on the interactions between spent fuel and water, where a great deal of work has been done but still remains to be done. This is related to their corrosion studies, and they are doing some very good work on corrosion studies. On post-closure drift stability and -- we looked at -- and I actually had a hands-on demonstration of the Pre-Closure Safety Analysis tool.

As Dr. Ryan mentioned -- if I could go do the next Slide, Slide 30 -- as Dr. Ryan mentioned, one of the key issues in the whole question of igneous activity is if material is emitted and gets into the air, then, the particle size distribution, the solubility of these particles that are released in an event of this type are very important to the ultimate dose. And we have recommended as we wrote to you in the March 4th letter, that the relationship between the specific radioactivity in the ash particles and the air borne concentration of those ash particles should be used to evaluate doses that result from the inhalation doses. And we really think that work is needed looking at the effects of particle size and solubility in particular.

What goes into the air and the nature of this material, very strongly effects what dose any recipient any receptor is subjected to. The particle size gives you a very -- is very strong indicator of how much is inhaled and how much lands on the ground and subjects an individual to an external dose. This is a very important area.

We also commented on the on-going and proposed experiments looking at spent fuel water interactions, and we are still in conversation with the center regarding our recommendations in this respect.

If I could go to the next slide, Slide 31.

We reviewed the center's work on drift stability. They were as the time, some disagreements between various people working on this. These have been very largely resolved, and the center did give us a very thorough recommendation.

The Pre-Closure Safety Analysis tool is a model that is intended to look at the safety of the facilities of the actual facilities, and clearly there is a problem because the design is still in progress. The tool is very good. It is quite transparent, and actually, once introduced to, it is quite easy to use. In our opinion, it has the necessary flexibility to accommodate changes in design and design development. The biggest problem with the tool is as with any model is looking for appropriate input data. This is largely summarized on the next slide, Slide 32.

It we found that the tool models accident scenarios, safety compromising scenarios quite appropriately, and the inputs are traceable throughout the tool.

If I could have the next slide, Slide 33.

As a result of our visit and continuing conversations with the center, it's in our opinion, the center work is addressing issues of importance to the NRC and to the work that the NRC has them do. The work continues to be of very high quality and we will continue to review their work periodically.

And with that, I will turn it back to Dr. Ryan, I believe.

DR. RYAN: Thank you, Dr. Weiner. Our next topic is the West Valley Site.

This is the committee's first effort to take a look at the application of the license termination rule to a complex site, and we hope to gain insights into the more generic applications of the license termination rule and assess methods and methodologies that develop as part of this project.

The West Valley site is a complex site. Some of the features of the site include that the land surrounding the West Valley Demonstration Project are thought to be available for release in an unrestricted way. Parts of the West Valley Demonstration Project are probably going to have a restricted use. There are two burial sites on the property and has vitrified high level waste awaiting geologic repository. So, those are just some of the major features of the West Valley site and their complexity.

The DOE performance assessment approaches that they are going to use as they develop in parallel both their environmental impact statement and their performance assessment are going to be a combination of deterministic, bounding, and probabilistic analyses. All three are planned.

The next Slide 37.

NRC staff's independent performance assessment will be probabilistic in nature, will use realistic assumptions, and the ACNW strongly encourages this staff's approach as this work develops and emerges.

Again, we just had one meeting this year. Our next steps, in addition to meeting with staff, will be to meet with DOE and the New York State Energy Research and Development Authority. As the environmental impact statement and the performance assessment plans mature, we plan periodic meetings with involved stakeholders. We plan

to report to you on our progress on our observations and recommendations regarding this effort.

And with that, I will turn it back to our chairman, Dr. Garrick.

DR. GARRICK: Thank you. We would like to close with a few comments of somewhat of a process nature. We would like to talk briefly about our action plan and also just highlight a couple of things that are in our future activities.

On Slide 40, we indicate that the action plan involves undertaking reviews of Commission approved topics. At least every two years; the ACNW updates its action plan to reflect new and continuing priorities. As you know, the plan identifies our vision, our mission, our goals, our priorities, etc. Its primary purpose is to guide the committee in carrying out its independent and technical advice on nuclear materials and waste management.

It is important that the planning process embrace various rich sources for inputting. For example, to facilitate the planning the work we are doing this year, we have already met with individual Commissioners. We have met with the Deputy Executive Director. We have met with senior Nuclear Materials Safety and Safeguards management, and we also obtained information from stakeholders. We obtained this through our working group meetings. We obtained it through our meetings out in Nevada, and our process then is to on the basis over this, submit to you a list of priorities. We usually categorize these priorities into top tier and second tier. Then, we move forward and document them as part of our action plan following your approval.

This has been a very effective process. It has not only given us some benchmarks to work against, but it has given us excellent documentation for self-assessment and majoring how well we seem to be doing.

Slide 41 is just a continuation of indicating how we work with individuals and organizations to document the planning actions.

There is always this issue of how we can improve.

One of the items that is always a problem is everybody is very busy and some of these topics come somewhat late in the game and there is an imposition of a requirement to develop source material for dealing with them. So what we tried to do in that regard is to work more closely with the staff. We have involved them directly in our planning and procedures meetings. These are the meets that precede our actual meeting. That seems to all be working very well.

The committee has long felt the need to become involved in licensing issues as early as possible in order for the advice to support the committee decision-making process or the Commission decision-making process. And we are working with NRC staff to figure out ways that we can be involved in so-called pre-decisional matters without compromising due process.

As far as future activities are concerned, as we said, that's guided mainly by the action plan. As you have already heard, we have considerable confidence in the working group meetings and what they provide in the way of source material for enhancing our analysis and our technical evaluations. They have been extremely valuable in that regard. We have a number of working group meetings lined up for the future as you have already heard one on igneous activity, and we will have one having to do with the ICRP

recommendations that are now out for consideration in the health, physics, and radiation biology area.

In keeping with our commitment to streamline the process and make it as easy as on everybody as possible, we are coordinating all the agendas and all of the activities associated with these working group meetings well in advance of their schedule to avoid burdening the staff.

Slide 43 does highlight a couple of future activities that we wanted to mention.

Dr. Ryan has shared with you current activities associated with the West Valley. One of the activities there that is very important and is almost in the category of a pilot effort will be the performance assessment, and we want to follow that very closely because it could become sort of a trend setter if you wish for future similarly complex facilities. We intend to work with the West Valley people closely on that and the NRC staff to make sure that such performance assessments make sense for those types of facilities.

We have had many discussions with you already regarding our role in the Yucca Mountain licensing process. We realize that our scope of activities goes much beyond Yucca Mountain, and there are plenty of other things for us to do. On the other hand, to the extent that we can support that process, we wish to do so. Right now, the guidance seems to be that we will be providing work at the request of the Commission with respect to the adjudicatory technical activity.

So, I think that is pretty much where we are. Of course, our underlying future activity guideline is the Commission itself and issues that come up and that are brought to our attention. We cannot always forecast those well in advance. For us to be effective, we

have to accommodate that and be able to respond to them as they appear. That's what we have tried to set up ourselves to go.

So I think that pretty much completes our formal presentation, and we would be delighted to answer questions.

CHAIRMAN DIAZ: Thank you, Dr. Garrick, and thank you to the members of the committee. We do value your advice and guidance. We look forward to continuing it.

When you were talking, I was realizing that at occasions during the last two years the Commission has been so pre-occupied with issues of security and the amount of time we had dedicated to it that it seems like we don't put enough attention on some of the other issues. And I want to assure you that that does not mean that we don't give them the proper importance. And being an optimist, Commissioner McGaffigan frequently, you know, he doesn't accuse me, he points out that I'm an optimist. I am still looking forward to that pointing, which we have subsumed enough with the security issues that life will return to normal, and we will be able to dedicate enough time to the simple issues of life, like Yucca Mountain and waste and things like that rather than the complicated issues of life, like security and what we do with it.

But I do want to you know that we do value your participation in the Commission's activities and that is very important to us.

I think I heard a theme, you can correct me if that's not correct, but I heard several times that you are satisfied with the progress that the staff has made in the different areas that you analyze and that the reports and the work is going in the right direction, that the quality is where each should be, and that you are encouraging the continuation of these efforts and a series of activity. That was the theme. I thought that

was extraordinary good news for the Commission. And this is an area in which we tremendously need your advice because although the staff is expert at this issue, we do realize that the independent advice that the committee can provide is extremely valuable. Is that correct across the line did I hear?

DR. GARRICK: Yes. That is correct. I think we have seen an enormous amount of progress in the last two years with the development of these key documents that we mentioned earlier. As you know, one of the tier one priorities of the committee is offering advice on the risk informing process. That has occupied a great deal of time. And we have been very much encouraged with what's happened of late. The risk baseline report is the latest and the most important evidence of that. And the thinking in terms of risk is clearly taking over with respect to the reports that we are receiving, and we been encouraged by that. There is a long way to go.

We mentioned the issue of transparency, communication, and what have you, and specific issue, for example, of the variety of the descriptors that were used to identify the Yucca Mountain issues and the need for transforming those into a more common and risk-oriented basis. But we have been delighted with what we have seen in the last year or so.

CHAIRMAN DIAZ: Okay. Well, I think you talked on what was the obvious.

The second question to that, having been satisfied with what you have seen, has the committee had any additional specific areas that you think we need to provide staff support and strengthening of those areas?

DR. GARRICK: Well, let me look the members to comment on that. Anybody wish to offer any suggestions of additional requirements or additional strengths?

DR. RYAN: No, but I would add to your comment that I think that the NMSS staff and management in particular has worked collaboratively with us on developing our agenda. I think Dr. Garrick mentioned that. That has been an important part of the alignment of the committee's activities with what is currently on the staff's agenda. I think that has kept us in good communication and well aligned. Now, topics will emerge. For example, the working group that is going to address the ICRP consultation papers is very current and necessary because there is a deadline on those comments. So we have re-arranged our schedules to move that up and help address an area where the staff has a need but also where we have an interest. So, open communication has helped up be more effective, and I concur with Dr. Garrick that over the last year or so, it has really helped.

In addition to our working group meetings, which are very focused but very detailed, I think has helped in part to make the process a little more efficient. Instead of three presentations over three of our meetings, we get it all done at once; and we get a rich record from which to offer advice and recommendations. So while it is intense for that one meeting, it is not as perhaps spread out over time. And it makes, hopefully, a little more efficient and focused. So, that has been effective for us as well.

CHAIRMAN DIAZ: All right. So fundamentally from our side, the message that I guess we should continue to carry to the staff is that communication with you -- and early communication -- is really needed for the committee to be able to discharge its functions, and we certainly think it is very appropriate.

DR. GARRICK: Yes. We appreciate that because as you know from the last meeting we had with you, we were feeling the need for improving the communications; and we set up a little task force ourselves. The chairman and vice chairman, who conduct a

series of meetings, starting with the Commissioners, and working with the EDO's office, as well as the NMSS management to see if we couldn't identify more specifically how we could make the process work as efficiently as possible.

CHAIRMAN DIAZ: All right.

DR. GARRICK: That has had a good impact.

CHAIRMAN DIAZ: And we will emphasize that. We thank you for bringing it to our attention. I assure you that we will make sure that the message is received properly. Let me go do something that I think is obviously that I had a strong interest for a long period of time regarding what to use for the actual mission of this agency, which is radiological protection, and dose, and collective dose, and health effects. Of course, I cannot be more in agreement with you Dr. Garrick that this is an area that needs to be cleared up so that we can not only do the right thing, but we can communicate the right things to the public. The importance of this issue cannot be overstated. It is really fundamental to the things that we do day in and day out.

I find that the good intentions that we have sometimes get curtailed by what I would call the established infrastructure or the established pre-conceived notions or all of the kinds of things that really prevents us in many ways to going forward and creating a clear message of what is really important to public health and safety. I wondered now that you have been interactive in this, do you have any specific suggestions in how can we set up dose and health effects in a manner that can be either a correlation or establish a way to deal with them because that is fundamental to what we do. Also, again, having been dealing in the public media, and I think issues of waste are always out there, is this issue, how do we carry not only the message, but how can we more effectively start to really say

collective dose has only applicability for certain cases when we have a controlled population and you want to establish some standards for how that population is controlled. But for large populations and small doses, it really does not make any sense.

DR. GARRICK: I think the risk perspective, if I may use that term, is the way to get to that. I think that if we are able to make the transition into a risk-informed process and evaluate things on the basis of risk that the things like collective dose will be put in their proper context and stick to the infrastructure that we have. One of the things that you always have to worry about is when you go do the effort of establishing a set of procedures, a set of guidelines, that you indeed follow them.

And that's the advice we give with respect to the implementation of the risk baseline report is that the risk insights as the Commission white paper of several years ago so elegantly noted are provided by doing risk assessments. So, we got to be very sure that we are in fact practicing what we preach there. So the most important thing is vigilance on the part of your advisors like us and your staff to implement the excellent infrastructure that has been put in place. And as we said, the combination of documentation that's together now contains just about all of the elements that are necessary we believe to achieve that goal of risk-informing the process, but we have to be very careful not to get careless about how the input to that process is generated. So we are going to ask a lot of questions about the kinds of analyses that were actually performed to follow through with the risk insights. I think if you have heard any feedback from our meetings, you have certainly been told that we have been pretty persistent in that regard. Anybody want to add?

DR. RYAN: That's fine. There is one additional, I guess a smaller point but certainly aligns with Dr. Garrick's comments and that is that often I feel that we are sloppy

with terminology. We talk about radiation dose. We talk about collective dose. We sometimes forget there is a background, and we cannot separate that out when we think about a theoretical dose in the future. We are trying to identify those areas where rigor on the science side will help can the clarity and hopefully will translate to a better and clearer communication beyond the technical realm. That is a big job, but I think that is something that we are trying to focus on as a way to move forward.

Collective does is useful in certain circumstances but as a communication of real health effects risk by itself, at low doses, it is meaningless. I think taking care at the beginning and talking about things in context of the whole sense. You know, the LNT is useful for radiation protection practice, not for the radiation biology and so on. That's part of what I think are some of the examples that we are trying to --

CHAIRMAN DIAZ: Oh, I think that is absolutely true. We did not develop the correct terminology, and we keep confusing it. If I were in that field, which I'm not, instead of talking about risk, I would always be talking about risk reduction. Instead of talking about dose and things, I would talk about radiation protection guidelines, for example, or radiation protection action levels rather than risk action levels. We do not have a set of terms that we can consistently use that means the same thing to everybody and that at the same time carry the same message that what we do is actually reduce risk and reduce radiation risk.

So anything that comes down your path that will help us in this, I think is something that we all have a strong interest on.

DR. GARRICK: One specific thing that we talked about and perhaps there is action being taken in that regard would be to update the whites paper developed a few

years ago on risk-informed performance based regulation because that was a step of improvement in terms of enhancing what we mean by such terms as risk insights, what we mean by risk, what we mean by risk significance, and what have you. So I think an extension of that based on the lessons learned over the last three years would be enormously valuable.

CHAIRMAN DIAZ: I think a few months ago, I asked the DEDO for NRR to re-look at it. Again, security has come in the midst of that, but I think the Commission has a strong interest in re-visiting those areas, or at least I do.

DR. GARRICK: Yes.

CHAIRMAN DIAZ: Dr. Ryan, you were talking about the biosphere and the working group observations. There were a couple of comments in there that I thought were very, very -- resonated with me. The issue of you do realistic analysis or calculations not only because of what they mean in regulatory terms but because they are actually fundamental to the credibility of what you do. Sometimes people don't realize this. They start with a simplifying model. They carry it, and eventually they spend a tremendous amount of time. And at the end, people cannot really believe it. So, I think we have an opportunity now that people are zeroing in on the fact that putting realism from the beginning is a fundamental objective that will eventually be carried the regulatory side, but it is fundamental to the actual credibility of what you are doing so that people can continue to work with it because if not people will start -- So I'm just going to agree with you on that.

There were a couple of phrases in here. You were recommending developing a -- when you said no high risk performance issues were the base case on the

level of risk when you are looking at the biosphere. Then there was a recommendation to improve realism. How do you put those two things together?

DR. RYAN: Well, I think the qualifier that I mentioned was that adding to the body of the science knowledge would add to confidence. There was a distinction made among the panel members and participants that some of these things might not have a big influence on a calculated dose, but if they were a little clearer and there was a little bit more conformity about the scientific interpretation, it would add to confidence that that is a correct answer.

So our letter to you in fact, identifies a number of things, and in an attachment that really were recommendations in a working group panel to the license applicants. They were not necessarily things that they felt were critical to the safety decision or regulatory decision but would be enhancements to help with confidence building, both internal and perhaps external, beyond the license application.

CHAIRMAN DIAZ: Okay. Thank you.

The issue of doing research to reduce the uncertainty, I think when you put that with realism, is what you are really saying realism is really a key way of reducing uncertainty if you start doing it from the beginning. Then you can determine what the uncertainty is and work at it?

DR. RYAN: Yes, and your paper on that subject have guided us as we design some of these working groups.

CHAIRMAN DIAZ: Good. I did something. Dr. Hornberger, on the geosphere transport working group observation, you again, on the issue of risk-informed approach and the reduction of uncertainties, if you look at this identified area, were you

able to give say an approximate quantification of how much reduction of uncertainty is going to be worth in the identified areas? Because sometimes reduction of uncertainty, really does not contribute that and other times it does. Do you -- has the committee been able to look at that and identify which areas were reduction of uncertainty to really be a contributor to any of the areas.

DR. HORNBERGER: I should probably make two points. First of all, the short answer to the question is no. We have not done quantitative analyses, we have basically asked staff to look at some things, and some of their analyses do point to at least some of the aspects where reduction of uncertainty could be important. The caution that I would throw in is, of course, we also I think should be looking for any cases where it could take us in the other direction. If for example, we learned that flow along major faults was somehow under represented in our analysis, it could in fact lead us to conclusions that we were not being quite so conservative enough. We don't think that is going to have a major impact but still, it is in the way of confidence building, to make sure that you have not left something out.

There are some I think obvious things where there could be very large improvements in the calculations and probably lead to lower doses being calculated. Some of these have to do with just matrix diffusion in the tuffs and the parameter, for example, that is as important as the block size. We do not have very good information on that. We know that it is important.

I also pointed out the sorption mechanisms for Neptunium could lead to significant things. Previously, this was not part of the Geosphere Working Group, but we have pointed out that we know so little about formation of secondary minerals and the

potential binding of a whole range of radionuclides that would in essence prevent large scale migration for very long periods of time. So there are some things where improved information could lead to drastic reductions in calculated doses.

CHAIRMAN DIAZ: Okay. That leads me to the next question. Are you familiar with any work that is actually going to be done in these areas? Is it programs? Is it there? Because the reality is that as we all know, we tend to focus on the primary actions because that is what we can do easily. And sometimes it is the secondary reaction that creates the next order of magnitude or reductions, especially when you are talking about migration of species in medias that are not designed for them to migrate very easily.

DR. HORNBERGER: Absolutely. Again, I think that the Department of Energy as we know have been so heavily focused on building the case for the license application that they have not really provided a lot of information to us on their plans. They do have, again, as you know, a research program that Bob Budnitz I think is heading up, and we have not been briefed on that. We are looking forward to a briefing in the future where some of this information we may learn about plans going forward, but I do not have any information right now.

CHAIRMAN DIAZ: All right. Dr. Weiner, I think you made quite an emphasis on the fact of the importance of the inhalation models. I think the Commission has for a long time been trying to make sure that we understand the whole thing about the igneous activity and the volcanic issues that people keep bringing up. Of course, I totally agree with you that the understanding of the particle size and all of the reactions that take place will actually be dominant after the fact.

Any comments on the initiating event? When we keep looking at the key technical issues and we keep looking at igneous activity, we always get this thing that work is in progress. Has the committee been able to look at it and realize where we are going with the igneous activity or the volcanism?

DR. HORNBERGER: As John mentioned, we have a working group meeting planned for September where we want to bring people together. It has in fact been on our plate prominently ever since the -- it must be over a year ago that the Commission asked us keep tabs on this and we have tried to keep very close tabs. There has not been too much new that has occurred or at least been ready for presentation to us until pretty much now. I know that the Electric Power Research Institute has completed a recent study on magna drift interaction, and we are going to be briefed on that at the September meeting. I know that the staff has continued to study a variety of issues including probability of igneous event. So I hope we will have more information for you at the next meeting.

CHAIRMAN DIAZ: I just wanted to prompt you on --

DR. GARRICK: Just one comment on your question about uncertainty because one of the things that we have come to do especially with respect to the Yucca Mountain is try to think in terms of the most significant contributors to uncertainty. While it is not any kind of an officially sanctioned list, we tend to have some things that are pretty visible as far as being major contributors. One of the things in that category is actually quantifying the long term environment of the waste packages. Every time you get into any kind of technical discussion about the corrosion model, you always seem to come down to needing to understand the intricacies of the corrosion environment. So clearly, if you are trying to evaluate a corrosion model or if you are trying to evaluate a waste package

degradation analysis, there has got to be a lot of attention given to how much we know about that environment as a function of long time.

You mentioned the igneous event issue and that has been on our plate a long time as an issue. As a risk analyst, I have always been troubled by the way in which the analysis has been performed, the separation of the probabilistic part from the consequences part. We hear presentations on consequences, and the first thing we hear about are a set of assumptions associated with the consequence model. Well in fact those assumptions are probabilistic in nature. And so the separation is kind of a violation of an intrinsic characteristic of risk assessment, which is to analyze the igneous event activity in the context of scenarios and keep the boundary conditions in place. And you do that when you analyze it in the content of scenarios rather than separating it into those kinds of components. We have been on that bandwagon a lot.

And there are others but, these are a couple of the issues that have really been a source of considerable uncertainty in the analysis we have seen.

DR. DIAZ: Okay.

DR. WEINER: I would like to respond briefly to your --

DR. DIAZ: I was going to turn to you.

DR. WEINER: Oh -- to your comment about aerosols. What most dispersion models tend to do is to simply take a convenient number and that number then gains historical significance of some sort. They take a convenient number related to particle size, their position, and so on, to actually look at particle size distributions, which is extremely important and at the physical and chemical properties of those particles, requires an experimental program. I do not think -- there has been no comprehensive experimental

look at that. And this is just my own view. I think it is very necessary. I did for myself a little bit of analysis just to see what the effect is of deposition velocity on inhalation dose. And it is very significant. I mean you can change the inhalation dose by orders of magnitude just by how fast things fall out, and I think this is an area that needs some exploration. I hope that we can do that in the future. I think it will go some length in improving public confidence about the consequences of any kind of aerosolized release.

CHAIRMAN DIAZ: If I may mention, we actually are doing some additional work regarding dispersion models with the issue of consequence analysis for any kind of accidents and it might very well be that it would curtail right into your things.

DR. WEINER: Very good.

CHAIRMAN DIAZ: I think have over used my time. I took advantage of the fact that Commissioner Merrifield was not here, but besides that I just want to make a comment on West Valley. West Valley is a very interesting site to put it mildly. I heard the comment that it has everything that you want or not want on its site. I think this is here -- is not in the future, is something that we need to deal with. I am hoping still that there will be a point in which we will get to consider the license termination aspects as far as what the Commission involvement is on it. So advice in this area certainly would be welcome.

With that, I will turn to Commissioner McGaffigan.

COMMISSIONER MCGAFFIGAN: Thank you, Mr. Chairman. I am just going to run through a few things.

First is a reaction to the conversation between Dr. Garrick and the Chairman about updating the white paper. The Chairman also alluded to security several times. We are going in all likelihood to be in a continuing resolution. We could be in a continuing

resolution for the whole year at the current year level. We have to squeeze out some money for some priorities but that is particularly tough on the Yucca Mountain budget because we were projecting an increase from \$33 to \$69 million. So the staff will have to live with \$33 million for many months and perhaps for a whole year in all likelihood. The rest of our budget will get wacked.

So, I appreciate your efforts to come up with new things for the staff to do that maybe are not programmed at the moment, but you might want to find a few things to cut. It is not on your list at the moment, but we sometimes task ACRS with helping us to figure out where in research we might cut a few things. The staff is looking for things to help them trim I think at the moment, rather than new things to add to an already heavy plate. So, that's a mild dissent from giving them something new to do here.

Let me start with Slide 8, the ICRP, with collective dose. I agree with the conversation earlier, but this is not just Slide 8. There is a later slide that says you are going to have a working group meeting in December about the ICRP recommendations. My questions are does ICRP do anything new about collective dose in the draft that they have just released? I have not had a chance to look at it. And number two, when do they expect comments? If my recollection is right, they expect comments by the end of year. Is your December meeting timely enough in order to influence any comments the Commission might want to send in to ICRP? And the staff may work on independently of you all. So that is the line of questions, where is ICRP on collective dose in the latest draft? Is it good or bad compared to the current? And, as a general matter, is your December workshop timely enough in order to influence any Commission comments?

DR. GARRICK: Well, let me just jump on that last question because we would not want the working meeting to dictate our ability to respond to that question. If the Commission wants the ACNW to deal with that issue in advance of the working group meeting, we certainly can do that. That's one thing.

As to what the ICRP review is, Mike is going to --

DR. RYAN: I've been in communication with Dr. Cool and Margaret Federline and others on that exact question. We want to be timely so that we can support your comments. So, we will move that --

COMMISSIONER MCGAFFIGAN: And are they due at the end of the year as my recollection?

DR. RYAN: Yeah. The end of the year is when comments are due. There has been no indication or hint that there will be slippage in that deadline but that is always a possibility on an international scale kind of consultation paper. We will not going to accept that there will be a delay. We are going to work in a timely way.

To answer your technical question, I have been through the document once in detail. I have not seen anything that dramatically changes the collective dose question and I do want to recognize that we recognize the staff director's memo on a specific aspect of the ICRP recommendations. So that is an area we will not be involved in.

COMMISSIONER MCGAFFIGAN: I find a lot of the collective dose calculations that the government as a whole dutifully does at the current time to be somewhat silly. I use the different adjective, but at the moment we have a satellite orbiting Saturn and bringing back absolutely beautiful photographs and lots of new scientific understanding of that planet and systems. I'm pretty sure it is Pu-238, Plutonium-238, that

is providing the energy so far from the sun, because solar panels would not be effective at that range. I'm pretty sure because I have seen these several times now that the President's science advisor had presented to him, probably back in the Clinton administration, a report that said the worst thing that could happen is when we sling shot the satellite around the earth in order to get it on its pathway, it might re-enter and everybody in the northern hemisphere will get some fraction of a millirem, a very small fraction of a millirem. But since it is four billion people times a fraction of a millirem, you get so many person rems and that could mean 20 people over the next 50 years, some number like that, might die from radiation effects. It is a really silly calculation that the President's science advisor dutifully says, "This is a silly calculation. Nevertheless, I'll authorize launch of this satellite." But, we do what we have to do. Luckily, public policy, good public policy prevails despite the need to do silly calculations.

DR. RYAN: Silly is okay with me.

COMMISSIONER MCGAFFIGAN: Yeah, yeah. On page 31, this goes to Dr. Weiner. I took a note while you were talking about that viewgraph. "The design of the facilities is still in progress," the surface facilities you were referring to. You were referring to the Pre-Closure Safety Assessment tool. I have had this question I think perhaps before. Do you have a good sense today -- you all are closer to this than I -- if I am a fuel assembly at Main Yankee or Trojan, or if I'm a high level waste log at West Valley or Idaho, and I'm dutifully in a nice canister at the current time with various overpacks that go on top of that canister, do I ever have to come out of my canister on my way to Yucca Mountain geological repository?

I read some of the stuff that comes out of DOE about how they are going to buy their own casks. They are not necessarily settled on the fact that if I'm a fuel assembly at Maine Yankee that I might not have to go through some transfer process before I'm shipped off. But in the ideal case, shouldn't our goal, if I'm trying to designing a system as a whole, be that once you are in a NRC certified container, at least the inner container, you don't have to be taken out of it again before you are placed wherever you are going to be placed for ultimate burial? Shouldn't that be our goal? I guess my question is do you fully understand (if you do, you're ahead of me) what happens today to those fuel assemblies that are in NRC approved dual mode casks at Maine Yankee and Trojan or at West Valley, and if they are logs, West Valley and Idaho, do you know what happens to me today on my way to Yucca Mountain if I ever get to Yucca Mountain?

DR. WEINER: The simple answer, no.

COMMISSIONER MCGAFFIGAN: Well, you're in the same boat as me.

DR. WEINER: I believe the question of what actually that fuel assembly is going to face is still one that is unsettled.

COMMISSIONER MCGAFFIGAN: Should the system be one where I do not have to do a dry transfer? I assume dry transfers are going to be the most -- the dry transfer facility at --

DR. WEINER: Yes.

COMMISSIONER MCGAFFIGAN: Some number of them may have to be dry transferred. But for the most part, the less handling of this fuel the better.

DR. WEINER: Oh, yes.

COMMISSIONER MCGAFFIGAN: If I can stay in this canister with different over packs all the way to wherever my final burial place is that would be the best because otherwise I'm subjecting real people --

DR. WEINER: Yes.

COMMISSIONER MCGAFFIGAN: -- to potentially real doses of significant quantity in order do manipulate canisters?

DR. WEINER: Yes.

DR. GARRICK: Well, as you know, Commissioner McGaffigan, many years ago, they were moving in the direction of multi-purpose canisters.

COMMISSIONER MCGAFFIGAN: Oh yes. I arrived here about the time the Congress, I think summer of 1996 when Chairman Diaz and I arrived here that the Congress terminated --

DR. WEINER: Yes.

DR. GARRICK: Yes.

COMMISSIONER MCGAFFIGAN: -- the multi-purpose canister program. It is something that I believe to this day was a major mistake.

DR. GARRICK: And another thing that has kind of complicated this whole process is the issue of thermal management with respect to what goes into the repository. If there is a lot of thermal management, that means a lot fuel handling and where that should be done is still being debated whether that should be done at the generator site or at the Yucca Mountain or in the surface facilities or what have you. But, we don't know as Ruth says, but in the discussions, we read about and we hear about, there seems to be

now a tendency to want to go back to something almost equivalent to a multi-purpose container.

Allen, you may have some information on this but there is still debating though, the details of how to re-shuffle the fuel if that turns out to be something they want to do in order to accommodate a different kind of repository such as a low temperature repository.

DR. WEINER: If I might. There has been a discussion very much off line of transporting the fuel with the fuel in some sort of central core container surrounded by vitrified high-level waste in steel canisters. I am not close enough to that program to figure out what the volume relationships are.

COMMISSIONER MCGAFFIGAN: Somebody has to look at this problem as a system.

DR. WEINER: Yes.

DR. GARRICK: Yes.

COMMISSIONER MCGAFFIGAN: And I fear, based on -- my knowledge is like yours, sort of reading stuff, and I fear a lot of this reading that I do is driven by lawyers rather than technical types who are fending off various litigation trials before the Claims Court. But somebody has to look at this thing as a system and look at risk prior to closure. This conversation is about pre-closure and where the greatest risks are at pre-closure and handling that darn fuel multiple times by real human beings, however well designed the facilities are for the dry transfers, is every time going to be a problem. I mean, it is not a problem. You can do it. It is going to drive up costs, and it is going to expose people to real radiation doses. Somebody has to look at the thing as a system. I agree with Mr.

Garrick that prior to 1996, there really was an attempt, I forget who was head of the DOE program at the time (Dan Dreyfus), he was former staffer of Senator Johnston I believe, and they were trying to look at the thing as a system, but the multi-purpose canister program went by the board just about the time it was reaching fruition.

MR. GARRICK: Yes.

COMMISSIONER MCGAFFIGAN: And we have suffered from that ever since. And I think it is all partitioned now, and it may well be influenced more by lawyers than by technical types. Let me ask a question of Dr. Garrick. You're a member of the National Academy of Engineering, right? Is anybody else in the academy? Okay, Dr. Hornberger. So you are my two victims. Can you tell me why there are not more dissents on academy panel reports? Is there something in the system there that encourages you have to have a consensus report even if some of the sentences are sentences that you disagree with, hopefully, perhaps strongly; but is there sort of guidance given to academy members serving on panels -- thou shalt end up with a consensus and dissent is not welcomed?

MR. GARRICK: I have opinions on that, but I think I would prefer to have George.

(Laughter)

I definitely have opinions on that.

DR. HORNBERGER: The short answer is no. There are no instructions given to people as to not having dissent. It is clear at the outset of academy committees that is the preference is to have a consensus report to work long enough and hard enough within the panel to not have statements with which people disagree but to hammer out the

statements so they really reflect the consensus so there is not disagreement. But, as you well know, there are cases where people will write a dissenting report and that is published as part of the report.

COMMISSIONER MCGAFFIGAN: The only one I'm aware of in NRC space is the famous one about the medical program. I think it was a former FDA official who was then at either the University of North Carolina or Duke who dissented from the basic recommendation for NRC to get out of the regulation of medical exposures or use of radioactive materials in medicine. He wrote such an absolutely convincing dissent that every Commissioner since I have been on the Commission from Shirley Jackson on has agreed with the dissenter and not with the main body of the report. I think, obviously, we have made our policy based on the dissenter.

I will give you a context for this question and then let Dr. Garrick talk. A member of the 1995 panel, and I got this exact quote. I went and listened to National Public Radio this morning upstairs. In the July 10th, weekend edition of National Public Radio, there was a segment about the previous day's Yucca Mountain decision. This member of the 1995 panel said the following, "If you now go out to hundreds of thousands of years, I don't understand how you can actually do a technical analysis to show positively, anything to do with the behavior of these materials and ground water and the geology of any site and make a convincing case to skeptics." Now, this person is a member of the panel which simultaneously said 10,000 years is the wrong place to regulate. Hundreds of thousands of years is the right place to regulate, and we believe you can do compliance assessments out to a million years.

Why would a person who has this view in 2004, and I assume he probably had it in 1995, agree to a report that said this when he believes something else?

DR. GARRICK: Yeah, yeah. Well, my opinion about consensus reports is that they lose a lot of depth and sharpness --

COMMISSIONER MCGAFFIGAN: I fully agree.

DR. GARRICK: -- in order to drive for consensus. And frankly, the reports that seem to have most depth technically, particularly if it is on controversial issues, other reports that have dissenting.

COMMISSIONER MCGAFFIGAN: I fully and completely agree.

DR. GARRICK: So I think it is an important mechanism and that it should be used more.

COMMISSIONER MCGAFFIGAN: I would respectfully suggest to those of you who are in the Academy of Engineering that you all have some discussion of this issue. You obviously, because you are here, recuse yourself from working on these specific issues, but this is a broader concern. I have seen, unfortunately, too many Academy reports now, consensus reports, that are not all that hot. We talked about one a year ago here that was the Academy report on Yucca Mountain that basically sort of blithely talked about making design changes at will --

DR. GARRICK: Phase management.

COMMISSIONER MCGAFFIGAN: -- phase management. It would have required an entirely different regulatory scheme from the one that we have in place, and they did not seem to understand that. And somebody on that panel might have recognized that or maybe they just don't. But then you have a permanent staff there that might help

educate panel members occasionally if they are way off track. But I have seen too many reports where I can't believe that some of the people on the panels actually believe some of the sentences in the report. And luckily, most of the time, the reports are not tied to a law that says, "Somebody has to go do something based on the report and consistent with the report." We can as we did in medicine here at the NRC agree with the dissenter and not with the body of the report.

But I think that the Academy system as a whole would be much better served on these complex issues that are not strictly technical to give us a range of views and even if you have been -- it would have helped the Congress in 1995 to know that there were people on the panel that didn't believe in the recommendation that we should be doing compliance assessments at hundreds of thousands of years, and the EPA should be designing rules at that time horizon. It would have helped if that was indeed their view and I suspect it was their view.

The other -- maybe I will leave it at that. The Academy system at the moment in the view of one person that has served 30 years in government and read many an Academy report, not just in NRC space, the Academy system at the moment is broken in some very real ways and to the extent that those in the Congress who are not technically knowledgeable or other members of the public who are not technically knowledgeable believe that the Academy is sort of the place where you, like the Greeks --. I forget where they go -- they would go into a temple and somebody would tell them the truth. To the extent that you guys are the temple of sound science, some of these reports do not reflect sound science, and they would be better served if there were a range of views and there were rollicking debate. Just as we here on the Commission, we have occasional differences, and our votes reflect differences. I think we are better for the differences, and

we arrive at better policy trying to at times bridge those differences or at times you just have to take a majority vote and proceed ahead.

But these are complex scientific and social science and policy issues that the Academy is charged time and time again to provide guidance on for technical agencies and the Congress. As I say, having served 30 years in government and consumed quite a few of these reports, there are some excellent ones. Dr. Garrick, I remember excellent reports in which you could serve because it was WIPP. It was not related to NRC's mission, and I think you were on panels that served the WIPP, the Waste Isolation Pilot Plant process, very, very, very well. But I cannot say that for many others. So it is just a charge totally separate from NRC for you all to take a hard look at that. All of you are candidates for Academy panels because it is not just members who serve on Academy panels. But I think the tasking order to the panels, you know, this search for consensus, somebody needs to think about. Thank you, Mr. Chairman.

DR. GARRICK: We will carry your message forward.

COMMISSIONER MCGAFFIGAN: Or not as maybe.

(Laughter)

CHAIRMAN DIAZ: Thank you, Commissioner McGaffigan. I want to again, thank the members of the committee for their work. You have our respect. You have our support. Sometimes we have constraints in the areas in which we can have the committee work, and you realize that.

We look forward to your input in the next few months. I think that will be extremely important. With that, if there are no further comments, we are adjourned.

(Thereupon, the hearing was adjourned.)