UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
***
MEETING WITH ADVISORY COMMITTEE
ON NUCLEAR WASTE (ACNW)
***
PUBLIC MEETING

U.S. Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Wednesday, June 26, 1996

The Commission met in open session, pursuant to notice, at 2:30 p.m., Shirley A. Jackson, Chairman, presiding.

COMMISSIONERS PRESENT:
SHIRLEY A. JACKSON, Chairman of the Commission
KENNETH C. ROGERS, Member of the Commission
GRETA J. DICUS, Member of the Commission.
STAFF SEATED AT THE COMMISSION TABLE:
JOHN C. HOYLE, Secretary of the Commission
GRETA J. DICUS, General Counsel

BRIEFINGS BY:
PAUL W. POMEROY, Chairman, ACNW
WILLIAM J. HINZE, ACNW
B. JOHN GARRICK, ACNW
MARTIN J. STEINDLER, ACNW
JOHN T. LARKINS, Executive Director, ACRS/ACNW.

P R O C E E D I N G S
[2:30 p.m.]

CHAIRMAN JACKSON: Good afternoon, ladies and gentlemen. As you know, the Commission meets periodically with its Advisory Committee on Nuclear Waste to discuss technical issues related to the management and disposal of radioactive waste. The Commission recognizes that the proper management of radioactive waste is vital for protection of public health and safety and relies upon technical input and advice from the Advisory Committee on Nuclear Waste to carry out our responsibilities in this area.

During today's meeting, the Committee intends to provide the Commission its views on the following topics, and you can correct me if I am wrong: 1) health effects of low levels of ionizing radiation; 2) time span for compliance of the proposed high-level waste repository at Yucca Mountain; 3) comments on high-level waste pre-licensing program strategy and key technical issues; 4) issues and NRC activities associated with the National Research Council's report technical basis for Yucca Mountain standards; 5) ACNW priority issues; and 6) expert judgment and elicitation.

I understand that copies of the presentation are available at the entrance to the meeting. Do either of my fellow commissioners have any comments at this time?

If not, before I turn the meeting over to you, Dr. Pomeroy, my colleagues and I would like to acknowledge that this meeting marks the final Commission meeting for Dr. Martin Steindler.

Dr. Steindler was an original member of the Advisory Committee on Nuclear Waste and has served as its vice chairman and chairman. He was also a past member of the Advisory Committee on Reactor Safeguards as well as the Atomic Safety and Licensing Board panel.

Dr. Steindler, your service over the past 24 years has greatly contributed to the advancement of nuclear safety and to improvements in our regulatory process, and I just wanted to say publicly at this meeting, in addition to the letter that we transmitted to you, that the Commission greatly appreciates the very many contributions you've made over the years, and we wish you all the best in all of your future endeavors. Thank you very much.

MR. STEINDLER: Thank you.

CHAIRMAN JACKSON: In fact, I would like us to -- [Applause.]

CHAIRMAN JACKSON: And he's speechless.

MR. GARRICK: Yes. That's a world record.

[Laughter.]

MR. STEINDLER: Perhaps a rare event. Let me remain speechless. Thank you very much.

CHAIRMAN JACKSON: Thank you.

Dr. Pomeroy.

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

The first presentation this afternoon will be on health effects of low levels of ionizing radiation. We have considered this in the past month or so and Drs. Garrick and Steindler will share the presentation of this activity. This is a work in progress rather than something that you have seen in the form of a letter.

MR. STEINDLER: Well, let me start out by saying that the viewgraphs that you have in front of you are not going to be quite followed in the order or, in fact, some of the contents that you have. This is a work in progress, and so we have taken the liberty to shift things around and have kept ourselves off-balance somewhat.

Let me start out simply by saying that clearly the Commission has emphasized appropriately risk-based and scientifically sound regulations as a fundamental approach to how the Commission does its business. We think that's clearly the basis for requirements to continue to examine what it is that the Commission does.

In our domain and the Advisory Committee on Nuclear Waste domain, there are significant

attempts arising to reduce residual levels of radiation to which the public would be exposed in its access to formerly contaminated facilities and formerly contaminated sites. Those attempts pose some questions on cost-benefit and specifically the things that have been raised in a very serious and emphatic fashion I would say in an increasingly loud tempo over the last several years. The costs that are involved and the potential benefits that are to be derived and the comparison of those two very often doesn't match.

Furthermore, from our standpoint -- that is, from the committee's standpoint -- the generation of enormous quantities of waste with relatively little according benefit poses some problems in both waste disposal as well as transportation and not trivial issues of risk to the workers involved.

Those general background circumstances, which we've in a sense outlined on the first viewgraph, led us to look at the effects of low levels of radiation because those issues, as I'll carry out a little further, keep arising in several areas.

First off, the regulated nuclear activities in this country and elsewhere, especially in those countries that have been at it for a while, are now reaching the stage where clean-up is becoming more and more prevalent. That was not true perhaps 20 years ago, but it's certainly becoming true now.

Furthermore, as a number of federal agencies can attest to and also, of course, the private industry, the costs associated with these clean-up operations and the accompanying waste disposal processes are extreme. They are often very difficult to bear and they're even very difficult to justify. And that issue alone has become very important as a national resource allocation issue.

The Commission has become involved appropriately in decommissioning and the regulations involved in decommissioning and the SDMP program, and all of those programs invariably face the bottom line of how clean is clean enough and how far do we have to go.

Of late, and by late I mean late in my kind of time frame, which is years rather than minutes, the new information that has been generated and has been brought out and is increasingly visible in both the scientific literature as well as what I would call the trade press, that new information has become fairly massive and is beginning to show that there are some unusual results, unusual in the sense that they challenge some of our pre-conceived notions, particularly the linear non-threshold model.

The linear non-threshold model is, of course, the basis for essentially all of the regulations that the Commission uses, and so we have now encountered what could well become a challenge to the risk-based notion of regulations.

We as the committee, I think, in the next viewgraph, if I remember what order I asked Andy to put it together, have made some comments that talk about negligible residual risk, which is akin to and related to certainly the whole question of, does the linear non-threshold model apply?

So with that as a background, our committee, actually part of a subcommittee with the ACRS, began to focus in on waste issues and specifically we began to look at the question of what are the health effects at very low dose rates and very low dose levels, which is where, of course, regulations normally operate. And the question we were addressing is, what sort of regulation bases are there and are they scientifically sound.

In order to get started on that program, we, together with some ACRS people, in a joint subcommittee, held a meeting to try and explore some of the information that is not involved in the linear non-threshold theory or model. The second viewgraph, I think, if Andy can pull it out, will show you a litany of our activities and the kind of things that we have been looking at from time to time on this topic.

Well, following the -- I would say not quite a working group meeting in the sense that it wasn't a full day, but we had almost a half a day-plus on the subject, it was our conclusion that this was a subject that the Commission should be looking at and should be looking at from the standpoint of collecting information so that the bases for its actions are at least transparent.

So our original conclusions, which you had in your viewgraphs, which gave you two options -- one is that we would suggest that you go through a study on your own or, two, we then learned that the NCRP was asked to look at that program and look at that topic and come back to the Commission with a study of what information is available. That was our original conclusion.

Then we had a chat with Dr. John Glenn, who is the supervisor from research of the NCRP interaction, and found that the kind of things that were concerning us -- namely, the need to be effectively complete in the analysis of the data, the need to be sure that not only are people looking at the information and the health effects of low levels of radiation, but that they do so in the context of some radiobiological theory and some understanding of the biological mechanisms that could be involved -- those were, in fact, being covered by the NCRP study in accordance with their action plan, their task definition.

So in a sense, the things that we were interested in recommending to the Commission are, in fact, now being done.

Our conclusion, therefore, you know, has been truncated from what you have in front of you. Our conclusion comes in very simple terms. One, we believe this is a very important and very timely subject, and it looks like that the folks in research have agreed to that general conclusion. We certainly strongly support the research initiative in moving ahead with the program, with the NCRP. We will make what efforts we can to monitor the progress of that program, and it is not yet clear to us what kind of progress reports the NCRP committee would turn out, but if it turns out intermediary reports between now and their final conclusions, we will probably look at them.

But equally important, once the report of that commission -- committee is out, we will try and analyze that and determine what implications those results have for the activities of the Commission in relation to formulating regulations.

It is work in progress. We believe it is quite timely and we think it's certainly important in relation to the rationale of regulations. That basically, I think, is our situation at this point.

I might just add that there is on question that this is a very controversial topic. The issues that we're looking at do not intend to simply dive into a controversial issue. That's not the purpose. The purpose is to see whether we can clarify in terms useful to the Commission what the data show and then analyze the impact on future regulations.

CHAIRMAN JACKSON: Is the end point of what you're trying to do summarized -- and I guess the viewgraphs are not numbered.

MR. STEINDLER: Unfortunately, they're not numbered.

CHAIRMAN JACKSON: It's the third from the back of this particular group, the one that says the committee's most recent general perspective --

MR. STEINDLER: Yes.

CHAIRMAN JACKSON: -- was noted. Is that a particular end point that, you know, you're focusing your attention to?

MR. STEINDLER: At this point, our concern -- the answer is no. At this point, our concern is to make sure that the data collection that the NCRP turns out and the quality of the critique of the information they have uncovered stands or could stand scrutiny in a fairly hard-nosed fashion.

What then follows from that remains to be seen. Part of what follows from that could well be in accord with this viewgraph.

CHAIRMAN JACKSON: Okay. Is there going to be a follow-on by Dr. Garrick?

MR. STEINDLER: I think --

MR. GARRICK: No, I don't have anything to add to it. But Marty is correct in that there are two separate issues here. There is the issue that could be described as a negligible risk issue, and then there is the linear threshold issue, and they don't necessarily need to be addressed simultaneously.

CHAIRMAN JACKSON: Okay. Mr. Rogers?

COMMISSIONER ROGERS: No, I don't have any.

COMMISSIONER DICUS: You mentioned some cost benefit and the savings that might be had. Of course, I recognize also this is a work in progress. Is there any feel for what kind of cost savings or benefits there are down the road? A broad question.

MR. STEINDLER: No, it's in fact the key question. In the course of our trying to put this thing together, one of the things we've said to ourselves is it would be very good if we had some estimate of what kind of cost-benefit ratios we had. The answer to the question is no, we do not at this point have those data available.

In thinking through what processes we might use to try and extract some order of magnitude, which everybody seems to be doing for some kind of hazardous material, and it doesn't make any difference whether it's lead and paint or arsenic and groundwater, we had some difficulty arriving at a decent protocol.

My personal intuition is that you can probably do this, but the data would be shaky, particularly since you don't know what the end point is. And it's the end point that we're trying to get at at this stage in the game.

Former Commissioner DePlanque addressed that issue in the paper she wrote, largely from analytical standpoints. And so there is -- a portion of that information has already been looked at. One can make a stab at it, but it would be a little iffy.

CHAIRMAN JACKSON: In your actual suggestions, you had two pieces to it.

MR. STEINDLER: Yes.

CHAIRMAN JACKSON: You seem to be endorsing the support, you know, and supporting the research initiatives with the NCRP.

MR. STEINDLER: Right.

CHAIRMAN JACKSON: Does that cover both aspects of your recommendation? I'm looking particularly where you indicate that you thought that NRC would need to have special attention in selected areas with the assignment of relevant experts. I mean, would --

MR. STEINDLER: We initially thought we would find that as a compelling suggestion until we had a look at the make-up of the committee. Upton is heading that committee, and our contention was that as long as he's heading the committee, some of the concerns that we had would disappear.

We did not and could not on our own evaluate the other members of the panel, and so that conclusion was based on knowledge of the chair. And we thought at the moment that was perfectly adequate, but the -- a portion of the controversy of this topic arises because, essentially in keeping with Thomas Kuhn's paradigm problems, the violation of the non-threshold model, linear non-threshold model is unpopular and was unpopular, and data that did not meet that model often failed to show up in the literature, and it's that problem that we tried to address, maybe not as obliquely as it should have been, in some of our conclusions. I think our general consensus is that, at this point, the NCRP will take care of that problem.

MR. GARRICK: Yes. Our underlying interest in this is to take steps towards establishing at least what our knowledge base is on this subject and to calibrate its quality, because we observed papers and studies that take very strong positions and some of them have been peer reviewed and rigorously confirmed by other authors. Others have not. And this whole issue of the instability of the information base is something that even without further research, if we could do something about that, I think it would be very helpful to us all.

We very seldom know where we should be starting from, and that's what I think the NCRP type investigation and some sort of distinctive and credible evaluation of the work that's been done, I think that would be an important first step, and that's sort of what's behind our recommendation.

CHAIRMAN JACKSON: Okay. But at this point, you don't feel that any additional expertise or resources are necessary.

MR. STEINDLER: Our understanding is that the committee is not fully constituted at this point, the NCRP committee or group is not fully constituted. It remains to be seen who else they put on the committee.

But let me just make a comment, that our concern on the quality of the information is on both sides of the coin.

MR. GARRICK: Yes. Yes.

MR. STEINDLER: There are problems with folks whose results do not support the linear non-threshold theory, and there are problems with data on the other side as well.

COMMISSIONER DICUS: You referenced the new information or new studies coming to light or studies that may not have been used in the past. Can you give us just quickly an idea of what some of those studies are.

MR. STEINDLER: Well, the one most often cited in the halls of this agency, the shipyard

workers study of 700-some-odd thousand people, and there is a mammogram x-ray exposure Canadian study which has been subject to a significant amount of controversy.

Myron Polycove probably would be able to give you a more complete list, and we can certainly --

MR. GARRICK: The shipyard study is an example of what appears to be, when it's described, a very comprehensive and controlled study on the one hand. On the other hand, it really wasn't published except in pieces and parts. And so that's the type of problem we're having as we hear about this whole subject.

CHAIRMAN JACKSON: The NCRP study is focusing on the linear no-threshold model and the quality of that knowledge base?

MR. STEINDLER: Yes.

CHAIRMAN JACKSON: And its validation?

MR. GARRICK: Yes.

CHAIRMAN JACKSON: It is not looking at the quality of the knowledge base with respect to threshold models and studies? I mean, is that what you're telling us?

MR. STEINDLER: I'm not sure they are going to limit -- once you define a work scope for the NCRP committee, they will expand the work scope as appropriate. So the answer to your question is --

MR. GARRICK: It's called research.

[Laughter.]

MR. STEINDLER: I believe that's a valid statement.

CHAIRMAN JACKSON: Okay.

MR. STEINDLER: But they are charged with looking at the data and critically evaluating it, and I would assume they are going to cover all aspects of it.

The Commission's interests are fairly narrow in the sense that we're looking at low dose and low dose rates, and in that sense, one of the things which has been commonly used to back the linear no-threshold theory becomes irrelevant -- namely, the Atomic Bomb Casualty Commission's database for the Japanese, which are high dose rates, low dose, modest dose, dose levels, and BIER 5 and others have made that distinction already.

CHAIRMAN JACKSON: Okay. Thank you.

MR. POMEROY: And our next presentation this afternoon will be on the time span for compliance of the proposed high level waste repository at Yucca Mountain, Nevada. The lead members that will conduct this discussion are Drs. Hinze and Garrick.

Bill?

MR. HINZE: Right. Thank you, Paul.

As we promised to you in a recent letter, we were going to look at this kind of compliance issue in greater detail. We have done so, and we have sent you a letter this month as a result of our deliberations presenting the findings on the application of this to Yucca Mountain.

The first page here, the first slide, shows an outline of our -- basically the letter and the presentation. We're going to say a few words about the background of this very vexing problem, and then we will look at the considerations in defining a time of regulatory compliance from a generic standpoint. And on the basis of the assumptions and premises in these considerations, we will then suggest regulatory principles from a general standpoint for establishing this time span for compliance of nuclear waste facilities; then, to focus this in on Yucca Mountain, we will look at the scientific and technical insights that we have learned over the past 15 years at the Yucca Mountain repository site; and then we'll apply this to the general principles for recommendations to you.

The time period of regulatory compliance can be defined very simply as the period that risk of adverse consequences will be below a specified standard. This will be the standard, the risk standard in 197.

The existing generic standards in 191 and our own Part 60 have been stated at 10,000 years within five kilometers of the repository. This, of course, has been subject to a considerable amount of controversy in arriving at those numbers and subsequent to the acceptance of those standards and regulations.

As a result, the National Research Council's panel that looked into the site specific Yucca Mountain standards rejected the 10,000-year compliance period, stating that it was without technical or scientific justification, and in a sense they were appropriately -- we agree that this is without that technical justification. They suggested possibly a -- or potentially a much longer period of time.

The dilemma, as we have spelled it out in this second slide, in developing a time span of compliance, is that the period of compliance must be long enough an event to evaluate the potential releases of radionuclides and the processes involved in transporting these to the biosphere to the critical group, and yet they must not be so long that the uncertainties overwhelm the process and the results become questionable at best. So we have this dilemma; however, we felt that with site-specific information, we could make reasonable assumptions in order that a defensible solution could be arrived at for the time of compliance.

In the next slide, the third slide, what we did was we tried to define some general assumptions as I've stated, and the first of these was kind of a baseline, and that is that the high-level repository system must be capable of preventing leakage of the radionuclides to the biosphere for a minimum of several thousands of years.

The second is that the risk evaluation must consider all of those things that are in 60 as part of the defense in depth, and this should be done using performance assessment.

But we are also cognizant of the fact that there are limitations to performance assessment as a predictive tool. It is primarily in its best sense used as an investigative tool, and helping us to distinguish between positive and negative attributes at the repository site and also looking at relative risks under various scenarios.

CHAIRMAN JACKSON: Let me ask you a question. What alternatives to performance assessment would you then recommend?

MR. HINZE: We do recommend the use of performance assessments.

CHAIRMAN JACKSON: No, I know, but I mean what predictive tools do you recommend?

MR. HINZE: Well, the alternative that is commonly mentioned as the alternative to performance assessment is to look at natural analogues, and we do have some natural analogues. And, of course, the Center, particularly in their geochemical studies, including those at Pena

Blanco, have been out front in terms of using natural analogues. And this is a very important benchmarking, if you will, to the performance assessment, and it's why this committee in letters to you has supported the natural analogues as an important aspect of the entire program.

CHAIRMAN JACKSON: Couldn't one argue that the use of natural analogues have a role in helping to bound uncertainties in performance assessment, you know, in order to set, if you will, confidence intervals?

MR. HINZE: Well, I believe that they are very useful. The natural analogues can be very useful in setting bounding conditions and also in calibrating, if you will, the performance of the site, and therefore calibrating the performance assessment modelling that you're doing.

MR. GARRICK: Not being a geologist, I can get reckless in this area. I think that the way I understand it as a non-geologist is that the natural analogues can -- and I think this is actually what you were alluding to -- the natural analogues can help us a great deal in reducing the uncertainty with respect to the natural geologic setting.

Now, the question is how much of the uncertainty has its origin there versus its origin with respect to human-related activities, and that includes not only the issue of human intrusion, but also all the human activities having to do with disturbing the geologic formation from the actual excavation work to imposing foreign material in there in the form of engineered barriers and what have you to the issue of human intrusion.

So it really depends upon what turns out to be the largest contributor to uncertainty, but there is no question, my geology friends have convinced me, that the natural analog is one source of giving us increased confidence in the geologic setting.

CHAIRMAN JACKSON: Thank you.

MR. HINZE: If I may proceed, then, we also felt that the time of compliance is very intimately connected with the definition of the reference biosphere and the critical group and should be tied to that in the regulations, not in the standard, but simply be based upon the risk that is specified in the standard.

Finally, we concluded that the uncertainties associated with processes and events that affect the repository will increase with time. I think that is pretty clear. Then if you apply those assumptions --

CHAIRMAN JACKSON: So there's on circumstance under which the uncertainties would not increase?

MR. HINZE: Well, no. For example, if you had a long enough time period, the igneous activity, the potential for volcanic activity would be one, would be the time span that you would have involved in the definition of it. But no, there are -- it's not a linear function of time. The uncertainties would not be a linear function with time. In fact, they may vary with time. And one of those aspects is the climate, that that may -- that may undergo a variable bound.

CHAIRMAN JACKSON: So it's not linear and theoretically it's not necessarily monatomic?

MR. HINZE: That's right. And it's certainly going to vary depending upon whether you're dealing with the degradation of a canister or whether you're dealing with a change in the geological process or the climate or the change in the -- you know, and on infinitum.

CHAIRMAN JACKSON: Okay.

MR. HINZE: In any event, this has led us to a suggestion in our letter to you of a two-part approach. The first part of the compliance time period then should be based upon the estimated time for release and transport of the radionuclides to reach the critical group. This estimate should be based upon consideration of the waste and the repository, the site characterization, using a total system performance analysis. And this GSPA must confirm the integrity of the site for a baselining of several thousands of years.

We have also suggested that the reference biosphere and critical group defined -- should be defined on the premise of no major changes in lifestyles from our current society and based upon our present knowledge, and that the climate changes can be reasonably bounded. Of course, they will vary as a function of time.

Further, the compliance time should be sufficiently short such that the extrapolations into the future should be -- should not lead to undue uncertainties, and this is a problem that we've just mentioned. And we have suggested that they be limited to reasonably modest uncertainties. That's the first part, and that's a specified period of time.

Now, the second part is based upon assessments extending to the calculated time of a peak risk, and this follows, if you will, very closely to the National Research Council panel's suggestion that -- and here we suggest that there should be no definitive measure of compliance, and thus, this should not become a de facto regulation.

But we certainly believe that one should test out to that period of time of peak risk and identify the important performance factors by comparing the calculated peak risk and comparing that against the standard that's specified in this first part, and on the basis of that, depending upon the difference, that perhaps ameliorating actions need to be taken, such as greater engineered barriers, waste containers, et cetera.

CHAIRMAN JACKSON: So in a sense, that relates to a kind of defense in depth or your way of crediting some kind of regulatory action.

MR. HINZE: Yes, ma'am. This committee I think is very much enamored with the defense in depth and appreciates its -- what it is accomplishing. And that's something that we have stressed throughout this.

We have been -- DOE has been investigating the Yucca Mountain area for 15 years or so, and although the site characterization is not complete, there are a number of insights that are important that relate to the time of compliance. And the first of these involves the climate. The current climate is arid, and I guess the second important thing is the climate is going to change, and perhaps that term "likely" should be taken out. The climate is going to change and it likely will change to a pluvial condition where we will have colder, more humid conditions. But still, it is our -- as our review of the situation suggests, that the area will still be semi-arid. And the net result is that we will have -- it's unlikely to have a marked effect on the reference biosphere or lifestyle of the critical group. This will be still south of the glaciation and it will still be in an arid or semi-arid area.

Furthermore, the flux as a result of these pluvial conditions will increase, but it will still be limited through the repository site.

Furthermore, the recent site characterizations have shown us that we have potentially short

transport times in -- of the fluids in the unsaturated zone, but we also believe that there is potentially long transport times in the saturated zone leading from Yucca Mountain to the critical group, and the critical group located some 20, 30 kilometers away to the south in Amargosa Valley.

The uncertainties in predicting the time-dependent and the spacial variations have come to the fore as a result of these discussions, but it is the committee's belief that with adequate site characterization and considering the integrative qualities of the processes, that the time dependent uncertainties and events and processes such as climate change will be more prominent than those derived from spacial variations. That is our conclusion. This is a high tectonic -- high gradient tectonic climatic area.

I'm going to skip the next one, and we then reach the point where we have the -- based upon these insights, we have recommendations for the Yucca Mountain repository compliance period, and these involve our two-part approach. And if you'll bear with me, I'll do this rapidly, because some of this is really repetitive of our general principles.

But first of all, the first part of the time period of compliance should be defined in the NRC regulations being developed to implement the EPA standard, and this should be based upon the knowledge of the engineering and scientific aspects of the repository. And we should apply performance assessment -- it's the best we have -- and use the best bounding conditions that we have as the analytical tool.

It should be defined in concert, very closely -- has to be, I believe -- with the reference biosphere and the critical group. And again, this is taking into account all of those characteristics that we know at the present time.

Finally, this time period of compliance should not be shorter than the estimated time for potential radionuclide contaminates to reach the critical group and no longer than the time period over which scientific extrapolations can be convincingly made.

In this regard, we have suggested to you in the letter that the NMSS staff might review the scientific and technical components involved in this, needed for this, and to be certain that there are no holes in our existing knowledge that will be critical to making that no shorter than/no longer than decision.

Based upon the current information, compliance period may be even somewhat greater than 10,000 years. That is certainly something awaiting much more detailed study than we have carried out.

The second part of this, then, requires the assessment, using the PA as the analytical tool, to extend from the specified compliance period of time in the first part to the calculated peak risk. The regulations for the compliance here should be significantly less stringent than are specified in the first part.

There needs to be strong consideration obviously of the increasing scientific, technical and critical group uncertainties, the biosphere, reference biosphere uncertainties.

Depending upon the extent that the peak risk exceeds the standard, steps may be taken to do something about the difference, the two, bring it closer calculated to the standard in the first part. And we strongly feel that the second part should not become de facto regulation. That's the second time I've said that and I really want to emphasize that.

We think that this has the potential to be a robust, relatively simple procedure of getting at the time of compliance that will be defensible.

THE COURT: Commissioner Rogers?

COMMISSIONER ROGERS: Well, I take it that when you say existing knowledge, that's really what we know right now, I mean like as of today, because there is probably not going to be much more available; is that right?

MR. HINZE: Well, we had a presentation by Steve Brocum from DOE this morning, and he was talking about the studies that DOE plans to continue in terms of confirmatory studies up until 2010. We don't have the details of those. We've asked for some of the details on that, but we don't have those. But presumably we're going to be getting some small amount more of information, but I don't think we're going to get -- within even a couple of decades, we're not going to get the kind of information that's going to give us a great insight into what the reference biosphere or the critical group might be several thousands of years or tens of thousands.

So I think that the international community, I think our -- the national community have set upon something that comes pretty akin to the present, but also based upon our knowledge. I would like to think that we have also -- this is my personal feeling, is that we also can look at rates of change that we have at the present time.

COMMISSIONER ROGERS: I'm just wondering if it doesn't seem as if we're using the knowledge that we have now based on the site to define this period of compliance as a regulatory requirement which in a sense somewhat seems to say that it's already met it because it looks to me like there's the possibility of a kind of circular process going on here, that you set the TOC based on what you know and then write that into a regulation, and how different do you expect the result to be when you go to licensing from that, because you've based it on what you know.

So I'm just a little bit uncomfortable about that aspect of it, and I wonder if you might address that.

MR. HINZE: Well, we have been concerned or we have certainly considered this ourselves. I don't know -- Marty, we've been discussing this just within the day. Perhaps you would like to say a few words

MR. STEINDLER: Well, let me just make the comment that what we have done here is we have defined a time of compliance that's site specific in terms of numbers using the generic approach or the general approach that in effect says, one, it's a two-phase process; two, the first phase is related to the site characterizations, namely, how fast does that plume arrive at the critical group; and the second phase is a site characteristic which says when and where is the peak dose.

Now, it's not circular in the sense that this is a simple time of compliance. What one then meeds to do is define the risk at time of compliance. If that risk is unacceptable, especially in the first phase, then you -- the conclusion you draw is that this site, with the information you currently have, doesn't look like it's going to be able to support within regulations the facility. That gets you to a linear conclusion. I don't think that will bring you back around.

Now, if subsequently it turns out that the analysis is fairly shaky because you're missing some very important pieces of information and you, in fact, go out and get that information, and you redo for the same or different time of compliance the analysis to determine what the risk is at time of compliance, then you can make a second decision as to whether or not it meets the standards or it doesn't.

But I think the issue that we're raising in this letter, which I think Bill will probably carry further, is that there are two things that we're saying. One is we think we have a methodology for rationally determining time of compliance rather than the coin-flipping which was done for the 10,000 years or other times of compliance as used internationally.

So, one, we have a rational way, which happens to be, as it probably should be, site characteristically specific; and then the second one for Yucca Mountain, Bill indicated something in excess of 10,000 years because that's what we know right now.

Now, if it turns out that DOE for one reason or another addresses the issue of the critical group and how fast the plume moves to it, and concludes on the basis of convincing evidence that it isn't 20,00 years, it's 4,000 years, then the time of compliance moves. But that's a site characteristic driven number.

MR. HINZE: You cannot be assured that the site is going to meet the standard on the basis of this time of compliance. It very well may not be, if the -- if -- if the totality of the systems analysis doesn't give you that correct number at the -- if you don't remain below the standard at that time of compliance. It gives you a measure of the integrity of the total system, including the site. It would be somewhat circular, I think, if you started moving the critical group around or you started changing -- COMMISSIONER ROGERS: No, I'm not thinking about the critical group. I'm just thinking about the engineering and scientific aspects of the repository. I'm not talking about the critical group. That's a different set of considerations, it seems to me, than what I'm concerned about. But I'm just troubled with what seems to me a requirement that you must have enough information to be able to do -- which -- and fed into a model of some sort to determine this time of compliance, these arrival times.

When you have that, isn't it rather -- I mean, if you have it with any confidence, because that's going to be now a rule, I mean, that's going to be the critical test that has to be applied to the acceptability of the site or the proposed licensing of the site, then isn't it just rather a simple step to decide based on an acceptable definition of the critical group as to whether the exposure limits are acceptable, the risk is acceptable?

MR. STEINDLER: Having pegged the time of compliance, you can ignore other statements concerning the level of risk. If you can't do that a priori, then it is the level of risk that determines whether at time of compliance, that facility will fly. But the level of risk remains an independent variable.

COMMISSIONER ROGERS: Well, determined by what?

MR. STEINDLER: Well, among other things, the transport properties, the source term, the chemistry, the geochemistry in the area.

COMMISSIONER ROGERS: Don't you need those to get the time of compliance?

MR. STEINDLER: No. The time of compliance largely will be determined by water travel time. Some things move with water; some things don't.

COMMISSIONER ROGERS: Yes, but the different characteristics of the site with respect to water transport have to be known --

MR. STEINDLER: Yes.

COMMISSIONER ROGERS: -- to determine the time of compliance, don't they?

MR. STEINDLER: Yes. Or at least estimated with some reasonable certainty.

COMMISSIONER ROGERS: Yes. Right.

MR. STEINDLER: That's right.

COMMISSIONER ROGERS: Well, I don't know, this is something I have to chew on a bit. It's a somewhat different way to approach it and I would like to think about this more. But the second approach, the -- well, before we get to that, the sort of bounds that you've set should be no shorter than estimated time for potential radionuclide contaminants to reach the critical group and no longer than the time period over which scientific extrapolations can be convincingly made.

Now, what is that upper bound? How do you get at that? What is this time period over which scientific extrapolations can be convincingly made? Isn't that a very difficult thing to pin down?

MR. HINZE: Well, it is a tough thing to pin down, and that's why we suggest this estimated time for the degradation of the waste as well as a transport as specifying the time. You want to minimize that time as much as possible so that you don't get into these large uncertainties.

We are -- I think we're going to have a very difficult time putting a bound on these uncertainties and their meaningfulness after a long period of time, and that's the problem with accepting, for example, the peak risk, because you're so far out there that your results are of questionable value in terms of the bounding conditions.

Does that make sense?

COMMISSIONER ROGERS: Well, yes, except I don't know -- I don't have any feeling about -- I mean, I think of this, the process you're describing here, in terms of three time periods. One is one in which the engineered barriers work fine before anything gets out, and then the time when things start to leak out of the engineered barrier and start to head towards the boundary and arrive at the point where you're going to measure the total period of compliance at that point. So there are two time periods there, the transport time and the time before release, which could be quite long. If the engineered barrier is really effective, and some people think that they could be very effective -- we won't get into that debate -- but if you're talking about thousands of years, some people think thousands of years isn't too hard a thing to satisfy an engineered barriers.

So you've got thousands of years in your first time period before anything gets out of the engineered -- past the engineered barrier, then the time to get out to wherever you're going to measure its arrival, where it could start to do some damage, you've got a second time period, and then you've got another time from then until the peak of the exposure starts to hit. And I don't have any feeling about what that third time is compared to the second time.

How long does it take for -- since the, you know, first arrivals start to show up before the peak develops and what determines that? Is that a -- I mean, you've sort of implied that that's

a very long time, but what sets it as a long time? I mean, I'm not challenging it, I just don't understand it. But then, if we're talking about very long times, then aren't we -- don't we have to worry about other kinds of effects which have -- external effects of various kinds, maybe vulcanism or something of this sort, that has a much greater chance of taking place, or earthquakes that might have a very much greater chance of taking place at that site if you wait long enough.

MR. HINZE: Exactly.

COMMISSIONER ROGERS: So the longer the time of compliance is, the more challenges can hit the site from these other sources even though it may be a very good site. So if you go into the very long extreme limit, something is going to hit it.

MR. HINZE: The probability of vulcanism is one.

COMMISSIONER ROGERS: Yes.

MR. HINZE: Yes.

COMMISSIONER ROGERS: And so then does that wipe it out?

MR. HINZE: That's why we have --

COMMISSIONER ROGERS: Because you've met the time of compliance, but you've also had a, you know, assurance that the site will be wiped out by an earthquake or a vulcanism. And so these are the things that, you know, I have a little trouble in putting together in understanding how this would work.

MR. GARRICK: You have articulated very well why performance assessment is difficult.

MR. STEINDLER: Well, let me just make a comment for the far out time. That's precisely why we're fairly careful saying that the stringency of criteria against which you judge that peak dose ought to be relaxed considerably, because your uncertainties get to be really fairly pronounced. It is not necessary, just because of the probability of vulcanism someplace in the area that you in fact blow all of the activity downstream. There is, you know -- and it's in that sense that you're not assured if you wait long enough that there will be a debilitating catastrophe at the repository, and that's the thing that presumably will save you.

The other side of the coin is, depending on how you --

COMMISSIONER ROGERS: That's a little shaky to -- MR. STEINDLER: It is shaky, and my geology friends are going to have to work very hard to convince somebody that they have a reasonable handle on it.

MR. GARRICK: I think the idea of breaking it into the kind of pieces you have is exactly what the performance assessment is attempting to do. You can think in terms of a source term and when, in fact, there is a source, and you can think in terms of the transport, and then -- through the geosphere and then finally the biosphere and uptake.

If we are to believe the performance assessments that have been performed by DOE, there is indications that the time to get to the biosphere is of the order of thousands of years, tens of thousands possibly with considerably uncertainty, and the time to peak risk is of the order of hundreds of thousands of years. And what we're really mainly talking about, as we gather more information and as we prove our understanding and develop new insights, is reducing the uncertainty in those kinds of numbers. I think that's what the characterization program will do.

I think that's what we -- I doubt that we're going to change, if you wish, the central tendency parameters very much, but we certainly are, with new information, going to have a major impact on the uncertainty, and that's a very important part of this whole process and we'll be probably coming back to that subject in a little while here.

MR. HINZE: If I may, I don't want to be repetitive, but it seems to me that it's just the reasons that you were bringing up, Commissioner Rogers, concerning this long time frame that has prevented us from accepting this idea of calculating and setting the regulation out to peak risk.

What we're really interested in is evaluating the integrity of the site and basically using some form of the subsystem requirements, looking at the various subsystem elements and making certain that the integrity of the site is sufficient that you will meet that standard in terms of the risks specified.

THE COURT: Commissioner Dicus?

You may go on.

MR. POMEROY: We're going to give Dr. Hinze about ten seconds. The next item on our agenda is comments on high level waste prelicensing program strategy and key technical issues, and as I say, Dr. Hinze will also present that.

MR. HINZE: Well, thank you, Paul, and thank you for the ten seconds.

[Laughter.]

Let me try and summarize. The Staff's high level waste prelicensing program strategy is an evolving strategy and that's necessarily true because of the changing DOE program and the resources available.

We certainly give, as we have stated in our February letter to you, our general support for this approach, and as we have heard more from the Staff on this topic, our concerns have been, continue to be decreased. We think that it has many strengths.

There are some weaknesses that I have listed out in I think it is the third slide here. I think one of the more important of the weaknesses that we feel still at this time is that it is unclear to us how the issue resolution will be achieved.

In the next slide we suggest that resolution should not be required of NRC, nor should the DOE be compelled to perform studies or analyses that they believe are unwarranted. We seek a cautious approach where we can expect that there will be differences remaining between the DOE and the NRC going into the licensing arena but we want to minimize that as much as possible, and we urge full documentation of those uncertainties.

CHAIRMAN JACKSON: You also suggest that certain issues should be left to a licensing board.

MR. HINZE: That's right. There will be differences that will be left to the licensing board. Yes, ma'am.

CHAIRMAN JACKSON: And you are positing that from the point of view of neutrality, schedule, resources?

MR. HINZE: Maybe that you could throw an infinite amount of resources and still not reach closure on it.

I think there are some topics that are going to be of a scientific nature that there will be

questions remaining.
I think that is the Committee's view.
CHAIRMAN JACKSON: And so you are saying that a licensing board is the way to come to some ultimate --
MR. HINZE: That's right.
MR. STEINDLER: I think the answer is more neutrality than resources.
CHAIRMAN JACKSON: Yes.
MR. HINZE: I guess I'd like to point out two more things in summarizing this, Paul, is that there has been concern about some of the KTIs, at least on the part of DOE. We are strongly supportive of this activity, KTI, and the seismic and tectonic processes and in the last slide we refer to future ACNW activities in which we are going to follow up in a working group meeting later this Fall, late Fall, on igneous activity which we hope to evaluate the path to resolution on this issue.
We also had been concerned about coupled processes. These are processes in which the one will affect the other so one plus one might not equal two. There are several KTIs that deal with these. These are going to be integrated in the technical integration in the TSPA, KTI. We just want to make certain that this is not lost, that the integration in these coupled processes, because it's integration that really is the important thing in the coupled processes.
We plan to hold a working group on this in which we will look at the integration. We'll be holding that in August.
CHAIRMAN JACKSON: Thank you. Commissioner Rogers?
COMMISSIONER ROGERS: Yes. You made the point that you didn't think that DOE ought to be required to do any studies that it doesn't feel it should do.
I wonder how that squares with your strong support for the vertical slice approach.
I am a great supporter of vertical slice approaches. They have worked very, very well in the reactor area and you seem to be quite enthusiastic in the application here.
On the other hand, suppose that DOE has a number of layers of information on systems but not everything that is necessary for vertical slice -- there are discontinuities in the vertical slice.
Are you -- what do you do then if the vertical slice fails to that extent that you can't go all the way through the system if there is information that is necessary to be collected to take that step and DOE doesn't' feel that it ought to be doing that right now? It costs money that they don't want to put in that direction. They want to put it someplace else. It seems to me you have an inherent possibility of a conflict there in the vertical slide approach between the continuity of that and the program management, DOE's management of the program from their point of view, which is not a vertical slice necessarily.
MR. HINZE: That conflict may remain and this in my view would have to go to the licensing arena to be resolved, whether the DOE has adequately justified their position with the analyses and data that they have, and that the NRC is asking too much or it's off on the wrong aspect.
That is a decision that DOE, it seems to me, has to make. We have to, the NRC has to give them our best shot.
COMMISSIONER ROGERS: Well, that's your answer --
MR. HINZE: And I think the Staff is doing just that.
COMMISSIONER ROGERS: In a sense it fails the vertical slice approach but there still may be enough left there to be useful.
MR. HINZE: There is enough. I think you will find us strong supporters of the vertical slice. There are inherent dangers. This is the first of a kind, non-prototype, complex issue, and one of the things that I appreciate every time the Staff talks to us, the first word is "flexibility" and I appreciate that because we have to remain flexible and as we review this with the Staff, that is one of the things that we're constantly looking for is this ability to know when to close out an issue and that is important, too, and we need more information on that -- when do we close it out? When do you just give up? You have given them your best shot in terms of questions and comments.
CHAIRMAN JACKSON: What you're really seeming to be dealing with is what I call "pay me now or pay ne later." The issue becomes one of, you know, what can be viewed as requirements at a prelicensing phase -- what ends up being part of a documentary, needed for a documentary record on which to make a licensing decision at a later stage.
It seems that what you are really doing is saying if it can't be resolved at the prelicensing phase, you're basically going to punt it over to the licensing.
MR. HINZE: Yes, ma'am.
CHAIRMAN JACKSON: Okay -- just want to be sure.
MR. POMEROY: And let me just say that we can even begin to see the beginnings of some of that already.
COMMISSIONER ROGERS: If I could just ask one little question. I didn't really understand what you were talking about with respect to iterative processes in the vertical slice.
I mean I know what an iterative process is but I don't quite see what you have in mind here with respect to the vertical slice approach.
MR. HINZE: Well, I think the process here, and it's been described that way by the Staff to us, is that you work your way down the vertical slice, but you get further information, and this may bump you back up and so that you go through the iteration, or -- and I'm concerned about this, I think the Committee is concerned about it -- where it --
MR. POMEROY: -- it touches on the coupled processes.
MR. HINZE: Yes, sir. Coupled processes is the perfect example and we're also concerned about the horizontal integration, if you will, because you have to be able to kick from one to the other and this may start the whole process all over again and that's just good science.
CHAIRMAN JACKSON: Dr. Pomeroy?
MR. POMEROY: The next item on our agenda, and I would say that we may not make all six of the items, but --
CHAIRMAN JACKSON: No, all you have to do is 7 minutes each, 6 and half minutes.
MR. POMEROY: I am not sure I can force Dr. Garrick into that.
MR. GARRICK: That's an acceptable challenge.
Actually this is a very brief topic because we covered many of the items already and I am going to talk about a letter we sent you on issues in NRC activities associated with the

National Research Council's report, the technical basis for Yucca Mountain standards.

As you well know, that National Research Council committee was asked to examine the technical basis of the standard and not to develop the standard and many of the issues that we addressed in that letter and that were addressed in the standard we have talked to you in one way or another in the past, and I am talking about things like timeframes, the issue of the critical group, human intrusion, the issue of subsystem performance or as we like to call it, "Defense In Depth."

So those are things that are not new but they are affected by this site-specific standard that we are moving towards.

In our letter we address several issues and they included regulatory timeframes and we have discussed that today, so I don't need to expand on that.

We also touched on the issue of low levels of radiation and their effects and we have covered that.

We also indicated in our letter that we would be doing work on the critical group and the biosphere.

In fact, we had a working group meeting here yesterday on those subjects and we'll be reporting on those in some detail later.

On the next exhibit one of the topics that was discussed in the Yucca Mountain standard report was this issue of threshold dose and what the identification of an acceptable threshold dose would mean in terms of the implementation of the Yucca Mountain standard and I think we have discussed that, and I distinguish that issue from the linear non-threshold theory issue. That's simply the issue of a policy matter of deciding that there should be a threshold dose.

As to other issues that we discussed on my last exhibit, we discussed this issue of using individual risk or critical group risk as opposed to using a resource or a surrogate measure of risk such as the ground water standard.

The Yucca Mountain standards committee made a very important recommendation having to do with human intrusion and in particular suggested the idea of a reference scenario that would be again somewhat policy driven but would be done in such a way that it would give added indication and added insights as to the containment capability of the repository.

And should the results from that differ in the wrong way from the results of complying with the standard otherwise. Then, of course, actions would have to be taken in a risk management sense to make the -- to comply with the standard.

One of the issues that you have heard about already today a couple of times, and the feeling of the committee, our committee toward that, is the issue of defense in depth. We are strong believers in the notion of defense in depth. On the other hand, when there is a specific site and the ability to deal with the specific design and that's the only one you're dealing with, then the emphasis is more on calibration of the performance of those subsystems, it seems to us then prescribing what those -- each of those subsystems should -- how they should perform.

So our position here is more one of quantifying the subsystem performance than it is one of prescribing subsystem performance and finally, as we said, we are very interested in this whole subject and the basis for computing the risk. That has to occupy a lot of attention, and the role of these issues that are in progress, such as the definition of the biosphere and the critical group in bringing us closer to a basis for recommending, if you wish, an approach to peak risk quantification.

CHAIRMAN JACKSON: With respect to what was, in yr letter, a fairly strong statement on population protection?

MR. GARRICK: Yes.

CHAIRMAN JACKSON: Vis-a-vis protection of groundwater as a resource, have you focused on a methodology for addressing that issue?

MR. GARRICK: Well, I think that, as far as what the actual standard is going to be, of course, that is out of our hands. But, as far as a methodology is concerned, if -- it seems to us that the primary issue here, given what we now know about the transport model and the biological uptake model, the primary issue here is how do we want to define the critical group.

One of the underlying principles that we have suggested be followed in our letter was that whatever we do in this regard, it ought to be compatible with a risk-based perspective. And so that would suggest that some sort of a critical group that involves definition that would give us confidence that it is compatible with a risk approach on the one hand and on the other hand clearly address the issue of the health and safety of individuals.

As you know, that's where there is a lot of debate right now and in the Yucca Mountain standard report by the National Research Council, there was a minority position taken on that issue that the critical group should essentially be the maximum exposed individual versus the other 14 members of the committee that favored a critical group that was more in line with a risk area.

So we have heard both sides of the argument and we have not ourselves come to grips with the conclusion there but we probably will be doing that fairly soon.

CHAIRMAN JACKSON: We will hope to hear from you.

MR. STEINDLER: Let me make a quick comment. In response to your question, it is likely that, first, the protection of the resource should be separate from the protection of the population, critical group or otherwise makes no difference. So it is radiation protection versus resource protection can be separated into two parts.

The second point is that likely, it seems to me, and that's -- we can -- the answer to your question is, no, that the committee itself has not addressed that issue specifically but it's also likely that the resource protection is going to be a site-specific activity and as such, then, the generic answer to how do you do this depends on where you're looking.

The radiation protection issue is fairly straightforward. We're familiar with that. The resource protection, how do you protect the aquifer if you wanted to or if you had to at Yucca Mountain for example? It's likely to be Yucca Mountain specific. But beyond that, I don't think we have thought very much further on it.

The issue came to a head because the EPA pulled both of those together into a single unit, lumped it under the population protection at 4 millirem per year and then when questioned as to what kind of risk level that represented brought in the fact that they in fact didn't -- the risk is not the basis for that number; resource protection is the basis for that number. And now things got pretty fuzzy.

That's the thing that we were trying to avoid.

MR. GARRICK: Yes, we were trying to make a distinction, simply, between resource protection and population protection. And the other -- the argument that's going on relative to the critical group is an argument of somewhat of consistency with respect to the application of a risk-based approach throughout the analysis, the thought being that if you have an analysis that has 10 elements to it, that it's not consistent to analyze nine of those elements one way and then the tenth element a different way.

And on the other hand, there are those who feel that such a change at that point in the calculation, "that point" being the actual calculation of the health effects or the dose to the maximally exposed individual, that such a change is warranted and that's just something that has to be resolved on the basis of information and evidence as we move toward trying to come to grips with this issue ourselves.

CHAIRMAN JACKSON: Okay. Commissioner Rogers, Commissioner Dicus?

MR. POMEROY: Okay, let me not follow the slides in these next two presentations but simply give you one or two of the highlights of the slides in order to fit into our time schedule.

I would first like to talk briefly about the ACNW's priority issues. I believe you all have a list of those in front of you and we certainly don't want to speed through them. I want to make the point that this is a dynamic document. We have changed it as a result from its initial configuration from -- as a result of, rather, changes in programs by DOE and resultant changes in the program of the NRC. We continue and would welcome comments from you with regard to items that should be on this list that are presently not on this list but this list is important to us because it serves as an important vehicle for focusing our activities and attention.

CHAIRMAN JACKSON: I just had a question with respect to priority item six, having to do with low-level waste disposal. And the question was whether or not you were soliciting input from agreement states?

MR. POMEROY: Yes, we are. In fact, we are talking with four agreement states tomorrow with regard to the question of time compliance for low-level waste disposal, Texas, Nebraska and two others. We are doing that and we are moving towards looking at the question of the time of compliance and the possible application of the same kind of generic thinking that went into the time of compliance for high-level waste as well.

As you know, we have a very strong concern about low-level waste.

CHAIRMAN JACKSON: We are well aware.

MR. POMEROY: These issues that you see before you were, in fact, derived by some sort of informal elicitation of expert judgment, namely the judgments of the four people sitting across from you and the staff, but they were based on what we considered to be the most important issues to the Commission and their timeliness and we are trying to treat them somewhat in that order as we go along.

I want to -- everything that you've heard today, of course, fits into that priority listing and we talk about that on one of the slides.

I would just like to mention, as far as our priorities go now, that in the next six months we have planned something on the order of five working groups, one of which we began yesterday, namely the specification of critical group and reference biosphere that Dr. Garrick just mentioned. We intend to have a working group in August on thermal loading and coupled processes. We have tentatively scheduled the radionuclide transport question for our September meeting. We have tentatively scheduled a review of the vulcanism issue as Bill mentioned earlier in our November meeting and we are discussing a working group on the analysis of uncertainties in the bonding calculations that fits under one of our categories of priority issues.

We are trying to focus on the things that we think are the most important and of the most immediate interest to the commission.

I'd like to stop there on that item.

CHAIRMAN JACKSON: You don't want to talk about expert judgment?

MR. POMEROY: I'd like to say two words about expert judgment, if I may.

The -- first of all, this committee is very pleased that we -- the branch technical position on the use of expert elicitation and the high-level radioactive waste program is nearing its completion. We are looking forward to a briefing by the staff in August, at which time we will take up some of the concerns that we still have remaining and we know that other people in the external community have those same concerns and we are looking forward to discussing the staff's response to those external community comments as well.

We continue to believe this is an extremely important subject. We believe that it -- when

--

that some issues are not resolvable, as we discussed earlier, and we think that in the licensing hearings we are going to see formal elicitations of expert judgment perhaps not only from DOE but also from perhaps necessarily from the NRC and perhaps from several intervening groups and one of the questions, of course, is how does one decide, how does one decide the admissibility of some of that information and I know that the Office of General Counsel certainly has worked hard, I believe, with the staff to reach some acceptable standard for this branch technical position and we look forward to a continuing interaction with them to try to establish what the groundrules are going to be.

We feel very strongly that all of the information from diverse formal elicitations should be introduced, somehow, into the licensing process so that the administrative judges in that case can look at the full range of uncertainty within a given issue and we want to see what the techniques are for ensuring that that careful and complete examination takes place.

CHAIRMAN JACKSON: Would you go so far as to want to require expert judgment in a safety evaluation format?

MR. POMEROY: I can see where it might be necessary. I would like to think about that.

CHAIRMAN JACKSON: All right, I will ask you again.

MR. POMEROY: Right. Thank you.

CHAIRMAN JACKSON: Commissioner Rogers?

COMMISSIONER ROGERS: No questions.

CHAIRMAN JACKSON: Commissioner Dicus?

COMMISSIONER DICUS: No questions.

CHAIRMAN JACKSON: Well, thank you. I would like to thank very much the members of the

Advisory Committee for a very comprehensive and informative briefing. You have presented a lot of information to us that says that you are working quite hard to help us independently assess the current issues regarding the safe management of radioactive waste. We look forward to continuing to work with you and to interact with you both on the content and the ranking of your priority issues. I am sure you will be hearing from us.

But what you've done appears to be well conceived and well documented and so we look forward to our continuing work. And, again, I thank you and again I take note of the excellent service of Dr. Steindler.

Unless there are further comments, we're adjourned.

MR. POMEROY: Thank you very much.

[Whereupon, at 4:01 p.m., the meeting was concluded.]