

BLUE RIBBON COMMISSION ON AMERICA'S
NUCLEAR FUTURE

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DISPOSAL SUBCOMMITTEE

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MEETING

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WEDNESDAY,
SEPTEMBER 1, 2010

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The Subcommittee convened at 8:30 a.m.
in Ballrooms D and E of the Washington
Marriott at 1221 22nd Street, Northwest,
Washington, DC, Chuck Hagel and Jonathan Lash,
Co-Chairs, presiding.

MEMBERS PRESENT:

CHUCK HAGEL, Chair
JONATHAN LASH, Chair
VICKY A. BAILEY
SUSAN EISENHOWER
ALLISON MacFARLANE
RICHARD A. MESERVE
PER PETERSON

ALSO PRESENT:

TIM FRAZIER, Designated Federal Official

THOMAS COTTON, Consultant to the
Commission

TIMOTHY McCARTIN, US Nuclear Regulatory
Commission

JONATHAN EDWARDS, US Environmental
Protection Agency

MARK PETERS, Argonne National Laboratory

ROBERT BUDNITZ, Lawrence Berkeley
National Laboratory

WARNER NORTH, NorthWorks, Incorporated

WILLIAM MURPHY, California State
University

DANIEL SCHULTHEISZ, US Environmental
Protection Agency

ROBERT NEILL, New Mexico Environmental
Evaluation Group

MICHAEL VOEGELE, Independent Consultant

STEVE FRISHMAN, Consultant to State of
Nevada Agency for Nuclear Projects

HANK JENKINS-SMITH, University of
Oklahoma

ROGER KASPERSON, Clark University

PUBLIC COMMENTERS:

JUDY TREICHEL

MARY OLSON

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P-R-O-C-E-E-D-I-N-G-S

8:32 a.m.

MR. FRAZIER: All right. If I could have everybody's attention, we're going to get started.

My name is Tim Frazier. I'm the Designated Federal Officer for the Blue Ribbon Commission on America's Nuclear Future, which makes me the Designated Federal Officer for the Subcommittees.

So, welcome to the Disposal Subcommittee meeting.

And I'm going to immediately turn it over to Mr. Lash.

CHAIR LASH: Thank you very much, Tim.

Good morning. And welcome to all of you on behalf of the Co-Chairman, Senator Hagel, and myself.

I want to welcome members of the public who have joined us here this morning, and the Commissioners, and in particular the

1 group of witnesses who are joining us today.

2 It's an extraordinary collection of experience
3 and wisdom and we are deeply grateful to all
4 of you for your willingness to participate.

5 These kinds of commissions are
6 only possible because Commissioners are
7 willing to donate their time and because
8 witnesses are willing to spend the time trying
9 to help us to sort through complex and
10 difficult issues.

11 Our focus in today's meeting is on
12 two questions about regulation. First of all,
13 what are the essential elements of a
14 technically credible, workable and publicly
15 acceptable regulation for disposal in geologic
16 repositories. And secondly, what are the
17 essential elements for a technically credible
18 and publicly acceptable institutional system
19 and process for regulating the safety of
20 disposal. We really couldn't ask for a better
21 set of witnesses, probably collectively 8 or
22 900 years of experience, in addressing those

1 questions.

2 And we've asked a member of the
3 Commission staff to begin the presentations
4 today, Dr. Tom Cotton, with giving us a
5 history and some background on these issues.
6 We've suggested to Tom he take a little longer
7 than we will ask the rest of you to present to
8 give us this background in order to save
9 everyone else from having to do it, and
10 because we have the opportunity to ask
11 questions of Tom since he's a member of the
12 Commission.

13 For the witnesses, I'd observe
14 that in past hearings we have found that the
15 question and answer is actually the most
16 useful part of the sessions. And so we urge
17 you to use your five minutes of presentation
18 to provoke us and to get a discussion started
19 and then you'll find us a very active group in
20 terms of asking questions and following up.

21 So, before we start with Tom's
22 presentation I'd like to ask the members of

1 the Commission whether any of you have any
2 opening comments or thoughts as we thought
3 out?

4 Allison, no?

5 Okay. So we will go through Tom's
6 presentation and then the first panel before
7 our break.

8 Tom, do you want to join us?

9 DR. COTTON: Okay. This is a
10 daunting task, in any event. And when I look
11 out at the audience and I know who else is
12 going to be presenting today, it's doubly
13 daunting. Because a lot of these people were
14 deeply involved in all of the things that I'm
15 going to be talking about. In fact, one of
16 them just reminded me or said he's interested
17 to see whether my history is the same as his
18 history. So, I'm very confident though that
19 you have plenty of expertise here who will fix
20 anything that I say. So with that, let me
21 start.

22 What I want to do is go quickly

1 through the regulatory authorities that are
2 involved, look at the timeline of things that
3 happened, spend a little time on the initial
4 regulatory structure that was developed, look
5 at a major reversal that occurred in '87 which
6 led to legislation in '92 that set us out on
7 the path of two separate sets of regulations,
8 one for WIPP and everything else and then one
9 for Yucca Mountain. And then look at those
10 two paths and see what happened on them.

11 So, generally, I'm going to look
12 at the authorities under the Nuclear Waste
13 Policy Act, but actually the authorities
14 existed before the Act was passed.

15 Under the Act, EPA sets the
16 generally applicable standards for protecting
17 the environment from releases from
18 repositories. It also has hazardous waste
19 regulatory authority, which does apply to
20 WIPP, and applies I guess in theory also to
21 geologic repositories, other geologic
22 repositories.

1 NRC sets the requirements for
2 licensing that are consistent with the EPA
3 regulations and the DOE sets siting
4 guidelines.

5 Now the next viewgraph is a bit of
6 a shock. I tried to put everything on the one
7 slide to show happened; and, yes, pretty bad.
8 But that's the message. I mean, basically the
9 message is this was a pretty messy process.
10 So, let me make a couple of points.

11 First was it's a very long
12 process. It started actually out in 1977 when
13 EPA started having public workshops on the
14 principles for regulating repositories and NRC
15 started working on it at that time, too. And
16 it went all the way out to right now because
17 there are pending lawsuits against the current
18 EPA standards.

19 And some other things that
20 happened:

21 One is it was characterized by
22 multiple rulemakings by three agencies going

1 on pretty much in parallel or slightly out of
2 sequence, like here, or let's say here.

3 It was characterized by major
4 legislative interventions. At 1982 the
5 Nuclear Waste Policy Act. 1987 with the
6 Nuclear Waste Amendments Act which selected
7 Yucca Mountain leading to legislation in 1992
8 which set us out on the two paths: One was a
9 standard specifically for Yucca Mountain and
10 one for WIPP and everything else.

11 It was also characterized by a
12 number of court decisions which set things on
13 their heels, and basically was a start over on
14 some issues. One was 1987 when the original
15 EPA standard was remanded, and another in 2004
16 when the Yucca Mountain standard was remanded.
17 And as pointed out, there's pending lawsuits
18 out here on the current standards.

19 What this did, all these
20 interventions, was leave the developers of
21 repositories without standards, without
22 definitive standards for extended periods of

1 time.

2 For example, from 1987 through '83
3 for WIPP and from 1987 all the way out to 2001
4 for Yucca Mountain to get the first
5 regulation, and that only lasted three years
6 and then they're back to waiting for another
7 four years. So, it's been a fairly complex
8 and messy process.

9 So, let me spend a little time
10 looking at the EPA regulations, because
11 actually that's, as it stands now, is the one
12 that would apply, I think, to any repository
13 other than Yucca Mountain, and it's different
14 in significant ways from the Yucca Mountain
15 standard.

16 The first place, it is for
17 repositories for high level waste and spent
18 fuel, and transuranic waste, which is what's
19 going to WIPP. It has three components:

20 A containment requirement to
21 protect populations;

22 Protection requirements for

1 individuals and ground water, and;

2 Then some assurance requirements
3 that provide added confidence in the disposal,
4 and;

5 It defines a controlled area
6 around a repository and says, look, the
7 repository engineered area and part of the
8 geosphere around the repository and you don't
9 expect the standards to apply inside that
10 repository system.

11 The containment requirements. And
12 this is really the heart of it. This is the
13 primary measure of performance in Part 191.

14 It protects populations, not
15 individuals, and it does it by limiting the
16 amount of specified radionuclides that can
17 escape from the repository in a 10,000 year-
18 period. And they are quantities that were
19 calculated to produce on the order of 1,000
20 premature deaths in 10,000 years. And EPA
21 looked at that, they did analyzes of
22 comparable uranium ore bodies and found that

1 those were essentially in the same range, and
2 that this was an acceptable level. So it's
3 a technology-based standard. They looked at
4 what repositories could do and said this is
5 very good, and that's why we'll set the limits
6 this way. And they emphasized that it was not
7 to be interpreted as setting a level of
8 acceptable risk that could not be exceeded.

9 So, they said they looked at what
10 repositories could do based on analyses of
11 generic repositories, they said that looks
12 very acceptable and we'll set the standards
13 that way.

14 It is a complex standard in that
15 it regulates the probabilities of exceeding
16 the limits instead of just regulating limits.
17 In other words, the applicant has to show that
18 there's no greater than one chance in ten of
19 exceeding the limits and no greater than one
20 chance in a thousand of exceeding ten times
21 the limits. And this is to be demonstrated
22 using performance assessments, basically

1 models of the repository system that take into
2 account all the significant processes and
3 events that could effect the repository and it
4 includes human intrusion as one of the events.
5 So that human intrusion was to be treated
6 probabilistically; you make estimates of how
7 much would occur, that gets rolled into the
8 performance assessment.

9 And concerns were raised at the
10 time, and Bob Budnitz can tell you about it,
11 about the feasibility of implementing that
12 particular kind of standard in a NRC licensing
13 processing. It wasn't that they couldn't do
14 the calculations. The concern was can you
15 defend it in a litigated licensing proceeding.

16 The 10,000 year-period was picked
17 because on the one hand, it would be long
18 enough to allow you to compare sites and media
19 without being, basically, masked by the
20 engineered barriers. They looked at
21 significantly longer periods and concluded
22 that the uncertainties and the predictions

1 were just too great to be useful out to those
2 periods. But they did endorse DOE's inclusion
3 of 100,000 years as a point at which to do
4 evaluations for comparing sites. Not for
5 regulating them, but for doing comparisons.

6 They adopted a standard of proof
7 they refer to as reasonable expectation, which
8 recognizes that you can't have unequivocal
9 proof of compliance of something like this for
10 those long time periods.

11 They established protection
12 requirements. One of them is an individual
13 protection requirement to, basically, limit
14 the dose to any individual near the
15 repository. And that's 24 millirem.

16 And then they established some
17 quantitative requirements with respect to
18 protecting groundwater, and it might be a
19 drinking water resource near the repository.

20 The compliance requirements were
21 less stringent. It was only to apply for the
22 first 1,000 years and assume that the

1 repository was not disturbed and didn't have
2 to use a detailed performance assessment.

3 The assurance requirements are
4 designed to compensate for the uncertainties
5 in these long-term mathematical projections.
6 There are requirements for:

7 Multiple-barrier systems. They
8 could not rely on perpetual institutional
9 control to prevent releases;

10 Preferred to be located in places
11 where there weren't resources that would
12 attract drilling for exploratory drilling,
13 and;

14 Should not preclude removal of the
15 wastes within a reasonable time after
16 emplacement. Now this, basically this
17 retrievability requirement, is for safety
18 reasons. It's not to preserve access to the
19 spent fuel for recovery for reprocessing,
20 which is an issue, the concept. It's purely
21 a safety issue.

22 And basically this was not to be

1 applicable to NRC-licensed repositories. NRC
2 was to come up with its own requirements like
3 this. So, let's look at what NRC did.

4 The Nuclear Waste Policy Act
5 specified a couple of aspects of the NRC
6 standard:

7 (1) Was that it had to provide
8 for multiple-barriers, and;

9 (2) It laid out three stages of
10 licensing construction, operation and
11 decommissioning.

12 Now, what's happened on reactor
13 licensing since then is that the construction
14 and licensing two steps has been merged into
15 one, but it's still this way for the
16 repository.

17 The key thing I want to focus on
18 that are mentioned in the NRC standard is the
19 individual barrier requirements. These are
20 requirements that NRC included that had to be
21 met in addition to compliance with EPA
22 standard.

1 They required almost complete
2 containment in the waste packages themselves
3 for a period of 300 to a 1,000 years.

4 They required a minimum release
5 rate from the engineered barrier system after
6 1,000 and specified a groundwater travel time
7 minimum of a 1,000 years from the repository
8 to the accessible environment to allow
9 radionuclides to decay.

10 It also allowed for other values
11 that could be approved by the NRC.

12 The purpose was to compensate for
13 the uncertainties that were inherent in these
14 long-term calculations. And NRC had some
15 concerns at that point the state-of-the-art on
16 this kind of analysis.

17 There were a couple of other
18 provisions in the NRC just worth mentioning in
19 passing:

20 They had criteria related to
21 specific aspects of the site that might be
22 favorable or unfavorable to disposal, but they

1 weren't go/no-go criteria. They were just
2 things to be analyzed in the course of the
3 licensing processing.

4 They adopted reasonable assurance
5 as the standard of proof; that's the standard
6 NRC term in licensing proceedings. But they
7 made it clear that the purpose was the same as
8 reasonable expectation as to recognize you
9 can't have complete proof in the normal sense
10 of the term for these long time periods.

11 They included a retrievability
12 requirement, again for safety reasons not to
13 retain access to spent fuel.

14 Now, let's briefly talk about the
15 siting guidelines that DOE came up. This was
16 a set of guidelines that was to govern a
17 process that was to start with comparisons of
18 multiple sites and wind up with selecting a
19 single site.

20 I won't go into the details. I
21 want to talk about the key issue that came up,
22 and I think it's going to come up again if we

1 get into the siting criteria again, is use of
2 "qualitative" versus "quantitative"
3 disqualifying conditions about sites. And
4 what I mean is something like a site cannot be
5 located closer than ten miles for a fault
6 that's been active in the last million years,
7 something like that. The specified quantities
8 of certain aspects of the site.

9 The argument in favor of that, or
10 a big one, is that you need something very
11 specific and clear to avoid subjectivity and
12 to give confidence this is a fair and open
13 process. The counter argument is that you can
14 wind up ruling out the site that would be
15 perfectly good, that you could do a perfectly
16 acceptable repository at.

17 In the event the guidelines that
18 were adopted emphasized the qualitative
19 conditions for screening, but at the end of
20 the day the final site selection was based on
21 actual performance assessment based on the
22 data from site characterization to tell

1 whether it would meet the regulatory
2 requirements.

3 Now, not surprisingly, there was
4 the lawsuits. And what was then in 1987 a
5 court vacated the disposal parts because of
6 some issues related to the protection
7 requirements rather than the fundamental
8 containment requirement. They upheld the
9 10,000 year performance period as reasonable.
10 They upheld the reasonable expectation
11 standard of proof against charges that it was
12 just too subjective. And the court said,
13 "Look, it would irrational to require things
14 that science can't do." And they also upheld
15 the idea that you can have a zone around the
16 repository in which you don't meet the
17 standards.

18 So, that put the cat among the
19 canaries, as it were and they were back with
20 all the issues back on the table being table
21 with a lot of things going on, a lot of people
22 getting their oars into the water on it.

1 Some of the key issues were old
2 familiar ones:

3 (1) Would that quantitative
4 probabilistic standard work? Was 10,000 years
5 just too long or too short, or just right;

6 Were the release limits too
7 stringent, and the particular issue I'm going
8 to talk about in a minute was with respect to
9 carbon-14 at an unsaturated zone site, read
10 Yucca Mountain;

11 There were questions about the
12 NRC's quantitative individual barrier
13 requirements and whether it was necessary,
14 whether it would impose unnecessary costs;

15 There were questions about
16 probabilistic treatment of human intrusion,
17 which I mentioned. That there was going to be
18 an all new performance assessment. Well, what
19 they were learning from WIPP performance
20 assessments was that it was looking like the
21 assumptions that were made about how many bore
22 holes, and I think even how big they were, in

1 exploratory drilling over a 10,000 year period
2 were going to drive the compliance
3 determination. And that seemed like a little
4 odd.

5 And then finally, there were
6 concerns about what the public perceptions
7 might be of changing the standard in
8 midstream.

9 One thing I want to call your
10 attention you. I think you have gotten
11 summaries of it, was this report from the
12 National Academies, Tom Isaacs was involved in
13 it, called "Rethinking High Level Radioactive
14 Waste Management." And I just want to call
15 out a couple of the points they made. They
16 weighed in on some of these issues.

17 They were concerned about over-
18 emphasis on the use of these quantitative
19 calculations to make detailed long-term
20 performance predictions. They thought that
21 could lead to some problems.

22 They were concerned about

1 establishing these very detailed regulations
2 early in the process before you had all the
3 data about the sites that you were going to be
4 investigating, and they thought that you could
5 wind up with standards you couldn't meet.

6 And they recommended a flexible
7 approach that focused on the ultimate
8 performance goal and then would allow some
9 adaptation as you moved around.

10 Now what happened was by 1992
11 there was some impatience in Congress. They
12 wanted to move on Yucca Mountain, they wanted
13 movement on WIPP and both were held up by the
14 lack of standards. So, we wound up with two
15 pieces of legislation, which I'll talk about,
16 one of which set us off with Yucca Mountain
17 and the other set us off on a path with WIPP
18 and everything else. And so I'll talk about
19 the WIPP and everything else path first with
20 the WIPP Land Withdrawal Act. And it
21 basically told EPA to go back and fix the
22 parts that had been remanded by the court,

1 come back in a year with a standard, and that
2 standard would not apply to Yucca Mountain.
3 Well, they didn't say "Yucca Mountain." but
4 the word meant Yucca Mountain.

5 They made EPA the agency to
6 determine compliance. Prior to that it had
7 been DOE because this was a defense DOE site.

8 They required compliance
9 recertification every five years. This wasn't
10 going to be a one shot and then it's done
11 decision.

12 And they exempted WIPP from some
13 of the hazardous waste disposal requirements,
14 but left them subject to the mixed waste
15 requirements that were implemented by the
16 state, which by the way gave the state a
17 regulatory authority over WIPP that they
18 didn't otherwise have, which I think was
19 important to the state.

20 So what happened to WIPP? Well,
21 it worked basically. They got the rule out in
22 a year. They changed the dose limit to 15

1 millirem, which one of the issues, and they
2 bumped the compliance period on the two
3 protection standards up to 10,000 years to
4 match the other 10,000 year standard. Came
5 out with an implementing rule. And basically,
6 they certified WIPP in '98. WIPP got a RCRA
7 certification from the state. It was
8 recertified in 2006. And I think DOE has
9 submitted the next recertification already, I
10 think. So that process is working fine.

11 Now let's look at the Yucca
12 Mountain path. Not nearly so smooth.

13 The Energy Policy Act told EPA to
14 come up with a site-specific standard for
15 Yucca Mountain that had a health-based
16 standard based on dose to individuals. And it
17 was to be based on consistent with
18 recommendations from the National Academy.
19 Now, I have to say this is really emotional
20 territory I think for a lot of people and I
21 need to explain what happened here.

22 This goes back to the point about

1 the standard being too stringent for an
2 unsaturated zone site. The EPA standards, the
3 release quantities were calculated looking at
4 generic repositories in the saturated zone.
5 Carbon-14 comes out, I think, as carbon
6 dioxide and goes in, will dissolve into the
7 water. And their analysis was based on that
8 and they came up with a limit. In an
9 unsaturated zone site which they did not
10 analyze for the standard in determining what
11 was feasible with a repository, it goes into
12 the atmosphere. Because there's no water to
13 stop it, it comes out as gas, it just goes up
14 in the atmosphere, distributes itself around
15 the whole world but in a quantity that
16 violated the quantity that EPA determined.

17 At the same time, the doses that
18 it produces, the individual doses, would be
19 very, very small because its distributed
20 throughout the whole atmosphere, and very far
21 below any, for example the 15 millirem
22 protection limit. But it dosed a lot of

1 people. It was referred to at the time, I
2 think, as "micro-doses to mega-people" was
3 kind of the issue. And it didn't mean that
4 you couldn't do a repository in an unsaturated
5 zone, but it meant that it was going to take
6 a very long waste package just to contain just
7 the carbon-14 while it decayed. It's a 5,000
8 year half-life. And at the time in the
9 debates DOE estimated it was going to cost, I
10 think, \$5 billion, something like that for a
11 waste package just to keep the carbon-14 and
12 meet that standard.

13 And that was talked about a lot on
14 the floor of the Senate in the debates. The
15 congressional judgment was that wasn't a good
16 idea. The told EPA to just come with a
17 standard that was based on dose, and based on
18 analyses of what was reasonable levels of
19 health protection. And then they asked the
20 Academy to weigh in on the subject.

21 So on one hand there was a
22 technical argument that you could say well

1 this was the kind of technical adjustment that
2 the Academy was thinking about of needing to
3 fix something that was a standard that was too
4 rigid and it was set before you had all the
5 data. On the other hand, it's absolutely
6 clear that people who were concerned about the
7 Yucca Mountain choice would basically see this
8 as simply cutting the regulations to fit the
9 site: Changing the rules and supporting the
10 predetermined decision.

11 So, the law put three questions to
12 the Academy:

13 (1) Does a dose standard make
14 sense?

15 The other two were related to that
16 concern about human intrusion and what its
17 impact would have. So they asked:

18 (1) Can you assume that if you
19 have post-closure oversight of the repository,
20 you can prevent it and can you supportable
21 predictions of what human intrusion would be?
22 But at the same time the Act, and people don't

1 really note this a lot, it mandated perpetual
2 oversight of the Yucca Mountain site and it
3 directed NRC to assume that that will work
4 except depending on what the Academy said.

5 So, in 1985 the Academy came out
6 with its report. They said, yes, a dose-based
7 standard will work provided, and we're right
8 back to this mini-dose problem, you will
9 accept that the risks from these very low
10 doses are negligible.

11 On the other two questions they
12 said no. No, you can't assume in the 10,000
13 period you could block human intrusion. And
14 no, you can't predict how much intrusion
15 there's going to be. So then they made the
16 recommendations and finding.

17 The big one was this one: They
18 said you should regulate at the time of peak
19 dose, which at that time was understood to be
20 well past 100,000 years at Yucca Mountain.
21 They said there was no scientific reason to
22 stop the performance assessment at 10,000

1 years. The only reason to stop it would be
2 out to the limits of geologic stability of the
3 site, which they thought was about a million
4 years. They said regulate based on a risk
5 standard rather than dose, they recommended
6 analyzing human intrusion not by trying to
7 predict how much there would be, but just by
8 specifying a scenario for intrusion and then
9 analyzing it and seeing if the results were
10 acceptable. And then they said the individual
11 barrier requirements really were not necessary
12 and could be counterproductive.

13 So, EPA came out with a final rule
14 through a standard rulemaking process. A
15 final rule in 2001. Adopted 15 millirem
16 annual dose. They included the groundwater
17 standard from the previous rule. They put in
18 a specification that compliance could be
19 measured as far as 18 kilometers from the
20 repository versus, I think it had been 5
21 kilometers usually. It's one of those cases,
22 it was based on analysis of the specific

1 characteristics of the Yucca Mountain site.
2 So in that sense, it is a site-specific
3 requirement. On the other hand, it is clearly
4 seen by critics as just gerrymandering the
5 compliance system to approve the site. But
6 that's the real risk of a flexible site-
7 specific approach.

8 It retained the 10,000 year period
9 despite the Academy's recommendation. They
10 still felt that these long-term projections
11 were not a useful basis for a regulatory
12 decision. They told DOE to go ahead and do a
13 peak dose projection, but it into the EIS so
14 people who basically would there would see it,
15 but it's not a regulatory test. They
16 reaffirmed reasonable exception and they
17 adopted the idea of a stylized approach to
18 human intrusion.

19 NRC decided not to change their
20 earlier regulation Part 60, the generic one,
21 and they came out with a special one for Yucca
22 Mountain. They dropped their quantitative

1 barriers requirements, as the Academy had
2 observed, but they pointed out that the
3 methodology of performance assessment had
4 evolved so well since they originally put them
5 in, that they no longer felt the need for
6 those quantitative requirements to give
7 confidence. They still did require that there
8 be a demonstration that multiple barriers are
9 contributing to isolation, but there's no
10 standard for each one of them. They included
11 the retrievability requirement, again.
12 Adopted EPA's reasonable expectation standard
13 of proof for post-closure to avoid the
14 confusion. And they gave guidance about how
15 that would be implemented in the license.

16 DOE did the same thing that NRC
17 did. Was they left the existing guidelines in
18 place and came up with a special one for Yucca
19 Mountain suitability. Got rid of all the
20 comparative parts of the regulation. And they
21 focused the determination on the analysis of
22 the total system performance, not analysis of

1 individual site characteristics. And that was
2 actually used for the recommendation in 2002.

3 Naturally, once the recommendation
4 was done and affirmed by the Congress, there
5 were multiple lawsuits against a lot of the
6 provisions in the regulation which were
7 described there. The key one is the court
8 rejected all of them except one, and that was
9 the contention that the 10,000 standard was
10 not consistent with the Academy's
11 recommendation that they regulate to the time
12 of peak dose. And they said the Energy Policy
13 Act said you had to be consistent with the
14 Academy recommendation. And the court looked
15 at it and said "You're right." And basically
16 vacated that portion of EPA's and NRC's
17 standard and said "Go back and either fix it
18 or get Congress to change the requirement that
19 you have to be consistent with the Academy's
20 recommendation."

21 So, they fixed it. Basically they
22 proposed a revision in 2005. Came out with a

1 final in 2008. I will skip over the fun time
2 that was had in going from the proposal to the
3 final.

4 They basically changed the
5 regulatory time frame. But the way they did
6 it was a two tier approach. They kept the 15
7 millirem for 10,000 years and then added a 100
8 millirem level for the period from 10,000
9 after the time of peak dose.

10 NRC then adopted that,
11 incorporated it into its standards. They
12 added some specifications with regard to how
13 to treat climate change. And I point this out
14 because what happens when you go to a million
15 year standard is now you got to take into
16 account glaciation, really major changes in
17 climate. And it seemed inappropriate to
18 expect the applicant to have to make the
19 predictions of exactly what that would be. So
20 the regulator specified that.

21 And they also said that the
22 technical basis for the performance projection

1 out to the million years, for 10,000 was
2 sufficient for the one out to a million years.
3 So they didn't have to go do a whole new
4 technical basis.

5 So, what happened? We're done.
6 That is what the license application shows
7 compliance with. The process is moving along,
8 but it's still pending the withdraw. And as
9 I said, there are lawsuits pending. So if it
10 does proceed, we'll be back in court on
11 provisions of those regulations.

12 So, where are we? It turned out,
13 this was an unprecedented job for the
14 regulators. I have a lot of sympathy for them.
15 The process was really bumpy, complex,
16 convoluted, left the repository designers
17 without clear standards for a long period of
18 time, and we've evolved two different sets of
19 regulations. One is just unique to Yucca
20 Mountain, and that is the path where most of
21 the regulatory thinking and development has
22 happened, it's on the one that is now unique

1 to Yucca Mountain. And we have one that's in
2 use at WIPP, and potentially applicable to the
3 other repositories.

4 And the bottom line is I think any
5 new repository siting process may require
6 further evolution and we should draw on the
7 lessons from these two experiences. And the
8 lessons, both with regard to the substance of
9 the regulation but maybe equally importantly
10 to the process we use them next time to come
11 with whatever we're going to use.

12 Done.

13 CHAIR LASH: Thank you, Tom. That
14 was amazingly fast and comprehensive.

15 And for those of us who haven't
16 lived this process through the last 30 years,
17 very informative. And I appreciate it.

18 DR. COTTON: And now we will find
19 out how long I have. I have some questions --

20 CHAIR LASH: We actually have a
21 few minutes for questions.

22 DR. COTTON: Oh, good.

1 CHAIR LASH: Members with a
2 question? Allison?

3 MEMBER MacFARLANE: Tom, that was
4 great.

5 I just want to hear a little bit
6 more of your wisdom here and what do you think
7 are some of the most important lessons taken
8 from their experience, and how would you apply
9 them going forward to a whole new system?

10 DR. COTTON: Exactly. That's for
11 the other folks.

12 As I went through this and looked
13 at it and then put together that horrible
14 viewgraph, I think it's the process problem we
15 really have to think about. They had multiple
16 things going on in parallel. There was even
17 an effort, I remember in that '87 to '92
18 period when somebody from the TRB had
19 recommended to the Advisory Committee on
20 Nuclear Waste that we consider a negotiated
21 rulemaking to corral all of these arguments,
22 get people to try to come up with one

1 integrated set of agreements about what to do.
2 And I think trying to avoid a repetition of
3 that kind of process would be a really good
4 thing to do.

5 MEMBER PETERSON: Tom, the 1995
6 National Academy study also included
7 essentially a statement that EPA could adopt
8 a standard that would be consistent with its
9 approach to regulating other hazardous
10 materials, which really chemicals. And that,
11 of course, raises a whole big set of issues
12 because the way we regulate chemicals does not
13 really take into account long-term potential
14 hazard. So how do we deal with societal
15 question of the fact that we regulate nuclear
16 waste in a very specific way, yet if you don't
17 do something similar for chemicals, then you
18 could have chemicals swamping the long-term
19 hazards for people?

20 DR. COTTON: I don't think I'll
21 touch that one with a ten foot pole. But I
22 will observe, I do remember a symposium at MIT

1 where they brought together the people dealing
2 with hazardous waste regulation and management
3 and the people dealing with nuclear waste.

4 And the nuclear waste people were talking
5 about how do you provide markers to indicate
6 to future civilizations 10,000 years from now
7 that there's a repository, and they were going
8 through all of this. And after that, a fellow
9 who was working on hazardous waste stood up
10 and said "This is astonishing to me." I mean
11 this just seemed crazy to them because they're
12 thinking about 60 years, you know really
13 short-term. Graphically there's a
14 dramatically different approach, but how you
15 bridge that gap I don't know. It would be a
16 good thing for the discussion later. But I
17 don't have an answer.

18 CHAIR LASH: I have a quick
19 follow-up question to Per's. There's
20 something I don't understand there. And then
21 a longer question.

22 The follow-up question: A lot of

1 the hazardous wastes that are regulated in a
2 way entirely different, don't actually have
3 half-lives.

4 DR. COTTON: Correct.

5 CHAIR LASH: So what is the
6 justification for taking a short-term
7 approach? If they don't have a half-life,
8 then they never mature, especially heavy
9 metals, those things remain toxic in
10 perpetuity. But we regulate them very
11 differently.

12 DR. COTTON: We're just used to
13 them.

14 Actually, the one place, and the
15 EPA can talk about this, I think in the land
16 disposal limitations that if you inject or
17 dispose of certain toxic materials, you have
18 to show that there's no migration from the
19 disposal site. And that's there's no
20 migration and they've adopted, I think, 10,000
21 years sort of as the limit. But that was kind
22 of ratcheted back from the high level waste

1 10,000 year period.

2 CHAIR LASH: Tom, I have a very
3 naive question. You were very clear that part
4 of the difficulty here was the two-track
5 process. There was a general regulatory
6 process and then there was the effort to
7 create a set of regulations that fit Yucca
8 Mountain. And without any imputation of bad
9 faith, you were very clear that people were
10 doing the best that they could with the
11 situation they had.

12 If our recommendations move back
13 toward a saturated site, does that mean that
14 this 20 years of work for Yucca Mountain is
15 irrelevant?

16 DR. COTTON: No. I think there's
17 a lot of the thinking was not just Yucca
18 Mountain-specific. There were aspects of it
19 that were very specific to the unique site,
20 like the 18 kilometer boundary. There were
21 things that having to do with the unsaturated
22 site. But I think a lot of the regulatory

1 thinking would be applicable they'll need to
2 think through.

3 For example, NRC's evolution of
4 thinking about barriers and they've got
5 through a risk-informed approach to
6 regulation. And they never went back and
7 fixed Part 60 after they got focused on Yucca
8 Mountain. So there's a lot of things that
9 need to be brought in from that experience.

10 CHAIR LASH: Senator, do you have
11 anything?

12 MEMBER BAILEY: Tom, thank you so
13 much for that very clear and comprehensive
14 presentation.

15 On the side of being a little bit
16 naive, I want to talk about three areas
17 really. And you can probably do them very
18 quickly.

19 On the issue of retrievability --

20 DR. COTTON: Right.

21 MEMBER BAILEY: -- versus I know
22 Per sent us something versus reversibility.

1 And I'm not sure necessarily the differences
2 there.

3 The issue as it relates to
4 tectonic activity or fault lines where the
5 sites are located: Who exactly does that
6 analysis?

7 And in looking at DOE and the
8 number of sites, I noticed in your article
9 that you wrote for a book that we had an
10 opportunity to look at before this, talked
11 about that initially there were a number of
12 sites looked at and it pared down to maybe two
13 sites, possible.

14 DR. COTTON: It was three.

15 MEMBER BAILEY: Or three. Okay.
16 You know that better than I.

17 And the fact that we did not
18 continue to look at a second site, I'd like to
19 talk a little bit about that.

20 And then also looking at EPA, NRC,
21 DOE how do you prevent it from being purely
22 political? You talk about that in your

1 article. And -

2 DR. COTTON: Carefully.

3 MEMBER BAILEY: Okay.

4 DR. COTTON: I talked about it
5 very carefully.

6 MEMBER BAILEY: I'm talking
7 advantage of you, thought.

8 DR. COTTON: Okay.

9 MEMBER BAILEY: Okay. Go ahead.

10 DR. COTTON: Well let me say,
11 okay, retrievability, there are a couple of
12 concepts. There's retrievability for safety
13 reasons. It doesn't have to be easy and EPA
14 said it doesn't have to be done easily, it
15 just has to be done. And they said basically
16 any mined repository could meet that standard.

17 There's, you can use another word,
18 recoverability which is the ability to get at
19 -- or ready retrievability, which is the
20 ability to get it out easily. And that's what
21 you talk about if you want to put in spent
22 fuel and then get it back out again because

1 you want to use it. And that's more
2 demanding, particularly like in a salt site.
3 The salt creeps in, it's harder to maintain
4 that kind of retrievability.

5 And then I think maybe the
6 reversibility concept there is more one of how
7 the whole program has an ability to stop and
8 go back and undo a decision. It's not so such
9 much a repository, but it's how the program.

10 With respect to the tectonic
11 thing. I was just using that as an example.
12 But right now the way things would be set up
13 is that that's the sort of thing that will be
14 addressed in siting in general guidelines for
15 siting of repositories. Okay.

16 On the second site, you know the
17 decision in 1986 that stopped basically work
18 on the second repository. There were supposed
19 to be two repositories originally and two
20 processes going on in parallel. And then that
21 was halted in '86 because the Department had
22 concluded that -- at least the rational was

1 that they didn't need the second repository so
2 soon. And then that scrambled the politics of
3 the agreement in the Nuclear Waste Policy Act
4 and that led to the '87 amendments.

5 The EPA/NRC/DOE thing, that's
6 where I come back to the process and I throw
7 it back to the people who were involved to
8 talk about how there might be a way to get a
9 credible process and is not perceived as being
10 torqued by political considerations.

11 CHAIR LASH: Any further
12 questions?

13 Tom, again, thank you very much.
14 Very, very helpful.

15 Our next speaker is Timothy
16 McCartin of the Nuclear Regulatory Commission.
17 Tim serves as the Senior Advisor for
18 Performance Assessment in the Division of High
19 Level Waste Repository. He'll speak to us
20 about the NRC approach toward regulations for
21 a deep geologic repository.

22 And thank you. I think Tom has

1 set it up beautifully for you. We'd like you
2 to be fairly brief. You can tell, you'll be
3 deluged with questions as soon as you finish.

4 MR. McCARTIN: Okay. And just a
5 procedure question: When you said five
6 minutes, I originally was told ten. I will
7 try to scale back to five if you'd like me to.

8 CHAIR LASH: No, no. I misspoke.

9 MR. McCARTIN: Okay.

10 Tom, I think you made off with the
11 clicker.

12 CHAIR LASH: It's just typical of
13 the process that we always change the rules
14 after people start.

15 MR. McCARTIN: And on behalf of
16 the NRC, I'd like to express our appreciation
17 for giving us the opportunity to give our
18 perspective on the regulations. Today I'll
19 talk to the two pertinent regulations we have
20 with respect to geologic disposal: 10 CFR
21 Part 60 which is our regulation for all sites
22 other than Yucca Mountain, and 10 CFR Part 63

1 which is our regulation for Yucca Mountain.

2 Having said that, I need to
3 provide at least a small disclaimer. That we
4 are currently in the process of reviewing
5 DOE's license application for Yucca Mountain.
6 I will talk to Part 63, but none of my
7 comments should be interpreted as any
8 indication of a decision, a view with respect
9 to the acceptability of DOE's license
10 application for Yucca Mountain.

11 And with that, I think Tom
12 actually did go through the roles. I think
13 just very briefly, EPA sets the standards for
14 the releases off the site. The Department of
15 Energy is responsible for designing,
16 constructing and operating the repository if
17 they are granted a construction authorization.
18 And ultimately the burden of proof is on the
19 Department of Energy to show that they comply
20 with NRC's regulations.

21 NRC is an independent regulatory
22 agency. We do not report to the President,

1 such as EPA and DOE. We take that
2 independence very fiercely within the staff.
3 Our job is to a safety review: That's it.
4 And that's what we are in the process of
5 doing.

6 We set the regulations.

7 We make our license decisions
8 based on the application: That whatever
9 applicant applies to the NRC, we use their
10 information.

11 We do ask what we call RAIs,
12 Requests for Additional Information of
13 applicants when they submit applications. But
14 we base it on what the applicant provides to
15 us.

16 And just as important, if a
17 license is granted, there's inspection and
18 oversight that the NRC continues to provide
19 that oversight to the licensed facility.

20 Let's go first to NRC's generic
21 regulations. And I'll just touch on a few of
22 the key points with respects to the Part 60

1 regulations, many of which are also in Part
2 63.

3 First, as Tom mentioned, this
4 phased approach. There's one license
5 application but there are multiple decisions
6 along the way at the appropriate time. Three
7 of those decisions are: At a construction
8 authorization phase; an operation stage which
9 is the license to receive radioactive material
10 at the repository, and; finally a closure
11 stage. Throughout that process it's continual
12 learning.

13 Now we do not substitute. At the
14 construction authorization phase we have to
15 have sufficient information to know that the
16 repository will be safe. But there is a
17 recognition that information will continue to
18 come in during construction, you will learn
19 more things. As repository drifts are
20 excavated, you learn more things. And that
21 information in our regulations there's ways to
22 factor in that information at: One prior to

1 the license to receive and possess, and at the
2 time of closure.

3 Part 60 does have the multiple
4 barrier requirement, those quantitative
5 limits, which in the late '70s when they were
6 first developed I will say NRC had never
7 conducted a performance assessment for
8 geologic disposal. There was uncertainty, so
9 they came up with three particular values. I
10 think the easiest way to look at it:

11 There was a waste package lifetime
12 to ensure that the waste was contained during
13 that period when the waste was the hottest and
14 estimating the releases would be the most
15 uncertain;

16 Then once packages failed, the
17 release rates should be sufficiently low, that
18 was the release rate part of it, and;

19 Then ultimately the groundwater
20 travel time that for whatever releases, they
21 should take a long time to get where there
22 might be contact with humans.

1 That was the basis between those
2 three subsystem criteria. Over time the
3 Commission, there was never acceptance of
4 those. It was difficult to implement and
5 there were discussions going on. However, as
6 I'll talk about for 63, when we went to revise
7 Part 63 we did opt to leave Part 60 in place.
8 That was done for efficiency purposes. We
9 acknowledged in 1999 when we published the
10 initial proposal for Part 63 that the
11 Commission always understood they would given
12 enough time to revise Part 60 if it needed to
13 be used in the future. And so it was put off
14 to the side, but there was a recognition that
15 some of these warts, if you will, were left
16 there.

17 With respect to the phased
18 approach, let's for the same of argument say
19 that's a 100 years from this time of
20 construction to the time of closure. That's
21 a fairly long time. The regulations require
22 what's called a performance confirmation

1 program. The Department of Energy would be
2 needed to conduct a continue to challenge the
3 basis for which the safety decision was made
4 and continue to look at those properties,
5 parameters, characteristics and challenge them
6 over that 100 year period. All that
7 information would be factored into the final
8 decision to close the facility. That's where
9 the retrievability requirement comes in with
10 respect to the NRC perspective.

11 If there wasn't a retrievability
12 requirement, let's say over this 100 years at
13 the time of closure you finish your
14 performance confirmation program and you
15 really don't have confidence in safety any
16 longer. If you couldn't remove the material,
17 it would be kind of a worthless decision:
18 It's not safe, but we can't get it out. And
19 so hence, these two requirements: Performance
20 conformation program and retrievability
21 somewhat go hand-in-hand. So at the final
22 decision the Commission would make to close

1 the facility, it's a meaningful decision in
2 that you could retrieve the waste if you no
3 longer have confidence in the safety.

4 There is the program for oversight
5 after permanent closure. It isn't relied on
6 to provide safety, but there are requirements
7 for continued oversight of the facility. That
8 would be done by the Department of Energy. At
9 the end of the day there comes a point where
10 NRC after closure would turn over regulation
11 of oversight of the repository to the
12 Department of Energy so there'd be just one
13 Government agency responsible for safety at
14 that time.

15 The post-closure period, as was
16 mentioned, is 10,000 years and EPA's post-
17 closure standards are incorporated into Part
18 60. However, the standards are not the
19 current standards at 191 today. As I said,
20 we've left in it place. We would have to
21 incorporate the current standards that are at
22 191. They're not there today in NRC's

1 regulations.

2 In terms of our regulations for
3 Yucca Mountain, as was mentioned, it's a
4 different kind of way of estimating and
5 looking at compliance with an overall safety
6 measure, the dose limit. It relies on a
7 performance assessment.

8 As I said, the Part 60 regulations
9 were developed really in the late '70s. This
10 was first proposed in the late '90s. So there
11 was almost 20 years of performance assessment
12 experience that had been gained at that time,
13 and consistent with the NAS recommendations
14 and EPA standards there's requirements for the
15 performance assessment to be conducted to show
16 compliance with the dose limit. Some of that:

17 The characteristics of the
18 biosphere, that was the NAS recommendation
19 that they said it was not fair to have the
20 applicant try to come up with this biosphere,
21 it would be more appropriate for the
22 regulatory to come up with some of these

1 characteristics that define how the
2 calculation would be done. And it's those
3 attributes of the system that are difficult to
4 defend, if you will, in a adjudicatory
5 hearing. It's more appropriate for a
6 regulation such as where people live, what
7 their diet is, et cetera; trying to estimate
8 that for hundreds of years, let alone
9 thousands and millions of years it's better
10 done in the regulations.

11 Multiple barriers. We did remove
12 the quantitative subsystem requirements. We
13 did not remove a requirement for multiple
14 barriers. It's done within the context of the
15 performance assessment. The performance
16 assessment clearly is relying on different
17 attributes of the system, be it a waste
18 package, waste form, flow of water, transport
19 of radionuclides, solubility of radionuclides.
20 There's a lot of attributes in the performance
21 assessment, the characteristics of those
22 barriers are what's required in the

1 regulations. DOE has to explain them and
2 defend them consistent with how they've
3 estimated the 15 millirem dose in the
4 performance assessment.

5 Okay. I will go very quick.

6 EPA's post-closure standards.
7 There's the dose limit for individual
8 protection consistent with the Academy
9 recommendations. There's also a stylized
10 calculation for evaluating human intrusion,
11 and the separate limits for the protection of
12 groundwater.

13 The compliance period is through
14 the period of geologic stability, which is a
15 million years.

16 Finally, what would we do tomorrow
17 if, indeed, we are no longer working with the
18 Yucca Mountain site? Considerations would be
19 for:

20 Revising Part 60, which was put on
21 the shelf back in 1999 with the recognition we
22 would be given the time to revise it;

1 I think, as was mentioned, the
2 Commission has adopted risk-informed
3 performance-based approaches to regulation. In
4 that sense, I think the quantitative subsystem
5 requirements would be removed. We would use
6 the performance assessment similar to Part 63;

7 We certainly have to conform the
8 current Part 60 to the current 191 that EPA
9 has that we do not have that current to date,
10 recognizing of course that there would be
11 three standards. Integrated release, the
12 individual protection limit and the
13 groundwater requirements that all represent
14 different levels of risk.

15 And these would be the kinds of
16 things we have to look at when we revise Part
17 60 in the future.

18 Thank you. I'll be happy to
19 answer any questions.

20 CHAIR LASH: Thank you very much.
21 We appreciate that.

22 Questions from Commissioners?

1 Per?

2 MEMBER PETERSON: I'd like to get,
3 I think the really important question that
4 would be one of the areas where a transition
5 to risk-informed approach might be made, which
6 is on the question of retrievability
7 requirements. And, of course, the point
8 behind retrievability is to reduce risks or
9 that you might decide you need to reverse what
10 you've done, or to mitigate. And the big
11 concern I have it's just like with safety
12 systems for reactors. You can add a safety
13 system that causes the accident, which is sort
14 of a perverse thing to have done. You didn't
15 reduce risk, you actually increased risk by
16 mandating that you had to have a safety system
17 that then can actually initiate an accident.

18 The issue with retrievability
19 requirements is that if you don't implement
20 them properly, you could actually be forced to
21 reverse thing because you picked a site or you
22 engineered the system in a way that it doesn't

1 perform well because you did it so that you
2 could reverse it, right?

3 So what I'd like to know is the
4 current standards. First, in terms of
5 retrievability, humans can mine virtually
6 anything out of anyplace. So it's really a
7 spectrum of difficulty. How does the current
8 standards, how do they set sort of what is
9 retrievable versus not retrievable, given that
10 it's actually just going to be really a
11 spectrum of difficulties to be able to do
12 that?

13 MR. McCARTIN: Right. And NRC's
14 current regulations do not provide a lot of
15 detail with respect to that. The discussion
16 we've had over the years about retrievable is
17 that:

18 (1) From NRC's perspective, it's
19 one done for safety, that you now have lost
20 confidence in the ability of the repository to
21 perform its safety function. And it would be
22 an unusual situation. And the regulations are

1 not intended to make retrievability easy, but
2 you don't want the capability rendered
3 impossible or impractical.

4 You're right. What makes it not
5 retrievable? And I think that the primary
6 thing would be the condition of the waste
7 package, I think would be a large part of
8 understanding is it truly retrievable. But,
9 you know, there aren't any rigid requirements.

10 MEMBER PETERSON: Right. So then
11 the second piece of the overall risk is this
12 question of how do you make the decision. And
13 so it seems to me that your performance
14 confirmation, does that defer until you've
15 emplaced everything into the repository? Or,
16 wouldn't it make more sense to have
17 intermediate steps where you learn from
18 experience so that you have off-ramps because
19 it's much less expensive to reverse if you do
20 it early, then if you emplace large amounts of
21 material? Again, we're thinking about this
22 being a better approach as to try to minimize

1 risks of high costs to reverse.

2 MR. McCARTIN: Yes. Well, that
3 would be more the Department's choice of how
4 they wanted to develop the repository.

5 In terms of NRC's perspective,
6 it's what we're interested in that the
7 performance confirmation program exists.
8 Because recognizing, let's say approximately
9 100 years from the start of construction until
10 a decision for closure, that's a very long
11 time period. And the prudent thing to do is
12 continue to conduct experiments, observations,
13 tests that challenge the basis you had for the
14 safety decision. It's not replacing it or
15 deferring the safety decision. You have to
16 have enough confidence. But continue to
17 challenge those bases.

18 You know, there's no question that
19 you would expect a project that long, after 20
20 years of excavating drifts and emplacing
21 waste, they're going to revise some things,
22 they're going to do things differently,

1 they're going to suggest changes.

2 MEMBER PETERSON: Yes.

3 MR. McCARTIN: That's all part of
4 the NRC process. The Department is free to
5 submit amendments, suggest changes, et cetera.

6 So I don't know if that's getting
7 quite to your concern. But from our
8 perspective it just is it safe? And if
9 economically it makes more sense for the
10 Department to conduct, say, a ten year pilot
11 program before they go into full, that's the
12 Department's decision. Our focus is safety.

13 CHAIR LASH: Vicky?

14 MEMBER BAILEY: Tim, thank you.

15 I see that you're also on the
16 panel next.

17 MR. McCARTIN: Correct.

18 MEMBER BAILEY: And I also was
19 looking to see if there was another NRC
20 representative this afternoon. So this
21 question may not be specific to what you do,
22 according to your title, but at what point is

1 there public involvement in your process?

2 MR. McCARTIN: Well, certainly
3 through our hearing process.

4 MEMBER BAILEY: And can you
5 explain that? Can you kind of detail that for
6 me a little bit? What's the process for that?

7 MR. McCARTIN: Well the first step
8 in the process is, certainly, our regulations.
9 And we go out for public comment and people
10 are allowed to comment on the regulations and
11 there is public involvement in deciding on the
12 regulations.

13 MEMBER BAILEY: Is there notice of
14 that? Is there a time period for that?

15 MR. McCARTIN: Sure.

16 MEMBER BAILEY: Is the notice only
17 in a specific area? How is this done?
18 Because I know the lawyers get it, I know
19 that. But how does the public get it?

20 MR. McCARTIN: Well, in terms of
21 Part 63 where we noticed in the Federal
22 Register notice and we went out to Nevada and

1 had public meetings in Nevada to seek public
2 comment and explain the regulation, what it
3 meant. We've had meetings in Nevada with the
4 local units of governments, the affected
5 Indian tribes with respect to their
6 participation.

7 The hearing process for NRC is a
8 formal adjudicatory process. And you have to
9 be allowed in as a party, so you'll have to
10 show that there's an affect on your, there's
11 a potential for harm to be in the party you
12 have to have, and you need to have an accepted
13 contention: You have to submit a contention
14 and be accepted.

15 MEMBER BAILEY: What's a
16 contention?

17 MR. McCARTIN: A contention is
18 something, people would look at the DOE
19 license application and say that they
20 disagreed with a part of that application and
21 they believe it isn't accurate.

22 MEMBER BAILEY: So I'm a citizen's

1 group. How do I involve myself in this
2 process?

3 MR. McCARTIN: Well, you --

4 MEMBER BAILEY: I'm not a lawyer.

5 MR. McCARTIN: Right. You can
6 submit a contention to the hearing and to be
7 a party in the hearing. Now some groups are
8 automatically in. Obviously, the State of
9 Nevada, they're considered a party to the
10 hearing and others. But there are other
11 groups that submit contentions or they can
12 team up with other groups and submit
13 contentions. But you do have to submit a
14 contention if you want to be a party to the
15 hearing.

16 MEMBER BAILEY: Okay. In full
17 disclosure, I'm a former State Commissioner
18 and former FERC Commissioner so I know their
19 process. I'm actually giving you an
20 opportunity just to state for the record.
21 Because this is something that we will be
22 considering as we look at how to make

1 decisions on certain of these questions. So
2 that's why I'm asking you specifically.

3 MR. McCARTIN: Sure. And
4 certainly the NRC has a website for the
5 Division of High-Level Waste Repository
6 Safety, which is doing this, that a member of
7 the public can go on there, see what's being
8 done, provide comments to the staff. There
9 are other forums. I was referring more if you
10 want to be a formal party to the hearing where
11 you have the ability to call witnesses and
12 cross-examine witnesses. But it is a fairly
13 formal adjudicatory hearing.

14 MEMBER BAILEY: So formal
15 sometimes can be intimidating, but do you feel
16 that it is transparent?

17 MR. McCARTIN: Well, anyone can
18 attend the hearings and observe. There are
19 transcripts. They are sometimes simulcast or
20 put on the web for people to view.

21 Transparent sometimes depends. I
22 think some of the contentions are very

1 technical in nature and require a certain
2 degree of understanding of that issue that
3 depending on one's background may or may not
4 be considered transparent.

5 MEMBER BAILEY: Okay. Thank you,
6 Tim.

7 CHAIR LASH: Allison?

8 MEMBER MacFARLANE: Okay. I will
9 skip my retrievability question and move right
10 on to performance assessment.

11 So, you said that between the late
12 '70s and the '90s there was great advances in
13 performance assessment experience.

14 MR. McCARTIN: Yes.

15 MEMBER MacFARLANE: And that's why
16 performance assessment was required to
17 evaluate the repository. This performance
18 assessment experience, what was it on? Was it
19 on complex earth systems, which is what you're
20 evaluating in the repository?

21 MR. McCARTIN: Yes.

22 MEMBER MacFARLANE: It was? Oh.

1 MR. McCARTIN: Well, now it
2 depends on what you mean by complex. Now I
3 will say I start --

4 MEMBER MacFARLANE: Almost any
5 earthy system is complex.

6 MR. McCARTIN: Okay. I joined the
7 NRC in 1981 to begin part of that process of
8 developing the first computer codes for the
9 development. We started with the SWIFT code
10 that the USGS developed for single-leak
11 injection. And there were certain flow codes
12 we've done. There was work at the University
13 of Arizona in unsaturated and saturated flow.
14 There was a number of programs that have
15 developed and we continue to use that
16 capability in international benchmarking
17 exercises; INTRAVAL was the last one for
18 validating transport codes for waste
19 management applications.

20 There's been a number of reports
21 over the last 20 years that --

22 MEMBER MacFARLANE: So you believe

1 you can validate these assessments?

2 MR. McCARTIN: The word "validate"
3 was used, but it's validate for the purpose.
4 And we are not in the business of saying we
5 are predicting the future. But we believe we
6 have --

7 MEMBER MacFARLANE: But that you
8 are in the business of predicting the future
9 because you're supposed to be coming up with
10 a specific number to meet --

11 MR. McCARTIN: We are not
12 predicting the future. We are judging the
13 safety of a repository: There is a
14 difference. And what we're saying is we have
15 the tools and techniques to evaluate the
16 processes between waste package lifetime,
17 degradation of the fuel, solubilities,
18 transport of the radionuclides to be confident
19 with reasonable expectation. We will never
20 have complete assurance, but reasonable
21 expectation that we believe this system is
22 safe.

1 Will it act exactly the way that,
2 say, someone is estimating it? You know, the
3 odds of that are low. We hope it actually
4 behaves much better.

5 CHAIR LASH: Senator?

6 CHAIR HAGEL: Thank you, Tim.

7 From your perspective is there
8 anything that you would add to or particularly
9 emphasize from Tom's cogent presentation and
10 chronology this morning?

11 MR. McCARTIN: I guess in summary,
12 the only thing at least from my perspective,
13 is that most of the regulations and standards
14 are in place. That I look at, you know
15 certainly from an NRC perspective, the phased
16 licensing approach, retrievability,
17 performance confirmation. There's a lot of
18 things in place.

19 What the most appropriate
20 performance measure, which is one part of it
21 has been the more debatable subject, and
22 that's the one that I think will be -- you

1 know, between the performance measure and the
2 time period, those are the two things that
3 continue to get, say, debate as compared to
4 most of the pieces are fairly stable.

5 CHAIR HAGEL: Thank you.

6 CHAIR LASH: Thank you very much.

7 We appreciate it. And appreciate the
8 comprehensive nature of the presentation.

9 Our next witness, and the last
10 witness before the break, is Jonathan Edwards,
11 the Director of the Radiation Protection
12 Division at EPA.

13 I do want to say one thing before
14 you start. I neglected to mention at the
15 beginning of our proceedings, this like all of
16 the meetings of the Committee and the
17 Subcommittees is being webcast. And also,
18 members of the public who want to participate
19 in our public comment session at the end of
20 the day should sign up.

21 Tim, where's the sign-up list.

22 MR. FRAZIER: The sign-up list is

1 right out front. See Nicole out there and you
2 can sign up.

3 CHAIR LASH: Thank you.

4 Mr. Edwards, thank you.

5 MR. EDWARDS: Good morning,
6 Chairman and members of the Commission.

7 My name is Jonathan Edwards. I am
8 the Director of the Radiation Protection
9 Division at the Environment Protection Agency.

10 On behalf of the EPA and
11 Administrator Lisa Jackson, I would like to
12 thank the Subcommittee for the opportunity to
13 provide information on the Agency's program
14 for establishing radiation protection
15 standards.

16 Previous meetings of the
17 Subcommittee and the full Commission have
18 demonstrated there is significant interest in
19 this topic. We hope that our experience will
20 serve to inform the Commission's
21 recommendations as they relate to the disposal
22 of spent nuclear fuel and high level waste.

1 However, as a regulatory agency tasked with
2 specific responsibilities in this area, EPA
3 does not believe that it is appropriate to
4 offer formal recommendations regarding the
5 form and content of future regulatory
6 standards. What I mean by this is that,
7 obviously, EPA as a regulatory agency and
8 values its independence and credibility, looks
9 at our role in this process as a very
10 clinical, detached, professional setting of
11 the standards and evaluation much like a sport
12 referee or umpire would maintain for vested
13 interest in the success or failure of a team
14 or the outcome of a game.

15 So I would like to say is you
16 should not take any statements that I'm making
17 today or that my colleagues make today as
18 advocating for or against Yucca Mountain or
19 any other site.

20 All right. I would like to begin
21 by describing EPA's overall authorities for
22 establishing radiation protection standards.

1 Reorganization Plan No. 3 of 1970

2 which created the Environmental Protection
3 Agency transferred certain functions of the
4 Atomic Energy Commission under the Atomic
5 Energy Act, and most notably the function of
6 establishing generally applicable standards
7 for protection of the general environment.
8 That's Section 2(a)(6). It's important to
9 understand two aspects of this broad
10 authority.

11 First, the general environment is
12 considered to lie "outside the boundaries of
13 locations under the control of persons
14 possessing and using radioactive material."

15 Second, this authority does not
16 extend to the implementation or enforcement of
17 the standards which typically falls to the
18 U.S. Nuclear Regulatory Commission or the
19 Department of Energy. These agencies are
20 responsible for licensing or otherwise
21 approving the use of radioactive material, as
22 well as for overseeing the operational aspects

1 of any facility under their respective
2 jurisdictions.

3 EPA has issued standards using
4 this general authority beginning with
5 standards applicable to the uranium fuel cycle
6 in 40 CFR Part 190, which was issued in 1977.
7 40 CFR Part 190 covers activities related to
8 electrical power generation from the milling
9 of uranium or through the extended long-term
10 storage and reprocessing of used fuel. It
11 does not cover transportation or disposal
12 activities.

13 EPA has also issued standards
14 pursuant to congressional directions such as
15 those required under the Uranium Mills
16 Tailings Radiation Control Act, that was 1978,
17 and we refer to that as UMTRCA, a fun acronym.
18 It always gets a laugh at briefings with our
19 senior management.

20 I would now like to discuss
21 generally the chronology of EPA standard
22 setting efforts.

1 Regarding spent nuclear fuel, the
2 Nuclear Waste Policy Act of 1982 directed EPA
3 to "promulgate generally applicable standards
4 for protection of the general environment from
5 off site releases from radioactive material in
6 repositories." That's Section 121. This
7 particular provision directed EPA to use
8 authority granted under other provisions of
9 the law and did not confer new authority to
10 the Administrator.

11 It is also important to understand
12 that under the division of responsibilities
13 laid out under this Act, EPA has no role in
14 characterizing or selecting the site, or in
15 approving the facility to operate.

16 EPA issued generally applicable
17 standards for the management and disposal of
18 spent nuclear fuel, high level waste and
19 transuranic radioactive waste in 1985 as 40
20 CFR Part 191, as you've heard Tom talk about
21 this morning. These standards were challenged
22 before the Court of Appeals for the First

1 Circuit which remanded portions to EPA for
2 further consideration in 1987. And you'll see
3 what the court's findings were there. I won't
4 go over them in detail since Tom touched upon
5 those already.

6 In 1992 Congress passed two
7 additional statutes that changed our
8 obligations regarding these standards. The
9 WIPP Land Withdrawal Act revised standards to
10 address the portions of 40 CFR 191 that were
11 remanded by the First Circuit and then applied
12 them to the Waste Isolation Pilot Plant. EPA
13 issued revised standards in 1993.

14 The Land Withdrawal Act also
15 designated EPA to implement and enforce these
16 standards for the WIPP, which is unique in
17 giving the Agency responsibilities beyond
18 standard setting. EPA issued certification
19 criteria in 1996 and approved the facility for
20 operation in 1998. WIPP and the Department of
21 Energy was able to begin operation of the
22 facility in 1999. As required by the Land

1 Withdrawal Act, the Department of Energy must
2 apply for recertification every five years.
3 EPA issued that first recertification decision
4 in 2006 and is currently reviewing the second
5 recertification application.

6 Finally, the Land Withdrawal Act
7 specifically stated that 40 CFR 191 would not
8 apply to the proposed repository at Yucca
9 Mountain.

10 The Energy Policy Act of 1992
11 directed EPA to establish public health and
12 safety standards applicable to the Yucca
13 Mountain repository. I'd like to point out
14 the difference in statutory language used in
15 the Energy Policy Act as compared to the
16 Nuclear Waste Policy Act.

17 As you know, the language in the
18 enabling legislation has a significant
19 influence on the actions of regulatory
20 agencies, so it may be useful to see the
21 differences here as the Commission develops its
22 recommendations.

1 As noted earlier, the Nuclear
2 Waste Policy Act directed EPA to establish
3 standards for protection of the general
4 environment from off site releases, which
5 provides fairly broad discretion to the
6 Agency. By contrast, the Energy Policy Act
7 specifies that EPA standards for Yucca
8 Mountain are to be "public health and safety
9 standards for protection of the public," thus
10 EPA's standards for Yucca Mountain were
11 required to specifically protect public health
12 and safety.

13 In addition, the Energy Policy Act
14 specifically requires that EPA standards
15 prescribe the maximum annually effective dose
16 equivalent to individual members of the
17 public. The Energy Policy Act is thus, much
18 more prescriptive regarding exactly how EPA
19 standards are to protect public health and
20 safety.

21 Equally important, the Energy
22 Policy Act required EPA to contract with the

1 National Academy of Sciences for a study and
2 to issue standards that were "based upon and
3 consistent with the findings and
4 recommendation of the NAS." I highlight this
5 provision because raised one of the more
6 difficult questions facing both regulators and
7 implementers of geological disposal, which is
8 the regulatory compliance period.

9 The Commission heard testimony at
10 the May meeting regarding the lengthy history
11 of the NAS in evaluating issues related to
12 geologic disposal. The National Academy of
13 Sciences issued its report in 1995, and EPA
14 followed with proposed standards in 1999. And
15 then final standards in the year 2001.

16 EPA standards were challenged on
17 several counts before the Court of Appeals for
18 the District of Columbia Court. And in 2004
19 the Court rules in EPA's favor on all counts
20 except one. The Court found that the
21 compliance period established by EPA was not
22 based upon and consistent with the

1 recommendation of the National Academy of
2 Sciences panel. The NAS recommended that a
3 compliance standard applicable to individual
4 dose apply at the time of peak risk; whenever
5 that occurs within the limits imposed by long-
6 term suitability of the geologic environment.

7 NAS concluded that the long-term
8 suitability of the Yucca Mountain site would
9 be on the order of one million years and, thus
10 it would be feasible to project future
11 exposures for compliance purposes for that
12 period of time. NAS did, however, indicate
13 that EPA may have valid policy reasons for not
14 strictly adopting the NAS recommendation.

15 EPA's concerns regarding the
16 increased uncertainty in projecting exposures
17 for periods as long as one million years led
18 it to establish a 10,000 year compliance
19 period, the same as 40 CFR 191. However, EPA
20 also required that DOE perform projections to
21 the time of peak dose and place them in the
22 Environmental Impact Statement to ensure that

1 the full record was available to the NRC and
2 the public. EPA viewed this approach as
3 consistent with the intent of the NAS
4 recommendation that long-term projections not
5 be neglected as well as with its statements on
6 its policy considerations.

7 The D.C. Court disagreed with this
8 and concluded that EPA's approach was not
9 consistent with the NAS technical
10 recommendation regardless of its policy
11 justification. The Court vacated the 10,000
12 year compliance period and remanded the rule
13 to EPA for further consideration. EPA
14 determined that its policy concerns regarding
15 uncertainty in future projections could be
16 adequately addressed by retaining the existing
17 compliance limit for the first 10,000 years
18 and then applying a different compliance limit
19 for the period beyond that and up to one
20 millions years with some additional conforming
21 changes to accommodate this extended time
22 period.

1 EPA proposed such an approach in
2 2005 and issued its final amended standards in
3 2008. These standards have been challenged
4 and the case is currently stayed pending
5 resolution of DOE's petition to withdraw the
6 license application now undergoing the NRC
7 process.

8 So in conclusion, with the
9 decision to no longer pursue Yucca Mountain as
10 the site of the repository, EPA is aware that
11 legislation will be necessary to adopt a new
12 course. At present, 40 CFR Part 191 would
13 apply to any future repository developed under
14 the general framework of the Nuclear Waste
15 Policy Act. EPA has no intention of revising
16 this regulation prior to issuance of
17 recommendations from the Blue Ribbon
18 Commission.

19 This concludes my statement. I'd
20 be happy to answer any questions that you may
21 have. Thank you.

22 CHAIR LASH: Thanks very much.

1 Vicky, maybe we'll start at this
2 end this time. No questions? Okay.

3 Allison? Per?

4 MEMBER PETERSON: Thank you. This
5 is very helpful information.

6 One issue that we face with
7 geologic disposal of radioactive materials is
8 the fact that some of these materials may also
9 have chemically hazardous components
10 associated with them too. And in the U.S. our
11 approach to regulating the disposal of
12 chemically hazardous materials is
13 substantially different from that for
14 radioactive materials. And in general, you
15 can correct me if I'm mischaracterizing
16 things, but we permit shallow land disposal of
17 chemically hazardous materials at hazard
18 levels that if they were radioactive, we would
19 require them to be replaced into a geologic
20 disposal. The issue is that therefore, things
21 that we require around chemically hazardous
22 materials can complicate significantly

1 disposal into a geologic repository, perhaps
2 without adding any value because a geologic
3 repository will provide far better isolation
4 than shallow land disposal can.

5 And so how do we treat this issue
6 that once you go into geologic disposal, the
7 chemical hazards associated with waste really
8 should be handled in a way that is consistent
9 with the fact you're getting far better long-
10 term isolation because it's going in with the
11 radioactive waste into geologic disposal? How
12 do we rework this?

13 MR. EDWARDS: That's a great
14 question.

15 Obviously, the strict hazardous
16 waste disposal regulatory scheme is covered
17 under the Resource Conservation and Recovery
18 Act, RCRA Act. And the sub-title C part of
19 RCRA deals with the requirements, the designs
20 for these hazardous waste materials for the
21 chemical disposal.

22 And you're right, they're not the

1 deep geological sites that we see examined and
2 looked at for radiological high level waste
3 and spent nuclear fuel. But they do have
4 fairly strict non-migratory requirements
5 around those particular landfills. And
6 modeling that does take them out for several
7 periods, certainly for the first thousand
8 years and out to even 10,000 years. But sort
9 of the reconciliation between the way we deal
10 with risk assessment and risk management and
11 regulation of chemicals and radiological
12 elements is an area that the agency's been
13 interested in for a while. In fact, about ten
14 years ago we contracted a study with the
15 Environmental Law Institute to take a specific
16 look at this. And it was important in the
17 sense of each of the different risk assessors
18 and risk managers understanding better the
19 processes.

20 I can't say that there's an easy
21 answer, though, for the question you've posed.
22 What I'd say is EPA would continue to seek

1 input from scientists, technical experts on
2 this particular issue. It certainly would
3 involve environmental groups and the public
4 and whatnot in this kind of debate. But at
5 this point there's no easy answer for that
6 particular question.

7 CHAIR LASH: I have two policy
8 level questions for you. It seems highly
9 likely that the Commission's recommendations
10 will require that Congress go back and reopen
11 the Nuclear Waste Policy Act. In light of
12 that, and in light of the 30 years experience
13 that the Agency now has in trying to develop
14 a set of regulations, do you have thoughts
15 about guidance that you would like to have
16 from Congress that would make this process
17 easier?

18 MR. EDWARDS: Well, certainly it's
19 obvious with most folks that some difficulties
20 over the last few decades deal with wrestling
21 with this very complex and technical issue,
22 and the need to weigh and balance a lot of

1 different scientific expertise that's offered
2 and recommendations. And, of course,
3 accommodate the interests of the public and
4 environmental groups, state and local
5 jurisdictions, the tribes and all that. So,
6 it's obviously a very difficult process to go
7 through.

8 I think against drawing back from
9 Yucca Mountain and speaking generally, success
10 could be seen in basically four different
11 approaches, I think.

12 First, the fact that you would go
13 into it with existing environmental standards
14 in place very early up in the process. We do
15 have the advantage now of looking at 40 CFR
16 191 as the standing applicable regulation
17 which has proven to be an effective regulation
18 since the Waste Isolation Pilot Plant is run
19 under that, there's a facility at the Nevada
20 Test Site that is under that regulation. And
21 so it's proven to be a workable, successful
22 regulation.

1 So I think knowing up front what
2 the environmental standards are so that the
3 site investigators, the site characterizers,
4 the site selection, the system design all the
5 way up and through construction operation,
6 closure and post-closure are informed very
7 early on on what environmental standards
8 they'll be held to and what will be required.

9 The second item I'd say is the
10 importance in the process of a public
11 involvement; the opportunity very, very early
12 on and frequently during the process for state
13 and local jurisdictions, for the effected
14 citizens, for national interests to be heard
15 in a public process.

16 Third, ideally it'd be a nice
17 situation to have multiple sites, or several
18 sites that you could look at and go through
19 and do the technical evaluation and look at
20 the merits of each particular site, and then
21 the country could make its decisions based on
22 looking at several of those different sites.

1 And then lastly, I would say that
2 -- and I know the Commission probably already
3 appreciates this, but I would highlight that
4 within the legislative language the more
5 binding the roles of the different functions
6 in that language, and there could be
7 attentions behind that, because it's binding
8 on the back end or when the Agency or agencies
9 go out through the Administrative Procedures
10 Act soliciting comment and input during the
11 regulations. So people should not interpret
12 this as showing a lack of appreciate, for
13 example, for the National Academy of Sciences
14 or other advisory groups. But just
15 understanding that the more specific you get
16 with the rules up front in the legislation
17 about what has to be complied it when you get
18 down to the procedures that we go through as
19 far as public notification, soliciting
20 comment, weighing and balancing the particular
21 comments the Agency becomes more restricted in
22 our ability to respond to those things through

1 the Administrative Policy Act.

2 So again, this is not to question
3 Congress' intentions when they write those
4 particular laws, but I'd like to just
5 highlight that as a particular thing to
6 consider.

7 CHAIR LASH: One other policy
8 question, then. You may not want to get into
9 this. But listening to Tom's presentation
10 about the complexity of the process and to
11 some of Per's and Allison's questions, it
12 strikes me that the division of responsibility
13 between EPA and NRC, which is basically at the
14 boundary of the site, is unusual. It wouldn't
15 apply in the Clean Air Act. In the Clean Air
16 Act you would promulgate regulations that
17 affected the operation of the facility that
18 created the risk, not just the risk at the
19 boundary. And that creates some of the
20 complexity we've seen.

21 Not speaking for your
22 Administrator, not speaking for the Agency but

1 recognizing we have to think about that and
2 how to resolve that complexity, do you have
3 any guidelines for us as we approach those
4 issues?

5 MR. EDWARDS: Well, as you know
6 the long which set up the Waste Isolation
7 Pilot Plant designated to EPA the authority to
8 determine the compliance criteria and go
9 through the certification process and
10 recertification process. It was not easy, but
11 EPA was able to work closely with DOE and
12 resolve items as we go along, as well as
13 collecting public input and scientific input,
14 and travel input along the way. So that's
15 gone well.

16 And you look at the timing in the
17 '90s, too. We were able to move fairly
18 efficiently into the final resolution of 191
19 into the 194 role, which is the compliance
20 criteria and then into approval from just the
21 Land Withdrawal Act and Energy Policy Act of
22 '92 into approval of DOE's site in 1998 and

1 then operation in 1999. So we've learned a
2 lot from that, and it went well. But that's
3 not to say that we don't have a lot of respect
4 for our NRC colleagues, and they have a large
5 staff that has a lot of experience and
6 expertise in this area. And we've worked well
7 with them over the years and with the Yucca
8 Mountain rule, too.

9 So, we would follow, obviously,
10 whatever the enabling legislation is in this
11 area. So you've got sort of two examples you
12 can look at: The WIPP, Waste Isolation Pilot
13 Plant and the roles that were there and the
14 Yucca Mountain scheme.

15 But again, one last point I would
16 say is that in being the regulator in the
17 sense of compliance criteria, development and
18 certification and recertification that also
19 has given us insight and informed us in our
20 abilities to write regulations, too. So that
21 has been sort of a positive feedback loop.

22 But, again, we would follow the

1 intent of Congress and the legislation.

2 CHAIR LASH: Per, do you want to
3 follow-up?

4 MEMBER PETERSON: A quick follow
5 on. Could you characterize -- I mean, you
6 actually mentioned this. But there's now been
7 experience from the licensing, construction,
8 operation of WIPP. How valuable is that? And
9 then there's also conjecture sometimes about
10 changing the mission for WIPP and such. But
11 it seems to me that it provides also
12 opportunity to gain experience with closing a
13 repository, which is also a technically
14 complex thing to do.

15 So maybe to describe a little bit
16 what have we learned from WIPP and does that
17 put us in a better place to develop standards
18 and to move forward with developing new
19 disposal facilities?

20 MR. EDWARDS: Yes, I think the
21 WIPP would be a very good case study for folks
22 to consider and look at. Obviously, it's been

1 operating now for 11 years. After going
2 through the very difficult site selection and
3 characterization process, and the site design
4 and development, and then moving into
5 construction and operation it's been operating
6 for 11 years. And it's operating with a
7 fairly safe track record. That's not to say
8 that EPA is here advocating for the WIPP, but
9 certainly the process has gone well.

10 I would say that some of the
11 advantages that WIPP process had for EPA is
12 that, again, since 191 was out there and we
13 were going through the updated remanded
14 portions, fairly early on the WIPP was able to
15 understand what kind of environmental
16 standards it would have to meet. And then
17 also learned the criticality of getting in
18 very early and talking with the local groups
19 and, obviously, the state government and
20 affected tribes.

21 One of the advantages I think the
22 WIPP site had is generally they had local

1 support for the facility. And that the state
2 government was not necessarily advocating for
3 it, but was somewhat neutral in the process.
4 So that was an additional factor in our
5 experiences at the WIPP.

6 But I think I'd wrap up by saying
7 that it's taught us the absolute necessity of
8 being very, very close in and talking to the
9 regulated party, DOE, very frequently to
10 understand every step along the way. You
11 know, the parameters they're looking when they
12 add, and the different approaches they use in
13 their performance assessments; all the
14 different factors they submitted in their
15 certification and recertification package.
16 And that's not to say that we, as the
17 expression is, go tribal with them. But we
18 have a lot of very, very productive
19 conversations very frequently.

20 In fact, just off the top of my
21 head, we meet with the DOE management, senior
22 level management around the WIPP at least

1 three to four times a year, sometimes even
2 more frequently, to talk through these issues.
3 These are the activities that EPA does around
4 the WIPP, are posted on the web, there's
5 opportunities to meet with us when we go out
6 to Nevada, we set up stakeholder meetings most
7 of the trips that we go out there. So, again,
8 there's these practices that contribute to the
9 success of what we're doing.

10 CHAIR LASH: Thank you very much.
11 We appreciate your joining us here this
12 morning.

13 We are going to take a coffee
14 break. It's scheduled to end at 10:15. We're
15 running a little behind, but let's start again
16 at 10:20.

17 (Whereupon, at 10:07 a.m. the
18 above-entitled matter went off the record and
19 resumed at 10:22 a.m.)

20 MR. FRAZIER: All right. We
21 should go ahead and get started.

22 CHAIR HAGEL: Thank you.

1 Welcome to our panelists this
2 morning.

3 This panel that I will introduce
4 will provide a range of perspectives regarding
5 the regulations for deep geological
6 repositories.

7 With us we have Dr. Mark Peters.
8 Dr. Peters, thank you. Who is Deputy Director
9 for Programs at the Argonne National
10 Laboratory.

11 Dr. Robert Budnitz, Staff
12 Scientist at the Lawrence Berkeley National
13 Laboratory. Doctor, thank you.

14 Dr. Warner North, President and
15 Principal, NorthWorks, Inc; Consulting
16 Professor, Stanford University.

17 Dr. William Murphy, Professor at
18 the Department of Geological and Environmental
19 Sciences at the California State University.
20 Thank you.

21 Daniel Schultheisz of the Office
22 of Radiation and Indoor Air, Radiation

1 Protection Division at the EPA.

2 And our last panelist who is our
3 old friend and familiar as of an hour ago to
4 this room, Tim McCartin from the NRC who will
5 participate in the discussion after each of
6 you have an opportunity to make presentations.

7 Thank you again, each of you.

8 Dr. Peters, I'll ask you to begin.

9 DR. PETERS: Thank you, Senator.

10 It's a pleasure to be here.

11 So, I've put together some slides.
12 I guess the luxury of being first, probably
13 good and bad both. I'm going to actually go
14 through each question and just provide a quick
15 perspective on each one. Like you say,
16 hopefully it'll -- some of it's going to be a
17 little bit repetitive because what I heard
18 this morning, I actually agree with some of
19 what I heard this morning.

20 So, first of all, let's start with
21 sort of an introduction. And this follows on
22 the discussion you started having with Tom

1 during his presentation.

2 There's the existing generic set,
3 the 10 CFR 60 and 191 regs that are general or
4 generic. And then you also have the site-
5 specific effort. I do totally agree with
6 Tom. There is things in the site-specific
7 regulations that are of broader applicability
8 that can be brought into the general set when
9 we go forward and update the regs. I'm of the
10 opinion you've absolutely got to go update the
11 regulatory basis to allow us to move forward
12 in whatever direction we go.

13 I'd also say, recognizing this is
14 a Disposal Subcommittee and I know you have a
15 much broader charter, the disposal piece is a
16 very important part of the fuel cycle, but
17 there's a lot of other parts of the fuel
18 cycle. And I know you're talking about the
19 regulatory basis for all pieces. I could
20 imagine, actually, an integrated regulatory
21 basis. That may be a very difficult thing to
22 do in policy space, but technically I think it

1 would allow us to have much more flexibility
2 to make decisions going down to the road.

3 To the specific questions, first
4 on time frame. Again, we heard this a bit
5 from the speakers this mornings.

6 There's evaluating behavior of
7 future humans on the time scale of one million
8 years. To me, it's just not possible.

9 I also don't think when you get
10 out to a million year time frames to have
11 quantitative demonstrations of compliance are
12 also not defensible, in my view, technically.
13 All the uncertainties, among other things, the
14 uncertainties become so large it's very
15 difficult to support a rational decision
16 making process.

17 I do think quantitative
18 demonstration of compliance is important. I
19 think few to several thousands of years --
20 notice I say few to several thousands. You
21 can argue is it a thousand, is 5,000 is it
22 10,000. We heard this morning about why

1 10,000 made sense in terms of discriminating
2 between sites, et cetera, et cetera. I'll
3 also remind you that internationally there's
4 strong precedent for that 10,000 year limit,
5 not only in the U.S. basis but also in other
6 countries' regulatory basis, and also in what
7 the IAEA and the NEA do. So, there is a sound
8 basis out there for that number. I think we
9 can debate about whether it would be a little
10 shorter. But in terms of going out to a
11 million years, I'm trained as an earth
12 scientist and so we're not about predicting
13 the future, we're about understanding the
14 past. But I do think that you can think about
15 in a qualitative -- I'll call it a qualitative
16 sense about the stability of a site, what the
17 evidence from the site tells you about how it
18 might perform over time; how it's performed in
19 the past and how it might perform forward in
20 a qualitative matter. So as opposed to having
21 a quantitative dose standard out to a million
22 years, I would go for much more of an argument

1 that the regulatory requires the license to go
2 through a qualitative demonstration of why the
3 site still makes sense.

4 That could be somewhat subjective,
5 and so the regulations will have to be
6 carefully worded. But I do think that that is
7 incumbent upon the licensee to do that.

8 That, to me, isn't as strong in
9 the current regulatory basis as it needs to
10 be.

11 In terms of how you demonstrate
12 compliance, I'm not an expert in performance
13 assessment. I'm actually an experimentalist.
14 I did field testing and lab testing, but I've
15 spent a lot of time thinking about the science
16 of performance assessment. And do find the
17 approach that's taken with features, events
18 and processes it's a sound process. And I
19 think it's an important part of what we need
20 to do to demonstrate compliance. It needs to
21 be underpinned by experiments and process
22 models. But I would also, and the second

1 bullet sort of gets to what I was alluding to
2 previously, there's other way of supporting
3 the safety case that aren't just a
4 quantitative performance assessment. So we
5 need to bring those other multiple lines of
6 evidence in, much more into the regulatory
7 framework than we do today.

8 Like we already talked about, as
9 we evolved from the generic set to the site-
10 specific set, that's where we limit it to a
11 more risk-informed performance-based
12 approached. And I think that's sound.

13 Without subsystem performance
14 criteria, Tim talked about that, I think
15 that's something that needs to be brought into
16 the general set going forward.

17 And finally, continuing to
18 describe both the multi-barrier concept,
19 defense-in-depth concept needs to absolutely
20 to be preserved. We don't want to get into
21 the situation where we're licensing
22 engineering around a bad site, that's for sure

1 going forward.

2 What about retrievability? We
3 already heard that it encompasses safety,
4 particularly from the regulator's perspective
5 and also resource recovery. I don't see
6 retrievability just going away. I don't see us
7 just throwing it away. I think Per actually
8 was headed in the right direction. I think it
9 needs to be a flexibility framework. We can't
10 be in a situation where we're actually picking
11 a site because it's retrievable but it doesn't
12 maintain long-term waste isolation like we
13 need. And this is, I think as Tim said, the
14 requirements right now are fairly general. In
15 order to get a flexible approach to
16 retrievability it will require more detailed
17 thought and the regulations have to be very
18 carefully thought through. But I think it
19 could be fit into staging also as you go
20 forward.

21 What about international
22 experience? I've already alluded to this.

1 There's extensive experience. You've got the
2 IAEA, the NEA and then you've got county-
3 specific efforts. You've probably seen
4 tabulations of all that's gone on in
5 regulatory in terms of establishing regulatory
6 frameworks for high level waste disposal and
7 spent fuel disposal. So I think we should
8 rely on that going forward. I think we have,
9 but I think we can even rely on it more, and
10 that's in many areas of staging, or adaptive
11 management, demonstration of compliance. PA
12 is an accepted approach to part of the way we
13 demonstrate compliance international. Level
14 of protection, which I'm not going to talk too
15 much right now anyway. And then also time
16 frames.

17 What about staging? So the
18 statutory structure of the NWPA framework as
19 well as the regulations have some forms of
20 staging in it vis-...-vis two-stage licensing.
21 Just for example, at Yucca Mountain
22 construction authorization followed by license

1 to receive and possess, ultimately followed by
2 a license to close. So there's pieces there,
3 although I would argue that that's not really
4 embracing adaptive management in the way you
5 hear people like Tom Isaacs talk about, or the
6 Academy talk about it in 2003. So I think
7 it's important as we go back to these generic
8 regulations to ensure that we actually
9 absolutely incorporate learn-as-you-go and
10 staging adaptive management in the way that
11 it's really meant. And that would include how
12 you interact with the regulator through that
13 process. Not the public, of course, but also
14 the regulator.

15 What about other geologic
16 repositories, other concepts, and how do you
17 do it? Do you need, I'll call it, concept-
18 specific regulations as opposed to site-
19 specific regulations?

20 An example that was given was bore
21 holes, and that's probably a good one. That's
22 kind of a good one to talk through. I would

1 argue, and it's not so different than the
2 site-specific argument.

3 I would much rather see us try to
4 develop a flexible set of regulations that
5 would allow us to think about a range of media
6 and concepts. That allows us to compare
7 between alternatives. Also keep that public
8 confidence. I think if you go down starting
9 setting concept-specific regulations like you
10 did with site-specific, I think you start to
11 perhaps lose that public confidence that we
12 really need going forward in kind of a staging
13 approach. And then it also optimizes, I
14 think, the way you go about screening,
15 selecting and ultimately licensing a site.

16 We heard this, I think, a bit in
17 the Q&As this morning. We really need to
18 setup this framework before we embark on the
19 program. You don't want to get into a
20 situation like we already went through where
21 you're back -- it's all my words -- we're back
22 fitting regulations as the process plays out.

1 So you'd like as much as you could to have
2 that up-front.

3 What about other regulatory
4 issues? I'm not going to touch the dual reg
5 with RCRA, at least in my comments. We can
6 talk about that during the Q&As.

7 I did want to plant the seed about
8 waste classification. And this is, actually,
9 important fuel cycle more broadly. The
10 current waste classification system as its
11 articulated in the regs and the statutory
12 framework is source-based rather than risk-
13 based. And there's a lot of activity going on
14 right now at the NRC, both in the high level
15 waste space, low level waste space. DOE's
16 looking at their own regulations. The IAEA
17 has a very nice safety guide out there that
18 articulates the need for a risk-based approach
19 to waste classification. So I would actually
20 argue that that should be on the table as part
21 of this. And I'm a strong advocate for a
22 risk-based approach to classification because

1 I think once we go down the path of down
2 selecting to a fuel cycle, this will really
3 allow us to develop an optimized system for
4 how we actually dispose of the waste streams
5 that come out of whatever fuel cycle we embark
6 on.

7 I believe that's it for me.

8 CHAIR HAGEL: Dr. Peters, thank
9 you.

10 Dr. Budnitz?

11 DR. BUDNITZ: Why do you run?
12 Because I only have ten minutes.

13 My name is Bob Budnitz. I'm an
14 employee of the University of California's
15 Lawrence Berkeley National Laboratory. It's a
16 DOE lab, and hence I work for DOE, except I
17 don't. I'm here on my own time. DOE isn't
18 paying me today. University of California
19 isn't paying me today. So what I'm about to
20 say doesn't represent at all, necessarily, any
21 position except Bob Budnitz's.

22 Secondly, you should know that

1 what I basically do for a living is reactor
2 stuff. I've been in the waste business for 30
3 years, but it's a small fraction. I'm a
4 reactor guy. Almost all the research I'm
5 doing at the Lawrence Berkeley Laboratory
6 today is funded through DOE, but by NRC. I
7 need to tell you that because when I say
8 something nice about NRC, you have to know
9 they're my sponsor. I'm unabashed, but I need
10 to tell you that.

11 Now in ten minutes I can only say
12 Mark did great; he said 13 things. I'm only
13 going to say three things, maybe two.

14 The first has to do with
15 analyzability. I am firmly convinced today
16 that for the purposes of demonstrating
17 compliance with a sensible regulation that
18 deep repositories of the kind that are
19 discussed all around the world can be analyzed
20 for those purposes. And I know that Allison
21 MacFarlane and I disagree about that. I want
22 to tell you Bob Budnitz's opinion that Allison

1 is in a minority in that view. I'm saying
2 that straight to her, and I told her in the
3 break I would.

4 The vast majority of people who
5 have worked in this business for a long time
6 believe that we can predict the future. Heck,
7 I can't predict day after tomorrow, but we
8 have certain scientific methods. It is the
9 opinion of the vast majority, which I share,
10 for the purpose of demonstrating compliance
11 with a sensible standard, and no standard for
12 a period time I'm going to talk about in a
13 minute, that analyzability is here. We can do
14 it. We do it. This is internationally
15 understood. Overseas people are doing it.
16 And that is, in fact, my view and I know
17 Allison disagrees. And I'm telling you what
18 I think the community thinks about that, and
19 there are other members of the community can
20 talk about what they think.

21 Now, the problem is how far in the
22 future. I am firmly convinced that it is easy

1 to do a 1,000 years. Heck, anybody that
2 doesn't have a canister that lasted a 1,000
3 years shouldn't be allowed. By the way, that
4 would allow you to put it under Central Park
5 or under Golden Gate Park, which we don't
6 want. But in fact, a 1,000 years is easy. Do
7 it with a canister.

8 Ten thousand years using the
9 interaction between the engineered system and
10 the, of course, the environmental conditions.
11 I believe that eminently doable against a
12 sensible regulation. And if you ask me what
13 I think about the period of performance, I
14 think and have thought for 30 years since the
15 Science Advisory Board of EPA that I was on
16 recommended this, that a 1,000 years is fine
17 in terms of how long we need to protect our
18 progeny against this stuff considering that
19 we're putting stuff in San Francisco Bay now
20 that's going to get out in a 100 years, or
21 500. But I understand 10,000, I'm not going
22 to argue with that because, in fact: 10,000

1 enables you to discriminate a good from a bad
2 site; 10,000 isn't hard to do; 10,000 isn't
3 expensive to do, we can do that analysis.
4 However, a million years? Ridiculous.
5 Preposterous. Let me describe.

6 In way less than a million years,
7 if the past is a predicate for the future, the
8 whole northern U.S. is going to be under
9 hundreds of feet of ice. There will be no New
10 England where I was raised. There's no
11 Chicago. And this regulation would say you
12 can't put something someplace because it's a
13 few millirem above some standard half a
14 million years from now and you have to invest
15 extra money to make that true. Crazy. That's
16 crazy as a matter of public policy to me.

17 And we're not spending even \$10,
18 never minding enough, to plan for that. And
19 as Allison said to me in the break, how about
20 Florida being under water in 200 years? Who
21 is planning for that? And yet this regulation
22 we have now -- you can finish that sentence.

1 I just think it's preposterous.

2 The analyses is doable with
3 conditions. I mean, uncertainties get big.
4 There's a whole lot. But it just doesn't make
5 any sense as a public policy.

6 Next point -- and I just think
7 that's way beyond.

8 Next point, and I don't have a lot
9 of time here so I'm cut and go straight to the
10 point. In my view, the idea that we have
11 three agencies, federal agencies, setting the
12 regulatory scheme for this is nuts: EPA,
13 generally applicable standards; NRC to write
14 the regulations against which a repository has
15 to meet; DOE setting the site standards, Part
16 960 or 963, whatever. I don't understand
17 where it came from. I lived it, but I don't
18 understand the public policy purpose for
19 having three agencies. It doesn't make any
20 public policy sense.

21 One agency should be charged with
22 setting the regulations and with enforcing the

1 way we do with most everything else.

2 By the way, in some schemes we
3 have states, but I don't think the states
4 should play in regulation here. We have
5 federal preemption for a reason.

6 It ought to be one agency. And I
7 don't mind telling you that my favorite is the
8 NRC. First, the NRC with its Commission
9 system has an independence from the political
10 process that is not true at EPA where the
11 Administrator reports to the White House. It's
12 not true of DOE where the Secretary is a
13 Cabinet member, they come and go without
14 terms.

15 The EPA and the NRC have technical
16 competence, as does DOE. After all, everybody
17 working there are feds. They're presumably on
18 her majesty's service, and I trust their
19 capability and their motivation, and their
20 good intentions but in fact, having three
21 agencies is crazy.

22 Now let me tell you something

1 about the NRC. Not just in the waste area,
2 but all the way through. For decades they
3 have demonstrated a technical competence and
4 an independence, and a non-politicized
5 approach which is very precious. And if you
6 want to try to -- you recommend, or the
7 Congress decides to put that someplace, the
8 country would be fortunate if wherever it's
9 put could establish that combination over the
10 years. We've already got it. Have a new
11 agency or a new place? It would be really
12 hard to establish the independence and the
13 technical competence, and the follow-through
14 and all the things the NRC has demonstrated
15 over the years.

16 By the way, some people don't like
17 them because they make decisions they don't
18 like. People that hope no reactors should
19 ever run don't like them because they get up
20 and put their clothes on and they run. But
21 their reputation is stellar, in my view. Of
22 course, I've told you they're supporting me so

1 I don't mind saying that. But I think that if
2 you think hard about what the public policy
3 purposes of having any other agency monkeying
4 around in this business, you'll recommend that
5 that be eliminated.

6 One last point, because I only
7 have another minute.

8 Way back, I was the Director of
9 the NRC's Office of Research at a time when we
10 had \$200 million, which today would be \$500.
11 Of course, the budget is now 20 percent of
12 that because of things that have happened.
13 That was in 1980. And I've been involved with
14 them ever since, off and on, and they support
15 some of my research. And it is my belief that
16 the technical competence of the NRC's Office
17 of Research supplemented by the technical
18 competence in the regulatory offices like NMSS
19 that Tim is in and the reactor people, is such
20 a strong resource that the tragedy is they
21 haven't been supported as well by the Congress
22 as they should be. And part of that is

1 because, if you don't mind my saying, because
2 they're rate recovery business put the NRC's
3 budget in a rate base and the reactor people
4 went and said "Lower their research budget,"
5 which was half of the budget, "so our fees
6 would go down." You don't mind me saying,
7 it's candid, it's what happened.

8 So the NRC's Office of Research
9 went down from here, to here, to here, to
10 here, to here. And if you look at the
11 research that Brian Sheron, who was here
12 yesterday, I suppose, can support, the amount
13 of research just counting noses and with
14 inflation, is less than 20 percent of the
15 amount I could support 30 years ago when I was
16 its Director. The other 80 percent is gone.
17 What a loss.

18 It's not very much money, a couple
19 hundred million. It's a huge increase in the
20 confidence of the Government, and therefore
21 our society, to understand these issues.
22 Okay? I say that with all due respect. I

1 told you they support me.

2 Now, a couple of other things I
3 want to say. I've been involved from the
4 beginning. When I was the Director of
5 Research and the Deputy before that when Part
6 60 was under consideration in 1979 and '80, I
7 was the Director of Research at the top of the
8 Agency; there are only three statutory
9 offices, I had one of them, when we were
10 debating what Part 60 should have in it. And
11 a couple of years later when EPA came out with
12 a draft 191, there was a Science Advisory
13 Board Subcommittee that I was on which advised
14 the Administrator of EPA about that. They
15 didn't follow our recommendations. I was on
16 that Academy Committee. I was on a review
17 committee for a decade with Tom Cotton and Tom
18 Pigford and others looking at WIPP. I've been
19 involved in this thing off and on for, I don't
20 know, 30 years with all sorts -- I've advised
21 EPA about their 197 standard. Even though I'm
22 a reactor guy, I've been involved for a long,

1 long time. And I want to tell you, good hard
2 working people working very, very diligently
3 with the best interests of the public in mind
4 have in many instances been stifled by the
5 clumsiness of this cockeyed scheme that
6 Congress put in place. Okay?

7 By the way, it was historical. In
8 the EPA enabling legislation they inherited
9 the old FRC, Federal Radiation Council
10 guidelines about generally applicable. So they
11 got it. Meanwhile, it had been in the AEC,
12 but they took it to them. And then when it
13 came to AEC splitting, they never got it back
14 to NRC. It's nuts. It's history.

15 DOE's siting thing, Part 63 later
16 changed. Came from the time when there were
17 going to be nine sites and they had to compare
18 them. But, you know, that should have been
19 all the way a regulatory, not the developer's
20 scheme. It just doesn't make any sense. And
21 yet we wrestled with it. And most of the
22 clumsy intellectual work that came out was a

1 direct result of the fact that politics and
2 industry, and the like -- can't go against
3 that, but I'm just telling you. Have lead to
4 this stifling of what good hard working people
5 have been trying to do to come up with
6 sensible regulations.

7 Okay. I'm done.

8 CHAIR HAGEL: Dr. Budnitz, thank
9 you for your mushy commentary. We appreciate
10 your --

11 DR. BUDNITZ: We're even.

12 CHAIR HAGEL: I know that Allison
13 will probably have something to say later on.

14 DR. BUDNITZ: She and I have known
15 each other for a long while.

16 CHAIR HAGEL: You have fulfilled
17 every expectation we had already about our
18 panel. So, thank you.

19 DR. BUDNITZ: Am I done?

20 CHAIR HAGEL: Well, I don't think
21 so. You're probably not. But right now
22 you're done.

1 DR. BUDNITZ: I'm fine. Thanks.

2 CHAIR HAGEL: But we'll get back
3 to you. Yes. Yes. Thank you. Thank you.

4 Dr. North, you may assume the
5 podium, or sit there, or dance, or whatever
6 you'd like. Welcome.

7 DR. NORTH: I think I will sit
8 here and I will not dance, and I will not
9 sing.

10 I thank the Commission for
11 inviting me to appear here. I appear here as
12 an individual. And what I will say, I say on
13 behalf of myself rather than any organization
14 with which I am now or in the past have been
15 associated.

16 I have put up the six questions
17 that were posed. I'm going to speak generally
18 about these, especially the first two in ten
19 minutes. Given the complexity of the
20 regulatory situation and its history that you
21 have heard, I cannot possibly go into detail.
22 But I would like to make some points about

1 major themes, and I will do that within my ten
2 minutes.

3 I had the honor in 1999 with an
4 international conference leading to the 2001
5 National Academy report "Disposition of High
6 Level Waste and Spent Nuclear Fuel." We
7 started with an international conference
8 involving about 200 people, I think a dozen of
9 which are participating in this meeting today.
10 We had 17 countries represented. And then a
11 group of us chartered by the Academy, 12
12 representing seven countries, put together
13 this report.

14 I'd like us to reflect what does
15 the cover picture represent? I suspect maybe
16 one of you on the Commission might have a good
17 guess. It's a picture to illustrate geology
18 and a major point in the geology.

19 In the front piece of the report
20 there is a quote that goes with the cover art,
21 and as Chairman one of the few things that a
22 chair can do unilaterally within the National

1 Academy system is choose the cover art and
2 explain what it represents.

3 So, the movie the "Gladiator" had
4 just been playing and I looked up some history
5 of Marcus Aurelius, and here is the quote.

6 "Time is a sort of river of passing events, as
7 strong as its current."

8 Well, does modern science and our
9 understanding of geology endure much of what
10 we understand has been developed in the last
11 50 to 100 years, or does it get swept away?
12 Now this was said 2000 years ago.

13 When we look at this landscape
14 created by glaciers, the last of which was
15 about 11,000 years ago, I think it gives us a
16 sense of geological time versus human time.

17 At our 1999 workshop I thought one
18 of the best lines was: "What can you trust:
19 rocks or people?" In geology we've learned to
20 understand what happens with rocks and water
21 moving through them as events occur over time
22 scales of the order of a million years.

1 Predicting how people will behave, even on a
2 time scale of a year or a decade, certainly
3 for a century or a millennium, is extremely
4 hard and we have very little basis on which to
5 make such predictions.

6 Now let me turn to performance
7 assessment, which is the area of my expertise.
8 I'm trained in risk and decision analysis.

9 In this report there is very
10 extension discussion of what is performance
11 assessment and how does it relate, not just to
12 the situation in the United States, but all
13 the various countries that are trying to
14 develop repositories as a long-term solution
15 for high level waste. The report concluded
16 that geological disposal is the only long-term
17 solution and we very carefully used the term
18 "disposition" to mean active management before
19 a repository was sealed.

20 Now there are many themes in
21 modeling and performance assessment, and this
22 will get into the Budnitz/Commission

1 MacFarlane debate, et cetera. In my limited
2 time I will give you one quote written in the
3 first report of the Nuclear Waste Technical
4 Review Board when I was an initial member of
5 this organization, and we wrote our first
6 report to the Secretary of Energy and the
7 Congress on performance assessment.

8 I will note a few themes which
9 I've highlighted here. First of all, you
10 can't just do it by data collection. It
11 involves models and expert judgment. It is an
12 extremely process to try to make an assessment
13 of what I will call the safety case for a
14 repository.

15 We criticized the Department of
16 Energy in this statement because we didn't see
17 enough about peer review. Our organization
18 was, I believe, set up at the instigation of
19 your fellow Commissioner Phil Sharp when he
20 was serving in Congress. And I feel
21 reflecting on my own experience with it for
22 several years and its history ever since,

1 which my colleague can discuss next, that this
2 institution was a very valuable addition to
3 the overall process.

4 So, we need peer review. And we
5 need to be able to deal with the
6 controversies, how the public sees the
7 acceptability of a nuclear waste repository or
8 a storage site.

9 There is a great deal that has
10 been written on social trust and credibility.
11 You will hear some of this in the second panel
12 today. I've listed a few things which I think
13 would be extremely useful background for you
14 if you haven't read them, including Chapter 5
15 of this report.

16 I will now go to the six
17 questions. In my judgment, with respect to
18 Yucca Mountain in particular and to a much
19 lesser extent on other sites, I believe the
20 present regulations are adequate and is a
21 decision criterion for the application for a
22 construction license. I believe that the

1 Nuclear Regulatory Commission is extremely
2 sophisticated. And I think you've heard from
3 my colleague, Dr. Budnitz, on that. I support
4 that. The state of this art has gone far
5 enough that I think a reasonable decision can
6 be made on that license application. I hope
7 that decision process goes to a conclusion
8 because I think to the extent it identifies
9 problems, it would be a very useful learning
10 exercise even if Yucca Mountain does not go
11 forward.

12 Point Number Two: I believe that
13 relying on regulations and compliance with the
14 regulation is inadequate for having the
15 enduring consensus among the public and the
16 political leadership that we'll need over a
17 time scale of the order of many decades to a
18 century for the process of selecting a site,
19 getting a construction license and placing
20 waste, and then the final decision to seal the
21 repository and stop active management.

22 Now with respect to other points,

1 I favor flexibility very strongly, and
2 therefore I favor retrievability. And I favor
3 a phased approach to developing a repository
4 with adaptive management and many decision
5 points. Details are laid out in this report,
6 and many other documents.

7 I will conclude my ten minute
8 presentation, I think I'm still on time, with
9 this quote from the 2001 report. "Measured
10 against the frequency of changes in government
11 leadership in democratic societies, the time
12 necessary for implementing the high level
13 waste policy is extremely long. For a policy
14 to remain place over this period, it must have
15 broad and enduring public support."

16 Think about regulating our airline
17 industry to achieve the kind of exemplary
18 safety record that they have achieved. That's
19 been done with extreme diligence to learning
20 and adapting, and re-engineering both the
21 human side and technical side. I would submit
22 we need a similar process. Extreme diligence

1 in getting good science and engineering,
2 transparency involving the interested and
3 affected parties in the decision process, and
4 in understanding the basis for decisions. And
5 doing this is an evolving way with the science
6 over the long time period involved.

7 Thank you very much.

8 CHAIR HAGEL: Dr. North, Thank
9 you.

10 Dr. Murphy?

11 DR. MURPHY: Thank you.

12 I've probably given thousands of
13 lectures, and I've never read one. But given
14 the circumstances today, I'm going to read
15 this. It's unique in that regard.

16 I appreciate this invitation and
17 the opportunity to share my ideas with the
18 Commission.

19 I'm a geochemist and a Professor
20 geological and environmental sciences at
21 California State University, Chico. I've
22 worked on problems of geologic disposal of

1 high level nuclear waste for about 25 years.
2 And I advocate permanent geologic disposal as
3 a feasible and proper solution to the problem
4 of high level nuclear waste.

5 I'm currently a member of the U.S.
6 Waste Technical Review Board, which is
7 supporting my participation here. I'm very
8 grateful for that support. And I'm very
9 pleased to be on that Board. It's been very
10 rewarding for me. But I want to make it clear
11 that the opinions I express here are entirely
12 my own and don't necessarily represent any
13 agency.

14 I'm also a technical
15 administrative judge on the Atomic Safety and
16 Licensing Board Panel of the U.S. Nuclear
17 Regulatory Commission. But in that role I've
18 been separated from anything having to do with
19 high level waste because of my long
20 involvement in high level waste. And
21 certainly I don't represent them here.

22 Given my limited time, I'll turn

1 immediately to provide some personal comments
2 related to the questions that you posed.

3 The first comments are on time.
4 The time frame for permanent geologic disposal
5 and its regulation has to be considered
6 objectively in relation to the half-lives of
7 the radio nuclides. And I'll take two, for
8 example, that are particularly notorious with
9 regard to their geochemical transport
10 characteristics: Iodine-129 with a half-life
11 of 16 million years and neptunium in the five-
12 valent state, neptunium-237 with a half-life
13 of 2 million years. These are objective times
14 that have to be considered.

15 Geologic systems are relatively
16 well understood on time scale on million year
17 time scale. And a million year time frame is
18 realistic, in my view, for technical
19 evaluations of geologic stability and for
20 evaluations of geologic isolation of nuclear
21 waste.

22 On the other hand, a million years

1 is a completely unrealistic human time scale.
2 Our species has only existed for, perhaps,
3 100,000 years. So, it's unrealistic, and
4 nevertheless I think it's amazing not
5 necessarily incredible, but amazing and
6 certainly unprecedented that ultimately the
7 principal isolation mechanism for the proposed
8 Yucca Mountain repository was the engineered
9 Alloy 22 container. That's amazing.

10 I've been interested in studies of
11 natural analogue systems; natural systems that
12 are analogous to repository systems, mostly
13 for Yucca Mountain. But I think the Cigar
14 Lake uranium deposit in particular, which is
15 in Saskatchewan is especially interesting to
16 illustrate my geologic perspective.

17 This uranium deposit is described
18 as the world's richest uranium deposit. The
19 primary mineralization is uraninite, which has
20 the crystal structure and chemical composition
21 essentially of spent fuel. It's very similar
22 to spent fuel.

1 And the deposition of that mineral
2 occurred 1.3 billion years ago. It's
3 presently about 430 meters below the ground
4 surface. And according to the literature, I'm
5 not an expert at Cigar Lake particularly, but
6 according to the literature there is no
7 surface geochemical or radiometric
8 manifestation of this richest uranium deposit
9 at the earth's surface, 400 meters. It's an
10 area that's very far north. It's been
11 glaciated repeatedly. And this kind of
12 observation makes me as a geologist
13 comfortable with the idea of a billion years
14 of geologic isolation, which is obviously far
15 more than regulatory concerns need to take
16 into account.

17 So on the issue of compliance, I
18 think compliance relates to public confidence:
19 Confidence in safety. Compliance needs to be
20 based on confidence.

21 From a technical perspective,
22 confidence in performance or safety of a

1 geologic disposal of waste can be achieved
2 through multiple lines of technical evaluation
3 that tend to converge on the same conclusion.
4 That's a scientific process. There's lots of
5 lines of reasoning: Site characterization,
6 for instance geological stability, engineering
7 design and assessment, laboratory and fuel
8 scale assessment, theoretical modeling,
9 performance assessment modeling including
10 performance assessments and natural analogue
11 studies. When the composite of these multiple
12 lines of reasoning come to comparable
13 conclusions, then my confidence is increased.
14 My confidence is increased when multiple lines
15 of evaluation tend to make the site look safer
16 as understanding increases with time.

17 I lose confidence in the system if
18 the trend seems to be that the more we know
19 about the system, the worse it looks.

20 My sense of confidence is also
21 diminished as political or economic interest
22 supersede technical and health interests,

1 which is a pattern that seems to be impossible
2 to avoid in the nuclear waste management
3 field.

4 Retrievability must be considered
5 in my mind in the context of the individual
6 geologic or engineered system. Retrievability
7 may be relatively impractical for certain
8 system like deep bore hole disposal or sub-
9 seabed disposal which might otherwise prove to
10 be very technically credible systems for
11 geologic disposals of nuclear waste.

12 In recognition of inevitable
13 social instability of the time scale of the
14 hazard of high level waste, retrievability is
15 a potentially hazard feature of a repository.
16 In my mind, a good geologic repository should
17 disappear, literally. It should become
18 invisible to society for the benefit of future
19 societies.

20 The concept of retrievability for
21 the purpose of maintaining access to a
22 potential resource has to be considered

1 completely separately from the notion of
2 retrievability for the purpose of judging the
3 safety of the system.

4 In the present state of high level
5 waste management in the U.S. I thin that
6 geologic site selection needs reconsideration.
7 I think there are many potentially excellent
8 sites. And the often asked question: What's
9 the best site is really an inappropriate
10 question. We don't need the best site. We only
11 need one that's good enough and to have
12 confidence that it's good enough.

13 With regard to regulations
14 concerning siting, there were requirements
15 developed by EPA and NRC and DOE. For example,
16 EPA required comparative performance
17 assessments for long times to be part of the
18 site selection process. NRC required a
19 balancing of favorable and potentially adverse
20 conditions in evaluating the sites. And the
21 DOE listed disqualifying features. But all of
22 this went by the wayside in 1987 in the

1 Amendments Act which derailed the site
2 selection process.

3 All these siting regulations were
4 abandoned in the aftermath of the Nuclear
5 Waste Policy Amendments Act of '87. And
6 there's a lot of international guidance, I
7 think for instance from IAEA on siting
8 guidelines.

9 And that's the end of my comments.
10 Thank you very much.

11 CHAIR HAGEL: Dr. Murphy, thank
12 you, sir.

13 MR. SCHULTHEISZ: Thank you for
14 the promotion, Senator.

15 I have to state categorically
16 before I begin that I have no opinions of my
17 own. I'm representing the Environmental
18 Protection Agency. So anything that I say
19 can't be attributed to me directly.

20 I'm only going to focus on a
21 couple of the question, those that were most
22 important for the EPA as we considered

1 developing the standards and particularly the
2 Yucca Mountain standards over the past few
3 years.

4 So, first, just in general why are
5 regulations are necessary? Why are we having
6 this discussion? And the primary purpose of
7 geologic disposal, as has been mentioned a
8 couple of times here, I think is to contain
9 the waste and isolate the radio nuclides from
10 the biosphere for long periods of times. The
11 regulations provide the framework for
12 developing a robust disposal system, one that
13 can respond in a variety of situations,
14 potential scenarios.

15 So as we regulators as EPA's job,
16 we see that our purpose is to devise a
17 reasonable test of the disposal system to see
18 how to evaluate the containment and isolation
19 capability of the site, and the engineered
20 barriers that are integrated into the site
21 characteristics. So the standards that we
22 develop basically provide performance

1 objectives against which to evaluate the
2 site's isolation and containment capabilities.
3 We're really not about predicting
4 environmental impacts or future health
5 effects. It's really everything is geared
6 towards an evaluation of whether the site has
7 met this test for the period of time and under
8 the conditions that we've prescribed.

9 So in general, there are several
10 different types of standards that have been
11 used here in the U.S. and international.
12 Projections of risk or dose to a designated
13 receptor is probably the most common. It is
14 the most explainable, and people understand it
15 better and can relate it to other standards.
16 So it is one that is frequently used.

17 The movement of radio nuclides
18 into the accessible environment from the
19 repository over a period of time is another
20 one that we've used in the containment
21 requirements discussed this morning by Tom
22 Cotton.

1 Concentration of radio nuclides in
2 an environmental media is yet a third way of
3 looking at the containment and the isolation
4 ability of the repository such as our
5 groundwater protection standards.

6 One of the difficulties is that
7 these latter two types of standards aren't
8 directly related to impacts to humans,
9 estimations of public health effects or public
10 health goals. And so they are sometimes harder
11 to explain as to how they determine safety.

12 So the question of how long
13 standards should be applied is obviously one
14 that has generated the most strongly held
15 opinions and expressions of disbelief that
16 you've heard today. But in general there's
17 growing acceptance that periods up to one
18 million years have to be looked at in some
19 way. There's really no consensus as to how to
20 do that, whether it's apply quantitative
21 standards, look at it more qualitatively. In
22 the Yucca Mountain rulemaking in 2001 we took

1 the approach of a quantitative standard up to
2 10,000 years and beyond that the projections
3 had to be done and placed in the record, but
4 there was no compliance standard applicable to
5 that. And the D.C. Circuit Court of Appeals
6 did not agree with that approach, that it met
7 the statutory requirements that we were
8 operating under.

9 The problem with that is that
10 there are, as you've heard, significant
11 uncertainties in projection dose and risk over
12 periods of time approaching a million years.
13 So this becomes increasingly problematic in
14 terms of what the standard means, what the
15 projections mean and how they relate to the
16 capabilities of the site.

17 There have been some suggestions
18 that indicators relying solely on the geologic
19 capabilities may be more predictable, and
20 therefore more useful in showing compliance
21 such as containment requirements, which is one
22 of the reasons why we established those in

1 1985 as the primary protection requirement.
2 And in 1982 it was, in fact, the only
3 requirement that we proposed. We did not
4 propose individual dose standard at that time.
5 We thought that the geologic projections would
6 be more defensible and less uncertain than
7 trying to deal with what happens when the
8 radio nuclides reach the biosphere.

9 So as far as EPA standards are
10 concerned, we have two end points that we
11 could look at:

12 The 10,000 year standards in the
13 Part 191 generally applicable rulemaking. Was
14 upheld by the First Circuit in 1987. It was
15 challenged and was upheld. On the other hand;

16 The one million year standard that
17 we established in 2008 for Yucca Mountain in
18 Part 197 is a site-specific based on site-
19 specific direction from Congress and a site-
20 specific recommendation from the NAS. And as
21 such, it really has no legal applicability to
22 any other site.

1 And a key question here is the
2 question of intergenerational equity. What is
3 our obligation to future generations? How
4 long does that apply? What necessary to carry
5 out that obligation?

6 In general, those obligations are
7 to minimize the burden on future generations
8 and to minimize the impact on future
9 generations to the extent that we can. But the
10 extent that we can applies not only in terms
11 of time, but also in resources that we have to
12 invest to try to reach some standard of
13 protection for people in the very far future.
14 And so the question really is: What is it in
15 our power to achieve over these time frames
16 that we're discussing? There is no question
17 we have these obligations, but what really can
18 we achieve?

19 In terms of demonstrating
20 compliance, performance assessment generating
21 results that are compared to quantitative
22 standards in terms of risk or dose. They can

1 generate the numbers. We can compare the
2 numbers. That's fine. But, a regulatory
3 judgment, as I thin we've heard several times
4 before, can't simply rely on the comparison of
5 a generated number to a standard and say
6 pass/fail, up/down, hit or miss. It's much
7 more complicated then that. Foresight may be
8 able to engineer compliance for 10,000 years
9 through applications of all sorts of enhanced
10 materials.

11 At the same time, if you're
12 looking at a million year time period, in the
13 year 900,000 if you've exceeded this standard
14 by a few millirem, is that unsafe and how do
15 you reach the judgment that that's really
16 unsafe?

17 We cannot prove that these
18 projections are correct. So what EPA has done,
19 as you heard this morning, we require a
20 reasonable expectation that the standards will
21 be met based on the full record before the
22 implementing agency, which in the case of

1 Yucca Mountain is the NRC.

2 So, in terms of performance
3 assessment that's really the tip of the
4 iceberg in terms of everything that has to be
5 considered in reaching a regulatory judgment
6 about the capabilities of the site and
7 disposal system including site
8 characteristics, history and stability, the
9 conceptual site model, field and laboratory
10 studies involving the chemistry, geochemistry,
11 materials that you are using in the engineered
12 barriers, natural analogues studies, was
13 mentioned here, the mathematical models how
14 complex they are, how they get simplified to
15 try to implement to a regulatory requirement;
16 a reasonable expectation that covers all of
17 these and many more things.

18 And as I say, in the far future
19 the meaning of the projections in terms of
20 dose and risk is increasingly questionable.
21 You're running into large scale geologic
22 climatic variation that you need to try to

1 account for. And so we have this one
2 simplifying assumption, which is that human
3 behavior in the future will be the same as it
4 is today. The level of the technology will be
5 the same. The level of medical knowledge will
6 be the same.

7 One thing we can say about this is
8 it is almost certainly wrong: We can pretty
9 much say that's the truth, but we can't say
10 what will be right.

11 So, the NAS in their advice to us
12 said there's no scientific basis for
13 distinguishing one future from another, so use
14 today's society as a basis for looking at the
15 standard.

16 So in this case, dose and risk
17 provides a benchmark. It's not a prediction.
18 It's not really a calculation of health
19 effects, even though that's the metric, that's
20 the language we have to talk in some ways. It
21 really cannot be viewed in that same light.

22 So, looking internationally what

1 can we learn from others? There are a handful
2 of countries that have standards that they
3 have issued. Nobody has implemented them.
4 The Yucca Mountain license application is
5 still the only one that has been submitted.

6 The Swedish regulatory authority
7 anticipates that we'll get an application
8 either by the end of this year or early next
9 year. And they are the closest to being
10 implementing of any of the sites.

11 So here there's a variety, these
12 are just general metrics that are used by
13 these countries, a variety of dose risk, time
14 frames, several thousand years up to a million
15 years.

16 10,000 years in the case of France
17 with calculations considered thereafter.

18 Germany uses lifetime risk for a
19 million years or annual dose depending on how
20 you want to do it.

21 The U.K. is very up-front.
22 They've established a risk guidance level.

1 They say that it's really not appropriate to
2 establish a standard or a constraint. We'll
3 use a guidance level and we'll decide whether
4 that's good enough. And they actually used
5 the words "good enough" without really
6 describing it.

7 So all of these other countries,
8 they emphasized the increased uncertainty and
9 the use of supplemental or qualitative
10 information.

11 Over very long times there's an
12 implied if not an explicit flexibility in how
13 the standard is interpreted over very long
14 times.

15 They address unlikely or
16 disruptive scenarios in a separate analysis;
17 sometimes there's no standard applied.

18 They apply a critical group, some
19 sort of approach. A high end group of people
20 who have highly exposed but not the most
21 exposed person. It's a little unclear as to
22 whether Germany is using that or not, but they

1 do talk about individuals associated with the
2 repository.

3 And the standards that EPA has
4 issued, both in Part 191 and Part 187, take
5 conceptually similar approaches to this.

6 And just as a last slide, the
7 references here. Really the best way to
8 understand how EPA has done this over the
9 years and the extent of our thinking in trying
10 to respond to these issues is in the
11 regulatory record. The Federal Register
12 notices for the proposed and final rules and
13 then the detailed responses to comments that
14 we submitted on both Yucca Mountain rule
15 makings go into it. But a lot of detail about
16 the international standards, about the
17 thinking, our thinking about applying the
18 standard as a quantitative limit for 10,000 or
19 a million years. So I would encourage the
20 Subcommittee to look at those and see how EPA
21 has really drawn out its reasoning over the
22 past almost 30 years now.

1 And that concludes my
2 presentation.

3 CHAIR LASH: (Off microphone
4 question.)

5 MR. SCHULTHEISZ: Yes. There's a
6 section in the 2008 response to comments that
7 goes into some details on the international
8 standards.

9 Now I'll point out that several of
10 these were issued within the last year. The
11 U.K., Germany and Switzerland all issue their
12 standards in 2009. The Swiss standards were
13 an update of the previous standards, and
14 didn't change all that much. But there are
15 some that we did not address because they came
16 out after our standards.

17 CHAIR LASH: Thank you very much,
18 Mr. Schultheisz.

19 So. we've particularly structured
20 this because we wanted to have the opportunity
21 to direct questions to all of you, and also to
22 hear your interaction with one another.

1 Mr. McCartin, we'd assumed that
2 your statement earlier would be your
3 statement. Did you want to --

4 MR. McCARTIN: I had a few remarks
5 I was going to make.

6 CHAIR LASH: Okay.

7 MR. McCARTIN: But I don't have
8 slides.

9 CHAIR LASH: Let's give you a few
10 minutes to make a few remarks. But we want to
11 have a chance to get interaction between you
12 and us.

13 MR. McCARTIN: Okay. Briefly, I
14 guess there's three quick topics I'd like to
15 talk to, and well let me narrow it to two:
16 Performance assessment and public
17 acceptability of regulations.

18 And I'll say with performance
19 assessment, as I said before, I started in NRC
20 in 1981 as the beginning of implementation of
21 a performance assessment capability at NRC.
22 In that capacity I was made the technical lead

1 for developing the Yucca Mountain regulations.
2 And the key to the regulatory improvements, as
3 I will call that, in increasing the efficiency
4 and effectiveness of NRC's regulations of
5 geologic disposal, what you saw was the use of
6 performance assessment to focus on those items
7 most important to safety.

8 The previous regulations, Part 60
9 had a number of prescriptive requirements.
10 Did that make it safe? Well, they were
11 requirements. You had to meet those. And
12 there was always debate. And at the time they
13 were promulgated, it was felt that that was
14 the best that could be done. However, with the
15 emergence of performance assessment you saw
16 Part 63 move, based on the NAS
17 recommendations, let's look at the performance
18 assessment as an overall compliance measure.

19 As Dan was suggesting, this is not
20 oh, does it meet 15 millirem and we're done?
21 No. It is far more than that.

22 What appropriately in my mind from

1 an efficiency and effectiveness standpoint,
2 what that performance assessment does is you
3 now develop an understanding of how the
4 repository will behave. DOE has to identify
5 the barriers important to waste isolation.
6 Well, what are the things you're counting on?
7 This performance assessment is a way to
8 encapsulate those things that are important to
9 performance.

10 Previously, as I saw over the last
11 almost 30 years now at NRC, if you went to a
12 geochemist, the problem was a geochemical
13 problem. If you went to a hydrologist, it is
14 a hydrology problem. If you went to a
15 materials person, it was a materials problem.

16 What the performance assessment
17 does is integrate all this thinking to the
18 end-product of dose. Well, what really are we
19 relying on? What's significant? And so the
20 performance assessment provides that
21 integration.

22 Absolutely critical to the

1 performance assessment is the discussions, the
2 support from all the other scientists and all
3 the other disciplines do you agree. From a
4 geochemistry standpoint you look at all the
5 factors, all the complexities; it's really the
6 pH that's driving this.

7 You can narrow things down. The
8 repository has no moving parts. If you are at
9 a good site, there should be a limited number
10 of things that you're relying on and you have
11 high confidence in to get you to safety. I
12 believe that that's what the changes that
13 resulted in Part 63 was take the benefit of
14 let's focus on those things are most important
15 to performance. The performance assessment is
16 a way to encapsulate this. But trust me,
17 there's all kinds of supporting information.

18 If you say something, there's a
19 simplified model in the performance
20 assessment. There can be laboratory
21 experiments, field experiments, all kinds of
22 research that has gone on to support why

1 that's supportable. That information then
2 gets taken to our hearing where it needs to be
3 defended. And that's where people can cross-
4 examine.

5 And that to me is how for
6 regulations in the future I believe the
7 performance assessment in Part 63 represents
8 a significant efficiency and effectiveness in
9 ensuring public health and safety over the
10 other regulations.

11 In terms of public acceptability
12 we have struggles how to best work with this.
13 And there is no easy answer.

14 There is one suggestion I have
15 heard that one could go out to the community,
16 wherever it is, of the effected people.
17 Explain the performance assessment, the kinds
18 of scenarios, the kinds of features we're
19 looking at in this site and talk through that
20 in as transparent a way as we can and get
21 suggestions from the effected.

22 Well, did you consider this? Did

1 you consider that? And factor those
2 suggestions into the performance assessment is
3 a way of possibly getting some acceptable from
4 the people that are most effected. And that's
5 something I know Janet Cocher at NRC has led
6 the public outreach. We're constantly looking
7 at ways to provide more acceptance. That is
8 very, very important to us, but it is a very
9 difficult thing with the complexity of this.

10 And I guess the last thing is,
11 NRC's independence. And since 1981 I don't
12 know how many performance assessment
13 calculations I've done; hundreds, thousands.
14 But I can say unequivocally that I have never,
15 ever been asked to change a number, to make a
16 number easy on DOE, or to alter the results.
17 The emphasis is always on is this defensible.

18 CHAIR LASH: I think you're
19 answering a question that wasn't actually
20 asked.

21 MR. McCARTIN: Okay.

22 CHAIR LASH: I suspect the

1 performance assessment issue, being deeply
2 perspicacious, is going to come up again in
3 the next few minutes.

4 Let me make a couple of requests
5 of the panel and also to my colleagues. We do
6 want to get interaction among you. I also want
7 to make sure my fellow Commissioners get
8 chances to answer questions. So let's try not
9 to have all six of you respond to every single
10 question, but if you have something urgent,
11 you've just heard another member of the panel
12 say something and you have a one minute
13 intervention, just let me know that but stick
14 to the quick response so we can keep things
15 moving.

16 And to my colleagues, it's clear
17 that we will have some discussion about the
18 role and value of performance assessment, but
19 let's make sure we get to the whole set of
20 questions, not just that one.

21 Allison, do you want to start off
22 since the issue's kind of on the table in

1 front of us?

2 MEMBER MacFARLANE: Sure. Thanks
3 very much.

4 I thank you all for your
5 presentations. I enjoyed them.

6 Seeing how Bob singled me out, let
7 me make a short statement here. I am not a
8 minority of one. There are many other earth
9 scientists, especially but not solely, who
10 have written critiques, very good critiques of
11 performance assessment. So, you should be
12 aware of that.

13 And performance assessment, of
14 course, we keep focusing on it here because
15 this is how the U.S. has been deciding whether
16 a site, the Yucca Mountain site in particular,
17 is meeting the standards that were
18 established. So that's why we keep coming
19 back to it. So it's important.

20 And although the last two speakers
21 may disagree with this, I think in the U.S.
22 it's become at least in terms of the public

1 perception, and in the way that especially the
2 Department of Energy has talked about their
3 project, it's been the sole way that this
4 situation is being evaluated. And I do think
5 that that's a problem.

6 I want to remind the panel, just
7 for the record, that performance assessments
8 were developed to evaluate nuclear power
9 plants totally engineered systems that were
10 expected to last a period of decades. And
11 they are now being applied to complex earth
12 systems that will last, and these predictions
13 are being drawn out, for hundreds of thousands
14 to millions of years. These are apples and
15 oranges. Okay? That's one of the problems.

16 To do a performance assessment I
17 am constantly told by you guys that you need
18 o know all the features, events and processes
19 that will occur over the time evaluated. And
20 the Department of Energy has claimed that it
21 does know all these features, events and
22 processes, and this is where I have a problem.

1 Because I know specifically that they do not
2 have a lot of information.

3 Like they say kinetic and
4 thermodynamic information on the mineral
5 phases that are relevant information on the
6 future impacts of climate change over even the
7 next few hundred years, for instance. And I
8 could go on and on, and on. All right. But
9 I won't.

10 So, you know and in place of lack
11 of information what's being asked for is
12 expert judgment. Okay? Expert judgment is
13 qualitative, but you're pretending that it's
14 quantitative. Okay? And then there's a
15 conflation of qualitative and quantitative
16 judgment. And I find that I've seen some of
17 you who really support performance assessment
18 say that the results of these mock performance
19 assessment models are data. You're conflating
20 model results with data. Models are models.
21 They are not reality.

22 And, in fact, Mr. McCartin just

1 said "with performance assessment now we have
2 an understanding of how the repository will
3 behave." Okay? Those are your words. That
4 means you think that the performance
5 assessment has given you absolute truth. It
6 has not. It is a model, and a bad one, an
7 opaque model. You can't make it transparent
8 to the public because none of you can fully
9 understand it on your own, all the parts of
10 it.

11 So, this was not supposed to be a
12 lecture. But anyway, Bob made it that way.

13 But I do have questions, and so
14 maybe some of, not all of you I suppose, might
15 want to respond to that. But I tend to think
16 that Bill Murphy made a good point when he
17 said "we're better off using multiple lines of
18 evidence."

19 But let me ask a couple of
20 specific -- well, actually respond to that and
21 maybe we'll ask specific questions later. Go
22 ahead.

1 DR. BUDNITZ: Well, I kind of
2 think we're going to agree on almost
3 everything except the judgment about how the
4 decision is framed, and therefore answered.

5 Of course a performance assessment
6 is not a prediction. Of course a performance
7 assessment is not a realistic description. Of
8 course a performance assessment has major
9 uncertainties. But the key to performance
10 assessment is that it enables a focused
11 sensitivity analysis to be done about the
12 things that matter and the things that don't
13 matter.

14 As an example, and Rod Ewing and I
15 have been friends and colleagues for 30 years
16 and he's a mineral phase guy of the
17 international stature, we don't understand the
18 mineral phases that would occur inside the
19 canister at Yucca Mountain were the water to
20 get in there and the uranium change. Okay?
21 We don't.

22 \ A lot of work needed to be done.

1 I actually was in the Yucca Mountain project
2 trying to support some of that for a couple
3 years until the Administration changed and it
4 got killed. But we still don't understand
5 that.

6 It turns out the results for the
7 purposes of making a decision don't depend on
8 that very much. In fact, they hardly depend
9 on it. The reason they don't depend on it has
10 to do with science.

11 And the point here is you don't
12 have to understand everything to be able to
13 make a decision if it doesn't depend on it, or
14 depends on it only a little

15 Second point: Reactors are an
16 engineered system. I've spent my whole life
17 doing reactor analysis, which is what I really
18 do. We license reactors, we run them. We
19 have confidence that the analysis makes them
20 safe enough because we understand them. But
21 in fact, no one today can do a thoroughly
22 correct thermal hydraulic analysis of a

1 pressurized water reactor or a boiling water
2 reactor in normal operation, never minding
3 during transients. And yet we run them and
4 we have confidence. Why? Because we've done
5 enough analysis to know that the things we
6 need to know we know, the things that we're
7 still uncertain about don't matter enough to
8 affect things. Even for an engineered system.

9 Same thing with aircraft. Neither
10 the Government nor Boeing, nor Airbus
11 understands the true accurate description of
12 those aircraft that I, by the way, am going
13 home on tonight. Why do we have confidence?
14 Because we can bound it.

15 MEMBER MacFARLANE: Bob, can I
16 just interrupt you

17 DR. BUDNITZ: Of course.

18 MEMBER MacFARLANE: And say the
19 reason that you have confidence is not just
20 not that you can bound it, it's that you can
21 do it. You can run the experiment.

22 DR. BUDNITZ: Ah, now I'm saying

1 not so.

2 MEMBER MacFARLANE: And you can
3 see whether it performs as you --

4 DR. BUDNITZ: Not so.

5 MEMBER MacFARLANE: Let me finish.
6 As you predict or not. You will
7 not be able to do that with a repository.

8 DR. BUDNITZ: But we can't do that
9 for a reactor either. We've not had a
10 meltdown, and yet we understand them enough.

11 MEMBER MacFARLANE: Yes, you have.
12 You've had multiple meltdowns.

13 DR. BUDNITZ: No, no, no. It's not
14 true. The scenarios that worry us -- let me
15 just go on because this a crucial point.

16 The TSPA is not the decision
17 criteria. It informs the decision. The
18 regulations that EPA wrote in 1991 that they
19 reiterated again, the regulations that NRC
20 wrote in Part 60 that they reiterated again,
21 of all the policies of every country, go read
22 them, say the analysis informs a decision by

1 people who sit, think and stare. And that
2 seems to me to be an essential element of
3 public policy.

4 And my judgment is, and you can
5 differ and we can differ honorably, that the
6 analysis we do is adequate to inform that
7 decision in the context of the regulations
8 that were written. And if you don't think so,
9 fine. But I don't think they're accurate. I
10 don't think that they're predictions. But I
11 think they're adequate for that purpose.

12 If you don't agree, fine. But
13 that's the decision or the judgment that I
14 have made and that I think is very strongly
15 held, not by -- of course you're not alone.
16 Not by everybody, but by a vast majority.

17 And then just to cite one example.
18 The Academy put together a committee of a
19 dozen or 15 people. We all said that in the
20 report: 15 to zero. Maybe it was 13, I don't
21 remember the number.

22 MEMBER MacFARLANE: Well, if you

1 don't invite a critic, you know you're going
2 to --

3 DR. BUDNITZ: I'm not going to
4 argue that.

5 MEMBER MacFARLANE: -- get
6 agreement.

7 DR. BUDNITZ: I'm not going to
8 argue that.

9 MEMBER MacFARLANE: And we don't
10 have any critics any here, unfortunately,
11 presenting to us.

12 I do have a question associated
13 with this. I'm sorry, I forgot to put this to
14 you.

15 Those of you who do support
16 performance assessments seem to be really
17 adhering to the idea that we desperately need
18 a quantitative way to evaluate this, and I
19 don't know why.

20 DR. BUDNITZ: I don't either.
21 Boy, I don't either. It informs judgment.

22 CHAIR LASH: Can I interrupt this

1 dialogue? I know that Dr. North wanted to
2 make a comment. I'll urge him not to set off
3 the entire debate, because I suspect there are
4 other issues that other Commissioners want to
5 raise.

6 DR. NORTH: I'm going to note that
7 what is called performance assessment in this
8 context, in many other context is called risk
9 analysis or risk assessment. And the question
10 comes down to: Is something we are about to
11 do acceptably safe? That might be drilling in
12 the Gulf of Mexico or it might be landing a
13 spacecraft on another planet where we
14 contaminate it with life from this planet.
15 And I actually worked that problem as leader
16 of a group for the NASA for Project Viking, a
17 landing that occurred in 1976. And I'll call
18 it performance assessment, and I'll tell a 30
19 second version of the story because I think
20 it's illustrative of how we get insight about
21 complex systems.

22 Our Vikings spacecraft had about

1 20,000 live microbes on it. The issue was
2 would one of them, at least, be able to find
3 an environment on Mars where it could
4 reproduce. My colleagues and I did over a
5 period of nearly a year a quantitative
6 analysis of this working with the many
7 specialties involved.

8 We got a quantitative answer: Six
9 chances in a million to compare to NASA's
10 regulatory standard of one chance in 10,000.
11 But we were able to essentially throw the
12 analysis away because the insight was that the
13 number was low because the ultraviolet flux
14 through Mars' thin atmosphere was such that a
15 particle that would be able to float from the
16 location of the spacecraft to some other
17 location would have to be so small as to be
18 not shielded by the ultraviolet light.

19 So in the wake of our analysis, to
20 my knowledge, the National Academy of Sciences
21 and others who have looked at this advising
22 NASA have not considered there was a need for

1 further analysis. We figured out a way of
2 looking at the problem, combining
3 understanding from different fields of science
4 where the question acceptably safe was viewed
5 as not needing a quantitative analysis. Yet,
6 when we were brought in nobody had the
7 insights that our analysis produced.

8 So, I will assert that the proper
9 role of performance assessment is to generate
10 an insight on what is important for safety.

11 I have concerns myself about getting too far
12 into the numerology. But as somebody who
13 works in this field, numbers allow precise
14 calculations and we learn from that.

15 Therefore, I would assert we should use the
16 numbers but we should not take the results too
17 seriously. View this as a way of exploring,
18 not a way of calculating precise numbers.

19 And to support this, I would
20 reference the Lewis report on Reactor Safety
21 written, in large part, by my colleague to the
22 left which makes this point in considerable

1 detail in the reactor context. 1978.

2 CHAIR LASH: Other -0

3 MEMBER PETERSON: Actually, let me
4 offer just a couple of observations and
5 possibly instigate a question on this specific
6 area. And then I'd like to move to the topic
7 of retrievability, which I think is also
8 important for us to dig into.

9 I'm going to ask in just a moment
10 is Yucca Mountain particularly complicated to
11 analyze, perhaps, compared to some other
12 potential geologic site which could contribute
13 to our problems? The analogy being that we're
14 currently also concerned that carbon omissions
15 into the atmosphere could perturb climate. We
16 have modeling efforts, we have a variety of
17 qualitative arguments. It's a very specific
18 problem that we're stuck with trying to
19 predict and it's essentially a similar set of
20 issues that we face in terms of trying to
21 inform public policy about what to do about
22 carbon dioxide. And if you think about it,

1 you're running into a lot of thing, and a part
2 is because it's a really hard system to
3 analyze.

4 So, would we be better off with
5 reducing -- I mean if you followed some
6 deterministic criteria, maybe this is not such
7 a contiguous issue if you're dealing with a
8 system that is more analyzable than Yucca
9 Mountain. So I'd like to just get some
10 opinions about is it likely that other
11 geologic media and sites that we might
12 consider could be more easily analyzed than
13 Yucca Mountain has been?

14 CHAIR LASH: Dr. Peters, would you
15 like to start?

16 DR. PETERS: Yes, I'll take a
17 crack at it. Yes and no.

18 Actually, you know my experience
19 is with Yucca Mountain, that's where I grew up
20 in this field so I've got a perspective on
21 Yucca Mountain. I don't know as much about
22 other media in terms of the details of getting

1 in the testing. But I would say it introduced
2 a set of complexity and uncertainties that are
3 more than you would see in other media is my
4 answer.

5 I'm just thinking off the top of
6 my head. But you added an unsaturated zone,
7 and when we really dug into the unsaturated
8 zone it got very complex, and when you think
9 about what's going on inside that drift,
10 things got very complex.

11 I'm not saying that the
12 application that was submitted won't
13 necessarily hold water, because I was a part
14 of developing it. But if it's a very complex
15 site, and whereas if you go to salt for
16 example, you look -- as Per's not even
17 listening.

18 So as you got to salt, it's got a
19 much simpler safety case, I would argue. If
20 you got a saturated zone site, you don't have
21 the UZ to play in as much, other than just
22 recharge; perhaps it's a simpler safety case.

1 So, there's probably some truth,
2 Per, to where you're headed.

3 MEMBER PETERSON: Also we do know
4 from natural analogues that there are places
5 where materials like uranium tend to want to
6 stay stable for long periods of time. And
7 it's not in an oxidizing, unsaturated media,
8 if I'm correct.

9 But, Warner, if you could --

10 DR. NORTH: Well, I will share my
11 experience. In 1985 I was a consultant to the
12 Board of Radioactive Waste Management when
13 they reviewed DOE's multi-attribute analysis
14 of five candidate sites with Tom Isaacs as the
15 leader of the DOE effort.

16 I think between now and then we've
17 learned that performance assessment which
18 seemed relatively straightforward when you
19 were doing it without not too much information
20 gets a lot more complicated when you have a
21 site that's proposed for licensing.

22 I've also had the advantages as an

1 initial member of the Nuclear Waste Technical
2 Review Board of traveling to Europe and to
3 Japan to look at their programs. I must say
4 the system proposed for use in Sweden and
5 Finland of using granite crystalline rock and
6 using a container which is very resistant to
7 corrosion in the geochemical conditions in
8 that rock would seem to be a simpler system.
9 But then you get into issues such as the next
10 ice age in Sweden, will be shear such that the
11 weight of the ice causes a fracture that cuts
12 your container in half.

13 So, I think until you get into it
14 it's hard to tell.

15 CHAIR LASH: Did you have some
16 other questions, Per? MEMBER PETERSON: Yes, I
17 had a set of questions that I'd like to shift
18 over that relate to retrievability. And what
19 I'd like to do is to note that we're going to
20 have some sort of requirements around
21 retrievability for a repository. The question
22 that I'd like to entertain is can we be more

1 specific about why from a societal perspective
2 we want retrievability? And then to engineer
3 the system to meet the societal goal as
4 opposed to having a more prescriptive and
5 deterministic requirement it should be
6 retrievability that may not efficiently
7 actually serve the society goal.

8 To think what societal goals might
9 look like, an analogous problem that we're now
10 dealing with is the cleanup of high level
11 waste in tanks at Hanford and Savannah River.
12 So what happened, of course, is that at
13 Hanford we had the early generation of high
14 level waste, carbon steel underground tanks
15 were constructed and built, which is better
16 than what the Russians did, of course. But in
17 order to have some level of chemical
18 compatibility the waste was neutralized
19 greatly increasing the volume in generating
20 slug and such, put into the tanks. You still
21 had corrosion. And as a consequence, the
22 cleanup has been protracted and difficult.

1 Now a question would be: Well
2 that made sense to do a little bit because if
3 you did just for the few years, at least the
4 overall effort to reverse that would be
5 tractable. In fact, we're already pretty much
6 reversed that at West Valley, which was a
7 small amount. But why did we keep going down
8 that path instead of switching to acidic waste
9 and stainless steel tanks, in which case we'd
10 already be done cleaning up tank waste,
11 largely?

12 Is this correct sort of view? And
13 then that gets to the question of: What's our
14 societal goal with respect to reversal?

15 I think we want to keep the
16 mortgage that we might build up reasonable so
17 that if you do determine you need to reverse,
18 you have a reasonable amount of effort to do
19 that?

20 I mean, Warner, I think maybe
21 you've thought about these topics, and others.

22 CHAIR LASH: Per, I take it your

1 question is not so much a technical question
2 about what should have been done there, but
3 the political question about why we couldn't
4 change course when we had sufficient
5 knowledge?

6 MEMBER PETERSON: Right. I guess
7 I need to be more specific in trying to phrase
8 the question from here.

9 The question is: Is the societal
10 goal that we're trying to achieve is to not
11 create a big reversal effort or to minimize
12 the risk that future society would be faced
13 with a huge effort to try to reverse something
14 as opposed as just making sure that it would
15 be reversible if you wanted to, but not
16 thinking about the cost and difficulty of
17 doing that?

18 DR. NORTH: I will take a short at
19 this. I was a study looking at the largest
20 risks from the weapons complex some years ago.
21 And subsequent to that I served as an advisor
22 to the head of Fluor Hanford for a couple of

1 years on some of the activities there to
2 remove some of the most dangerous materials.
3 I didn't work on the tanks, per se.

4 There is a book called "On the
5 Homefront" which documents the history of
6 Hanford and the releases that have occurred,
7 and I will call it the lack of performance
8 assessment in due diligence as that site was
9 operated during periods of the Cold War. I
10 won't try to explain the behavior of the
11 people that made the decisions. It is my
12 judgment that the problem with the high level
13 waste in the tanks could have been foreseen,
14 and might have been foreseen, but that
15 knowledge was not used and acted upon. They
16 went ahead with it.

17 So, all this is by way of saying I
18 think we need transparency. I think we need
19 performance assessment or risk analysis, or
20 something like it to try to anticipate what
21 may fail and why, and do a best effort on that
22 and communicate it to those who might be

1 effected.

2 Now with respect to
3 retrievability, it seems to me there is the
4 issue for future societies that uranium and
5 plutonium might be valuable for energy use.
6 And then there is the issue of if we dispose
7 of waste in some way, and I'll think of some
8 deep borehole technology, and then we find out
9 there is a path from where we put it down that
10 deep hole such that the radioactivity might be
11 released into the accessible environment, then
12 we've got a problem similar to those tanks at
13 Hanford. And we ought to try to avoid that.

14 MEMBER PETERSON: So then, in
15 terms of thinking this from the perspective of
16 risk, though, let's say that the probability
17 that a borehole might leak is going to be
18 substantially less than the probability that
19 Yucca Mountain might leak.

20 DR. NORTH: But I want to see
21 where did that probability calculation come
22 from. What expert judgment, what use of

1 models, what physical principles, et cetera.

2 If it's just a number, I've learned to be very
3 skeptical of those.

4 MEMBER PETERSON: Okay. Well then
5 I'd just ask for expert opinion as to the
6 probability that Yucca Mountain might leak
7 versus a deep borehole might leak from people
8 who looked at the two technologies. And just
9 a qualitative comparison.

10 DR. NORTH: Again, let's think
11 about it in terms of what's the level of the
12 investigation. It is a number off-the-top-of-
13 your-head; I think the probability is one in
14 a 100 or is this after very serious review of
15 all the applicable science and doing the
16 calculations?

17 On our Mars example, for example,
18 we went into a lot of detail about the Martian
19 atmosphere and about the way UV sterilizes
20 microorganisms and which kind, and how do you
21 know, and so forth to put this case together.
22 It was not a set of off-the-top-of-the-head

1 judgments. And it stood up to review by
2 people like Joshua Lederberg and Carl Sagan,
3 who were pretty smart about the biological
4 aspects.

5 MEMBER PETERSON: I agree.
6 Actually, you need to make decisions based on
7 substantial analysis. But my question would be
8 should one try to minimize the risk that you'd
9 be faced with reversal in a way that looks at
10 both the probability that you might in the
11 future learn that the system is not going to
12 perform well? And can you evaluate that risk?

13 And then also through how you
14 phase the emplacement of waste, say, try to
15 learn during an initial phase and have an off
16 ramp as opposed to just continuing to do the
17 same thing like we did at Savannah River and
18 Hanford, even when you began to probably
19 realize that you were generating a big
20 mortgage by continuing down that path?

21 CHAIR LASH: I think that Dr.
22 Peters wanted also to respond.

1 DR. PETERS: You kept going and
2 now I've got another thought.

3 CHAIR LASH: Okay. Well, cover
4 both.

5 DR. PETERS: Well, I want to go
6 back to boreholes. You know this, but your
7 questions about boreholes, it all depends on
8 what you're putting down there, first of all.
9 You know that.

10 MEMBER PETERSON: Yes.

11 DR. PETERS: Is it cesium-
12 strontium capsules or is it spent fuel? You
13 know, those are two dramatically different
14 things.

15 And also, as you well know, the
16 uncertainties associated with a field of
17 boreholes if you're thinking about trying to
18 understand geologically what's on down there
19 if you've got a field of boreholes that you're
20 trying to waste down, think about being able
21 to understand geology between those boreholes,
22 the uncertainties that are associated with

1 that.

2 So it's not a panacea like I hear
3 some talk about: Well, let's just put it all
4 down deep boreholes. I think we need to
5 hesitate from going that direction. I don't
6 think it's what I hear from; that's the first
7 point.

8 MEMBER PETERSON: Okay. I
9 apologize. To operationalize this then, for
10 example if one in your waste classification
11 criteria were to categorize material by the
12 likelihood that you might want to retrieve
13 them and start with the stuff that you believe
14 you're unlikely you want to retrieve, you
15 would reduce risk of being faced with a big
16 reversal bill, right?

17 DR. PETERS: Yes, sir. So I think
18 you're on the right track. So I think when
19 you think about retrievability in the context
20 of staging and adaptive management --

21 MEMBER PETERSON: Yes.

22 DR. PETERS: -- I think you

1 separate safety and resource recovery first of
2 all, because they're at different phases in
3 the decision process.

4 MEMBER PETERSON: And to
5 operationalize that you would say well why
6 don't we focus initial disposal on, say,
7 cesium-strontium followed by high level waste,
8 then with a serious decision point there,
9 potential disposal of spent fuel, right?

10 DR. PETERS: That's a scenario,
11 yes.

12 MEMBER PETERSON: That would maybe
13 allow you to go to sites that have lower or
14 more expensive retrievability? You can
15 retrieve at infinite expense, infinitely
16 difficult material?

17 CHAIR LASH: Per, can we move on?
18 I know Vicky has some questions. Allison has
19 another round of questions. I have an easy
20 and naive one.

21 Vicky?

22 MEMBER BAILEY: Mine will probably

1 be easy. Just a quick question.

2 The capacity of boreholes, is that
3 the same as we might see in permanent other
4 geological? Can I have an answer to that?
5 What's the capacity difference here that we're
6 talking about?

7 DR. PETERS: I don't have the
8 numbers off the top of my head. There's
9 reports on it. But in general, you drill a
10 lot of boreholes, you can put a lot of stuff
11 down it. But in terms of putting a lot of
12 spent fuel down a borehole, like if we were to
13 go that direction --

14 MEMBER BAILEY: Right.

15 DR. PETERS: -- that to me is a
16 bit more hard to imagine. You really need
17 something mined, a mined repository, in my
18 mind.

19 MEMBER BAILEY: Okay.

20 DR. PETERS: This is a personal
21 opinion.

22 MEMBER BAILEY: Yes.

1 DR. PETERS: I see boreholes for
2 specialized waste streams, I'll call it.

3 MEMBER BAILEY: Okay. Any other
4 comments on that? Go ahead, Dr. Murphy?

5 DR. MURPHY: I've seen reports
6 recently that our conventional estimates of
7 high level or high activity wastes would
8 require about a 1,000 boreholes.

9 MEMBER MacFARLANE: Yes. That's
10 for the existing stockpile of spent fuel.

11 MEMBER BAILEY: Not for future,
12 but current capacity. I'm sorry, I should
13 have been more specific. Okay. All right.

14 Actually, I want to go to Dr.
15 Peters. Your responses on the regulatory
16 changes and also on other regulatory issues,
17 and Dr. Budnitz obviously mentioned from the
18 standpoint of his views, he argued for a
19 singled regulator. And I guess I want to ask
20 Dr. Peters, is that where you were going with
21 your thoughts on more appropriate interactions
22 with the regulator? And how important during

1 this staged process what can we do to do
2 public acceptability?

3 DR. PETERS: I actually didn't
4 even go there on the two regulators versus
5 one. If I'm implied it. Thank you, there's
6 three. So you've got DOE, NRC and EPA. And I
7 didn't even want to imply that I was going
8 after that one. Bob went after it, for sure.

9 MEMBER BAILEY: So I'm giving you
10 a chance to.

11 DR. PETERS: Yes, I'm going to go
12 after it now.

13 I personally think that we could
14 do a much better job of simplifying it. So I
15 would argue for a not so different than the
16 WIPP model where you have one agency focused
17 on developing the regs and the compliance, et
18 cetera. So, I like that model.

19 I'm not going to pick a winner,
20 like Bob did.

21 MEMBER BAILEY: Okay.

22 DR. PETERS: I'll let the Congress

1 decide who the winner is on that.

2 MEMBER BAILEY: Okay. Bob?

3 DR. BUDNITZ: I just want to chime
4 in that. There is a very important public
5 policy purpose for multiple clumsy process.
6 The Founding Fathers did it with how we enact
7 laws, and that's an extremely valuable thing.
8 They made it clumsy in order to assure against
9 quick one decision, off you go. And that has
10 served the Republic well over more than two
11 centuries.

12 And I thin the federal system with
13 its state and federal roles is another example
14 of that, quite separate from the way we enact
15 federal laws.

16 In this case these are all federal
17 agencies. And I said I don't understand the
18 public policy purpose for multiple federal. If
19 someone can tell me. Except the purpose of
20 making it clumsy, and I understand it. But
21 except for that, trying to make it slow and
22 clumsy and so on and if you're opposed to

1 anything going on, you love clumsy processes;
2 you can sue 75 different times on different
3 things. But if they're all feds working as
4 federal employees do to try to advance what
5 Congress told them is their mission and to try
6 to advance the sensible public policy, I don't
7 understand it. I mean, it's as simple as
8 that. Okay.

9 MEMBER BAILEY: And back to Dr.
10 Peters, on your risk-based versus source-based
11 approach can you talk to me a little bit more
12 about why you favor one over the other?

13 DR. PETERS: Well, I think it's
14 similar to kind of the way we go with risk-
15 based regulation overall.

16 But let's back up. So if you look
17 at the regulatory and statutory framework now,
18 what I mean by source-based is anything that
19 was derived from reprocessing as being high
20 level waste, quite frankly just to simple.
21 There's details in there that people in this
22 room could talk to better than I, but that in

1 and of itself is a restrictive classification
2 in that some of the waste streams that come
3 from reprocessing aren't, in fact, high level
4 waste there.

5 So if you truly look at it from a
6 risk perspective, then some of the waste
7 stream could be handled as low level waste,
8 for example, which could or could not be
9 handled in a different disposal environment.

10 But I think we're basically looking if you
11 retrieve this source, you're not really
12 looking at the risks and the health effects.
13 So it's really an old way of looking at what
14 now we're already going to risk-informed
15 performance-based regulations overall anyway.

16 So to me, the waste classification system
17 eventually needs to catch up; that's my
18 perspective.

19 MEMBER BAILEY: Any other comments
20 on it? All right. Thank you.

21 CHAIR LASH: So I'm going to ask
22 one questions. I hope several of you will

1 respond. It follows up on Vicky's questions a
2 moment ago. And then I'll come back and start
3 with the second round with Allison and Per.

4 I found it very helpful, Dr
5 Budnitz, your explicit conclusion:

6 (a) That we need to unify the
7 regulatory process. It doesn't make sense to
8 have multiple agencies for public policy
9 reasons;

10 (b) Recommend that a specific
11 agency, and;

12 p In the course of recommending a
13 specific agency, you essentially articulated
14 some criteria. You recommend NRC because it
15 is independent, has the expertise, and
16 essentially has a culture of considering these
17 issues that you thought was useful.

18 DR. BUDNITZ: And a process.

19 CHAIR LASH: Yes. And I'd like to
20 divide that into several pieces, and make sure
21 I get input from others on the panel as well
22 on this.

1 Would you recommend that the
2 process be unified regardless of the choice of
3 agencies?

4 DR. BUDNITZ: Yes.

5 CHAIR LASH: And secondly, do you
6 think that those criteria could be -- it's
7 essentially balancing the criteria. And I had
8 the sense that you thought independence was
9 most important. And then after you've
10 answered that, I'd like to hear from any
11 others.

12 DR. BUDNITZ: In that sense I
13 think I can correct myself.

14 CHAIR LASH: Okay.

15 DR. BUDNITZ: I think the most
16 important is that the Nuclear Regulatory
17 Commission has demonstrated a long record of
18 very high technical competence and they've
19 shown it in how they've gone about both
20 establishing the regulations for Yucca
21 Mountain and the interaction over a decade
22 with the applicant, the DOE and its

1 contractors, and how they've gone about this
2 review.

3 If you look carefully at how EPA
4 went about certifying WIPP, you will find no
5 impugning of their motivations, of course.
6 That process was far less detailed, intense,
7 technical and drawn-out.

8 Now I'm not arguing. WIPP's a
9 great site. I was on the applicant's side for
10 that, namely Sandia employed me and some
11 others for a decade to help them review the
12 technical basis for what they put in. So in
13 that process, I was actually on the side of
14 the applicant.

15 But when I watched the regulator
16 do what they did, and they did a good job, but
17 they didn't muster the resources that I would
18 have hoped. They didn't ask as many or many
19 rounds, or as much detail, okay? Again, I'm
20 not impugning.

21 But the thing that really troubled
22 me was, and I'll say this as directly as I

1 can, the single most important thing EPA does
2 is air pollution. There' was an office, it
3 was called Air and Radiation Programs.

4 CHAIR LASH: And Noise. Air
5 noise.

6 DR. BUDNITZ: Oh, excuse me. And
7 air was 99.999. And if you were running that
8 office, radiation was down here somewhere.
9 I'm not saying they didn't do a good job. But
10 Nuclear Regulatory Commission had -- I'm
11 talking about the WIPP process without
12 impugning any of the motivations and the fine
13 work of the staff, they didn't the resources,
14 they didn't ask for them, they didn't get them
15 so they didn't do it. What they did was, you
16 know WIPP turned out to be a wonderful site.
17 It turned out the analysis was very robust, so
18 it went through. And I'm happy about that.

19 But if I asked that to happen in
20 the Office of Air and Radiation at EPA today,
21 air is still going to be more important.

22 And so I find that structurally an

1 issue. That has not to do with the
2 competence, but with the resources that they
3 brought or they could bring, or that political
4 processes would allow them to bring. Okay?

5 CHAIR LASH: So, having gotten an
6 even more clear response from Budnitz, I
7 wonder whether anybody else has any other
8 views, particularly on other criteria that
9 might be important?

10 MR. McCARTIN: Well, in terms of
11 the two regulators or one, if you will, I
12 think the roles of EPA and NRC are defined
13 well. While we don't always agree, we have
14 over the years with the Yucca Mountain
15 regulations we've had a lot of interactions.
16 I think it's resulted in better standards and
17 regulations.

18 I don't know if it's that clunky.
19 I think there are a lot of reasons why things
20 have taken so long for Yucca Mountain. They
21 aren't necessarily problems with EPA and NRC.

22 The one thing I guess I would

1 caution is that there are other requirements
2 that NRC is responsible for in Part 60 or 63
3 that I think are somewhat unique to NRC's
4 licensing approach. And we have safeguards
5 materials, things of that nature, security
6 that if it was just the post-closure standard
7 it would be one thing, but with spent fuel and
8 other items that will be there, there are some
9 unique aspects that I think NRC at this time
10 is the right agency for that particular
11 material.

12 But, you know, I'd be interested
13 what Dan wants to say. But I've felt the
14 interactions have helped the process.

15 CHAIR LASH: Thank you.

16 Mr. Schultheisz?

17 MR. SCHULTHEISZ: Yes. I would
18 have to agree with Jim about the interactions
19 in the Yucca Mountain process. And we
20 actually left some certain decisions in the
21 2008 for the beyond 10,000 year standards to
22 NRC to determine; the long-term climate

1 characteristics. And so there's a lot of
2 interaction there, there's a lot of expertise
3 that NRC has.

4 And I will not disagree that their
5 program is much better resourced than the
6 radiation program at the EPA, and probably
7 will always remain so. You know, that's part
8 of their fundamental mission is dealing with
9 all aspects of the nuclear fuel cycle, and
10 that is just other than the standard setting
11 part of it, that is not really an EPA mission
12 critical function.

13 And so I can't disagree that we
14 had a much smaller team involved in certifying
15 and now recertifying the WIPP probably than
16 NRC would have been able to bring to bear. We
17 did not do independent performance
18 assessments. NRC did. We did not do a lot of
19 other independent research, as NRC did.

20 Of course, you could argue that
21 Yucca Mountain, the spent fuel high level
22 waste program is going to demand far more

1 resources than the DOE defense TRU program
2 would in any case, and that may be a
3 legitimate issue.

4 But I do agree with Tim that the
5 agencies have become I think much smoother at
6 working together over the past decade or so.

7 CHAIR LASH: Anybody else? Dr.
8 North?

9 DR. NORTH: I would urge the
10 Disposal Subcommittee to think more broadly as
11 you are going to do this afternoon with the
12 institutional panel.

13 There is the task of setting
14 regulation, and then there is the task of
15 evaluating a license application such as NRC
16 is now doing. I would urge those tasks to be
17 separated.

18 And I would urge consideration of
19 outside review groups, including committees of
20 the National Academy of Sciences who
21 repeatedly review WIPP, Bob Neill I hope will
22 talk about his group and their activities in

1 WIPP this afternoon. It isn't just a matter
2 of a federal regulatory agency. It's a debate
3 to try to get out what is the best science and
4 are we making decisions properly given what we
5 know about the science.

6 So having information and
7 skepticism come in from a variety of other
8 parties seems to me something that is very
9 much needed to be encouraged rather than there
10 is a project manager, which might be a federal
11 agency like DOE, and then there is a
12 regulatory authority which might be EPA, NRC
13 or some combination. I think it should be
14 more broad than that.

15 CHAIR LASH: As a lawyer coming to
16 this kind of problem, I think I would expect
17 that there would be a proposer, a disposer and
18 a rulemaker and that those are very separate
19 functions and should be kept separate. I
20 understand that that's somewhat of an
21 oversimplification in this context.

22 Dr. Budnitz and then we'll move on

1 to Allison.

2 DR. BUDNITZ: I just want to
3 disagree with Warner. But I want to start out
4 by saying that Warner and I studied freshman
5 physics together. I was a sophomore and he
6 was a freshman in 1959 or '58, so we kind of
7 know each other for a couple of years.

8 I respectfully want to disagree
9 with Warner about something. You know, I'm a
10 reactor guy, in the reactor the Nuclear
11 Regulatory Commission is constantly modifying
12 the regulations as cases and details come up
13 in the context of some broader, but then they
14 modify details, either guidance or regulation,
15 because the thing they wrote nine years ago or
16 even two years, or 14 years ago doesn't fit
17 the case. And they have to do that. And so
18 they have varies processes for either modest
19 changing the guidance or sometimes changing
20 the regulations all the way to the Federal
21 Register and the Administrative Procedures
22 Act, or sometimes it's at a lower level.

1 Now if you got to go to another
2 agency to do that, that's clumsy and I don't
3 understand the public policy purpose of that.
4 In fact, it actually gets in the way because
5 one of the things you want to do if an issue
6 arises is to make sure the regulator in a
7 prompt and useful way provides the right
8 guidance or regulation, as it may be, to the
9 applicant who is trying to adjust what they
10 found to the case and still maintain safety
11 and security and environmental protection.
12 And I'm really worried about the
13 implementation phase, and I've been worried
14 about this for the longest time.

15 Imagine Yucca Mountain was going
16 ahead and they're nine years into it, and
17 they're emplacing and they find something.
18 Going back to another agency, boy, is that
19 clumsy. I just don't see it as satisfying the
20 purpose. Okay?

21 And that's down in the details,
22 not just setting standards which I could

1 understand a little, although even that I
2 don't.

3 CHAIR LASH: Allison, you've been
4 waiting patiently.

5 MEMBER MacFARLANE: Okay. Great.
6 So although Bob and I violently disagree on
7 something, we violently agree on others.

8 DR. BUDNITZ: You bet.

9 MEMBER MacFARLANE: That's right.
10 And because you have lots and lots
11 of experience here and I respect all of that,
12 I would like to hear from you on a couple of
13 questions and also maybe Bill Murphy and
14 Warner as well. And this question isn't one
15 that you were asked, but because you're
16 sitting there I want you to answer it.

17 What agency or entity do you think
18 should manage the characterization site
19 selection, that kind of thing, of this whole
20 process?

21 And then I want to ask you all
22 about waste classification and whether you are

1 satisfied with it or not, and how you would
2 change it?

3 So, Bob, yes.

4 DR. BUDNITZ: You're asking me?

5 Well, as far as I'm concerned, the
6 logic is the applicant does everything needed
7 to support the application for permission
8 using and following the guidance set down by
9 the regulator as to what is necessary.

10 MEMBER MacFARLANE: Yes. So who
11 should that applicant be if it were up to you?

12 DR. BUDNITZ: Well if it was up to
13 me, well first of all the applicant today is
14 a federal agency.

15 MEMBER MacFARLANE: Right.

16 DR. BUDNITZ: If I was rewriting
17 the regulation?

18 MEMBER MacFARLANE: Yes.

19 DR. BUDNITZ: I think that --

20 MEMBER MacFARLANE: You mean the
21 law. If you were rewriting the law.

22 DR. BUDNITZ: Excuse me. Yes. If

1 I was rewriting the law, I'm not sure -- and
2 I haven't thought a lot about this because I'm
3 actually trying to be engineer. About whether
4 the model of an independent agency like TVA
5 makes more sense then letting it be in the
6 Cabinet, a part of a Cabinet office. I
7 haven't thought that through. I understand
8 the arguments pro and con, but I haven't
9 thought through them and I just don't want to
10 go there. But I understand there's pros and
11 cons there.

12 MEMBER MacFARLANE: Okay.

13 DR. BUDNITZ: To me, though, the
14 essential thing is that the applicant, whoever
15 it is, must be responsible for developing the
16 whole case fitting within the guidelines laid
17 down by the regulator as to what the case is.

18 MEMBER MacFARLANE: Do you not see
19 that to be the case right now?

20 DR. BUDNITZ: Oh, it's the case
21 now. It's the case now. You bet.

22 MEMBER MacFARLANE: Right.

1 DR. BUDNITZ: And it, if you don't
2 mind my saying, worked at WIPP and it worked
3 at Yucca Mountain to that stage, yes.

4 MEMBER MacFARLANE: Okay. And
5 waste classification?

6 DR. BUDNITZ: The idiocy of the
7 current system, and that's a strong word but
8 I'm going to use it, is that certain wastes
9 that look identical, this one and this one,
10 are regulated differently just because of
11 their source.

12 MEMBER MacFARLANE: Yes.

13 DR. BUDNITZ: That's a historical
14 artifact that goes back to the '50s. Excuse
15 me. Goes back to the original Atomic Energy
16 Act, which was in the '40s. And has been
17 maintained because of its historical inability
18 to just -- it's just inertia, and it doesn't
19 make sense.

20 MEMBER MacFARLANE: Yes.

21 DR. BUDNITZ: For example, as
22 perhaps you know, we have some wastes that are

1 regulated highly and another identical waste
2 isn't regulated at all by anybody. Why?

3 Because one's an NARM and one's NORM, and ones
4 raffinate -- I mean, where'd that come from?
5 It came from history. That don't make any
6 sense.

7 If you don't know what NARM and
8 NORM are, I'll give you a lecture later.

9 MEMBER MacFARLANE: Okay.

10 DR. BUDNITZ: Okay. But the idea
11 that we should regulate waste streams based on
12 their characteristics has impeccable logic.
13 And the idea of regulating by the source of
14 their material doesn't make sense to me.
15 How's that?

16 MEMBER MacFARLANE: Okay. Warner,
17 go ahead.

18 DR. NORTH: I'd commend to you the
19 chapter reviewing international programs in
20 this report and the recent report by Dan
21 Metlay for Nuclear Waste Technical Review
22 Board on the international programs. It seems

1 to me that there are a number of models being
2 used outside the United States that have some
3 real virtues to them. I was particularly
4 interested in and impressed with SKB as the
5 applicant in Sweden and SKI as the regulatory
6 oversight agency.

7 It seems to me that you want an
8 applicant that is both very highly motivated,
9 has access to the best science and the best
10 engineering, and also has a very strong
11 motivation to reach out into the communities
12 where a repository or storage site might be
13 located and develop a relationship with those
14 communities.

15 It seems to me SKB has done that
16 job very well. I don't know a lot about it,
17 but I would urge you to investigate.

18 MEMBER MacFARLANE: And the waste
19 classification?

20 DR. NORTH: This is with respect
21 to the Swedish repository program.

22 MEMBER MacFARLANE: Right. I know.

1 I know. But what do you think about the
2 current waste classification system? And if
3 you don't like it, how should it be changed?

4 DR. NORTH: I think I'm going to
5 leave that for other people.

6 MEMBER MacFARLANE: Okay. Bill?

7 DR. MURPHY: First of all, I can't
8 comment on waste classification. It's not
9 something I've studied or have expert judgment
10 about.

11 One question I think you posed was
12 who should do site characterization.

13 MEMBER MacFARLANE: Yes.

14 DR. MURPHY: And I think that's an
15 excellent question.

16 I think that it gives me an
17 opportunity to say something I wanted to say
18 earlier in response to the question whether or
19 not Yucca Mountain was more complicated than
20 other potential sites.

21 I've worked on several sites, and
22 I've studied many others, and they're all

1 complicated. That's the nature of the system.

2 Many of the fundamental
3 assumptions about the WIPP site, which was
4 purported to be simple before they built it,
5 were completely wrong: The permeability, the
6 creep rate, the amount of water that's there.

7 MEMBER MacFARLANE: Yes.

8 DR. MURPHY: Very fundamental
9 things about the WIPP site that were believed
10 before they did site characterization turned
11 out to be wrong.

12 Many of the things that are
13 thought about Yucca Mountain before site
14 characterization turned out to be wrong. And
15 people still sometimes say it's a dry site.
16 That's absurd. It's ten percent water above
17 the water table. And I think a problem that
18 we faced in the case of Yucca Mountain was
19 that the site was selected before it was well
20 characterized. Site characterization is
21 essential and it's hard. It's complicated.
22 The systems are inherently complicated. It

1 doesn't mean that they're impossible.

2 We've learned a great deal about
3 Yucca Mountain. The entire science of
4 groundwater flow in fractured unsaturated rock
5 has changed because of Yucca Mountain. So
6 it's not that there isn't expertise adequate
7 to address the hard problems, but it needs to
8 be done and preferably before decisions are
9 made.

10 MEMBER MacFARLANE: Yes. And who
11 should do that?

12 DR. MURPHY: I don't know who
13 should do it. But I know in the case of Yucca
14 Mountain there was really excellent work done
15 by the people at Los Alamos on site
16 characterization. There was really excellent
17 work done by the USGS on site
18 characterization. There were excellent work
19 sponsored by the NRC Research Office for a
20 while. And so there were a lot of players.
21 Livermore did some work on site
22 characterizations. So the National Labs were,

1 I think, principally the agencies where the
2 expertise was.

3 CHAIR LASH: Per, do you have
4 additional questions?

5 MEMBER PETERSON: Yes. The first
6 thing I'd like to do is to go back just
7 shortly to retrievability and look at the two
8 different reasons why one might want to
9 retrieve. Because one is that you want to get
10 the material back out because you've
11 determined that it might have some value. And
12 then the other is that you determined that
13 there's something about the performance of the
14 system is not going to be acceptable and you
15 want to try to fix that.

16 For the first, I guess, Mark, you
17 expressed a lot of discomfort with putting
18 spent fuel into boreholes. Is that because you
19 would believe that you could get into the
20 performance problem or into a resource
21 recovery problem?

22 DR. PETERS: Well, it was partly

1 because it was both. It was partly resource
2 recovery problem, but also because it's the
3 shear number of boreholes and the
4 complications of getting spent fuel down a
5 borehole. There's other operational, but
6 there's the shear volume. To me if you're
7 going to dispose of spent fuel, there's
8 perfectly good media. You could go out and
9 build a nice mined repository that
10 operationally is much easier to deal with.
11 That's just kind of intuition on it. But
12 resource recovery is a part of it, correct,
13 likewise.

14 MEMBER PETERSON: Okay. On the
15 case of the performance problems, the other
16 alternative if you discover them is to
17 mitigate, right? So to what extent can we
18 have some judgment about how much we should
19 rely on the possibility to mitigate potential
20 problems versus retrieve, going back again to
21 the fact that it's possible that by selecting
22 a site and engineering to enhance

1 retrievability you might in the end actually
2 get worse performance and therefore, end up
3 more likely to retrieve it because of what
4 you've done?

5 Tim?

6 MR. McCARTIN: Certainly the
7 intent of NRC regulations is not to make the
8 site less safe. And so we would look very
9 dimly on retrievability designs that look like
10 they were making it less safe. So we would
11 certainly not try to do something like that
12 and not have a licensee feel they had to do
13 that.

14 In terms of mitigation, our
15 regulations have the provisions that it's
16 expected that different conditions will be
17 encountered. When DOE encounters that, they
18 have to analyze it and see what they might do.
19 You know, if it changes the safety
20 significantly, they need to come back to the
21 NRC and we need to evaluate that and see what
22 the next step is.

1 Clearly, any decision to retrieve
2 safety purposes will carry with it a fair
3 amount, I would assume, public debate and
4 discussion and, hopefully, be transparent
5 what's done, whether there's other conditions
6 that can be relied on so it doesn't need to be
7 retrieved or it needs to be retrieved. The
8 intent, at least from a safety standpoint, is
9 not to make the site less safe.

10 The same thing has been said with
11 performance confirmation testing. What are
12 you going to do to confirm? Well, there's a
13 lot of things you might want to do. You
14 wouldn't do things that make it less safe.

15 MEMBER PETERSON: Warner, and then
16 one other question.

17 DR. NORTH: I'd like to tell a
18 story about the early days of the Nuclear
19 Waste Technical Review Board with respect to
20 retrievability.

21 The original plan for spent fuel
22 at Yucca Mountain was to emplace it vertically

1 down a shaft and put it in boreholes. My
2 Chairman, Don U. Deere looked at this in his
3 first months as the Chair of the Nuclear Waste
4 Technical Review Board and thought this was a
5 crazy idea.

6 You could come in from the side
7 with essentially a horizontal tunnel where you
8 could take these very heavy waste containers
9 and you could move them around much more
10 easily, and you will avoid a great many
11 problems in terms of the safety issues of
12 putting a very heavy thing down a shaft and
13 getting it emplaced properly.

14 So, I would urge that we think
15 about this not just as a regulatory issue, but
16 as a good management and operations and safety
17 issue of how the operator is able to emplace
18 and then maybe move around or even retrieve
19 the waste materials and how that can be done
20 in a way that doesn't lead to a lot of worker
21 exposure to radiation or the potential for old
22 fashioned industrial accident, et cetera.

1 CHAIR LASH: Did you have another
2 question, Per?

3 MEMBER PETERSON: Actually, no.

4 CHAIR LASH: Vicky, any more?

5 Oh, did you want to add something,
6 Dr. Budnitz?

7 DR. BUDNITZ: Yes. I had a comment
8 about Per's.

9 At Yucca Mountain when the final
10 analysis that was submitted was done, the
11 risks of those doses to the receptor on the
12 surface were really quite low. But one of the
13 dominant risks turned out to be from
14 earthquakes. Even though of these very low
15 doses, a lot of it was from earthquakes, large
16 earthquakes out in the future that were not
17 sure to happen in any given year, but were
18 sure to happen over millennia sooner or later.
19 And that analysis was one in which I was
20 particularly participating during the few
21 years I was at Livermore, because what I do in
22 reactors is a lot of that stuff: Seismic.

1 And we ended up with a good deal
2 of uncertainty about how it would actually
3 behave. But the bounding analysis we did,
4 which was I think very robust, convinced us
5 that that particular repository was actually
6 very nicely chosen and designed against that
7 phenomena.

8 We now believe that earthquakes
9 way larger than the earth can probably sustain
10 will, nevertheless, not compromise the overall
11 performance. So if someone says "What about
12 earthquakes," because there are earthquakes in
13 that area. You can't say there aren't. Of
14 course there are. Those earthquakes that we
15 understand might happen over the millennia, or
16 even hundreds of millennia, turnout in the
17 analysis not to compromise the overall
18 criteria. And that's wonderful.

19 Now, that isn't necessarily
20 something anybody knew going in. I'm talking
21 about back in the '80s, nobody knew that. In
22 fact, we didn't figure it out until the middle

1 2000s, which is really a comeuppance when you
2 think that had it come out otherwise, we would
3 have been very, very unhappy.

4 If the earthquakes by themselves
5 would have compromised what was otherwise
6 absent earthquakes a good site design
7 combination, there probably would have had to
8 been an awful lot of work to figure out what
9 to do. It probably might have been done, but
10 it was very hard.

11 Now that tells you something, and
12 you got to be humble about this. One of the
13 problems we have is that retrievability is
14 there in case our children or their children
15 learn something, science or engineering, that
16 we didn't know or have a different perspective
17 on it which forces them to say you know, they
18 were doing the best they could our
19 grandparents, but we don't think that's good
20 enough. To me, that's the fundamental thing.

21 This resource recovery thing, I
22 understand that, but it just doesn't wash with

1 me. We're talking about safety here. And it
2 seems to me that with that in mind, again the
3 Yucca Mountain site is particularly suited for
4 that in a way that salt is not.

5 By the way, salt you can recover
6 it, okay, but boy is it hard compared to a
7 mined thing that's there for a couple hundred
8 years and you don't have to do anything. You
9 can go back in.

10 And I don't know how to balance
11 that. Let me describe. This is a crucial
12 point. We have as a fundamental principle in
13 our society that we've enunciated throughout
14 this process around the world the issue about
15 equity across generations.

16 On the one hand, the generation
17 that made the waste ought to pay for its
18 disposal. All right. On the other hand, we
19 want our grandchildren to be able -- you can
20 finish the sentence. On the one hand we want
21 them to pay. On the other hand, will our
22 grandchildren have to pay a lot because of an

1 error we inadvertently made? That's a
2 judgment which is only to be confronted in the
3 event that some mistake is found and which
4 will tear your hair out all the way along.

5 So it comes down in the end it's a
6 policy call that somebody has to make. And
7 who is the place that makes it? In our
8 regulations today it's the five Commissioners
9 at NRC who make that call.

10 And by the way, if it was EPA, it
11 would be the Administrator. Okay?

12 Now, that's not only appropriate,
13 it's the way we do things here. All right.
14 And I like that way because it seems to me
15 that these intergenerational equity things are
16 something you can't write into a regulation,
17 and you can't even give much guidance except
18 the words. But they do come down to a
19 judgment, depending on the site, the waste and
20 the design, which I don't see how to foresee
21 even except just a trust that the decision
22 maker will do it right.

1 CHAIR LASH: I have one last
2 question that actually flows from that. It's
3 about the boundary between expertise and
4 social values. And it comes up with respect
5 to the question of length of time in which you
6 assess risk. And I find your arguments about
7 a million years quite persuasive, but I think
8 we will face this question in other areas than
9 just whether it's a thousand, ten thousand or
10 a million years. And I was very struck by the
11 testimony we heard from Elizabeth Dowdeswell
12 who managed the Canadian process. And as I
13 understood what she was saying, they
14 essentially turned the whole analysis upside
15 down. Rather than having a group of experts
16 come with a proposal and the public respond
17 it, they had the public say what are the
18 values that are most important and then went
19 back to the experts and said how could you
20 achieve a result that adheres to these values.

21 And this is a difficult issue. How
22 do we take advantage of the enormous expert

1 capacity that we see here that you have at
2 NRC, and at the same time recognize where
3 there are areas where really it's the public
4 values that have to come first and that will
5 shape whether the outcome is legitimate and
6 maintainable.

7 So, I just welcome comments from
8 any of you on what the right boundary is and
9 what kind of process we can design to
10 accommodate it.

11 DR. NORTH: Tom Isaacs and Lee
12 Merkhofer, who consulted for the Canadians,
13 and I had a class about a year and a half ago
14 where we compared the Canadian process with
15 our knowledge of the process in the United
16 States.

17 I think there's a lot to be said
18 for having a bottom process involving the
19 public to get them to understand the nature of
20 the problem before we go out prescribing
21 technical solutions. My thoughts on the
22 matter reflect two National Academy studies

1 that I've been a part of. One in 1996 called
2 "Understanding Risk," and another in 2008
3 called "Public Participation In Environment
4 Assessment and Decision Making." These are
5 both referenced in my one page statement. And
6 I would be delighted to talk at length about
7 them, but I'm restraining myself right now.

8 CHAIR LASH: I've relied on them
9 both.

10 Any other comments?

11 DR. PETERS: I guess one plea. I
12 agree with you, but to me whatever comes out
13 the end of this process, hopefully, new policy
14 I would like the policy to prescribe that
15 process as opposed to just saying "Tell the
16 Government to go do it," if I may.

17 CHAIR LASH: Right.

18 DR. PETERS: Because I can
19 imagine, you can imagine. And, you know you
20 may say that's micromanagement, but actually
21 I think that's a very, very complicated
22 question and I think that there needs to be

1 some level of guidance provided to the
2 Government about how exactly to engage the
3 public in the right way.

4 DR. BUDNITZ: But, just to defend
5 what's what, the Administrative Procedure Act,
6 APA, was followed by EPA when they adopted the
7 first 191. And I want to tell you, the EPA
8 went through 25 or 30 drafts of that thing
9 between, you know A and Z. And I may be the
10 only person on the planet that's got all of
11 them in a box in the basement. I was pretty
12 much involved at that time. And there was
13 constant interaction with the public of the
14 time, 1980/'81/'82.

15 Tom Cotton is nodding, because he
16 was part of it at OTA at the time, and others
17 in the room. To get this feedback about the
18 10,000 years and the level of protection, and
19 you remember this thing about how many deaths
20 there were going to be over the ten millennia.
21 It wasn't as if that process failed in the
22 sense that anybody, and lots did, could chime

1 in, and they did. It wouldn't be accurate to
2 say that that process of adopting 191 in 1981
3 was done absent public interaction.

4 Then, of course, NRC did Part 64,
5 same process.

6 Now, if you didn't chime in, well
7 okay you got a chance later because as Tom
8 Cotton showed, there were nine different times
9 when everything was being revisited so you had
10 plenty of chance to get in there. I don't
11 think that the APA, properly implemented, is
12 a flawed process for enabling public
13 participation.

14 And by the way, of course the
15 public also includes the people who sued, the
16 people who had standing in hearings. Sometimes
17 the standing was denied because they couldn't
18 show it. There's a whole lot of things, you
19 know legal and technical.

20 It seems to me we had a process
21 that worked in principle. Why didn't it work
22 in practice? It broke down when one site was

1 picked. That's where it broke down. Okay.

2 One site was picked, absent the full
3 information.

4 CHAIR LASH: That is Congress
5 broke the rules?

6 DR. BUDNITZ: Wait, wait. No.
7 Congress makes the rules.

8 CHAIR LASH: I understand. But
9 the social understanding was of a different
10 process.

11 DR. BUDNITZ: There was a compact
12 which Congress embedded in the EPA. Everybody
13 understand this? And which didn't happen for
14 a reason in 1987 that we can revisit.

15 By the way, the second repository
16 program OCRD that was going to find a
17 repository in hard rock in the east was also
18 eliminated in '86. It's all part of that same
19 sort of political thing. There was a compact
20 in which there was going to be a second
21 repository east of the Rockies, and some of
22 you remember that. I was actually part of that

1 process, too. It was awful.

2 And so if you're going to try to
3 put a process in place that's different then
4 that, it will like this process always be
5 subject to override, just as if you don't mind
6 my saying, just as the cancellation of the
7 Yucca Mountain thing, if you don't mind my
8 saying, was in Budnitz' view extra legal.

9 Now, you know, okay, it' extra
10 legal. I mean, by the way, Budnitz' stuff
11 isn't extra legal, but the policies are extra
12 legal. But it happened. Okay? I'm grown up,
13 right? You can't do anything about that,
14 Jonathan Lash, as best I can tell except just
15 hope that we'll work together.

16 MEMBER PETERSON: Jonathan, can I
17 have one more question?

18 CHAIR LASH: Per?

19 MEMBER PETERSON: I have one
20 additional question. To make an informed
21 decision about whether a site is sufficiently
22 suitable that if you pursue it, you have a

1 reasonably good expectation that you can be
2 successful to meet regulatory criteria and
3 license and construct a site, one needs to
4 collect some information that likely depends
5 on the specific characteristics of the
6 geologic media and stuff. Is there someplace
7 one can go to get some idea of what specific
8 information do you really need to have
9 collected to be able to make an adequately
10 informed decision? Because I don't want to
11 get a specific technical answer, but at least
12 is there someplace to go to get that
13 information? Is it just boreholes? Do you
14 actually have to mine out into the material or
15 at what level do you have enough information?

16 DR. NORTH: I can't address how
17 much information is adequate. But I would say
18 that an organization that had that problem
19 should definitely go around the world and
20 visit all the other nuclear waste repository
21 programs. Because a great deal of geological
22 exploration and inputs into performance

1 assessment have been done in many national
2 programs across a wide range of types of site.

3 MEMBER PETERSON: But is there
4 someplace I can go to find out what things
5 would you need to do to get to the point of
6 being able to make a informed decision?

7 DR. BUDNITZ: Yes.

8 DR. NORTH: Yes.

9 MEMBER PETERSON: If the answer is
10 yes, that's good.

11 DR. BUDNITZ: Yes. The second
12 repository program, OCRD, the Office of
13 Crystalline Repository Development, which was
14 looking at all these sites in the east from
15 1981 or '82 until it was canceled in '86, and
16 I was in the thick of that, and Bill maybe ran
17 it at Battelle Columbus, had a carefully
18 thought out and public process determination
19 of just those things. And it's all in the
20 record. It was very carefully -- they had
21 huge public meetings; 500 people showed up in
22 Atlanta for three days. And all of those

1 things.

2 Remember, they had 27 different
3 sites in all different media all over the
4 east; the east, Midwest, southeast and so on.
5 And they had public input from people in a
6 zillion states; 20 of them and their agencies.

7 And it was all carefully thought
8 out. It's still in the record. I've got
9 copies of it. And it remains a very valid
10 logic for site investigation and criteria.

11 CHAIR LASH: And go to the
12 European. Go to a couple of the European
13 programs, I would argue to.

14 MEMBER PETERSON: And then the
15 next element is how much time is it likely to
16 take once you say I want to get information
17 about a specific place that there's reason to
18 believe might be reasonably good? How long
19 does it take to collect the information needed
20 to make that informed decision? Is it one
21 year, is it five, is it 50?

22 CHAIR LASH: Tim and then, Mark,

1 you were hesitating around a response. And
2 then we'll wrap up.

3 MR. McCARTIN: Yes. I mean at the
4 initial stage, I think first of all you need
5 to know what you're going to dispose of.
6 Because the nature of your source term will
7 have a dramatic effect on what you need and
8 what you're interested in in the natural
9 system.

10 Ultimately, I think everyone looks
11 at where does the water go. I think you have
12 to understand where the water goes. You've
13 got waste, you've got water and then the types
14 of disruptive events that might effect things;
15 that's your initial look. And then you start
16 doing some of the site investigations.

17 I think back to Hanford, Hanford
18 the only thing you could say that there was a
19 work going on. The more information that was
20 collected consistent with what Bill Murphy was
21 saying, you got more uncertainties.

22 If I have a single borehole, I

1 have a very simple model that is true. You
2 start collecting more. But I think ultimately
3 the water is what removes the waste and takes
4 it somewhere where you might not want it.

5 MEMBER BAILEY: Tim --

6 DR. PETERS: I usually take the
7 bait on stuff like this. There's too many
8 qualifications: It's not one and it's 50,
9 it's ten.

10 MEMBER PETERSON: If it is tens,
11 then we've got a big policy problem. I think,
12 you know just the willingness to try to do
13 this over again --

14 DR. PETERS: I understand. I
15 understand.

16 MEMBER PETERSON: -- becomes
17 unappetizing if it's going to take a really
18 long time.

19 DR. PETERS: Well, if you think we
20 can go out there and do this in two to five
21 years, I think that's not -- my perspective is
22 that's hard to imagine for all the reasons

1 we've been talking. When you go out and
2 actually start studying something, you learn
3 how complex it really is. And so we need to do
4 this right this time. And so you've got to
5 take the time to do it right. And so we do
6 have a policy challenge because you have to
7 give us the time and the cover.

8 I use "you" collectively. We need
9 the time to do it right.

10 CHAIR LASH: Vicky had a follow-
11 up.

12 MEMBER BAILEY: Yes, just real
13 quick.

14 Tim, and others, I keep hearing
15 about it depends on the type of waste.
16 Civilian waste, defense waster, military.
17 Tell me what are you saying when you say "it
18 depends on the type of waste."

19 MR. McCARTIN: Well, certainly
20 well the half-life and the quantities and
21 types of things. I mean, if you have a lot of
22 plutonium, you're interested in certain

1 things. If you have removed the plutonium and
2 you're interested in other nuclides, you may
3 have different concerns at a particular site.

4 MEMBER BAILEY: So that will make
5 a difference whether it's a mined repository
6 or boreholes? Are we talking used fuel, spent
7 fuel? We talking military?

8 You know, we're here to look at
9 all of it. If I'm into reprocessing, am I
10 going to --

11 MR. McCARTIN: Right. But the
12 acceptability of a particular site can depend
13 on the type of waste that you're going to
14 dispose of. That's all I was trying to say.

15 MEMBER BAILEY: Would you see
16 multiple sites if we had two or three and we
17 said, well at one site we're doing one thing
18 and at another site we're doing something
19 else? Help me understand what you're saying.

20 MR. McCARTIN: Yes. Well --

21 MEMBER BAILEY: If I'm to get it
22 right, is that what Dr. Peters says?

1 MR. McCARTIN: Well, as he was
2 suggesting with the strontium and cesium for
3 deep boreholes, it's pretty good for that.
4 Maybe it requires more characterization, more
5 understanding for input of plutonium down that
6 borehole. And I think that's all the --

7 MEMBER BAILEY: Is there an issue
8 as it relates to water surface levels, other
9 issues that I have to think about depending on
10 the type of waste?

11 I don't mean to pinpoint Tim.

12 DR. NORTH: What may give you one
13 issue with respect to Yucca Mountain if you
14 emplace spent fuel, which has not been cooled
15 for a long period of time, you are injecting
16 a lot of heat into the rock formations next to
17 where the place has been placed. That heat
18 may drive off water. And the water goes away
19 in the rock and with the heat it may dissolve
20 some chemicals in the rock that change the
21 corrosiveness of the water.

22 So, it isn't just about

1 understanding the repository, it's
2 understanding the repository as a system which
3 has, for example, heat going into it that is
4 not anything that that type of nature would
5 have experienced.

6 In Yucca Mountain this became a
7 design variable: How hot do you want to get
8 the rock? And there were discussions about we
9 want to go well above the boiling point of
10 water or we want to spread the waste out more
11 so that you wouldn't have that level of
12 heating occur in the rock in the early years.

13 And then as part of the
14 performance assessment you have to say what
15 are the consequences of various levels of
16 heat? Do you get corrosive water that might
17 come down on the canister and cause the
18 canister to erode faster than would have
19 happened under natural situations? In other
20 words, you don't have a natural system, you
21 have a system which has been changed.

22 CHAIR LASH: I would like to thank

1 you all. This has really been a fabulous
2 exchange, enormously useful for us. Thank you
3 very much for your patience with some of our
4 questions, which are things that you probably
5 dealt with when you were undergraduates 40
6 years ago. But in any case, it's been a very
7 session.

8 Fifty, yes.

9 We will reconvene in one hour. So
10 ten minutes later than scheduled. And I'll see
11 you all in an hour.

12 (Whereupon, at 12:38 p.m. the
13 above-entitled matter went off the record and
14 resumed at 1:39 p.m.)

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

2 1:39 p.m.

3 MR. FRAZIER: Okay, if I could get
4 your attention, we are going to resume the
5 meeting and start the afternoon session. So
6 without further ado, I will turn it over to
7 Senator Hagel.

8 CHAIR HAGEL: Thank you, Tim. Good
9 afternoon and we again thank our distinguished
10 panelists.

11 We, this afternoon, will turn to
12 other aspects of the regulatory institutional
13 system that will be needed to make the system
14 effective and publicly acceptable. We will
15 ask our next panel to advise us on these
16 issues.

17 With us for this panel this
18 afternoon we have Robert Neill, Director
19 Emeritus of the New Mexico Environmental
20 Evaluation Group. Welcome.

21 Dr. Michael Voegele. Is that
22 correct? Voegele. As I said, Dr. Michael

1 Voegele, independent consultant and former
2 chief scientist for the Yucca Mountain project
3 and we appreciate you being here.

4 Steve Frishman, Technical
5 Consultant to the State of Nevada Agency for
6 Nuclear Projects. Steve, good to see you
7 again. Thank you.

8 Dr. Hank Jenkins-Smith, Professor
9 and Associate Director at the Center for
10 Applied Social Research at the University of
11 Oklahoma. Nice to have you. Thank you. I
12 just spoke to your president about two hours
13 ago, Senator Boren, and he wishes you well and
14 says don't embarrass him.

15 (Laughter.)

16 CHAIR HAGEL: No, he didn't say
17 that. He spoke very glowingly of you and how
18 fortunate we are to have you. So, thank you.

19 And Dr. Roger Kasperson, research
20 professor and distinguished scientist, Clark
21 University, thank you as well.

22 Let's begin with Mr. Neill. Thank

1 you.

2 MR. NEILL: Thank you, Mr.
3 Chairman.

4 CHAIR HAGEL: And you all know the
5 rules and ten minutes, and so on. Okay.

6 MR. NEILL: Thank you. In 1978,
7 New Mexico had a number of concerns about the
8 proposed transuranic waste facility by DOE but
9 lacked the resources to address them. DOE
10 offered to fund an independent technical
11 evaluation and the state accepted. I set the
12 group up. I was the director for 22 years,
13 retiring a year after WIPP opened in the year
14 2000.

15 Now the punch line is that it is
16 absolutely vital that a state have an ability
17 to do a detailed technical evaluation of a
18 proposed repository. Well what are some of
19 the essential elements for a state review?

20 Well one, obviously is
21 objectivity. You don't want people on the
22 staff that are either violently pro nor anti

1 on it. It is sort of obvious.

2 Independent. It is essential that
3 the work not be subject to political approval.
4 And as a matter of fact, when a governor of
5 New Mexico intervened on EEG and didn't like
6 some of the answers we were coming up with and
7 felt perhaps we were being a little too hard
8 on DOE, both Senator Domenici and Senator
9 Bingaman intervened to assign the group from
10 state government to New Mexico Tech. And I
11 will always be eternally appreciative to both
12 those gentlemen for their efforts to ensure
13 the credibility of the work that was being
14 done.

15 Also, you need to have people that
16 are really confident, senior knowledgeable
17 staff. Virtually everyone I hired had a
18 graduate degree of some type in different
19 disciplines. Also multi-disciplinary is
20 obvious but it is important to note that the
21 key issue here is the potential radiation
22 exposure to people from one of these

1 facilities. Therefore, it is essential that
2 the leadership be vested in radiological
3 health or radiation protection, or health
4 physics, whatever you want to call it.

5 We decided from the very beginning
6 that we wouldn't just write a nasty letter to
7 DOE or so but we would publish our reports.
8 And over the course of the time we published
9 80 reports, put out 500 copies on the street
10 and this was really good. So if we were
11 raising an issue, DOE couldn't just blow it
12 off or ignore it and people would say well how
13 about that, DOE, is this reasonable or is this
14 unreasonable?

15 Presentations at public and
16 professional meetings are essential and also
17 it is necessary to keep the legislature and
18 the congress fully informed. I probably
19 testified 50 times before the state
20 legislature and the congress over the course
21 of my work there.

22 We also had formal field trips

1 where we had people of diverse views present
2 their views and we wrote them up in a detailed
3 report, which was published. We encouraged
4 the staff to have key roles in the
5 professional societies. As a result of this,
6 I was fortunate in being asked to be a member
7 of a number of committees at the National
8 Academy of Sciences, DOE, EPA, and also OTA,
9 when we had that and the Aspen Institute.

10 Long story short, we determined
11 that DOE had met the EPA standards and
12 recommended disposal. And part of the success
13 of WIPP at the risk of sounding immoderate is
14 public confidence from the EEG evaluation of
15 the impact on public health.

16 Two things that are, in general,
17 lacking at times in here was candor and
18 humility in saying what the uncertainties in
19 protections of potential disruptions over
20 10,000 years, whether they are manmade or
21 naturally occurring destructions. And the
22 example I would use is that all our mothers

1 are very, very proud of the work that we have
2 done and, you know, I really trust this
3 totally but when you start telling your own
4 mother what people are going to be eating
5 10,000 years from now or what the potential
6 root of exposure of these materials coming
7 back to the biosphere, you know, your own
8 mother may have some questions as to the
9 validity of those assumptions.

10 Now what is WIPP, again? It is a
11 nineteen billion dollars repository and the
12 critical radionuclide is plutonium-239 for
13 WIPP. It is the long-lived, 24,000-year one.
14 And a reminder that the contact handle
15 transuranic waste is respirable. There are no
16 limits on the respirability. It is soluble.
17 It is not fused in an insoluble matrix. And
18 it is contained in the 55 gallon carbon steel
19 vented drum. The isolation is essentially
20 based on the containment in the salt beds.

21 The absence of engineered barriers
22 are when we proposed the legislation it was

1 required that engineered barriers be included.
2 The amendment was modified before it was
3 passed to say that engineered barriers shall
4 be used if necessary to show compliance with
5 the standards. And since they were able to do
6 the calculations without the engineered
7 barriers, none were included, although we have
8 a magnesium oxide but that is not one
9 important.

10 Two important things on this slide
11 is that the public acceptance is far greater
12 for activities involving the defense of our
13 country. This is known intuitively, whether
14 you call it patriotism or what have you but
15 there is a greater receptivity and acceptance
16 of those types of activities.

17 And I might mention you ought to
18 point out that on high-level waste, ten
19 percent of the inventory is defense-related.

20 Secondly, on the hazards of the
21 radwaste, the states do not regulate either
22 high-level waste nor transuranic waste. DOE

1 does. The responsibility was given to them by
2 the Congress but the states do regulate the
3 non-radiological components.

4 Now in the case of WIPP, the
5 question was raised this morning, they are
6 trivial exposures from the non-rad components.
7 And the agreement that the state has with DOE
8 is that nothing in this agreement shall relate
9 to the radiological constituents in the waste.

10 Now, on lessons unlearned on waste
11 disposal, it is essential that we plan,
12 evaluate, and plan some more to avoid this
13 changed-our-mind syndrome. There are a dozen
14 examples in the paper published earlier this
15 year.

16 One other thing which is important
17 is consistency in disposing of materials. DOE
18 was able to dispose of the transuranic waste
19 in shallow land burial prior to 1970 and did
20 so. And that was legally correct. Since
21 then, we now have new standards requiring deep
22 geologic disposal and the material that, for

1 example, at Los Alamos, is under three feet or
2 six feet of dirt. This is acceptable because
3 it is legally correct.

4 There is a paper published in the
5 UNM Law School Journal earlier last month by
6 my daughter and myself, as a matter of fact,
7 urging DOE to dig up these materials and put
8 them in WIPP for consistencies sake.

9 A 1957 NAS report was cited
10 frequently here last meeting but it didn't
11 mention the fact that they said, hey, you
12 ought to resolve the major technical concerns
13 before you authorize construction. Those
14 words of wisdom sort of went down the tube.
15 And don't use the screening technique of
16 identifying the criteria that is desirable for
17 a site, where you have five, and then you
18 narrow it to three, and then one. We don't
19 use that in choosing a spouse where we list
20 the criteria that we want in a repository is
21 equally a serious decision for it.

22 At national meetings, there are

1 any number of papers that are presented but we
2 always talk about the transparency and
3 openness. You never see papers presented
4 saying how we really messed up. We spent
5 these funds unwisely. They really didn't get
6 -- On the low-level waste sites, six of the
7 first ten had to be closed because they
8 leaked. Oak Ridge had the open pits where the
9 rainfall was less than the evaporation. Now
10 it is true most years. Some years it wasn't
11 and we had a real mess on our hands.

12 So, on the regulatory standards it
13 is essential that one resolves jurisdictional
14 disputes between the agencies promptly. You
15 cannot evaluate any performance without a
16 yardstick to do so. I think it is
17 unconscionable that the two regulatory
18 agencies, NRC and EPA spent over two years at
19 loggerheads arguing about what their
20 respective roles were. And I would recommend
21 that the Commission take steps to try to
22 adjudicate those kinds of things promptly.

1 Probabilistic analyses are
2 essential and the public understands that
3 fully. You don't need deterministic ones.

4 Lastly, predicting a dose from the
5 materials becoming back to the biosphere,
6 resuspended and inhaled as is ingestion from
7 diet over one million years, that is a
8 meaningless exercise and those standards must
9 be revisited.

10 By the way, most of the NRC and
11 EPA standards are salvageable. There is no
12 reason to go back and reinvent the wheel from
13 scratch.

14 And before we had EPA standards,
15 Sandia did the calculations on WIPP of
16 calculating max doses at 1.6 million years.
17 So I just throw that in to be fair on it, even
18 though I am opposed to the one million year
19 criteria.

20 Asking Congress to solve technical
21 regulatory problems should go out the window.
22 If DOE wanted to bring waste to WIPP for

1 experiments, you have got Congress to approve
2 that and they said take that a step further.
3 Not only do the experiments, you have got to
4 do them before you bring waste for disposal.
5 The experiments were without merit and had to
6 be cancelled. The law then had to be changed.
7 Also, the EPA required 10,000 year analyses.
8 Congress then asked NAS to take a shot at it
9 and came up with a million years.

10 And I think the moral of the story
11 here is don't ask Congress to do the work that
12 we want to do.

13 Now, it is important to provide a
14 perspective on this which is sometimes
15 lacking. This illustrates the total U.S.
16 population exposure; that in two decades, the
17 medical radiation exposure to our population
18 went up by a factor of 7.3. As a matter of
19 fact, the nuclear exposure went down by a
20 factor of 0.2 but one is 9,000 times greater
21 than the other. I mean, it is as though we
22 have a bookkeeping system where we account for

1 the pennies and don't bother to count the \$100
2 bills. This is a report by the NCRP last
3 year; 160. It is a very reputable group. And
4 the reason why the public is seemingly
5 accepting of this is that the public believes
6 that the benefits of the early detection
7 outweigh any risks of the radiation exposure.
8 Mind now that medical is 50 percent of the
9 total population exposure that we have. It is
10 an enormous number and I would submit that it
11 is terribly important that the Commission urge
12 all the principles to not only do risk
13 analyses which are vital but do benefit
14 analyses as well. What are the benefits of
15 some of the high-level waste, whether it is
16 energy independence, whether it is solving
17 problems with some of the defense high-level
18 waste and things of that type?

19 So this is extremely important and
20 we need to put them all into perspective. You
21 know, that thousands of people die each year
22 from starvation in Africa. Food irradiation

1 can increase the shelf life by months. There
2 is no electricity. The food spoils. People
3 have to shop every day. And this is an
4 example of the beneficial aspects of ionizing
5 radiation.

6 CHAIR HAGEL: Mr. Neill, could you
7 wind up?

8 MR. NEILL: Yes, sir.

9 CHAIR HAGEL: And then we will get
10 all of your panelists there ten minutes and
11 then we will get the questions. Thank you.

12 MR. NEILL: Yes, sir. Twelve
13 seconds.

14 Ten million has been spent to date
15 and we have collected twenty-two billion from
16 ratepayers. Yucca was expected to cost
17 ninety-seven billion. The new one will be
18 greater than that. And the future funding is
19 going to be far more difficult to obtain and
20 I would recommend that the Commission consider
21 trying to get those funds collected and that
22 they be put in a separate account, rather than

1 the general treasury.

2 Thank you.

3 CHAIR HAGEL: Mr. Neill, thank you
4 very much. Dr. Voegele?

5 MR. VOEGELE: As the person who
6 doesn't really belong on this panel, I will
7 try not to dig myself into too deep of a hole.
8 The questions that you asked are rather broad
9 and it would take far more than ten minutes to
10 do them justice.

11 I have chosen to take a small bite
12 of the apple and I am reacting in particular
13 to the statement about avoiding extended out-
14 of-sequence confusing process of regulatory
15 development.

16 I am going to examine selected
17 aspects of the regulations that are traceable
18 to policy that I will try to identify that
19 really complicated the disposal program or
20 caused concerns related to what is normally
21 caused as changing the regulations to fit the
22 site.

1 I want to point out that the
2 regulations themselves do not lead to the
3 abandonment of Yucca Mountain. Those
4 regulations are difficult but they are
5 understandable. They are clumsy and
6 proscriptive but the Department of Energy was
7 able to prepare and docket a license
8 application. So I am going to present some
9 observations about why I believe the
10 regulations and to evolve and maybe a lesson
11 learned that is a little different from you
12 were expecting. There is perspective in my
13 points that I think you have to expect that is
14 going to happen in the future as well.

15 As to the social part of this, I
16 personally don't think the public involvement
17 in the program was meaningful -- The Yucca
18 Mountain program was meaningful. I do think
19 it was meaningful in the WIPP program and that
20 is why I don't think anybody was satisfied by
21 it. And it is very easy to try to write that
22 off as part of the difference between working

1 within a peer democracy and a constitutional
2 democracy but I prefer to look at it as an
3 issue that we were dealing with some very well
4 intentioned goals that were just poorly
5 implemented in terms of involving the public.

6 So we will go from here. The
7 policy basis I want to talk about involve the
8 interagency review group in 1979, which is a
9 source of the position the country adopted to
10 solve the waste disposal problem within the
11 current generation's lifetime. And I want to
12 make it very clear that I agree with that goal
13 but I don't necessarily agree with the way it
14 was implemented. I don't think that you had
15 to solve something. You had to make something
16 happen within 30 years and lock the door and
17 walk away and never think about it again. I
18 believe it is perfectly legitimate to talk
19 about finding a way to solve that problem and
20 maybe passing onto the future generations an
21 opportunity to become involved, if it is
22 necessary. There we go with the public

1 involvement.

2 I want to mention a couple of
3 things about the Nuclear Waste Policy Act as
4 a precursor to these comments. It did cause
5 us to have three federal agencies involved and
6 that led to some complexity that I am going to
7 talk about in a minute. One thing I want to
8 point out here as an example of public
9 involvement is the Nuclear Waste Policy Act
10 required the Department of Energy to create
11 environmental assessments for looking at
12 selecting the sites to go forward for
13 characterization. And in developing the
14 citing guidelines for the environmental
15 assessments, the Department of Energy believed
16 they were involving the public but they ended
17 up with a set of regulations that could not be
18 printed within the amount of space that a real
19 environmental assessment would allocate to
20 addressing those types of concerns. So it is
21 a situation where the Department was trying to
22 address the congressional perspective of

1 involving the public but created something
2 that he public couldn't deal with in the way
3 the public was used to dealing with it.

4 I want to talk a bit about the
5 National Research Council's report in 1990.
6 You heard about that this morning and I am
7 going to focus on a couple of different
8 aspects of that and I am going to talk about
9 why the National Academy's Board of
10 Radioactive Waste Management believed we were
11 on a path to failure with the complexity of
12 the regulatory structure we had at that time.

13 A little bit on the regulations.
14 You heard a lot from Dr. Cotton this morning
15 and I just want to highlight a couple of
16 things he said and add a few extra
17 perspectives.

18 40 C.F.R. 191 originally was a
19 release standard and its own science advisory
20 board had suggested to the Environmental
21 Protection Agency that that was not the proper
22 way to do this and the environmental

1 protection agency responded and suggested that
2 if we went with the dose-based standard, it
3 would encourage looking for sites which would
4 actually disperse the waste and the EPA didn't
5 want that. And please feel free to forward to
6 2008 when we actually have that type of
7 standard today, but nonetheless, that was an
8 issue in screening.

9 Another issue that the EPA was
10 dealing with was rather than having a full
11 risk-based regulation, they based a regulation
12 on what they believe was technically
13 achievable. In fact, there is a quote and I
14 don't have it with me that something to the
15 effect that if we did not believe that
16 repositories were capable of performing so
17 well, we might have made a different
18 standards.

19 Finally, I will emphasize what Dr.
20 Budnitz talked about. The Science Board
21 disagreed with them and one particular thing
22 they disagreed with was not only the level of

1 the standard but the probability that was used
2 for the screening criteria and that is still
3 haunting us today.

4 The Nuclear Regulatory Commission,
5 in developing their Rule 10 C.F.R. Part 60
6 dealt with subsystem performance objectives.
7 Mr. McCartin talked about that this morning
8 and that was a way to address uncertainty. A
9 point that I want to really emphasize and this
10 is building on the solving it within a single
11 generation's lifetime, is the reasonable
12 assurance finding that the finding that the
13 Nuclear Regulatory Commission makes to say
14 that we believe that this can be done safely
15 is done before construction begins. And that
16 is also true of 10 C.F.R. Part 63. That is
17 not conducive to setting up a program that we
18 will talk about a little bit later on that
19 gives people an opportunity to learn from
20 experience such as was done with WIPP during
21 the recertification processes.

22 I wanted to mention that the

1 Nuclear Regulatory Commissions have never had
2 sole reliance on the natural barrier system.
3 And you will often hear people criticizing
4 those regulations and that is not true. There
5 has never been sole reliance on the natural
6 barrier system. And the point that I want to
7 leave you with specifically, and this sets you
8 up for some of my next viewgraphs, in 1985,
9 the Nuclear Regulatory Commission amended 10
10 C.F.R. Part 60 to allow disposal of the
11 unsaturated zone. That gives you a real
12 glimpse into what those regulations were at
13 that time; not just we are going to add
14 something. This is to allow disposal in the
15 unsaturated zone.

16 So you are looking at Yucca
17 Mountain being an unsaturated zone site. We
18 did not even in the NRC's mind have a
19 regulation that allowed disposal in the
20 unsaturated zone.

21 Moving on to the Department of
22 Energy citing guidelines. My principle

1 comment there, again, they were not required
2 to be promulgated as a rule and DOE went
3 through a rule making process and created
4 something that was so large, it ended up with
5 a 6,000-page environmental assessment,
6 including the comment responses, as opposed to
7 150 pages as an average member of the public
8 might have expected for such a document.

9 Nuclear Regulatory concurrence was
10 required. Commission concurrence was required
11 on those citing guidelines. And again, I am
12 going to come back to that in just a minute,
13 why that is crucial.

14 The Nuclear Waste Policy Act
15 itself had some guidance to the Department of
16 Energy about screening. And this is where the
17 disqualifying condition concept came from 10
18 C.F.R. 960 and those led to expectations as
19 well on the part of people. And I am going to
20 try to conclude with a perspective on the
21 difficulty in dealing with a simple to
22 understand regulation that can be strictly

1 enforced, as opposed to one which really deals
2 with risks to mankind.

3 We mentioned this earlier this
4 morning. The Environmental Protection Agency
5 remand in 1987 was procedural. It was not
6 technical and the Energy Policy Act of 1992
7 was meant to be a remedy for that.

8 Now the Nuclear Waste Policy Act
9 amendment created some regulatory issues as
10 well. One of them is the Department of Energy
11 had not amended its siting guidelines when the
12 NRC amended its rule to allow disposal in the
13 unsaturated zone because it wanted to compare
14 all sites equally. It did not want two
15 different sets of criteria for comparing one
16 site for another. That left DOE after the
17 Waste Policy Act was amended with a single
18 site that did not match the siting guidelines.

19 You can begin to understand why
20 we had to change the rules to fit the site.
21 DOE put themselves in a pretty bad position.
22 This is not quite so important. The

1 Environmental Protection Agency began with a
2 saturated zone focus and I think Tom talked
3 about that this morning with a carbon-14
4 issue, the gaseous versus solid. But again,
5 EPA did not have specific criteria to address
6 unsaturated disposal issues.

7 And this was said this morning as
8 well and I will just reiterate it because I
9 believe it as well. There was a lot of public
10 frustration following what was seen as
11 reneging on a commitment that was made to pass
12 the Nuclear Waste Policy Act. Those of you
13 who many people have had the privilege of
14 hearing me speak about the Yucca Mountain site
15 and one thing I have never said is Yucca
16 Mountain was selected fairly.

17 Now I want to talk about the Board
18 on Radioactive Waste Management statements on
19 how they affected U.S. policy. And I am sure
20 you are all familiar with the statement that
21 said the program is unique in its rigid
22 schedule, its insistence on defining technical

1 requirements in advance for every part of the
2 multi-barrier system. The part that sometimes
3 gets lost, we are up to yellow already, you
4 started me earlier, is that the encouraging
5 expectation of absolute certainty about the
6 safety of the repository program is a
7 scientific trap that can't be done for 10,000
8 years.

9 And I will close with the bottom
10 point there. A policy that promises to
11 anticipate every conceivable problem or
12 assumes that science will shortly provide all
13 the answers is bound to fail.

14 So lessons learned. Changing the
15 rules to fit the site was necessary,
16 technically but I don't think you could have
17 found a worse thing to do institutionally. We
18 just had to change those regulations because
19 they didn't fit the site and yet everybody
20 believed that that was bad.

21 More than lip service is needed to
22 involve the public. The public wants rules

1 that are simple and strict. Nevada's argument
2 that it had to give up the veto to be able to
3 negotiate with the Department of Energy, that
4 is vital. I have said this in shorthand,
5 hundreds of concerns that the NRC staff did
6 not consider acceptable, I meant that to mean
7 that in a different environment, many of those
8 things might have been able to have been
9 worked out before they became contentions.

10 So very, very quickly I will try
11 to wrap this up. The path forward has to have
12 trust, has to deal with the uncertainty, has
13 to deal with time. There must be real public
14 involvement with this. The responsibilities
15 must be real. I believe the state needs a
16 role of responsibility and I believe there
17 needs to be a compensation package.

18 So my last viewgraph is for my
19 last 30 seconds. Twenty-one years after the
20 remand, we basically ended up with the
21 international consensus regulatory position of
22 how you should be doing that, although their

1 screen probability is still too low. I
2 believe there were important lessons to be
3 learned from WIPP. The public involvement and
4 the re-certification approach I think is key.
5 It is something I think we would like to see
6 in a new program. And I think we need to
7 remember the large first-of-a-kind engineering
8 projects will benefit from proceeding in
9 stages.

10 Thank you.

11 CHAIR HAGEL: Dr. Voegele, thank
12 you.

13 Mr. Frishman.

14 MR. FRISHMAN: Thank you. I first
15 have to say that while I am a technical
16 consultant to the State of Nevada, what you
17 hear from me today is from me after 30 years
18 of experience, having gone through the
19 regulatory process, as well as the entire
20 Nuclear Waste Policy Act process, even from
21 before it was written. And I have spent the
22 entire time working from the perspective of

1 the state first of Texas and then of Nevada.

2 So I have seen this from a very different
3 direction from almost everybody else you have
4 been hearing from.

5 I want to go directly to your
6 question about how can needed regulations be
7 developed in a coordinated, consistent and
8 timely manner? And instead of going through
9 the litany of all things good, I decided that
10 it might be more interesting to just
11 intuitively see what kind of a process could
12 possibly look. And I started out thinking
13 well, do we try to invent something that is
14 absolutely novel? Do we try to work with
15 systems that are there already that can be
16 modified and maybe overcome some of the
17 difficulties, such as long periods of time
18 that it took both EPA and NRC to get
19 regulations straight but on different paths.
20 But some of that having to do with major
21 debates within their own agencies and some of
22 it having to do with debates between the

1 agencies. So how do you address something
2 like that?

3 I also went through, I think, all
4 of the processes from both of those agencies
5 and from DOE in developing their regulations
6 and guidelines and they all had different
7 personalities. They all treated people
8 differently. They all said how proud they
9 were of their dealing with the public and as
10 Mike has observed as well, they were talking
11 at the public. They weren't getting
12 involvement and they weren't, in terms of
13 anything effective that the public could
14 actually do. You know, it is come and listen,
15 we will tell you. And I remember even one
16 instance where, and I will get back to this
17 point in a minute, where NRC and EPA staff
18 people actually sat on the same stage in
19 Denver and they wanted to talk to the
20 representatives from the various effected
21 states. But the talk turned out to be a
22 demand session on the part of those two agency

1 staffs were tell us what you don't like about
2 our regulations. And this was before the
3 regulations were even final and that was a
4 rather bruising day for everybody and we gave
5 back some bruises that were well-deserved.

6 So trying to put together a scheme
7 and try to preserve what may be good and see
8 if we can side-step what may not be so good,
9 it occurred to me that there is a combination
10 of things that might actually suggest it could
11 be successful, starting with putting together
12 an expert panel of EPA expertise staff, NRC
13 staff, and experts from the public, and
14 diverse experts from the public, people from
15 the fields that know about radiation, people
16 from the fields who know about environment,
17 and on and on with that list. Diversity is
18 the important point.

19 Have this panel put together a
20 nationwide inquiry, maybe starting out
21 following the pattern that EPA has seemed to
22 move into when it is proposing regulations,

1 and that is pose some sort of large-scale
2 questions but make it very clear that these
3 are only example questions. People can talk
4 about whatever they need to talk about in
5 terms of what they thing regulations should
6 be.

7 And while that crystalline rock
8 program over 20 years ago convened large
9 groups of people and listened to people, or
10 tried to listen to people, or said they
11 listened to people, in this one I think it
12 really needs to be a discussion where the
13 public is able to say what concerns them about
14 the safety of high-level waste disposal in the
15 context of today's circumstances.

16 We certainly shouldn't ignore the
17 path but I think people think differently now
18 from what they did 20 years ago about
19 radioactive waste, in some cases regression
20 and in some cases progress. I don't want to
21 judge either right now.

22 But I think a national inquiry,

1 what got me thinking about that was the
2 apparent benefits that came from the one in
3 Canada on a broader scale but this would be
4 primarily dealing with regulation. And this
5 panel then produces a report that literally
6 doesn't make, necessarily even make
7 recommendations. It just records what they
8 heard and organizes it.

9 And one of the things that has
10 always been a rub is that too many people in
11 the meetings that we are used to are told that
12 what they are saying is out of scope, which
13 means it is going to ignored for sure by the
14 people who are writing the regulations.

15 Well, with a regulation such as
16 this, there should be a NEPA evaluation of the
17 regulations. So therefore, the scope should
18 be wide opened because the information gained
19 is not only to write the regulation but to
20 write the NEPA evaluation of the regulation.

21 So once the report is done and the
22 report should be probably issued in draft form

1 so people can see what the panel did here and
2 how they organized it and if they feel they
3 want to make recommendations, that is fine,
4 but I don't think it is mandatory.

5 Once that is written, then that
6 becomes the guide for writing the regulation.
7 And while I don't intend to say anything that
8 sounds like I am agreeing with Bob Budnitz,
9 but I think it should be a single regulation
10 and I think it should be, even though I am not
11 beholden to anybody, I think it should be
12 written by the Nuclear Regulatory Commission
13 and I think it should be written with the
14 assistance and advice of EPA, the panel
15 members who were there and heard it all.

16 And also, at least with the
17 oversight of the public members of that panel,
18 so that they can see that the regulation is
19 one or way or another faithful to what the
20 panel heard.

21 I think this will go a long way.
22 And what got me sort of thinking of going in

1 this direction is that I first was a little
2 curious when you said that the theme of today
3 was going to be regulation and I started
4 thinking, well, why would you start there.
5 And it occurred to me there is a really good
6 reason for starting there. And that said, if
7 there is no confidence in the regulation
8 itself, there is no confidence in anything
9 that falls from there. So unless the people
10 believe that the regulations are in fact aimed
11 at their safety and I think they need to have
12 the assurance that it is generic, generic
13 meaning everyone is equally saved, then from
14 there, you may have the chance of devising a
15 program that could flow from at least a
16 feeling that people are being protected in
17 this really complex area.

18 And so that would leave us with a
19 process that I think as I said sort of was
20 inspired in part by the Canadian process. It
21 also, think, has a couple of other advantages.
22 It takes what I see as the good of both APA,

1 Administrative Procedures Act, review and
2 comment rulemaking, and the good of a
3 negotiated rulemaking because those
4 discussions with the public and with a
5 knowledgeable panel who can sort of try to
6 pull out of the public what they think the
7 public is really concerned about and really
8 interested in, I think that sort of brings out
9 or takes advantage of some of the good of
10 negotiated rulemaking.

11 At one point there was even a
12 suggestion, everybody was so frustrated, there
13 was a suggestion that there be a negotiated
14 rulemaking for the high-level waste program.
15 And we were all I still believe, correctly,
16 scared to hell. It would have been a
17 bulldozer job. We didn't have enough in
18 common to negotiate anything.

19 So but in this case, I think if
20 the people believe that the panel is serious
21 about we are trying to figure out what you
22 want in the way of safety, that still will be

1 technically competent and still will satisfy
2 the regulatory needs that we know we have,
3 then move on from there.

4 I suggested the NRC primarily
5 because they have a structure in place and
6 they have a structure that while for the
7 hearing portion is really close to the public.
8 The public organizations and individuals don't
9 stand a chance in that system but
10 organizations do who can afford it and states
11 do. So inviting states and local governments
12 and tribes in early, so that they actually
13 feel that they have some ownership on the
14 regulation, will then maybe encourage them
15 later to play or to do whatever they can to be
16 involved in a hearing if it comes to that
17 later. But I think we have to recognize that
18 it is out of the public's hands once it gets
19 docketed, once an application is docketed.

20 And I don't know what more can be
21 done about that, other than the agency still
22 has to deal with an environmental impact

1 statement to go with a regulator's decision
2 and the public should be encouraged to come
3 back into that, rather than being forced to
4 write contentions on a NEPA document which
5 NEPA never intended to have happen.

6 Thank you.

7 CHAIR HAGEL: Mr. Frishman, thank
8 you. Now to Senator Boren's favorite Oklahoma
9 professor --

10 (Laughter.)

11 CHAIR HAGEL: -- Dr. Jenkins-
12 Smith.

13 MR. JENKINS-SMITH: That is a
14 scary proposition. It really is.

15 My name is Hank Jenkins-Smith. I
16 am a professor of public policy. I will be
17 talking today about a synthesis of work that
18 I have been doing for the last 25 years at
19 Oklahoma, Texas A & M University and the
20 University of New Mexico. This work was
21 sponsored over a long period of time by all
22 those universities, by Sandia National Lab, by

1 National Science Foundation and other
2 organizations. I will be synthesizing that
3 today.

4 Let me just start by saying that I
5 believe that we start out with a structural
6 credibility deficit that is really a
7 combination of the way we have designed our
8 policies concerned with used nuclear fuel and
9 the way our institutions are structured. The
10 history, particularly at Yucca Mountain but
11 elsewhere, has been one of relative
12 inflexibility with how we have defined those
13 institutions. They have been built initially
14 with a particular objective that trapped the
15 policy debate in particular ways.

16 The policy designs can be built
17 that reflect public concerns in a way that can
18 really increase the prospects for public
19 support. There is no guarantees in this game
20 but you can design the initial policy in a
21 fashion that either pushes you down a road of
22 greater contention or that provides the

1 prospects for greater support.

2 And the last issue I want to get
3 to here is that the regulatory process
4 interacts with the level of controversy
5 associated with the policy over time. And
6 that changes the way that the technical
7 communities that are involved can engage in
8 this process, which creates a different type
9 of organizational challenge.

10 Used nuclear fuel management
11 raises a bunch of interesting kinds of
12 problems. We begin right now at a point where
13 there is substantial support for nuclear
14 energy, for increasing the share of U.S.
15 energy supply that comes from nuclear power
16 plants. What is intriguing about that is that
17 that change in perspective has come about
18 largely because of changes in the perceived
19 benefits of having independent supply within
20 the United States that assures a large base.
21 It is not because people have seen the risks
22 of things nuclear as diminishing over time.

1 So it is a benefit-cost
2 calculation on the part of the public and we
3 have tracked how that has evolved over time
4 but it isn't because the risks seem to have
5 gone away. The challenge for the management
6 of used nuclear fuel and the potential for
7 recycling or disposal is that when we focus on
8 that piece of the policy process, we are
9 really looking from the public standpoint at
10 the costs and not the benefits. We have
11 isolated a piece of what is seen as generally
12 a beneficial direction for U.S. policy but for
13 purposes of talking to the proposed host
14 communities, we have isolated all the bad
15 parts. And that frames the way the policy
16 debate can happen in that community in an
17 unfortunate fashion. It generates a lot more
18 opposition than support.

19 Let me preface this by saying
20 there is the institutional aspect of this and
21 I will get to the public support in just a
22 moment. With federalism, the way it is

1 designed in the United States and particularly
2 with the supremacy clause in the Constitution,
3 we have an interesting game theory problem
4 when you are negotiating between federal
5 agencies or federal entities and states. And
6 that is, that the states, as a player in the
7 negotiation, are always put in the position of
8 knowing that the other party can change the
9 rules because Congress can and there is a long
10 track record that states can refer to showing
11 that in fact the federal government, Congress
12 can change the rules.

13 And so it is difficult from the
14 position -- if you were put in the position of
15 being a representative of that state, say a
16 governor or a state level official, and you
17 are negotiating for the future well-being of
18 your citizens, you are having to place an
19 awful lot of trust in the hands of an entity
20 that has a track record of changing the rules.

21 I urge you all, if you haven't
22 read it yet to look t the letter written in

1 1982 by the governor of Wyoming in response to
2 the attempt to negotiate a monitored
3 retrievable storage site in the state and he
4 vetoed the continuation of an evaluation
5 process simply saying that governors can't
6 assure the well-being of their future
7 citizens. Now that is an institutional
8 arrangement issue that has to do with the
9 entities that are doing the negotiating.

10 And governors, these are not
11 governors that tend to be opposed to federal
12 policies. We are talking Utah, Wyoming,
13 Nevada. These are people who are put in a
14 nearly untenable position from a standpoint of
15 really simple rules about how negotiation
16 happens. I anticipate that that problem won't
17 go away, as long as we have that institutional
18 design in place.

19 Let's talk about policy design for
20 the moment. I think of policy design as the
21 broad parameters in which people begin to
22 think about the benefits and the costs and the

1 processes for handling a major public issue.
2 Now policies themselves come in bundles of
3 attributes. If we were thinking about the
4 nuclear energy process generally and we
5 included the whole cycle, we would have energy
6 production with its implications for energy
7 security, for jobs, for economic development,
8 along with the waste cycle and everything else
9 that is involved.

10 You can see here that in these
11 combinations of attributes, we are dealing
12 with process issues, numbers of disposal
13 sites, the regional distribution of those
14 sites, criteria for selection, process issues
15 such as who gets a say, how you frame the
16 policy itself and what venues are employed for
17 doing that. The facility design aspect which
18 interacts with all of these things and is
19 usually seen as an outcome of the former
20 process has to do with questions of
21 retrievability, depth, there are a variety of
22 different strategies from Greenpeace's

1 advocacy of having an aboveground pyramid,
2 sarcophagi to deep bore hole. So you can
3 think in terms of many variations in design.

4 But there are also extra storage
5 kinds of attributes associated with the
6 facility. Many of the European designs
7 encompass a research facility associated with
8 a prospective disposal facility, particularly
9 if you are envisioning long time periods for
10 investigation of a site, the potential for
11 treating the materials as a resource,
12 potential for future design and building of
13 reprocessing facilities at a site, and other
14 attributes of the policy.

15 My point here is that if you think
16 about what you are asking a host community to
17 engage in or if you are thinking about asking
18 a nation to engage in a discussion about
19 siting these facilities, the things that can
20 be involved are not restricted by some magical
21 prior. Now, in the U.S. case, we have
22 generally, as the Yucca Mountain process

1 indicates, we have talked about design chiefly
2 as a disposal facility, as a place that we are
3 going to take waste, designate it as such,
4 permanently place it, observe it for a while
5 and then close a facility.

6 That is a way of designing a
7 policy. Note what it is doing though is that
8 it is isolating specific aspects of the policy
9 and not focusing on others. Now, we have done
10 a lot of experiments at the University of
11 Oklahoma on what it is that leads to
12 acceptance or not of respective repositories.
13 One of the issues is retrievability and we
14 have focused on this qualitatively and
15 quantitatively. And I am showing you here
16 when we ask people how they would prefer to
17 see a repository as a retrievable site or as
18 a non-retrievable site, you get a substantial
19 majority that would like to see
20 retrievability, in large part because they see
21 the future development of knowledge and
22 capacity as something that future generations

1 ought to be able to bring to bear on the
2 problem and precluding that discourages them.

3 In focus groups when you raise
4 this kind of question with an average cross-
5 section of lay citizens, you often get laughed
6 at if you try to tell people that they ought
7 to, we ought to just seal it for fear of
8 future generations. So as a preconception,
9 this is a very significant concern.

10 When you look at bundling of
11 attributes with a repository, we have looked
12 at how people's preferences or support for a
13 repository would change if you bundled it with
14 a laboratory or if you bundled it with a
15 reprocessing facility. And depending on where
16 you start, you get some really interesting
17 changes here.

18 Focus on the oppose columns on the
19 upper chart there. It is a research
20 laboratory. If you are going to make a mine-
21 like geologic repository of the sort that
22 Yucca Mountain was envisioned to be, if you

1 pose the question broadly, you get a fraction
2 that oppose it, half of those who oppose the
3 policy initially say their support would
4 substantially increase in the event that it
5 was coupled with a laboratory. That is
6 similar numbers for deep bore hole.

7 Similar kinds of changes occur
8 when you ask about adding a repository to the
9 process. These are attributes of design that
10 have significant implications for public
11 support for a repository. You frame these
12 issues differently, you start out with less of
13 a deficit, in the policy debate that ensues,
14 people are able to talk about benefits of the
15 site, as opposed to just minimizing the costs
16 of the site. Structurally, that is a very
17 different debate.

18 And I am going to stop here
19 because I am out of time but I can also raise
20 the other issues on technical credibility
21 later. So I will end.

22 CHAIR HAGEL: Doctor, thank you.

1 Mr. Kasperson.

2 MR. KASPERSON: I would be remiss
3 in citing this if I didn't register the
4 concern coming out in my community of social
5 scientists about the way the Commission has
6 been established and is carrying out its
7 functions. And I think that there is a fairly
8 deep concern about whether the requisite
9 expertise that the Commission vitally needs is
10 necessary.

11 In ten minutes I am going to try
12 to do something that I know is impossible.
13 There are probably 50 to 100 books that have
14 been written on the social science aspects of
15 nuclear waste disposal and probably a thousand
16 peer reviewed articles. And in ten minutes I
17 won't get to say very much about all of that
18 but I am going to try to make a few essential
19 points with encouragement for the Commission
20 to identify these as major issues that it is
21 facing in designing a new approach to
22 radioactive waste disposal and to really dig

1 into those issues, however that is done.

2 Okay. That said, I think that it
3 is pretty well understood and it is not just
4 the finding of social scientists but here, for
5 example, is a statement from the National
6 Academy of Sciences, from its Board of
7 Radioactive Waste Management. Here is another
8 one that we recently published two weeks ago
9 or something in Science magazine indicating
10 the kinds of concerns that are out there. So
11 I tried to make the case today that while you
12 gave us a set of questions that were focused
13 on regulation, we don't think that those are
14 really the basic problems that you are facing.
15 And the problems are issues that are
16 underlying the regulatory system and I will
17 try to say something about what I think they
18 are.

19 All right. So what are the
20 fundamental problems that we are talking
21 about? Well, we see four of them that we
22 think we are talking about a deep uncertainty

1 problem here. We have already heard about the
2 need for effective public involvement. By the
3 way, extremely difficult to do. And you are
4 not going to get answers here from me. It is
5 one of the areas that I think you really ought
6 to dig into deeply.

7 Fairness in both process and
8 results is going to be essential but very
9 difficult to achieve in the design of the new
10 system. And perhaps most pervasive and
11 already spoken to by several members on this
12 panel, this whole process that you are about
13 to generate and initiate must move forward
14 under conditions of high social distrust. And
15 I want to make the argument with you if you
16 think you are going to regain social trust,
17 think again because it is not going to be
18 possible within the time frame that it
19 necessary. And proceeding under conditions of
20 high social distrust as opposed to high social
21 trust is a whole different matter about the
22 design of the processes and how that may

1 effectively be done.

2 So, deep uncertainty is a major
3 problem and it has a number of aspects. As we
4 know, the long time frames we have already
5 heard about the difficulties in making the
6 traditional proof of safety that we would do
7 in most environmental and risk regulations.
8 The Academy has concluded that the physical
9 and chemical phenomena that control the site
10 and the repository really make it very
11 difficult to predict what future events and
12 future risks will be.

13 And we know that we are going to
14 put down a system some place that is going to
15 interact with human systems. And basically,
16 major components of those human systems I will
17 argue are essentially unknowable. So they
18 contribute to the deep uncertainty that is
19 involved with the problem.

20 We also know it will be, as we
21 have already heard from the panel a first-of-a-
22 kind facility, which will make the risks and

1 uncertainties highly site-specific.

2 And the implication of all of this
3 is that the understanding of risk and
4 uncertainty will be, as we have heard,
5 evolutionary in nature and it will develop
6 with the progress of science and experience
7 and you are not going to have it by doing a
8 nice, neat, risk assessment at the beginning
9 of the process. It just doesn't work that
10 way. And so you are going to have to deal
11 with a very different kind of problem than
12 problems that -- I have worked in the risk
13 analysis field, I have for a long time, and I
14 would say it is an abuse of risk assessment to
15 try to throw risk assessment at this kind of
16 a problem. We can talk about that.

17 All right. How to achieve
18 effective public involvement and
19 collaboration? Tough question. You know, if
20 you talk to federal agencies here in
21 Washington, they will all tell you that of
22 course risk communication has to be two-way

1 and then try to find anybody who does it. And
2 it hasn't worked very well in the risk
3 communication efforts, I would argue,
4 surrounding Yucca Mountain. And we are going
5 to have to do some hard thinking about what
6 real two-way risk communication, particularly
7 including the listening function to people or
8 what I put it is not the outreach but the in-
9 reach function connected with risk
10 communication. That is essential. It doesn't
11 normally occur. Everybody acknowledges risk
12 communication is two-way and it never happens
13 and we are going to need to figure out, it is
14 going to be a major imperative in this
15 particular case.

16 And so we need to, I am going to
17 skip over some of this, but we need to get
18 started very early. We have a series of
19 guidelines about how you can undertake
20 stakeholder participation and try to do a good
21 job and it is very difficult. It involves
22 baseline studies and public perception and

1 things like that, a monitoring system of how
2 concerns change over time with events and new
3 information and so forth and so on.

4 I am going to jump forward. I am
5 not going to walk you through this. I just
6 want to indicate that in the social sciences,
7 we have tried to create some very complicated
8 analytic frameworks, just as we have with the
9 technical aspects of the program. And I would
10 be worried if you haven't seen any of these
11 because they are an essential part of where
12 the information analysis comes from of some of
13 the major problems that you have to deal with.

14 Okay, let's go on. Fairness will
15 be an absolutely essential element of this
16 process, as several panel speakers have spoken
17 to already. And those kinds of fairness we
18 should keep in mind are just not the fairness
19 of the ultimate regulation or how many sites
20 or how the sites are selected but the whole
21 process, the whole procedural aspect of how
22 the regulatory system and how the disposal

1 process is developed. And is that process
2 going to be fair? Is it going to be dominated
3 by a few leads in Washington? How is it going
4 to be done exactly?

5 And judgments about the fairness
6 of the process will begin at this point, that
7 people will be looking at the entire process
8 of the development of the disposal program.
9 So we have to stop worrying about it now,
10 today and that should continue on through the
11 process.

12 Okay, word about social trusts,
13 since I am short on time. I would say over
14 the past 25 years we have done about as bad a
15 job as we could have done on the social trust
16 question in this area. And we have succeeded
17 in losing the trust of the principal
18 stakeholders in publics who have to be
19 involved in decision making in the management
20 of waste.

21 And we also know, and I will just
22 show one little figure, here is some work from

1 Paul Slovic in Oregon in which Paul is famous
2 for his group sitting people down and doing
3 paper and pencil exercises and he had them
4 rate what a whole series of different trust
5 building activities are located at the top of
6 this, top half of this diagram, versus
7 activities and events and so forth that may
8 lose trust.

9 The interesting thing about this,
10 I mean it is very interesting to see what in
11 the composition of these two, but notice that
12 the lines on the top that the trust building
13 things are all relatively short, brief lines
14 and the lines on the bottom are really big
15 lines, by comparison. And Paul is making sort
16 of an experimental point out of psychology
17 that the effects that we have on people, once
18 trust is lost it is extremely difficult to
19 regain it.

20 And let me just finish then with
21 one final -- So what does all this mean for
22 regulatory systems? This I know the

1 Commission is very concerned about, which is
2 that we really need to have an explicit
3 recognition that we are dealing with a deep
4 uncertainty problem and that is a deep issue.
5 That is a profound issue and it means that we
6 are going to do something. We are going to
7 manage this problem in a very different way
8 than we have said about managing it in the
9 past. And there are implications for the
10 burden of proof and who should bear it and who
11 bears the matter of removing uncertainties.
12 Is that the risk bearers, the host publics and
13 so forth or is it the managers of the system?
14 And fairness is going to be an absolutely
15 crucial issue.

16 Thank you.

17 CHAIR HAGEL: Mr. Kasperson, thank
18 you. We particularly appreciate your
19 resounding vote of confidence.

20 (Laughter.)

21 CHAIR HAGEL: To the five
22 panelists, we are grateful. Thank you. Now,

1 your work is not yet complete. We would like
2 to have a round of questions. So if you are
3 agreeable, we will start with who has a
4 question?

5 Allison, we will start with you.

6 MEMBER MAC FARLANE: Sure. I have
7 lots of questions but I will just start with
8 a couple for Dr. Kasperson. Thank you for
9 coming. And clearly we have a lot to learn
10 here and I know you guys have written a lot
11 about this. So I am quite aware of that. And
12 this is really the fundamental, you have
13 touched on what I think are the fundamental
14 issues associated with nuclear waste disposal.

15 So a couple of questions, then.
16 And maybe you will think this one is
17 irrelevant but I am always fascinated and we
18 sort of touched on this this morning but we as
19 a society, as a culture, don't seem to have
20 much of a problem with disposing of things
21 like arsenic and lead, and heavy metals but we
22 do have this enormous problem with stuff that

1 will disappear eventually. So that is one
2 question.

3 Another is do you think that the
4 original Nuclear Waste Policy Act, before it
5 was amended, was considered fair by the
6 public? And then finally in terms of trust,
7 could an agency like the Department of Energy
8 regain trust in any kind of reasonable time
9 period?

10 MR. KASPERSON: Well, let me take
11 a shot at those three questions and maybe my
12 colleagues here would like to jump in on this
13 as well.

14 First of all, we do think that
15 really a number of those other problems like
16 lead in the environment and so forth, which
17 has very long half lives and so forth, is a
18 very serious problem that doesn't get the same
19 attention.

20 We know from studies that have
21 been made that nuclear materials are highly
22 dreaded and it is sort of interesting to try

1 to figure out why when you put things
2 underground people are extraordinarily
3 concerned. Even when we were experimenting
4 with state programs with low-level waste, we
5 found out and we were talking about surface
6 and near-surface facilities, people were very
7 concerned about putting anything in the
8 ground. So that is one issue.

9 The second issue is nuclear
10 materials and regular nuclides, themselves,
11 that there seems to be a very strong set of
12 fears, in particular, connected with those and
13 that has turned up in lots of experimental
14 results and so forth and there is lots of
15 speculation about why that might be.

16 A second point about, I am
17 forgetting your second point, but social
18 trust, I think, was the third.

19 MEMBER MAC FARLANE: The third,
20 Nuclear Waste Policy Act, the original wasn't
21 fair.

22 MR. KASPERSON: Yes, I guess my

1 own deal is I don't think by and large the
2 public knew enough about that Act to really
3 make a decision of fairness but I think that
4 the architects of that act went to a lot of
5 trouble to try to develop an architecture of
6 fairness in the number of repositories and
7 where they would be located and those kinds of
8 things.

9 Some of that was lost in the
10 amendments that subsequently occurred which
11 destroyed. And then when we chose the site
12 before we did the technical work, that was not
13 a help either. So I think that the whole
14 process of implementation of the Act lost a
15 lot of the initial value of the architecture
16 there.

17 On the social trust question and
18 maybe my colleagues will agree or disagree,
19 but I think DOE has a really hard job to
20 operate under. And what I would probably, if
21 I were advising the Department of Energy, what
22 I would say is act in a way that really

1 deserves trust and merits trust and assume
2 that it is not going to exist. And you are
3 not going to be able to rebuild it in the time
4 frame that you are going to need to make
5 decisions.

6 And so I think a decision process
7 which assumes distrust, rather than trust, is
8 a very different kind of process. And one
9 guide is really realistic to what we are
10 facing.

11 MR. JENKINS-SMITH: If I could
12 just weigh in just slightly on that question
13 and I will go in reverse order, I think we
14 need to be careful not to over generalize. I
15 mean, the case of WIPP is really interesting.
16 I am sure it is all Bob Neill's fault that the
17 WIPP process worked out the way it did but in
18 the late 1980s, the New Mexico public was two
19 to one opposed to the waste isolation pilot
20 plan and the public imagery that was
21 associated with it at that point was very much
22 tied to nuclear disasters. I do remember the

1 bumper stickers that said Three Mile Island,
2 Chernobyl, WIPP, and all of the discussion
3 that went on there. But that policy process
4 that spanned the latter half of the eighties,
5 all the way up to 1999, when the truck started
6 rolling, was a fascinating one. The
7 University of Mexico sponsored a time series
8 survey in which we measured twice a year what
9 the New Mexico public thought of the risks and
10 the support for that facility. And there was
11 a gradual rise that was punctuated in a couple
12 of cases.

13 When EPA approved the facility,
14 there was an uptick in public trust. When the
15 trucks actually got there, there was a
16 substantial uptick in trust. By the year
17 2001, the substantial majority of the public
18 supported the operation of that facility. And
19 I say that not because I think that this
20 demonstrates great trust. It simply says that
21 there are more than one set of processes that
22 can be employed that might get you to a

1 successfully opened repository. There are
2 many publics. I think we ought to be careful
3 about how we use that term.

4 MEMBER MAC FARLANE: Yes. No, I
5 agree.

6 Just briefly, then Steve can jump
7 in. Do you think then based on your little
8 history of what happened in New Mexico, do you
9 think the opening of a repository in Sweden or
10 Finland might have any impact on what happens
11 here?

12 MR. JENKINS-SMITH: Yes, I do. I
13 think that the more successful examples there
14 are -- I mean, keep in mind that what happens
15 in the course of a policy debates is that
16 there are a number of major considerations.
17 Think of them as dimensions of concern by the
18 public. One might be safety. One might be
19 economic costs, something like that. The
20 issues that are out there that are brought
21 into the debate are going to be those that
22 reflect on those dimensions of concern.

1 So to the extent that there are
2 successful sites out there, yes, that is going
3 to be part of the debate but only if the
4 debate is set up in such a way that there are
5 people who really want to bring all the issues
6 to bear. Again, if it is an issue that is
7 defined only about minimizing risk, then the
8 primary discussion is going to be what those
9 threats are. And it is going to be very, I
10 mean, when you talk about very small risks and
11 what scientists understand are ten to the
12 minus six, the risk, there is a very lumpy
13 bottom end to the public's notion of
14 likelihood and that is going to substantially
15 shape the kinds of issues that are brought to
16 bear.

17 So if you don't have reasons for
18 people to say positively you should do this,
19 well you can have a lot of evidence. It is
20 simply not going to resonate much in a public
21 debate.

22 MR. FRISHMAN: I just want to get

1 to your question of whether the Nuclear Waste
2 Policy Act was fair. We knew at the time of
3 its writing which states were most likely
4 going to have the potentially acceptable
5 sites. And so most of the jockeying that went
6 one was among and between those states versus
7 all of the states that were afraid they might
8 get it because the deals that have already
9 been sort of cut would break down. So the
10 intent was that it be fair. And the champion
11 of that intent was Congressman Mo Udall and he
12 beat up a lot of people in the course of
13 trying to be fair.

14 And in the end, I think the fact
15 that the repository capacity we knew was going
16 to be exceeded for the first repository and we
17 had to have a second, that is an indication of
18 the knowledge that it was unfair.

19 CHAIR HAGEL: Per.

20 MEMBER PETERSON: Actually, it is
21 interesting, Steve, that you just raised this
22 question of capacity because that was my first

1 question. I have got a couple of questions
2 and actually I was hoping, Hank, that you
3 might be able to help me with something.

4 Statutory capacity limits seem to
5 be a frequent feature of the laws that bring
6 into effect disposal systems. And in the case
7 of trying to drive the system so that you will
8 have multiple disposal sites, I am curious
9 about this because at least my thinking on it
10 is that the major issues associated with
11 repositories are inter-generational equity
12 problems. And I don't understand the logic
13 behind punishing people in multiple places a
14 thousand years in the future to generate
15 equity when it is our actions that have
16 created the problem.

17 On the other hand, you do have a
18 whole bunch of reasons to try to reach
19 interregional equity for the current
20 generation but there are other ways to do
21 that, such as minimizing transportation
22 distances by geographically disbursing say

1 interim storage facilities, by transferring
2 wealth from generators to those who have the
3 responsibility for disposal and such.

4 If one were to work on that, do
5 you think that it is still politically
6 necessary or socially necessary to have
7 statutory limits on capacity for disposal
8 facilities or should we just go technical?

9 MR. JENKINS-SMITH: I think that
10 is a question that would be really interesting
11 to investigate but the history of these kinds
12 of limits, actually in the WIPP case, it had
13 to do with the type of waste that was to go
14 into the site because there was a period of
15 time when they were investigating putting
16 high-level waste reactor waste in the
17 repository and that led to a substantial
18 political backlash and therefore the
19 conditions that this only be transuranics.

20 And that issue, the cap has
21 largely been seen as a way of making sure that
22 current generations are spreading the risk,

1 rather than as an intergenerational issue, I
2 think. But it really bears on the question of
3 whether the host community desires to
4 undertake that activity.

5 I would posit that if you had a
6 host community in the United States that
7 really wanted to host that facility that had
8 cooperation from the state level, that there
9 wouldn't be the pressure on limits that you
10 see when you are setting it as an a priori
11 issue. That what happens is that when we are
12 looking prospectively at who is going to bear
13 the burden, the limits become an issue.

14 MEMBER PETERSON: I understand. I
15 have another question that relates to what I
16 thought was a very intriguing point that you
17 made.

18 You showed that there can be
19 significant changes in the level of support
20 for facilities for disposal and, I presume,
21 for storage as well. If they are coupled with
22 extra storage attributes such as research or

1 reprocessing, what is striking is that it
2 seems that the increase in support is quite
3 similar between the two. But of course, those
4 have very large different implications in
5 terms of what you are doing with the fuel
6 cycle, which also has very important
7 independent set of policy dimensions that we
8 have a different subcommittee that is working
9 on.

10 So one thought on that because you
11 can construct policies that couple either
12 reprocessing or research with these sorts of
13 activities, one of the things that
14 differentiates reprocessing is that very
15 likely what is going to happen is that you
16 will have a transfer of wealth from waste
17 generators to these communities and that may
18 contribute in some ways to acceptance because
19 of the fact that it shows some interregional
20 distribution of benefits and risk or transfers
21 of benefits and risk.

22 Would it be helpful if you go the

1 research route to pay for that research from
2 fees that would be charged to the waste
3 generators, as opposed to from taxpayer fees?
4 Would that assist in further increasing the
5 feeling that there is some stronger basis of
6 equity because the people who are making the
7 problem are also paying for the work to create
8 a solution and transferring wealth. Would
9 that be something that also would be helpful
10 from the perspective of generating local and
11 state acceptance?

12 MR. JENKINS-SMITH: I suspect that
13 it would. I have to say I don't have any
14 experimental evidence on that issue. But the
15 key underlying driver in this as we have
16 teased it out in focus groups and seen it in
17 the data is when people think that the
18 facility is not only a purveyor of risk but is
19 actively engaged in trying to see how minimize
20 those risks or better manage them in the
21 future, it really does a lot to offset the
22 dread that we know is attached to things

1 nuclear.

2 I suspect that if you attach that
3 even further to the idea that those who are
4 benefiting from nuclear energy or paying their
5 mil and that mil is going to support that
6 research itself, that that connection would
7 probably help. I would have to actually
8 empirically investigate that to know the
9 answers definitely.

10 MEMBER PETERSON: Dr. Kasperon,
11 could you maybe comment on this question also?

12 MR. KASPERSON: Well, I think I
13 didn't emphasize it in my presentation but I
14 think there ought to be as much risk reduction
15 and so forth as we can reasonably achieve and
16 we ought to try to make as fair a system as we
17 can make but there will probably be come
18 residual risks and unfairness. I think that
19 should be compensated for.

20 And I guess my own view about the
21 compensation would be you could do it like the
22 French do it, which is to build schools and so

1 forth in the facility.

2 My own view about that is that it
3 ought to be sort of a negotiation in which the
4 host community gets a right to try to indicate
5 what its preferences would be for different
6 kinds of compensation but the compensation
7 level should probably be determined nationally
8 for the disposal facility.

9 MEMBER PETERSON: So then another
10 attribute of having that compensation include
11 either research or reprocessing, probably even
12 more so for research is that it also implies
13 that you have a local base of people who are
14 scientifically and technically knowledgeable
15 and credentialed who live in the community.
16 Well of course, New Mexico has two major
17 national labs with this sort of expertise.

18 To what extent might that also
19 contribute to building or facilitating a
20 higher level of trust? Both Hank and Roger.

21 MR. KASPERSON: Well, one comment
22 that I would make is that first of all, there

1 frequently is a surprising level of expertise
2 that may exist in the community, if you are
3 not looking for large numbers of people. But
4 the other option would be to provide resources
5 so that the local community can higher its own
6 technical experts, so we know how to carry on
7 its negotiation.

8 MEMBER PETERSON: Exactly. In
9 fact, Roger Neill spoke to the value of doing
10 that. Maybe so I don't take too much time, I
11 would like to move to a different question for
12 Michael.

13 You noted that in the licensing
14 process, the regulatory process, you are
15 concerned about the fact that currently the
16 determination of reasonable assurance occurs
17 before construction is done. Correct?

18 MR. VOEGELE: Correct.

19 MEMBER PETERSON: So, I would be
20 interested in the technology of deep bore
21 holes. One of the reasons that it is
22 interesting is because technically it has a

1 very, very different set of characteristics
2 from a conventional mined repository, the most
3 fundamental being that they are like small
4 modular reactors or something like that. In
5 other words, you build one in a few years.
6 You fill it. You close it. You get the
7 experience of the entire lifecycle up through
8 decommissioning in a short period of time.
9 And you would do one initially as a
10 demonstration before building additional ones.
11 Thus, reasonable assurance determination could
12 occur from having done the complete lifecycle
13 of the disposal facility before you would
14 expand and do additional work.

15 So clearly, this means that bore
16 holes are different and therefore may not fit
17 with the current regulatory framework in this
18 way. Could you comment on this specifically
19 as well as other ways that they may not fit or
20 things you might need to do, such that bore
21 holes might become an option if that is what
22 one might want to do.

1 CHAIR HAGEL: Excuse me. May I
2 interrupt just a moment? I know one of our
3 panelists has to leave on time to catch an
4 international flight. So we are going to try
5 to stay on track here.

6 And please go forward, Michael,
7 and answer Per's question. Try to keep it --

8 MR. VOEGELE: Very quickly.

9 CHAIR HAGEL: -- summary version.
10 Then I am going to take the prerogative of the
11 chair and ask the co-chair for one last
12 question and then we will get you all on your
13 way and one of the distinguished members of
14 the panel will be off and running to wherever
15 you are going. Thank you.

16 MR. VOEGELE: The Nuclear Waste
17 Policy Act had actual provisions about how to
18 do the licensing in stages for a repository
19 system. That would not apply, at least
20 readily apply to a bore hole system. And the
21 only thing I know that is comparable to a bore
22 hole disposal system would be a no-migration

1 variance petition under something like RCRA,
2 which I think I forgot who mentioned it this
3 morning. It may have been Tom, historically
4 has been done with the 10,000-year assumption
5 and it just kind of traces back to the
6 repository program anyway.

7 But what I suggested about and I
8 believe the National Academy has written more
9 than one report on stage development,
10 internationally people have adopted a safety
11 case process where there are step-wise
12 decisions reviewed with the public about how
13 to take the next step forward. I don't know
14 how to do that readily with a bore hole
15 program. I think you basically have to do as
16 much research as you can and make an
17 assumption before you start putting that
18 material down. If you are going to be down
19 one or two miles burying this material, it is
20 very difficult to understand what the analogue
21 to a performance confirmation program would
22 be.

1 I don't see the current
2 regulations being readily adaptable to bore
3 hole disposal and I don't see them being an
4 easy solution to them, either.

5 CHAIR HAGEL: Thank you. Thank
6 you. Jonathan?

7 CHAIR LASH: We have at least
8 absorbed the point that you were making, Dr.
9 Kasperson, that the problem here is first of
10 all process more than technology. That
11 doesn't mean that we understand what the
12 solutions are.

13 And I want to pick up on something
14 that Professor Jenkins-Smith said and use it
15 to pose a hypothetical to the two of you and
16 try to dig a little bit into how you solve the
17 problem.

18 I believe you said when you asked
19 people about the level of assurance of future
20 human intervention from a deep geologic
21 repository, how much assurance they would
22 have, 60 percent left at the prospect that

1 there could be some long-term assurance that
2 people wouldn't subsequently invade that
3 space.

4 And frankly that reflects my own
5 visceral reaction and yet we see rules being
6 set up premised on the idea that we can
7 somehow answer that question through the
8 technological design of a site.

9 And I think that in a normal
10 public process in which a public entity is
11 coming to the public and asks that question
12 and gets laughed at, there are two responses.
13 One is, we really have to work harder to
14 education them that we are right. And the
15 second is maybe we can tweak the rules to show
16 that we are right.

17 And I am interested in how you
18 construct the process that can respond by
19 saying, that is right and we will build a
20 process premised on the understanding that we
21 all know controlling something for 100,000
22 years is preposterous and how do you build

1 that into the process so that the public
2 values become the driving force, rather than
3 the problem to be overcome.

4 MR. JENKINS-SMITH: Well, I think
5 that the way that one could do this would be
6 by opening up what it is we think that the
7 policy is designed to do. And one option is
8 to think about fuel cycle facilities that have
9 a number of functions that would include
10 determining which kinds of materials could be
11 disposed of and disposing of those in a
12 fashion that would be, could be reversible.
13 Actually, it is an interesting term, this
14 whole reversibility debate.

15 In Finland, in France, and more
16 recently in the UK, this is a big issue. And
17 in Finland, the whole question of public
18 approval of their repository turned on the
19 question of whether the repository would be
20 designed in a way that you would retrieve the
21 material. In France, the reversibility issue
22 is a much bigger deal because they are talking

1 about changing the direction of policy on the
2 basis of future learning.

3 But the concern that is raised
4 isn't that we are trying to plan for a 10,000-
5 year horizon. It is that we are assuming that
6 we will get there in an uninterrupted fashion.
7 And people look backward a hundred years and
8 they think about what the technological
9 capabilities and the level of concern that
10 those generations had for how they were
11 handling materials for the present period of
12 time. And they even think about the type of
13 changes that have occurred in recent memory
14 with the technologies that they employ.

15 And I think they see difference in
16 kind in capacity. I mean one interesting
17 thing is how far deep bore hole, as an option,
18 has come since the Yucca Mountain process
19 started, in terms of the sort of technological
20 assurance that we could do this kind of thing.

21 So options don't hold still and
22 people are aware of this. And I think that

1 that is one of the primary concerns that
2 underlies a Yucca Mountain-style approach,
3 which is permanent disposal, permanent
4 ceiling, treating it as a waste, which is an
5 interesting kind of categorical change and
6 moving on.

7 CHAIR LASH: Can I interrupt for
8 one moment? You gave me a very articulate
9 answer to a question that I didn't ask.

10 MR. JENKINS-SMITH: That is what
11 professors do.

12 (Laughter.)

13 CHAIR LASH: I thought that was
14 what politicians did.

15 (Laughter.)

16 CHAIR LASH: You are articulating
17 a plausible solution to the problem that we
18 can't control the future sufficiently but I
19 was asking, how do we design the process so
20 that it responds to that public concern and
21 says, that is legitimate, we will change our
22 goals, our parameters, rather than you just

1 don't understand because you don't have a
2 Ph.D.

3 MR. JENKINS-SMITH: The WIPP case
4 is a good example of this. And I am sure that
5 Bob Neill can tell you a whole lot more
6 detailed stories than I can.

7 But I was involved in the
8 transportation side or watching closely and
9 there were multiple instances in which
10 concerns that were raised did in fact lead to
11 programmatic change.

12 And in fact, I remember at one
13 point talking with the woman who was running
14 most of that program for the Department of
15 Energy. Her name was Judith Holm, who always
16 struck me as a stellar public employee. But
17 what she did was she started keeping a record
18 of the kind of changes that were being made.
19 And when she engaged the public in these
20 communities, she could explain many of the
21 types of changes that had in fact taken place.

22 The audience, chiefly for her,

1 were precisely the kind of people who
2 communicate that well. She was working with
3 the emergency responders in rural communities
4 all along that transport route. And so when
5 she would do the staged accidents that they
6 were doing for learning purposes, she would be
7 able to communicate this to much of the
8 community or that subset of the community that
9 everybody else in the local community turns to
10 for reassurance about exactly this kind of
11 problem.

12 And I can't attribute causality
13 but I do know that when we measure over a
14 substantial period of time in New Mexico
15 public fear about transport, that the fear
16 drops as you get closer to the route, which is
17 exactly the reverse of what the NIMBY-type
18 literature leads you to expect. But there was
19 some amazing success in that program.

20 And I would urge you to talk to
21 Judith Holm about some of the extraordinary
22 work that she and her team did in that

1 particular case because she figured out who to
2 talk to and did a really good job of
3 explaining how the program had in fact
4 changed.

5 CHAIR HAGEL: Gentlemen, we are
6 going to bring this to an end because, as I
7 said, one of you has to catch a plane and
8 maybe more of you but we are grateful for your
9 good work, your answers, and your
10 availability.

11 On a personal note, I am sorry
12 that we have besmirched the reputation of
13 professors by the co-chairman's recent comment
14 but nonetheless, we move forward.

15 We will take a short break. We
16 will be back in ten minutes. Thank you.

17 (Whereupon, the above-entitled
18 matter went off the record at 3:06 p.m. and
19 resumed at 3:24 p.m.)

20 CHAIR LASH: So, we're back and we
21 feel surrounded. I hope it feels comforting
22 to be surrounded by this many centuries of

1 expertise.

2 (Laughter.)

3 CHAIR LASH: Those of us who have
4 come to the issue relatively recently don't
5 carry the baggage of 30 years of its not
6 having gotten done. Our purpose in asking you
7 to participate in this round table is, in
8 particular, to hear interaction among you.

9 So we will certainly start with
10 some questions from the panel members but we
11 would be eager to have you not only jump in
12 but to jump in to ask one another questions.
13 You have all heard all of the discussion today
14 and surely there have been times when you had
15 to bite your tongue right through not to say
16 something. So, we would like to give you that
17 chance to jump in.

18 Vicky, since you did not get to
19 ask a question in the last session, do you
20 want to start us off this afternoon?

21 MEMBER BAILEY: Okay. Boy the
22 pressure is on. Right? Actually, I will.

1 The two things that I was wanting
2 to hear more discussion on, the issue of
3 sufficiency of regulation. I think in Dr.
4 Voegele's -- Is he still here? Someone left.
5 Okay. He talked about that. And you talked
6 about a new set of regulations.

7 Our earlier panel felt that the
8 regulations in place were sufficient. I would
9 like to hear a little bit more about that.
10 And then on the issue of voluntary host sites,
11 once again this is not a siting Commission but
12 I am trying to understand the issues as it
13 relates to disposal, storage, repository
14 areas, how we should look at this, how we
15 should view this, what are the advantages. Is
16 it totally foolish for us to even think that?

17 I think once again, Dr. Voegele's
18 presentation, you talked about, you mentioned
19 voluntary host sites and that you didn't think
20 that they were a possibility and more than a
21 bribe. And maybe you can tell me what you
22 meant by bribe would be needed but your

1 conclusion was that that would not be a
2 possibility. So I open that up to the entire
3 panel. I think that is something we seriously
4 need to hear about if it is foolish to think
5 that because obviously, Nevada thought that
6 they were given very bad treatment, a very
7 negative taste in their mouth as to how this
8 process was done. They felt they were the
9 site of last resorts, I guess when they were
10 first starting this process. There were
11 several sites in line but they ended up being
12 the sole site. And that was just negative
13 from thereon out. So, Dr. Voegele.

14 MR. VOEGELE: I get to start.
15 Right?

16 MEMBER BAILEY: You get to start.

17 MR. VOEGELE: Let me just start
18 out by saying that I had, you can insert
19 whatever word you want, I will use privilege.
20 I am not ashamed of it. I worked on every
21 document the Department of Energy ever did to
22 address any of the regulatory requirements or

1 the legal requirements for this program over
2 a period of almost 35 years. And I understand
3 those silly regulations. So I am not as
4 uncomfortable with them as somebody who would
5 pick up those books and start reading it. I
6 don't have a problem with the sufficiency of
7 the regulatory structure, other than I believe
8 it is too prescriptive and very difficult to
9 understand. My bigger issues are in terms of
10 the process in which those regulations are
11 implemented and it is going to go right to the
12 second part of this as well.

13 I don't believe that the public
14 was given a fair opportunity to participate in
15 that process. I think those things which were
16 given to them which were meant to be public
17 involvement were not what they looked like
18 they should have been on the surface. Is that
19 a fair statement? I mean, do I need to be
20 Hank Jenkins-Smith and go for a long time with
21 that?

22 It is just that -- Let me give you

1 -- Here is my best example. Okay? Here is my
2 best example for you. We did an Environmental
3 Impact Statement for the Yucca Mountain site.
4 That Environmental Impact Statement was part
5 of the Nuclear Waste Policy Act and that was
6 the document that was going to identify how
7 one site was selected from three sites. Peel
8 back the onion skin one little bit and you
9 will understand that Congress, when it passed
10 the nuclear waste policy act, took a whole
11 bunch of things off the table that the public
12 would expect to deal with in Environmental
13 Impact Statements.

14 The need for a repository,
15 alternatives for a repository, they are
16 already off the table. And now you have
17 amended the Nuclear Waste Policy Act and you
18 have taken a document which was meant to
19 justify selection of one site from three and
20 you have already picked the one site. What is
21 left for the Environmental Impact Statement?
22 It is not a meaningful public Environmental

1 Impact Statement. That is the kind of thing
2 that I am talking about.

3 Now when I talked about their not
4 being a willing volunteer, it is in the exact
5 same context. Why would a state that didn't
6 have a responsible role in determining whether
7 or not this was going to go forward. Let's
8 say you had a state that was willing to step
9 up and say I would like to participate in this
10 process but in return for that, I don't want
11 20 million dollars a year. I want a seat on
12 a Nuclear Regulatory Commission. I want
13 oversight responsibility. I want to my own
14 site characterization program.

15 Now, could all of those things
16 have been done under the Nuclear Waste Policy
17 Act? Perhaps but they weren't. And that is
18 what I was talking about.

19 And he didn't hit me in the ear so
20 I guess I am not too far off.

21 MEMBER BAILEY: All right.
22 Point/counterpoint. Go ahead.

1 CHAIR LASH: Hank, you wanted to
2 jump in?

3 MR. JENKINS-SMITH: Unless Steve
4 needs to get there first.

5 On the issue of compensation and
6 the voluntary nature of the process and I
7 think the jury is out on that right now but
8 compensation is a tricky issue that has to be
9 understood in an interesting way.

10 I think that when you talk to
11 people about whether they would accept a
12 repository, the things that are germane to
13 that issue are the parts of the problem that
14 don't normally get there. If they are going
15 to say to their children, yes, I support
16 having this thing come in here, they have to
17 have some sort of story they can tell about
18 why that repository is actually good, as well
19 as risky.

20 And in my work, the thing that
21 resonates most with people is if they can say,
22 yes, I signed on to that because I think that

1 this facility is going to engage in activities
2 that make sure that the risks to future
3 generations are smaller, that it is not
4 monetary compensation that gets you to the
5 point where you can start thinking acceptance.
6 So it is those other dimensions of the policy
7 issue that we were talking about earlier, I
8 think, that are crucial for making something
9 initially worth talking about.

10 Once you get it to the point that
11 it is worth talking about, then you can talk
12 about compensation. If somebody starts out
13 opposed, however, offering money tends to make
14 them even more opposed because it is seen as
15 blood money. In fact, it is seen as a
16 confirmation that all of the awful things that
17 they initially believed must really be bad or
18 you wouldn't be offering them money to take
19 it.

20 MEMBER BAILEY: So why was WIPP
21 different?

22 MR. JENKINS-SMITH: WIPP was an

1 interesting case from a number of
2 perspectives. One, it was initiated by the
3 local community elites in southeastern New
4 Mexico. It never had a split or it never had
5 significant opposition at the state level
6 officials. In part, that was because the
7 materials that were being handled at that
8 facility came from within the state. So there
9 was material at Los Alamos that was going to
10 go down there. The state had also a long
11 history of involvement in the nuclear weapons
12 complex. And for that reason, handling those
13 materials was seen as a legitimate kind of an
14 activity or continuation for the state.

15 But note that it was still highly
16 sensitive. As soon as we started talking
17 about adding other kinds of wastes to that
18 repository, given that it was all about
19 handling and disposing of these materials, it
20 started to blow up. You would have much more
21 significant state-level opposition and you
22 would have had a much more difficult time

1 garnering public approval, had there been
2 champions opposing the site in state office
3 and if you had elections that were fought on
4 the basis of who could be most successful at
5 opposing the facility.

6 And so one of the things that is
7 important to understand at this stage is the
8 way the policy is designed is going to frame
9 the path that the public discussion takes and
10 that is going to condition a great deal of
11 public support. It doesn't guarantee it. You
12 know, but you can certainly undermine the
13 prospects greatly by designing a policy where
14 it is all about how we can make a bad thing
15 least bad, which is what we do when we
16 minimize a risk.

17 MEMBER BAILEY: Steve?

18 MR. FRISHMAN: Well, I think you
19 can see that in Nevada's reactions over the
20 years, where the people of Nevada were
21 extremely accepting of the Nevada Test Site.
22 And it is because, as it was explained to me,

1 it is because they thought they were serving
2 the national interest and in a way that was
3 protecting them from something that they
4 wanted to be protected from.

5 In 1977, GAO suggested to the
6 Department that they start looking for sites
7 at atomic energy defense facilities because
8 they were relying on that. And I think the
9 department, or at least some decision makers
10 in government were genuinely surprised to find
11 out that Nevada didn't want to get dumped on
12 because we saw absolutely nothing in it for
13 us. But the opposite was true for years and
14 years and it was a great misperception on the
15 part of the government to try to dump on us.

16 MR. NEILL: Now, I think the state
17 may very well volunteer for a proposed
18 repository in the same way that when an
19 economic situation may be grim, people do
20 volunteer to have the state prison located in
21 the -- As a matter of fact, in Santa Fe they
22 requested the state prison over the university

1 because it would have a more stable
2 population.

3 (Laughter.)

4 MR. NEILL: The original mission
5 of WIPP in the Draft Environmental Impact
6 Statement included spent fuel and that was
7 pulled by DOE because the House Armed Services
8 Committee had said that if we include the
9 high-level waste, that will include NRC
10 jurisdiction and we don't want the NRC in the
11 act. So that was taken out and WIPP was then
12 confined only to the transuranic waste.

13 Now a lot of the discussion I have
14 heard today really relates to the biological
15 risks. I don't know explicitly whether it is
16 risk, dose, dose-based, risk-based, but it is
17 essential to include all of the other factors
18 of advantages as well as disadvantages. And
19 there are some disadvantages.

20 There is nothing to be ashamed of
21 to say if this repository goes ahead, we are
22 probably talking 120 billion dollars of which,

1 what 25 percent would be spent locally, 50
2 within the state, 25 percent elsewhere. There
3 are jobs. There are other things involved.
4 I haven't heard any mention for the national
5 good, whether it is for patriotism to get rid
6 of some of the defense wastes and some of the
7 other factors. And we have to, I think it is
8 essential to do not just risk analyses of such
9 a proposition but to do the benefit analyses
10 as well, including all the, as Congress says,
11 the social, economic, political, all these
12 factors together and addressing it.

13 CHAIR LASH: Other comments?

14 MR. McCARTIN: Yes and Steve may
15 want to comment on this. I mean, I think
16 public support for a repository, no matter
17 where it is, is always going to be a
18 challenging thing to understand what should
19 you do. What is the right approach? And even
20 within the State of Nevada, there is Nye
21 County who in all the meetings we have been at
22 with Nye County, they neither support nor are

1 against the repository. They have remained
2 neutral and just say they want to see the
3 safety case put forward and make their judge
4 there. And so Nye County is the county that
5 Yucca Mountain actually resides in.

6 It is interesting. I don't think you
7 can characterize one single view but it is
8 very complex. I will say that. And what it
9 would be interesting to have Nye County do,
10 have them explain what led them to this
11 neutral position, which seems to be in
12 contrast to the state.

13 CHAIR LASH: Are there other
14 comments?

15 MR. NEILL: Just a very quick one.
16 Mike can tell you the Citizens Advisory Board
17 for Nevada Test Site published inventory of
18 attitudes of the offsite population and you
19 end up with a bimodal distribution. There
20 were some people that are clearly opposed to
21 having a high-level waste facility there but
22 there also were people that supported the

1 facility as well. So this issue of how do you
2 inventory or gauge public involvement, you can
3 use a few bumper stickers and things like that
4 but you really, it is a little bit more
5 complex, as one would say. There is a huge
6 spectrum of views.

7 MEMBER BAILEY: Let me go a little
8 bit further on this issue of public trust.
9 Dr. Kasperson?

10 CHAIR LASH: He's gone.

11 MEMBER BAILEY: Oh, he's gone.

12 CHAIR LASH: Oh, here he is.

13 MEMBER BAILEY: I thought that was
14 him. Sorry. See, I'm already seeing things.

15 The issue of public trust, which
16 you said will be very difficult, if we think
17 we are going to regain that, think again.

18 So, I would like to hear from
19 others. You know, one of the comments I made
20 at the first Commission meeting was that there
21 obviously isn't a crisis as it relates to the
22 scientific issues, the science and the

1 technology that we are looking at here, but
2 there is, in my mind, a crisis of confidence
3 and I have heard that repeatedly throughout
4 our hearings, throughout our discussions.

5 You know, if I manage to put in
6 place a process for public involvement, you
7 know, how prescriptive do you think that needs
8 to be? Is it more restrictive, as I think I
9 heard Director Edwards I think from EPA say
10 something to the effect that that might be not
11 a good thing for us to be too prescriptive?

12 I guess the issue of public trust,
13 I would like to hear comments on that. If I
14 do things to make it seem like we really give
15 credence to the fact that we want public
16 involvement, we want to hear from them, but at
17 the end of the day, someone has to balance the
18 issues, whether it is Congress, whether it is
19 the NRC, whether it is DOE, EPA, someone has
20 to balance all the issues and somebody is not
21 going to be happy. But what can I do to say
22 that we are sincere as it relates to the issue

1 of building public trust and confidence in the
2 process?

3 MR. KASPERSON: The position that
4 I have taken on that and when I occasionally
5 talk with people in government about this or
6 in corporation, I say, you know, I think you
7 ought to behave in ways and you ought to be
8 concerned with trying to develop social trust
9 and do the kinds of things that may help to
10 win some of that support but you need to
11 understand that it is probably a long process.

12 And Paul Slovic in his work has
13 sort of argued that you can lose trust in a
14 single and then it may take 10 or 20
15 subsequent acts on the other side to rebuild
16 that lost trust.

17 And so my own view about that is
18 act in ways to deserve the trust and try to
19 rebuild it. Try to behave in really
20 responsible ways. It is complicated, by the
21 way, because there are different dimensions to
22 trust as we know. So, just to give an

1 example, if you have an emerging study and the
2 study is not there yet, do you hold it back
3 until you are really more sure of the result?
4 That helps to build competence, which is one
5 major dimension of trust. On the other hand,
6 you are not being forthcoming with it. So it
7 is pretty hard to win on both of those. I
8 mean, you interfere with one dimension and you
9 win on another dimension.

10 So I think the trust is, so my own
11 view is well, do the best you can and try to
12 rebuild trust in an effective way because it
13 probably is the most precious resource of all
14 the things that we are talking about that is
15 related to fairness and so forth.

16 But I think if you just realize
17 the realities that the trust has really been
18 lost and it is probably going to be very
19 difficult to rebuild and it is going to take
20 a long time. Then you build a management and
21 decision system that puts much more reliance
22 upon the other parties than it does -- the

1 experts can't do things here and assume that
2 they are going to be trusted because they
3 won't be. And people want to put more of the
4 power in their own hands. So you need to
5 design a different kind of process, I think,
6 in regulation and decision making and so
7 forth. So anything that doesn't have
8 significant sharing of power with the people
9 who are going to host a repository and so
10 forth, I think is probably in for a tough
11 ride.

12 CHAIR LASH: Could I ask a follow-
13 up question? Would the creation of a new
14 independent Nuclear Waste Management Authority
15 responsible for proposing and managing a site
16 make any difference?

17 MR. KASPERSON: Well, I think it
18 would help, personally. I think DOE has a
19 really tough road to sled here because of its
20 history. And I mean, I remember when I first
21 decided to look at these things in the 1970s,
22 I think there was a proposal at that time that

1 the Commission be an independent commission
2 responsible for radioactive waste and a number
3 of countries have gone in that direction. And
4 I think that is one possibility that ought to
5 be looked at.

6 MR. BUDNITZ: I have a related
7 angle that I think is very important for the
8 long haul. The nation needs a long-term
9 sustained, government funded research endeavor
10 that engages scholars, scientists, engineers,
11 social scientists, a whole spectrum of people
12 in research and creating new knowledge and
13 consolidating knowledge we have on all of the
14 subjects you have heard about today and you
15 probably have been hearing about for the last,
16 what, three or four months. The fact is, it
17 doesn't exist. And it doesn't exist because
18 the mechanism for brining it about, which
19 exists, was defeated by the political process.
20 It is easy to explain.

21 The Department of Energy, through
22 the waste fund and Yucca Mountain and so on,

1 had such a thing. I ran it for two years,
2 until it was killed because of a political
3 exigency. And no one stood up and said we
4 need that over the long haul. That is one
5 example.

6 The Nuclear Regulatory Commission
7 had, for the longest time, a sustained effort
8 in the Office of Research and in NMSS, the
9 office that does the regulation, but it was
10 too narrow because the mission of that agency
11 is to do the research to expand the knowledge
12 to enable them to do regulation. Very
13 important but not prominent.

14 And no one wanted to go with a
15 ten-foot pole near the social sciences. In
16 2002, I proposed I was newly at DOE and I was
17 running what was to become the new science and
18 technology, the R&D program and I proposed the
19 science and technology effort, a component of
20 that in social sciences.

21 And Dan Madia is here and I
22 remember we had a bunch of discussion with a

1 bunch of social scientists. Perhaps Roger
2 wasn't involved but others were. We came up
3 with a program that wasn't going to be very
4 expensive and it got killed.

5 It got killed because people said
6 if the Department, which is the proponent,
7 does social science research, it is going to
8 look like we are manipulating public opinion.
9 Well, okay, but the courage to sit down, carry
10 out, and sustain a science effort, an
11 engineering effort, a social science effort,
12 and some combination of people that know about
13 regulation, so that a cadre of scholars with
14 decades by 30 years later of experience and
15 funding and interaction provides the expertise
16 in 2040 that you see here in 2010. Some of us
17 are here in 2010 because it started in the
18 '80s with us but we are scientists and
19 engineers. Luckily, a few social scientists
20 were supported elsewhere, Roger being among
21 them but way short of what is needed and
22 without the sustaining commitment. And it

1 seems to me that quite separate from whatever
2 happens, because whatever happens is going to
3 take years. Right? Getting that started now,
4 I don't know who, NSF maybe? I don't know who
5 but some place that would provide the
6 community of interest that would grow and
7 become as expert as you will need in 2030.
8 You are not going to get it if you don't do it
9 and it ain't going on now. In fact, what
10 little there was collapsed with the collapse
11 you know about last year. Okay?

12 MR. JENKINS-SMITH: You know,
13 there is a downside to the social science
14 involvement, though, Robert.

15 MR. BUDNITZ: Of course there is.

16 MR. JENKINS-SMITH: I think that
17 social scientists may be in part implicated in
18 this because so much of it was tangled up with
19 advocacy.

20 MR. BUDNITZ: That's fair.

21 MR. JENKINS-SMITH: And it is
22 difficult for agency managers who are making

1 many of those kinds of choices to talk about
2 funding when the funding appeared to be going
3 for advocacy purposes. And that is something
4 that social scientists have to sort out.

5 MR. BUDNITZ: So let me try to
6 describe. When the science and technology
7 effort within Yucca Mountain, RW was proposed
8 by me in 2002, and at the highest level of the
9 Department, right up to the Secretary's level,
10 they said no. It looks like advocacy. I
11 said, let's give a couple million to the NSF
12 and let them decide, using their processes,
13 which scholars should carry out which research
14 and it will be grants, no control grants.
15 Right? No, we are going -- I don't have to.
16 It was just --

17 (Laughter.)

18 MR. BUDNITZ: It seems to me that
19 the Congress as a matter of policy, could, do
20 you mind my saying should, make that one of
21 the imperatives of the long ten and twenty
22 year need that the nation needs. And we can

1 fund it in a way that avoids these, shall I
2 say, things you have said. I know how to do
3 it.

4 MR. FRISHMAN: Let me point out
5 though that it is interesting to hear Bob's
6 explanation of why the highest levels in DOE
7 didn't want to do it. Meaning, get involved
8 in supporting working the social sciences.
9 The perception within the Department, I think
10 correctly because we recognize it, too, is
11 that we they didn't want to appear to be
12 starting a ministry of propaganda.

13 But in fact, we weren't assuming
14 that. We figured if they tried to do that, we
15 could deal with it. What we saw was that it
16 was a direct effort to continue something that
17 they had started years ago and that is, they
18 refused to consider any aspect of stigma and
19 perception of risk. And we saw this as a
20 mechanism to shore that up.

21 MR. BUDNITZ: But that was, of
22 course, if you don't mind my saying, a piece

1 of the sort of research that we thought social
2 science experts could --

3 MR. FRISHMAN: Well, that is what
4 we wanted done and we saw that reaction from
5 the Department as a means to make sure that
6 they cemented in what we had been told for
7 years and years and that is, we are not
8 allowed to consider it and neither are you.

9 MR. BUDNITZ: Steve, I am going to
10 have to argue that case. I joined the
11 Department for two years, 2004 --

12 MR. FRISHMAN: No, I am trying to
13 explain the difference in perception of --

14 MEMBER MAC FARLANE: Let me
15 interrupt you guys.

16 MR. BUDNITZ: And I saw that
17 stigma right away. So we had to find a way
18 around it and I suggest you guys find a way
19 around it.

20 MEMBER MAC FARLANE: Let me
21 interrupt you guys just to say that I think
22 that that is a good idea, Bob. And speaking

1 as a person who has tried to get funding from
2 the federal government for nuclear waste
3 research and I know this is true on the
4 science side and on the social science side,
5 there is no where to go if you are an
6 independent researcher. There is no where to
7 go, which is pathetic. It means that they
8 don't. You know, you don't want the research
9 to be done. And the DOE, maybe it has done a
10 lot of research. Hardly any of it was
11 published in the peer review literature.

12 And so, from a scientific
13 viewpoint, that is useless. It is not
14 adequate.

15 Can I ask a question? Okay, so
16 just to go back to a previous thread because
17 we have all these experts here. For a
18 disposal process to work, one thing, you know,
19 and I think we will think more about the whole
20 process for siting and a repository or
21 whatever it is going to be, you know, there
22 are many aspects to it but something that has

1 been discussed today and I would like to hear
2 more about from you guys is how to, or the
3 best way that you think to include public
4 involvement. And in particular, are there
5 good examples out there where this has been
6 done? Examples from the U.S. Examples from
7 other countries.

8 And I understand, Roger, all your
9 concerns that this is really complicated and
10 everything. I am not looking for an easy
11 answer but I think we need to address this
12 issue and we don't have a lot of time. So, I
13 would appreciate any advice.

14 MR. BUDNITZ: I have one good
15 example, which I could cite from the
16 Department of Energy. In 1982, with the Act,
17 the country decided that there were going to
18 be, as it turned out, nine sites in the West,
19 the South, the Southeast, for the first
20 repository. And in order for equity, there
21 was to be a second repository in the Northeast
22 or the North or perhaps in the middle of the

1 country and a second repository program was
2 begun in 1982 and went on for four or five
3 years and, in fact, was finally killed just
4 before the decision about Yucca Mountain, you
5 know, that just picked one.

6 The second repository program,
7 which I was deeply involved, Bill Madia at
8 Bettelle Columbus ran it and he had an
9 advisory committee that I chaired from start
10 to finish of that, of various people, has a
11 record that you can get, and you should go
12 hear from Bill Madia or somebody that he will
13 tell you about, of a wonderful start at full
14 public involvement thought through carefully.
15 There were 22 sites. We had a bunch of public
16 meetings. People came. State officials came.
17 I said this earlier but there is more to say.
18 And they had consultation from various social
19 scientists, as well as lawyers and the like.

20 And they were just at the stage of
21 getting to the hard stuff when the plug got
22 pulled. But the record that they accumulated

1 of thinking and there were reports and
2 meetings, and lessons learned from them is all
3 there for you to learn from. And I think it
4 would be a terrible shame that you are going
5 to possibly not take advantage of that because
6 it is sitting there for you and it was all
7 killed in 1986.

8 CHAIR LASH: Roger, did you want
9 to respond to that also?

10 MR. KASPERSON: Well, I am sitting
11 here thinking what would be a helpful response
12 to try to make to that.

13 I think one good starting point
14 would be you know the National Academy of
15 Sciences just came out with a report the end
16 of last year, which has been in process, I
17 think for about three years on public
18 participation. Were you on that one?

19 MR. NORTH: Yes, I was on that.
20 It is dated 2008 and the name is Public
21 Participation in Environmental Assessment and
22 Decision Making. And I guess I would think I

1 want to say how much of a generic problem this
2 is through the federal government. We are
3 looking at this issue here now but I have been
4 involved in reviews at the Department of
5 Homeland Security and the climate research
6 program and renewable energy and so forth.
7 And this is an issue in all of them.

8 I mean, all those reviews have
9 found major deficiencies in this area. And
10 first of all, it seems to me that that Academy
11 report would be a good starting point from
12 which you might derive a set of criteria and
13 so forth. But there is a cadre of people out
14 there, including people like Warner and others
15 who worked on that report, who have thought a
16 lot and are experts on the question of public
17 participation. And I would like to see a
18 group convened and given the task of designing
19 and doing just what you are saying, designing
20 a national program, which I assume would
21 probably be a tiered program that needs to
22 begin immediately, if you will, and carry

1 through.

2 And I think that people in
3 corporations and in government agencies and so
4 forth will tell you time and time again that
5 what we do with public participation and
6 outreach and risk communication is you look at
7 your budget at the end of your process of
8 doing your report and if there is any scraps
9 left over, you run a little public
10 participation program.

11 A serious program would begin on
12 day one and be a critical part of the
13 development of that study and would make the
14 study better through the public participation.
15 But we don't do that anyway in the federal
16 government, that I am aware of. Maybe an
17 exception would be NOAA and its research
18 program as a place where I see most
19 interesting work going on in public
20 participation. But I do think that there is
21 a national capability. It is not a PR
22 problem. It is a problem for people who work

1 seriously on the question of public
2 participation and stakeholder involvement.
3 And I think it needs to exist at multiple
4 tiers because I think some of the critical
5 stakeholders are state officials and utilities
6 and so forth. There is a different kind of
7 process when you actually get into the citing
8 situation. So, you hold public participation.
9 You need a public participation program for
10 that. You need one at the national level.
11 These things should all be peer reviewed.
12 There is a community of people out there. And
13 I think you might actually -- and it needs to
14 be invested in. It needs to take time and it
15 needs to take money. And it needs to be just
16 as serious as all the technology and science
17 stuff that we do and that will be first when
18 that happens.

19 CHAIR LASH: I see three of
20 panelists who want to add something and then
21 I know Per has a question. And we will
22 probably end with the thread that you set off.

1 Bob, I saw your hand up, and Warner, and then
2 Hank.

3 MR. NEILL: Thank you. The
4 Nuclear Waste Policy Act required DOE to do
5 the planning for a second repository. The
6 Department said, you know, it would be a lot
7 easier, I think, to get the inventory of the
8 first one increased, then to go through all
9 the machinations for a second repository. And
10 that was logical and we agreed. The only
11 trouble is when the first one went down the
12 tubes, there is no back up. So the moral is,
13 don't put all the eggs in one basket again,
14 whatever you do.

15 CHAIR LASH: Warner.

16 MR. NORTH: I am going to expand a
17 little bit on some of the things Roger said.
18 I would like to make the point that Roger was
19 involved early in the 1970s, I believe, in the
20 Swedish program, setting it up with the
21 considerations of social science and public
22 involvement. As a spectator, I thought that

1 was a really useful contribution in orienting
2 their national program. France is a case
3 study of how they started off with the
4 technical people running it and ran into very
5 serious problems, such that they had to
6 reformulate the whole program.

7 I would like to comment that the
8 2008 report that I worked on, I might add over
9 five years, we were disappointed in the amount
10 of literature out there, especially where you
11 could test public involvement in a program
12 versus no public involvement.

13 Now a lot of anecdotes and a lot
14 of stories but very little, shall we say,
15 controlled clinical research. There have been
16 a number of areas where the federal government
17 has started off to do a lot in this area but
18 then given politics and people's concerns, it
19 is not continued. Climate alteration is one
20 of these. There was a big exercise in this
21 area which was stopped and I think much
22 valuable opportunity involving people at a

1 local level on what does climate alteration
2 mean to you and what might be done about it
3 that this wasn't pursued by the government as
4 it might have done.

5 Now, I will add a little anecdote
6 of my own. I was involved in a Superfund
7 site. There were a whole bunch of these that
8 EPA has had to deal with. I was brought in as
9 a consultant to the responsible party, in this
10 case VEPCO, Virginia Electric and Power, an
11 electric utility. The first thing I suggested
12 we do is have a meeting over lunch between the
13 leaders of the environmental group and
14 representatives of the utility. And we were
15 able to start a dialogue on the basis of some
16 apologies from the utility for past
17 performance, get some local experts from the
18 university to review the analysis, and in
19 relatively short order, we were able to get a
20 Superfund site turned into a public park with
21 great enthusiasm on all sides.

22 I thought the process was very

1 straightforward. You get people to talk to
2 each other, exchange information and you
3 figure out that there is a way to do it very
4 well. It costs a little bit more money. And
5 if everybody is satisfied that you can proceed
6 in this direction, you can turn a noxious
7 facility into something that the local
8 community takes great pride in.

9 I have to say, this was never
10 documented. It was used by EPA administrator
11 Lee Thomas in testimony. I have talked to
12 him and to a number of his staff trying to
13 find that testimony. I was never successful.

14 So, that is another point I want
15 to add. I think if we look at our history, a
16 lot of prisons have cited. A lot of
17 environmental messes have been cleaned up,
18 often with public involvement, sometimes done
19 with skillful leadership and not documented in
20 the social science literature.

21 CHAIR LASH: Hank you had a
22 comment? Just before you do, do you know a

1 book called Leadership Without Easy Answers,
2 Ron Heifetz book --

3 MR. JENKINS-SMITH: Yes.

4 CHAIR LASH: -- in which he
5 documented the Tacoma smelter case?

6 MR. JENKINS-SMITH: Yes.

7 CHAIR LASH: I would be interested
8 in your reactions to that.

9 MR. JENKINS-SMITH: It is a good
10 case. I want to take a slightly different
11 angle. We have been talking about public
12 participation and involvement and that is a
13 huge category. It involves many things and it
14 has different objectives that are implicit
15 within it that you have to take into account,
16 before you start thinking about appropriate
17 directions to go here.

18 But public involvement has to
19 differ substantially, depending on what it is
20 that is being engaged. If you are engaging
21 simply garnering public acceptance of
22 something that is a net bad, it is a different

1 story than it is if there are benefits to be
2 had. And I think that one of the things that
3 is unfortunately not systematically
4 researched, is the degree to which different
5 mechanisms work differently when you have
6 different policy designs at stake.

7 But there is another aspect to
8 this that I urge the commission to be somewhat
9 attentive to and that is, the fact that when
10 you are getting close to the question of
11 representation when you are dealing with
12 public involvement. There isn't one public.
13 And as much of Roger's work points out in the
14 social amplification of risk, one of the
15 things that happens is that there are
16 interested parties who are, for ideological or
17 material interest reasons, deeply engaged in
18 an issue like this and have big stakes in the
19 outcome and will do everything they can to
20 effect the course of policy events. And they
21 may not at all represent the broader public.
22 We tend to treat them as the public because

1 they are the ones who show up at the hearings.
2 They are the ones who intervene in the
3 processes. But that is not the public in the
4 sense that we think of it when we are thinking
5 about politics and we are thinking about
6 representatives processes.

7 And there have been some very
8 serious efforts to try to engage a
9 representative public in these kinds of things
10 that involve citizen juries where you actually
11 do random selection of members of the public
12 or some sort of representative stratification
13 and engage in discussions and there are
14 conferences that, on an annual basis have
15 attempted to do this. The problem is is that
16 you change the people who are engaged in those
17 processes so they no longer represent the
18 public from which they were drawn if you
19 engage them too deeply.

20 So the dilemmas we face are
21 interesting. And I will end up with another
22 anecdote like Warner likes to do, that drives

1 this home.

2 I once was involved, this was the
3 case of trying to arrive at public consensus
4 about incineration of nerve agents at the
5 various depots that we have across the United
6 States, and there was a very active
7 infrastructure of interest groups that engaged
8 this issues at all the different sites and
9 that had been put on site-specific advisory
10 boards and given all sorts of representational
11 involvement. And I came across a county
12 commissioner at one of these events and he was
13 spitting mad because he had to stand for
14 election and he had to go on the basis of his
15 record and get reelected to represent his
16 county. And then he gets to an issue that is
17 a major issue for his county and there are all
18 these people who purport to represent the
19 public, in his view, who don't, who had a seat
20 and he didn't. He was furious.

21 And this is what happens when you
22 overlay one kind of representational system in

1 the name of public involvement in an already
2 structured system in which we have elections
3 and people have to stand for them and all
4 kinds of rules like that. Just be careful.
5 Be careful. That is all I'm saying.

6 CHAIR LASH: Per.

7 MEMBER PETERSON: In addition to
8 being a member of the Disposal Subcommittee,
9 I also am a co-chair for the Reactor and Fuel
10 Cycle Technology Subcommittee. And there are
11 some linkages between disposal and fuel cycles
12 that I would like to explore with just a
13 couple of questions starting from the two
14 slides, Hank, that you showed earlier on
15 implications of design options, co-locating
16 research laboratories or reprocessing
17 facilities with repositories and then
18 retrievable versus permanent disposal and
19 opinions about those two things from the
20 perspective of the parallel activities that
21 might be under way with research on advanced
22 reactor fuel cycle technologies and/or

1 reprocessing.

2 So the first question I would have
3 would be would one expect to see similar
4 response in terms of public support, if one
5 were to co-locate research laboratories or
6 reprocessing facilities with centralized
7 storage. I would assume that you would have
8 somewhat of a similar response but this
9 important because we have a variety of
10 different types of infrastructure that may be
11 needed for a system to work. And certainly we
12 know that storage is a big part of how you go
13 forward. So that would be one part of the
14 question.

15 The second is that I note that
16 when you find the 69 percent preference for
17 retrievable storage, that is with respect to
18 the storage of used nuclear fuel.

19 MR. JENKINS-SMITH: Correct.

20 MEMBER PETERSON: And my question
21 would be if one were to prioritize initially
22 taking defense high-level wastes from the

1 defense sites that currently have those
2 materials for disposal and defer the question
3 about disposal of spent fuel until you have
4 had time to do additional work and research
5 and stuff to make a more informed decision
6 about whether it actually merits disposal or
7 not, to what extent would that possibly change
8 this current 69 percent desire to see the
9 stuff be put in retrievable storage.

10 In other words, is this being
11 driven by people's perception that you are
12 throwing away something that you shouldn't or
13 is this because they think that throwing it
14 away might be unsafe and you are going to have
15 to reverse that process?

16 MR. JENKINS-SMITH: It is both of
17 them with respect to used nuclear fuel. Note
18 that between the research and safety and new
19 learning versus the resource, the learning for
20 safety purposes is the bigger jolt and it has
21 a bigger effect on increasing support for the
22 repository.

1 So I think it would have a
2 substantial effect, particularly in a policy
3 debate when you are talking about something
4 that is indeed a waste, for which the prospect
5 of treating it as a resource is remote, that
6 it would, that that part of the justification
7 for retrieval would be moot for most of the
8 public.

9 MEMBER PETERSON: Oh, actually,
10 quick, it is also likely or not likely that
11 you would see similar sorts of statistics with
12 respect to coupling research or reprocessing
13 activities with centralized storage facilities
14 as well.

15 MR. JENKINS-SMITH: Yes, it would
16 be. It is a fairly, for most people, the idea
17 of long-term storage and disposal are pretty
18 close to one another but the reaction would be
19 roughly the same.

20 MEMBER PETERSON: Okay.

21 CHAIR LASH: Vicky has one follow-
22 up question.

1 MEMBER BAILEY: Not on this
2 subject. On a different subject but back to
3 a question that I asked on regulation.

4 Steve, I wanted to pursue a little
5 bit further and maybe the other panelists can
6 comment, you made some recommendations on a
7 regulatory panel, as such, in your comments.
8 And I don't think I gave you a chance to
9 discuss that.

10 But I would also like to hear some
11 input from others because obviously we have
12 heard, you know, there are those who think we
13 just need one regulator and there are
14 different views about the issue of how to
15 develop regulation for a new repository
16 process.

17 MR. FRISHMAN: Well, I was looking
18 at what we know to be deep and well-resourced
19 expertise in both NRC and EPA on this subject.
20 They certainly should be, after the years they
21 have spent. So I was looking at taking
22 advantage of that and also taking advantage of

1 their knowledge in the actual writing of
2 regulation but then forcing them to do
3 something that they rarely if ever do, which
4 is work together as equals in developing
5 information and add to them the people who are
6 or some people from multi-disciplines who are
7 experts and considered public.

8 I have done a funny thing here
9 where I have said there is public and there is
10 government but I hope you understand what I am
11 saying and find some of those people and take
12 advantage of their expertise in terms of being
13 able to better grasp what their interest and
14 concerns are at their level of expertise but
15 also would have the sensitivity to help bring
16 the interests and concerns of the not-so-elite
17 public to the table. And I think their main
18 job would be, this is why I mentioned the way
19 EPA often does proposed rules now where they
20 pose a set of questions. And they certainly
21 are not the only questions. AS I said,
22 everything is in scope but they can start that

1 discussion by having an informed list of
2 questions.

3 And in my one-pager, I put out a
4 few of the areas. And there are lots more.
5 Just about everything that was talked about
6 this morning is fair game.

7 But part of the purpose of the
8 expert public is to do everything you can to
9 bring out what it is the main general public
10 is interested in, concerned in, and will
11 either lead to improved confidence or lower
12 confidence, depending on how well that group
13 works.

14 MEMBER BAILEY: Could I hear from
15 some of the other panelists? I know Bob, you
16 have talked about the NRC and Warner, you have
17 talked about --

18 MR. NORTH: I would just like to
19 know, Steve, that the process you have
20 proposed is quite consistent with what is
21 described in the 2008 report on how one might
22 want to proceed.

1 Starting with a framing of the
2 problem involving people that are expert but
3 also involving people representing the public
4 and having iteration back and forth where the
5 expert scientists carry out analysis and
6 provide their insights to the public
7 representatives. The public representatives
8 react to that. And then as you go toward
9 conclusion you have some fundamental value
10 issues that may appear and that is a point for
11 wider discussion among the public. Or you may
12 find that there are some crucial technical
13 issues. That is an invitation for more
14 intense work by the experts and the analysts.

15 So the process needs to go back
16 and forth and iterate toward a conclusion.

17 CHAIR LASH: Tim, did you want to
18 comment? Then we will wrap up.

19 MR. McCARTIN: Yes. In terms of I
20 think EPA and ourselves, we have worked better
21 over the past few years together with respect
22 to Yucca Mountain. There are certain things

1 in the regulations that are EPA's jurisdiction
2 and some that are NRC. And so it is
3 difficult. I think we talk to each other but
4 sometimes we will have different views but
5 ultimately, there are some things that are
6 EPA's call, some things that are NRC's. And
7 the process is worked reasonable.

8 Now, in terms of public input, we
9 have tried. And I realize in terms of you
10 always can be a better listener. We have had
11 numerous public meetings. We have gotten a
12 lot of input. I can promise you there are
13 three or four of us at the NRC that have read
14 more than once every single comment that we
15 got with respect to the Yucca Mountain
16 regulations. We have put forward statements
17 of consideration when we finalized the
18 regulation, responding, we felt faithfully to
19 every single comment we received. We do tend
20 to group things and so people might not see it
21 but how many people read the Federal Register?

22 I do sympathize with the public

1 that is out there. You know, I don't think I
2 have looked at the Federal Register on any
3 routine basis. Is there a way for us to
4 interact with some of the people we interact
5 with at those public meetings? We get their
6 input. Very simple input sometimes. Very
7 useful. But we never get back to them. We
8 write our Federal Register notice. And so I
9 think some people they are not going to see,
10 their name or their specific comment. It
11 might be lumped together with others. And
12 even if they read the Federal Register or they
13 might not notice it, it would be useful to --
14 We have tried to go back to communities more
15 than once. And so they get the dialogue
16 going.

17 But there is, I think we --
18 Starting in '99 was our first public meetings
19 in Nevada. Some people would say they weren't
20 very good. I am a glass half-full person and
21 so I think we learned a lot from those
22 meetings but we went out as technical people

1 to explain our regulations. It didn't work
2 with the people. We have done a lot of work
3 since then and I would like to think we have
4 done better but it is a challenge. If we
5 fail, it is we really don't get back to some
6 of the people that I think provide very
7 valuable input to us.

8 And I will say I have repeated
9 this story to the interns at NRC that very
10 first meeting and why I feel the first
11 meetings in Nevada with respect to our
12 standard were successful. There was one woman
13 in Caliente who stepped forward to the
14 microphone. And she remembered as a little
15 girl that she was out on the playground,
16 Caliente is downwind from the Nevada Test
17 Site, and saw little flakes come from the sky.
18 And they were told to go inside. They were
19 left with little burn marks on their arms.
20 They were downwind from the Test Site. One of
21 the shots ended up there. She looked us
22 straight in the eyed. She had two brothers

1 that had died of cancer already. She looked
2 at us and said, we are counting on you to
3 protect us.

4 That kind of information from the
5 public -- She could not clarify our job better
6 than that. We talked to her after the
7 meeting. But those are the kind of people
8 that are out there and she didn't ask us to
9 deny the application. She didn't ask us to
10 approve it. We are counting on you to protect
11 us.

12 And so I think there things out
13 there. There are the public out there. Those
14 are the people we need to talk to in addition
15 to the people, that same meeting someone
16 called me a liar. We need to talk to that
17 person and understand why are you calling me
18 a liar. And over time, we built up and that
19 person doesn't call me a liar anymore, I will
20 say. But that personal getting back to
21 people, I think that is how you gradually
22 build up trust. And you are absolutely right.

1 The people who are at the meetings, do they
2 represent a good cross-section? I don't know
3 but that is the starting point, getting those
4 people that they feel they can talk to us and
5 they will get an answer back from us. And I
6 think they talk to their neighbors and
7 gradually, hopefully, that is how trust in the
8 process builds up.

9 CHAIR LASH: Thank you, Tim, and
10 to all twelve of you, we really appreciate
11 your agreeing to spend an entire day with us
12 and participate in both your panels and this
13 round table.

14 We are still at the sponge stage
15 trying to absorb as much as we can but pretty
16 soon we have to move on to sorting it out and
17 beginning to frame a response. And we will
18 look forward to ongoing interaction. I am
19 wanting to take to heart what you just said,
20 Tim. I mean, we have the same kind of
21 responsibility to all of you who have taken so
22 much time with us to respond and let you know

1 how much you have influenced us and how we
2 have decided to move forward in the way that
3 we do.

4 We have -- The members of the
5 roundtable, thank you very much and you can
6 step down.

7 We have one more phase, which is
8 public comment. Do we want to reorganize the
9 room or stay organized as we are?

10 MR. FRAZIER: What we can do is
11 either move the podium back out --

12 CHAIR LASH: Okay.

13 MR. FRAZIER: -- and take a few
14 moments to do that or we can have the public
15 sit over there where Tim is and we will make
16 Tim move.

17 CHAIR LASH: On Tim's lap?

18 MR. FRAZIER: Judy would like to
19 sit on your lap. Let the record reflect.

20 CHAIR LASH: We have two people
21 who have signed up to speak to us. We are
22 looking forward to welcoming Judy Treichel

1 back who has spoken to us before and Mary
2 Olson.

3 Judy why don't we just let people
4 get out of the way and then we will invite you
5 forward.

6 You have been with us often so you
7 know that we will invite you to speak for five
8 minutes but we are glad you are here. And
9 there is a lot of material for you to respond
10 to today.

11 MS. TREICHEL: Yes, there
12 definitely is. First, and mine is always
13 haphazard because I take notes as I go along.
14 So it doesn't fit -- This isn't a prepared
15 presentation. Judy Treichel, Nevada Nuclear
16 Waste Task Force.

17 In response to Tim and talking to
18 the public all the time, it wasn't that big a
19 deal because they were there because they were
20 going to do Yucca Mountain. So, if you really
21 liked Yucca Mountain, you felt like you had
22 something to contribute but if you had any

1 reservations about Yucca Mountain, you were
2 just getting the joy of being able to sit in
3 front of a microphone.

4 And for Tim, I would say, you
5 know, he said he couldn't tell if they were
6 making any impression on people, that they
7 explained their regulations. Yes, they did.
8 Ad nauseam. We heard exactly what the
9 regulations were over and over. But if he had
10 wanted a gauge, what he would have done is
11 told us what changed because we talked. What
12 difference did we make? And that is where we
13 would have felt like we were having a two-way
14 conversation with NRC.

15 I would say that you have got to
16 get away from making this statement all the
17 time, "make it publicly acceptable." That
18 means you have already made it. And then the
19 next step is making it publicly acceptable.
20 It is too late. You have got to start with
21 the public going in and as somebody said,
22 frame the conversation, decide where everybody

1 starts by already agreeing. Is there nuclear
2 waste? Yes, we all agree there is nuclear
3 waste.

4 And then you can start up from
5 that point where you keep having people and
6 then when you start to get places where you
7 don't agree, you can kind of figure out how
8 you need to blend it. But with Yucca Mountain
9 there was so much already over and done with,
10 that none of that ever happened. And I think
11 people have to be in on the making of the
12 regulations. It has to be bottoms up like
13 they are talking about in Canada. I don't
14 know if that will always work but it started
15 right.

16 And I am not sure that you get a
17 volunteer, even if you have multiple sites but
18 you should have multiple sites and you should
19 tell people what kind of thing you are looking
20 for. And if there are people who really want
21 to engage some place, I would never discourage
22 anybody. I was vehement about it not being

1 Nevada. But because the public didn't want
2 it, the officials didn't want it, we had
3 already had testing, we had real experiences
4 like the lady with the stuff on the arms and
5 whatever. So it has to really begin at the
6 beginning.

7 And the public is definitely not
8 involved in the current licensing process.
9 You can't be. You have to have an attorney.
10 You have to have all sorts of expertise and a
11 lot of stuff that takes a lot of money.

12 The last thing I would say is
13 there have been questions all day about how do
14 you start developing trust. Where does trust
15 come from? Well, I will tell you where it
16 doesn't come from and it doesn't come from
17 what DOE is doing right now. They have
18 already started up. They are already
19 relooking at nuclear waste and they are doing
20 it with what I call secret meetings and
21 anonymous communication. You don't know who
22 you are talking to when you get an email that

1 just says nuclear energy. And when there are
2 other agencies that are invited to participate
3 and some agencies that ask if they can
4 participate, and they all get together in the
5 public or any member of the public like myself
6 is absolutely refused, that is ridiculous.
7 And that is how they are staring up now.

8 So it is already wrong and it is
9 already going in the wrong direction. So that
10 is what I would say.

11 CHAIR LASH: Thank you for being
12 with us. Mary Olson?

13 MS. OLSON: Mary Olson, Nuclear
14 Information and Resource Service and I do
15 represent the engaged public. We have a lot
16 of engaged public and they are very interested
17 in what this commission is up to. And I would
18 say that they echo many of the concerns that
19 Judy Treichel just raised.

20 I want to tag the fact that that
21 Nuclear Information Resource Service was a
22 party in the challenge to the EPA's Yucca

1 Mountain standard. We were one of the groups
2 that brought that suit and w certainly had a
3 front row set in the 1990s Nuclear Waste
4 Policy process, a very close working
5 relationship with both the administration and
6 a lot of congress.

7 I want to tell you that sitting
8 here today, it finally became clear to me that
9 the Commission is repeating a mistake already.
10 I understand this is a big complex issue, you
11 have a lot of people in a short time but by
12 breaking into topical subcommittees, you are
13 preventing the very thing that our community
14 does, which is when we do a risk-benefit
15 analysis, and believe me we do, we do it for
16 the whole system from the generation of the
17 waste, its cradle, to its grave.

18 And so I want to challenge the VRC
19 to consider starting with problem definition.
20 What is your goal? Our goal is isolation of
21 this waste from the biosphere. The irradiated
22 fuel from commercial nuclear power has 95

1 percent, more than 95 percent of the
2 radiological burden that we are all worried
3 out. So I said yesterday, if it wasn't
4 radioactive we wouldn't be here. You know, it
5 is the ionizing radiation that makes the
6 issue. Right?

7 So 95 percent of the problem, the
8 goal needs to be isolating it from the
9 biosphere. If that is not your goal, you need
10 to be transparent about it, then you need to
11 state what your goal is.

12 Okay, so assuming we share that
13 goal, we look at it this way. The stuff is
14 somewhere now. It could be handled better.
15 We would like to be spread out, hardened. We
16 like it to be monitored. We like the local
17 communities to be more involved.

18 But it is being stored now on
19 licensed sites. So given that fact, then you
20 look at any steps further. And from our
21 perspective, transportation is very risky. It
22 is not secure, compared to the local site

1 where it is now. It is not certain. The
2 regulation transport allows up to two years
3 and it is a single shipment, two years in
4 transit. It passes through very dense
5 populations if something were to happen and
6 the routine radiation exposures are, by
7 definition, higher than leaving it where it
8 is. So you are increasing the risk just to
9 move it. So you better be moving it for a
10 good reason. And our goal is isolation from
11 the environment. So if you are moving it to
12 a site that is going to leak, that is not a
13 repository that is a dump and we are going to
14 oppose it.

15 If you are moving it to reprocess
16 it, quite frankly, that is not isolation from
17 the environment either. We are going to
18 oppose it.

19 And you know, I am not saying we
20 are the be all and end all. I am not saying
21 we have all the power in the world. I am
22 telling you our thinking process and why your

1 committee isn't able to do that thinking
2 process because you have cut it into pieces
3 that don't reflect the whole system.

4 So I hope at some point you are
5 going to be gathering yourselves together and
6 really doing that.

7 So finally I just want to say that
8 you know, we want to work with a positive
9 future. And I have had the unique opportunity
10 after 20 years in my job of stepping into an
11 advocacy role. I did it with the Commission,
12 the five commissioners at the Nuclear
13 Regulatory Commission in June, advocating for
14 hardened onsite storage. We will continue to
15 advocate for that. I think you have very,
16 very strong support over 200 groups signed on
17 to the statement that is posted on your own
18 website because we submitted it and I am
19 constantly using your site to give you more
20 hits when I refer other people to it.

21 And you know, we are ready to join
22 hands and say let's do this well. Let's do

1 this well. And so then the next thing I want
2 to say is that I think there is much more
3 diversity in our community about the need for
4 repository program. I think there is support
5 for the discussion of a repository program.
6 I am not going to say my organization is
7 endorsing it. It is not. But if there is
8 one, you have got to start with clear rules
9 and then you have got to be willing to reject
10 a site that doesn't meet those rules. And we
11 have been dancing in the streets ever since
12 Yucca Mountain was -- You know, there has
13 never been a clear statement as to exactly why
14 but from our perspective in 1998, we had the
15 data to show that site was going to leak and
16 not meet the site suitability guidelines in
17 statute. And it caused us deep shame in our
18 government that there was not the courage to
19 acknowledge that and reject the site at that
20 time.

21 So you know, yes, absolutely Yucca
22 Mountain should be off the table and

1 absolutely we should have a scientifically
2 credible process. So I am going to take it
3 one step further. It needs to not only be a
4 standard, it needs to a viable strategy. And
5 it really scares me to hear that five years is
6 too long for this process. It is probably
7 going to take five to ten years to even get a
8 viable strategy in hand. Then, you go looking
9 for the site.

10 You go looking for a site before
11 you have a good standard and a viable
12 strategy, it ain't going to work. And there
13 is, I think, interest in it working.

14 CHAIR LASH: Thank you. It was --
15 You covered a lot and it was clear and
16 unequivocal. We appreciate it. Keep putting
17 stuff on our website and keep coming back to
18 talk to us.

19 MS. OLSON: I live in North
20 Carolina. I will see you in South Carolina.

21 CHAIR HAGEL: Jonathan, may I --

22 CHAIR LASH: Please.

1 CHAIR HAGEL: -- make a comment?

2 And I appreciate both Judy and Mary's thoughts
3 but I really have no standing to contribute
4 what I am about to say because I am not one of
5 the two co-chairs, although you and I share
6 co-chairmanship of this subcommittee.

7 I think it is important to reflect
8 a little bit on what Mary said because she
9 brings out some important points. Now in the
10 absence of our commission co-chairmen, I would
11 offer this. Her terminology reflect on the
12 whole system. It is important and it is
13 accurate. And I want to assure her, at least
14 from this Commissioner, that we are doing
15 that. The three subcommittees essentially
16 were put together, structured so that we could
17 have some management and organizational
18 structure over so many very important and
19 complicated parts. That is why we have these
20 hearings.

21 I also want to note that many
22 members, Per being one and I think Vicky

1 another, Susan Eisenhower on this subcommittee
2 another, serve on more than one subcommittee.

3 Another point I want to make is
4 that the subcommittees will start blending and
5 start working together once we have some
6 information that we all believe, all members
7 of the commission, that is relevant and
8 important and focused on the objective of the
9 Commission, at least the tasks that we were
10 given by the Secretary. So it is not without
11 not only an awareness but an actual
12 practicality we are doing these things. We
13 are, in fact doing essentially everything I
14 heard Mary talk about. And I think she is
15 right, the points that she makes.

16 So I would offer that with, of
17 course, no standing, but that has never
18 stopped me. But thank you.

19 CHAIR LASH: Do any of the members
20 of the panel want to make any closing comments
21 for this afternoon? Vicky?

22 (No response.)

1 CHAIR LASH: Well then I just want
2 to thank the panelists for being such engaged
3 participants. We will begin a process
4 tomorrow of trying to decide how to actually
5 move forward to sort through some of what we
6 are hearing and also decide what further
7 information we want to gather, what kinds of
8 meetings do we want to have in the future.

9 To all of the interested public
10 who have joined us at this meeting and past
11 meetings, we really appreciate your being with
12 us and hope to see you at our future meetings.
13 Keep the pressure on.

14 (Whereupon, at 4:34 p.m., the
15 above-entitled matter went off the record.)

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