

BLUE RIBBON COMMISSION ON AMERICA'S  
NUCLEAR FUTURE

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DISPOSAL SUBCOMMITTEE

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MEETING

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THURSDAY, NOVEMBER 4, 2010

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The Subcommittee convened at 8:30 a.m.  
in the Carlton Ballroom at the St. Regis  
Hotel, 923 Sixteenth Street, Northwest,  
Washington, D.C., Chuck Hagel and Jonathan  
Lash, Co-Chairs, presiding.

MEMBERS PRESENT:

CHUCK HAGEL, Chair  
JONATHAN LASH, Chair

MARK AYERS  
PER PETERSON

ALSO PRESENT:

TIM FRAZIER, Designated Federal Official  
JOHN KOTEK, BRC Staff Director

GEORGE DIALS, B&W Technical Services  
Group

LAKE BARRETT, L. Barrett Consulting  
JOHN GREEVES, formerly of the US NRC  
R.D. ANDERSON, formerly of Sandia  
National Laboratories

LINDA LEHMAN, Contractor to US DOE

ROBERT ANDREWS, Intera, Inc.  
W. GARY GATES, Omaha Public Power  
District

PUBLIC COMMENTERS :

STEVE FRISHMAN

JUDY TREICHEL

ALEX PAVLAK

C-O-N-T-E-N-T-S

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

8:29 a.m.

Call to Order

MR. FRAZIER: All right. If we could get everybody to move to their seats, we're going to try to get started here really quickly. I'd like to take this opportunity to welcome you to the -- wow, is this really loud -- welcome you to the -- it could be me, I have had my coffee this morning -- welcome you to the Disposal Subcommittee of the Blue Ribbon Commission on America's Nuclear Future.

My name's Tim Frazier. I am the Designated Federal Officer for the Commission, and without further ado, Senator Hagel, when you give me the high sign, we'll turn it over to you.

Opening Comments

CHAIR HAGEL: Tim, thank you as always and good morning. Thank you. We want to thank all of our panelists this morning, those who continue to contribute to our

1        efforts. I think everyone knows that this  
2        Subcommittee was formed to address the matter  
3        of how the U.S. can go about establishing one  
4        or more disposal sites for high-level nuclear  
5        waste, in a manner that is technically,  
6        politically and socially acceptable.

7                Our last meetings have covered the  
8        issues of the need for disposal facilities,  
9        alternative approaches for the disposal  
10       process, to develop a disposal system or  
11       systems, and essential elements of technically  
12       credible, workable, and publicly acceptable  
13       regulations for disposal and institutional  
14       systems needed for the regulations to work  
15       well.

16               Last month, the Subcommittee held  
17       several meetings abroad in Finland and Sweden.  
18       As I think most people already know, these two  
19       countries successfully finished site selection  
20       processes for final repositories, and appeared  
21       to have achieved a high degree of public  
22       acceptance.

1                   Our goal was to learn from their  
2                   experience. We had a number of very  
3                   productive meetings and site visits, where we  
4                   had a chance to communicate with federal and  
5                   local government officials, scientists,  
6                   engineers, environmentalists and local public  
7                   representatives.

8                   A summary of these meetings will  
9                   be posted on the website later this month, and  
10                  I want to thank my co-chairman, Jonathan Lash,  
11                  and the members of the Subcommittee who  
12                  participated in that effort. It took a lot of  
13                  time and attention and discipline, and I think  
14                  it was very productive.

15                  The purpose of today's meeting is  
16                  to explore lessons learned from previous site  
17                  evaluation processes, and to hear a utility  
18                  perspective on the implementation of the  
19                  Nuclear Waste Policy Act. As always, we have  
20                  an impressive collection of experts who can  
21                  share their experiences and perspectives on  
22                  this issue.

1                   We would like to remind our  
2                   invited panelists that they are to keep their  
3                   formal presentations, if they can, to ten  
4                   minutes or less, and that the remainder of the  
5                   allotted time will be spent on questions and  
6                   a conversation and discussion with  
7                   Subcommittee members.

8                   We are webcasting this meeting, as  
9                   we have done for all Commission meetings. We  
10                  want people who aren't able to get to our  
11                  meeting locations to be able to follow our  
12                  proceedings. The video archive for this  
13                  meeting will be posted on the Commission  
14                  website.

15                  At the end of today's morning  
16                  session, we will hear from any member of the  
17                  audience who wishes to speak. A sign-up sheet  
18                  for the public comment period is available  
19                  now, and will be open for sign-ups until noon.

20                  Of course, the amount of time  
21                  allotted to each speaker will depend on the  
22                  number of people who wish to speak. We

1 appreciate the time and efforts, again, of our  
2 speakers, and have put into their  
3 presentations that the analysis and their own  
4 expertise and perspectives that we know will  
5 significantly contribute to our efforts, not  
6 only this morning but our overall objective.

7           Also, I wanted to mention that it  
8 is the last Subcommittee meeting for this  
9 year, for this Subcommittee. This  
10 Subcommittee will be taking time to process  
11 the received information that we've gleaned  
12 over the last six months, and we'll have  
13 additional hearings, if necessary, while  
14 continuing to receive public comments and  
15 input.

16           With that, I will open the floor  
17 to the commissioners for any statement or  
18 comment they wish to make, before we move next  
19 to our item on the agenda, and that is to hear  
20 from our panelists. At this point, I will ask  
21 my distinguished co-chairman, Jonathan Lash,  
22 for any additions he would like to make.



1                   CHAIR LASH: Thank you and good  
2 morning. Just two brief points. First of  
3 all, we continue to be astonished and deeply  
4 grateful at the willingness of experts from  
5 across the country to come and talk with us  
6 and help us through this task.

7                   We have found universal  
8 willingness to come give us your thoughts, and  
9 help a Commission that started from pretty  
10 much zero to move ahead on this topic. I  
11 noticed one thing as we were traveling in  
12 Finland and Sweden, two countries which are  
13 really quite close to reaching a consensus on  
14 a solution to waste disposal.

15                   In Sweden, we visited the facility  
16 they have constructed, that is a purely  
17 experimental facility to test their waste  
18 solutions, 450 meters deep in granitic rock,  
19 in which they've dug demonstration drifts and  
20 begun testing.

21                   Their solutions and, despite the  
22 fact that in terms of the success of their

1 process, they've gotten much further than we  
2 have, it was quite remarkable the extent to  
3 which the decisions taken by the United  
4 States, the views expressed by this  
5 Commission, the input of U.S. experts like  
6 yourselves, carries enormous importance.

7 They attach great weight to what  
8 we decide and what we do, and it adds to our  
9 sense of responsibility in addressing this.  
10 So I think we have a chance to reach an urgent  
11 solution for a problem the United States  
12 faces, but also help the world move forward.  
13 So we appreciate your participating in that  
14 very much.

15 Per, I don't know if you have  
16 anything to add?

17 MEMBER PETERSON: No, thank you.

18 CHAIR HAGEL: Thank you. Now  
19 before we turn to our panelists, let me ask  
20 John Kotek, who is the BRC staff director, to  
21 give a Subcommittee rundown of the Commission  
22 papers that have been requested so far to

1 assist this Subcommittee in its work. John  
2 Kotek.

3 MR. KOTEK: Yes. As much as  
4 anything, this is sort of an advertisement.  
5 The Commission has asked for papers to be  
6 completed by some outside experts, where we've  
7 found areas where we needed some help.

8 So for example, we have had papers  
9 prepared on federal commitments related to  
10 waste, and also on options for geologic  
11 disposal. You'll see we reached out to the  
12 law firm of Van Ness, Feldman and then Dr.  
13 Chris Whipple, who's well known to many of the  
14 folks in this room, I'm sure.

15 Those papers are available right  
16 now on the Commission website. I just wanted  
17 to make sure people knew they were there. If  
18 you look on the website, there's a tab that  
19 says "Commission Papers." Click on that. You  
20 can see what's been provided to us.

21 We're more than happy, always  
22 eager to receive comment on any of those. So

1 again, for folks who are interested, go have  
2 a look, and if you think there's something  
3 there that needs to be commented on, we'd love  
4 to hear it.

5 Next slide, please. Can I get the  
6 next slide? We've got other ones, a longer  
7 list of ones that are going to be coming down  
8 the path.

9 I won't read them all to you here,  
10 but what I can do is have a list, post it on  
11 the website, of kind of what's coming. But  
12 you'll see that we're trying to get some  
13 outside help exploring a broad range of issues  
14 that are before the Commission.

15 Again, these will be posted on the  
16 Commission website. They're not the work of  
17 the Commission, they're the work of outside  
18 experts that we've asked to provide us advice  
19 in specific areas, and we would love to hear  
20 thoughts from anybody who has something else  
21 to offer in those areas.

22 So we'll get this list on the

1 website in the next several days, so you know  
2 what's coming, and again, appreciate any  
3 thoughts you have to offer. That was what we  
4 wanted to accomplish here. Thank you.

5 CHAIR HAGEL: John, thank you.

6 Now to our panel. The panel discussion is  
7 focused on, will be focused on lessons learned  
8 from past site evaluation processes.

9 In particular, we have asked our  
10 speakers this morning to focus on two specific  
11 questions. What were the drivers behind the  
12 scope of scientific work and the associated  
13 cost and time required of the WIPP and Yucca  
14 Mountain sites?

15 Second, how can a future site  
16 evaluation process be designed to allow the  
17 many necessary and sometimes conflicting goals  
18 for site evaluation to be met, to be met in a  
19 credible way within a reasonable time and at  
20 a reasonable cost?

21 We have with this us this morning  
22 Dr. George Dials, Executive Vice President,

1 B&W Technical Services Group. Welcome. Mr.  
2 Lake Barrett, former Acting Director, Office  
3 of Civilian Radioactive Waste Management of  
4 the U.S. Department of Energy, and now owner  
5 of his own consulting company, L. Barrett  
6 Consulting.

7 Mr. John Greeves, former Director,  
8 Division of Waste Management at the NRC.

9 Thank you. Dr. Rip Anderson, retired  
10 scientist at Sandia National Laboratories; Dr.  
11 Linda Lehman, contractor to the U.S.  
12 Department of Energy for Performance  
13 Assessment, former consultant to the state of  
14 Nevada; and Dr. Robert Andrews, principal  
15 scientist at Intera, Inc.

16 To each of you again, thank you  
17 very much. We look forward to your comments  
18 and to the exchange, and we will begin with  
19 Mr. Dials.

20 Panel Discussion

21 MR. DIALS: Thank you, Senator and  
22 members of the Subcommittee. I'm honored to

1 be here. I sort of felt boxed in the corner  
2 there with my old colleague, Lake Barrett.  
3 But Lake used to be my DOE boss when I was the  
4 president of the M&O contractor in Yucca  
5 Mountain, that's not a position I'm  
6 unaccustomed to.

7 I am honored to be here. I know  
8 we have a few minutes, but I am very pleased  
9 to talk about lessons learned from two  
10 national repository programs, both of which  
11 I'm honored to have had some small role in.  
12 I was a member of the Senior Executive  
13 Service, and actually I was able to form and  
14 staff the Carlsbad area office.

15 It's now called the Carlsbad Field  
16 Office, when it was decided we really needed  
17 to pull together the various and disparate  
18 organizations trying to get the WIPP licensed  
19 and opened, and required a lot of people to  
20 move to Carlsbad, New Mexico.

21 Several of their wives have yet to  
22 forgive me for that action, but it was

1 essential in that program. Then I was also  
2 honored after I left DOE service to be chosen  
3 to be the president of the M&O contract team,  
4 to run the final couple of years of TRW's role  
5 in the Yucca Mountain project, and Lake and I  
6 worked very closely together.

7 I do want to talk about lessons  
8 learned on these two programs, because they  
9 have some great similarities in terms of  
10 timescales of concern and in terms of the  
11 technical and organizational aspects,  
12 timescales in terms of identifying and picking  
13 acceptable sites, and then moving forward  
14 through site evaluation to the review of  
15 regulatory and licensing requirements, and  
16 then licensing programs.

17 They're quite different, though,  
18 in terms of ownership of the problem, in the  
19 sense of who really had control and owned the  
20 waste, and what were the mandates for dealing  
21 with, on the WIPP program, the defense-related  
22 transuranic waste, for example, and on Yucca



1 Mountain, it's the used nuclear fuel and the  
2 high-level waste.

3 They're different in terms of the  
4 sort of stability of the regulatory  
5 environment in which they were being  
6 evaluated. There was lots of concern and  
7 angst when it was decided, under the WIPP Land  
8 Withdrawal Act and others, that the EPA would  
9 actually be the regulator for determining if  
10 WIPP met the compliance requirements and could  
11 open, rather than the NRC.

12 But that was one of the signature  
13 events that occurred, that enabled the WIPP  
14 program to move forward under a stable  
15 regulatory program and meet compliance  
16 requirements that were both stringent and  
17 well-defined.

18 So the programs are different in  
19 the sense that one has been successful in  
20 terms of its ultimate objective, that is, in  
21 getting a licensed and operating repository  
22 open that's permanently disposing of a waste

1 form that we felt problematic, and that's the  
2 WIPP program.

3 The Yucca Mountain program  
4 unfortunately has become the victim of  
5 primarily political decision-making. There  
6 was no technical, rationalized technical basis  
7 for the decision not to move forward with  
8 Yucca Mountain, and I'm sure other speakers  
9 here who have been intimately involved will  
10 speak to that.

11 I wanted to emphasize a couple of  
12 points in the time I have, of areas where we  
13 should look for the lessons learned, and I  
14 have a few viewgraphs that will help me do  
15 that, and our technical staff are very  
16 accomplished. They did indicate with an R and  
17 an F which direction we need to go, and I  
18 appreciate that assistance.

19 I would like to say that, finally,  
20 on both of the programs I've been involved in,  
21 the successes that we've had, and there have  
22 been great successes both in WIPP and Yucca

1 Mountain, are attributable to the hundreds and  
2 thousands of dedicated professionals, many of  
3 them who have spent their life working on  
4 those programs.

5           There have been many scientific,  
6 technical, administrative, communication,  
7 public outreach successes, and there are  
8 lessons to be learned of great value for  
9 moving forward with government programs in  
10 both WIPP and Yucca Mountain. There have been  
11 failures in both programs, and as a senior  
12 manager in both programs, I will take  
13 responsibility for my part in some of those  
14 failures.

15           But the failures in these  
16 programs, particularly Yucca Mountain in my  
17 opinion, are failures at the very senior  
18 management level, where we lost focus on our  
19 primary objective of solving the problem and  
20 removing high-level waste from the  
21 environment.

22           That was the simple objective of

1 both of these programs, and at their genesis,  
2 they were combined. If you go back and read  
3 the history of it, the WIPP site was sited  
4 initially to dispose of all of the nuclear  
5 waste in the United States.

6 After some deliberations, it was  
7 decided that the program should be divided,  
8 because of their different timescales of  
9 concern. That is, the actinides remain  
10 radioactive for hundreds of thousands of  
11 years, whereas the fission products are tens  
12 of thousands of years.

13 And there were those who thought,  
14 including my thesis advisor at the time, Dr.  
15 David Rose at MIT, that if you separate them  
16 into long-scale and sort of intermediate-scale  
17 timescales of concern, you would actually be  
18 able to solve the most serious problem in  
19 terms of health and safety risk to the public,  
20 that is, the used nuclear fuel piece, much  
21 more quickly and readily than the hundreds of  
22 thousands of years problem.

1                   Now it didn't quite work that way,  
2                   but that was the concept. So there's a  
3                   lessons learned when we look at the programs  
4                   in that context. We need a rationalized  
5                   approach and I think there are lessons learned  
6                   in looking at both these programs, in a  
7                   comparative sense with the steps that were  
8                   taken to how the programs were rationalized.

9                   You can't just talk about solving  
10                  one piece of this problem without looking at  
11                  the whole picture, and that's basically what  
12                  we suggest here, that not all of these pieces  
13                  are going to be dealt with at one time, and  
14                  you don't have to have the solution for every  
15                  technical aspect of it to move forward with a  
16                  solution to the immediate problem.

17                  The immediate problem with  
18                  transuranic waste at one time was that we had  
19                  transuranic waste at over 23 sites around the  
20                  country, posing some risk to the public, and  
21                  we decided to communicate this in simple  
22                  terms.

1                   That is, if you define how many  
2                   people are at risk, what can you do to reduce  
3                   the risk? So if we took a 50-mile radius  
4                   circle and drew it around each of the sites,  
5                   and found that there were 53 million people at  
6                   some risk and undefined, because we weren't  
7                   sure how much of the risk was real or not,  
8                   compared to what we were trying to do, is to  
9                   move it to one site half a mile underground,  
10                  with a 50-mile radius circle with 60,000  
11                  people.

12                  The public understood that there  
13                  was some great improvement in comparative  
14                  risk. If you did that with used nuclear fuel  
15                  you'd find that there's probably over 100  
16                  sites where you have high nuclear fuel high-  
17                  level waste. I haven't drawn those 50-mile  
18                  radius circles, but if I did, I would -- I'll  
19                  just make a wild guess.

20                  There's probably over 150 million  
21                  people at some risk to ultimate exposure and  
22                  potential health and safety impacts, if we

1 left it there and something bad happens over  
2 the next 100 years. So we need to do  
3 something about that.

4 So you look at it in a holistic  
5 sense, and the very important part is  
6 ultimately, no matter how you look at this  
7 problem, the international community, Finland,  
8 Sweden and other countries you visited, the  
9 National Academy of Sciences, the  
10 International Atomic Energy Agency, the OECD  
11 NEA, all the deliberative bodies of the world  
12 who have looked at this problem, say we  
13 ultimately need a repository, a disposal site.

14 So the Disposal Subcommittee has a  
15 very critical part to play in this as to  
16 formulating how do we get, in the United  
17 States, to the selection of a disposal site  
18 and the implementation of the programs to get  
19 there?

20 One of the things we need to do is  
21 get a rational regulatory period of timescale  
22 framework to do the evaluation, rationalized

1 as to apply the principles of scientific  
2 management for desired result.

3 There's a variant of that. If you  
4 have children, you will know the variant: the  
5 variant when your children come say, the dog  
6 ate my homework or the computer crashed or  
7 whatever, the car rolled down the street and  
8 hit a building.

9 The variant is to provide a  
10 plausible but untrue reason for conduct. We  
11 had that variant operative very visibly in the  
12 last several months on the Yucca Mountain  
13 program. My colleague, Lake Barrett, wrote  
14 one of the best letters to the editor  
15 addressing the variant behavior that's  
16 happened on Yucca Mountain. It was published  
17 in Energy Daily recently.

18 I liked it so much I asked him to  
19 autograph it for me. I wish I could have  
20 written it. As timescales are concerned, a  
21 million years isn't credible, ladies and  
22 gentlemen. It isn't credible to the public,



1 it isn't credible to the politicians who try  
2 to make the decisions, the policymakers, the  
3 management team. It isn't credible.

4 You know, look at all the  
5 significant events that have happened here in  
6 a fairly short time, compared to a million  
7 years. We need a credible regulatory  
8 framework. I know I'm out of time. We need  
9 to think about sites. You're going to be  
10 ultimately thinking about sites because we  
11 need disposal decisions to be made in site  
12 evaluation.

13 I just picked this one out because  
14 there's a heck of a lot of bedded salt around,  
15 and we've already had an example, a pure  
16 example of a repository that's gone through a  
17 very detailed and rigorous compliance  
18 assessment, that was peer-reviewed by expert  
19 groups in the United States.

20 It's also the first program peer-  
21 reviewed by a combined OECD NEA, IAEA peer  
22 group, and passed muster in terms of, it met

1 the requirements in salt. That's not the only  
2 formation or geological structure surrounded  
3 by it. If I put one up of granite, there'd be  
4 lots of granite sites around too. Oh, I  
5 missed one.

6 CHAIR HAGEL: Mr. Dials, could you  
7 wrap up here in about 60 seconds?

8 MR. DIALS: I will.

9 CHAIR HAGEL: Then we can get back  
10 to anything else you need.

11 MR. DIALS: You need peer reviews,  
12 you need credible peer reviews, you need peers  
13 who are truly peers, who are not involved in  
14 the management, who do not benefit financially  
15 or any other way from the programs, but they  
16 need to review the scientific/technical  
17 programs.

18 Peer reviews were conducted both  
19 at WIPP and Yucca Mountain. The National  
20 Labs played a role. That needs to continue.  
21 Finally, you need a transparent decision-  
22 making plan that the public, the politicians,

1 the policymakers, the opposition groups are  
2 bought into and it's published and advertised.

3 On this plan, which was a five-  
4 year plan for the WIPP program that I used and  
5 carried around in my inside pocket, and  
6 Senator, every time I briefed Senator Domenici  
7 you can be sure he pulled his out and said  
8 okay, where are we, all the opposition groups  
9 pulled theirs out and said, when's the next  
10 public outreach meeting?

11 There were 47 public outreach  
12 meetings, pre-identified, prescheduled on this  
13 chart. You need some framework that the  
14 public, broadly speaking, can understand,  
15 value and participate in. Thank you very  
16 much. I look forward to answering your  
17 question.

18 CHAIR HAGEL: Mr. Dials, thank you  
19 very, very much. Let's now turn to Mr.  
20 Barrett.

21 MR. BARRETT: Thank you, Mr.  
22 Chairman. I believe the main site evaluation

1 driver is a relentless societal demand for a  
2 virtual zero-risk, zero-uncertainty, near-  
3 utopian repository.

4 This was instigated by those who  
5 did not want a solution to radioactive waste,  
6 those that were opposed to whatever particular  
7 site was being considered, and well-meaning  
8 bureaucrats and academics, who either  
9 intentionally or unintentionally fostered  
10 unrealistic, overly-expensive and time-  
11 consuming demands.

12 For Yucca Mountain, this started  
13 with a dead-right, blue-sky National Academy  
14 report that basically required a million year  
15 standard, just like George described a moment  
16 ago.

17 The EPA, under political pressure,  
18 piled on with traditional ultra-low-risk dose  
19 requirements, additional inappropriate  
20 resource protection requirements like the  
21 drinking water protection standard, and all of  
22 these initial overly-protective standards in

1 turn is implemented by the ultra-stringent and  
2 demanding NRC adjudicatory, regulatory  
3 implementation process, that in itself has  
4 cost over half a billion dollars alone.

5 Additional jaw-bone requirements  
6 from the Nuclear Waste Technical Review Board  
7 added further burdens in the name of "helpful  
8 perfection." Taken altogether, this NAS, EPA,  
9 NRC, NWTRB gauntlet was so demanding that it  
10 makes it extremely difficult for any real site  
11 to succeed.

12 This is not to say the task is  
13 impossible for a high-performing site.  
14 Despite all these overly-protective near-  
15 perfection requirements, it appears that after  
16 over \$7 billion and 30 years of analysis, the  
17 proposed repository at the Yucca Mountain site  
18 can achieve all these super-safe requirements.

19 In my view, the obvious least-  
20 cost, least-time solution that is safe for the  
21 American people is to continue and improve  
22 with a Yucca Mountain monitored, reversible,

1 hybrid storage repository facility.

2 If Yucca Mountain is not to be  
3 used, costs and time for another site  
4 evaluation could be reduced if the near-  
5 perfection requirements can be reduced, and  
6 the implementing organization is empowered to  
7 more effectively meet the challenges than the  
8 DOE was.

9 Unfortunately, given the anti-  
10 nuclear waste rhetoric and fears over so many  
11 decades, it will be politically challenging to  
12 reduce existing requirements.

13 In my view, previous nuclear  
14 safety requirements are like an irreversible  
15 ratchet. They never loosen. The Yucca  
16 Mountain site evaluation cost and schedule  
17 experience may well be the good old days when  
18 compared to any new, real repository site  
19 evaluation.

20 However, an existing site like  
21 WIPP is a possibility, but reversibility,  
22 natural resource potential exploration and

1 erosion out to a million years will be  
2 challenging evaluation issues that should not  
3 be underestimated.

4 Remember, the grass always looks  
5 greener when viewed from across the street,  
6 but it's not so green when you stand on top of  
7 it and look at it. Managing a politically  
8 sensitive, open, transparent, complex state-  
9 of-the art science program like this, in a  
10 very highly regulated environment and  
11 contentious political environment, within a  
12 large catch-all civil service organization  
13 like DOE, is not easy for many, many reasons.

14 A direct executive agency branch  
15 like the DOE is about the worse place to do  
16 it, with constantly changing bosses who have  
17 dominating political electioneering  
18 responsibilities.

19 Actions going back as far as the  
20 1986 termination of the second repository  
21 program, the Fiscal Year '96 Congressional  
22 budgetary redirection, the Nevada primaries of

1 2004 and 2008, and the current Nevada Senate  
2 election situation, provide ample proof of  
3 this.

4 In addition, there is very limited  
5 authority granted to DOE OCRWM office, to meet  
6 the many challenges in a timely, effective  
7 manner. Budget competition and many other DOE  
8 internal rules make it very difficult to  
9 implement a program like this.

10 In my view, a focused government-  
11 chartered, private-public entity would be a  
12 much better management structure to  
13 effectively evaluate any new repository site,  
14 to establish an integrated storage facility,  
15 hopefully in conjunction with advanced nuclear  
16 R&D initiatives, or finishing with a  
17 statutorily designated but much enhanced Yucca  
18 Mountain facility.

19 Now I would like to, in my  
20 remaining time, put this in context with some  
21 schedules. Can I have the first slide please?  
22 Well, next slide. Next slide, please. I want



1 to quickly go through and show you the site  
2 evaluation process.

3 The first beginning, this is  
4 generic for what happened at Yucca Mountain.  
5 I believe it would be generic for any new site  
6 that you look at. The first period is policy  
7 development period. Back in 1978, the IRG was  
8 sort of like you. That led four years later  
9 to policy being written, the Nuclear Waste  
10 Policy Act.

11 Next slide, please. Then you go  
12 into preliminary siting. In the case of Yucca  
13 Mountain, this was cut short, as you know, by  
14 the '87 amendment. Next slide. Then there's  
15 a detailed site characterization period.

16 For Yucca Mountain, this took 15  
17 years, and I'll come into some of the lessons  
18 learned, why I believe that should be closer  
19 to seven years if we did this again.

20 Next slide. Then you start into  
21 the facility licensing part. The first phase  
22 would be for the applicant, whoever that is,

1 to submit a license application. In the case  
2 of Yucca that took six years, and in my view  
3 that should have been only three.

4 Next slide. Then the regulatory  
5 organization has to make a decision. That is  
6 nominally a four-year process, per the Nuclear  
7 Waste Policy Act. The NRC is halfway through  
8 that. They've suspended that review at the  
9 moment, but if that were allowed to continue,  
10 that would have been 2012.

11 Next slide, please. Then the  
12 nominal eight years' construction, and you'd  
13 be looking at operation in the 2020 timeframe.  
14 So it's been 42 years from the start to the  
15 finish, with site evaluation being the  
16 longest, at 15 years.

17 Next slide, please. Site  
18 characterization lessons learned. 15 years,  
19 took that long because of many different  
20 delays for many different reasons. First,  
21 there was the state permits, and this gets  
22 into the social science part of it, where they

1 delayed this for several years.

2 Then we had the budget reduction  
3 changes, some from the new Republican Congress  
4 in '94. Then we had internal Congressional  
5 appropriations for many years, where that was  
6 cut back. The management of betterments and  
7 the standards were always changing during  
8 Yucca Mountain.

9 The EPA standards and everything  
10 else was changing. It's very hard to have  
11 moving targets and keep the focus with a chart  
12 like George showed earlier, which he had for  
13 WIPP, and we have similar charts for Yucca  
14 Mountain.

15 The one I would like to talk about  
16 the most is the management challenge for  
17 cultural integration. To do a project like  
18 this, it takes -- you have to meld together  
19 and integrate very distinct, different,  
20 cultural groups of people who don't work well  
21 together naturally.

22 The first is world-class academic

1 earth scientists. These folks are in academic  
2 institutions, really good people, but they  
3 don't necessarily work well with a bunch of  
4 mundane other groups. But you have to have  
5 world-class, state-of-the-art science.

6 Then you have the nuclear  
7 engineering type of people who come out of the  
8 reactor world primarily. They don't  
9 necessarily work so well with some of the  
10 others. They have their view on how it ought  
11 to be.

12 Then you have the underground  
13 people, be they miners running tunnel bore  
14 machines, deep borehole figures if you want to  
15 do deep borehole disposal, the reality of that  
16 world, the very practical, we call it "mud-  
17 and-boots" world.

18 These all have to work together in  
19 a highly regulated Nuclear Regulatory  
20 Commission culture, which these folks don't  
21 understand, don't particularly like, and they  
22 will buck it. Following the stringent NRC

1 requirements is very critical, and it's a big  
2 job for any organization to do that,  
3 especially difficult within the DOE world.

4 If it's private, I think you'd do  
5 much better. Ward Sproat did a wonderful job  
6 of pulling together the license application in  
7 2008. But this is something that you ought to  
8 keep in mind as we go forward. It has to be  
9 done.

10 Of course, there's political  
11 delays. I won't talk about that. Management  
12 continuity, Ward Sproat talked to you about  
13 that and he's absolutely right. You can't go  
14 changing bosses every couple of years. I was  
15 the longest-serving director, and I was only  
16 an acting director, and that's not the way it  
17 should be.

18 Next slide, please. As far as  
19 program restructuring, I think this is really  
20 absolutely mandatory for success in the  
21 future. I think we need to implement an  
22 organization that would be a public-private

1 corporate new entity. This would minimize --  
2 you're never going to eliminate political  
3 interference. You can minimize it though.

4 It needs to be empowered. I think  
5 you've heard about that and talked about it.  
6 It needs to have funding, it needs to have  
7 management capability to hire and fire and  
8 control various contractors at various times.  
9 Management continuity, and most importantly,  
10 to work with the host entities, be they the  
11 states, be they the local. Next slide please.

12 I'm not going to go through this  
13 in detail, but this is very similar phases.  
14 If we were to go forward, it shows you  
15 starting in 2010, and I put guesses on dates.  
16 But there are a few differences here.

17 One I put in green, the second  
18 phase really is, we should establish the  
19 regulatory criteria before we get into site  
20 evaluation. You've had meetings about that  
21 before. So we need to not have the standards  
22 changing while we're doing the work.

1           Then I split the work into three  
2 parts. The regulatory part on the second  
3 line, and the bottom line is the technical.  
4 Those are kind of standard. But a key thing  
5 for the future going forward is host  
6 relationships.

7           We've got to have a better  
8 relationship with the host. You saw that in  
9 the Nordic countries. Well, I'll tell you,  
10 they have no states, and if we had no states  
11 and we weren't the United States of America,  
12 we would have had this done. But setting that  
13 aside.

14           But constant interchange between  
15 the host and the regulatory world, the  
16 technical implementing world at all times,  
17 with host agreements that evolve and are  
18 phased as it goes forward.

19           I believe that would be the  
20 formula for success, once you start operation  
21 of the continuous science and technology  
22 improvement through value engineering and

1 advances in science.

2 And if this were to go forward on  
3 what I believe a reasonable schedule would be,  
4 with a faster site characterization of seven  
5 years, licensing prep of three years, we're  
6 talking about operating around 2044.

7 Now that's kind of a significant  
8 date, because that is 100 years after we  
9 started making high-level waste at Hanford at  
10 the end of World War II.

11 My personal view, 100 years is a  
12 long time, and I think it ought to be faster  
13 than that for the children, for reasons George  
14 talked about, the number is around existing  
15 sites, it's 165 million people, all right, and  
16 these are the headwaters of rivers and lakes  
17 and places, and that's not what we should be  
18 leaving for the grandkids. Thank you very  
19 much.

20 CHAIR HAGEL: Mr. Barrett, thank  
21 you. Mr. Greeves.

22 MR. GREEVES: Good morning,



1 Chairman and Committee. Thank you for  
2 inviting me. If you would please, start my  
3 slides. I just have a few to keep a focus.  
4 Ten minutes isn't a long time.

5 I started my waste management  
6 career with the Nuclear Regulatory Commission  
7 in 1980 at the NRC. I actually worked with  
8 Lake Barrett, Linda Lehman, and in many ways  
9 the other people on the panel over the years.

10 In that timeframe, in the early  
11 80s, we were reviewing multiple sites, and by  
12 the middle of the 80s, we had narrowed it down  
13 to three, the Nevada test site, the Basalt  
14 Waste Isolation project up at Hanford, and the  
15 Salt Project in Texas.

16 We actually were working on what  
17 was called "site characterization reports" and  
18 as a young engineer, I was working on the site  
19 characterization report for the Hanford  
20 project, which was completed.

21 As many speakers have told you  
22 today and previously, it takes a credible

1 technical and societal decision process to be  
2 successful with deep geologic repositories.

3 In my view, the U.S. program has  
4 failed regarding the societal decision process  
5 at Yucca Mountain. However, the U.S. has  
6 succeeded in implementing a credible technical  
7 and societal decision process at the WIPP  
8 facility. Overly-prescriptive regulations can  
9 drive the cost and schedule of these types of  
10 facilities.

11 Noted in the remarks that I  
12 provided, the adaptive stage management  
13 process, as suggested by the National Academy  
14 of Science and others, should be followed.

15 I believe it helped Sweden and  
16 Finland and even WIPP gain public trust in the  
17 selection, characterization and development of  
18 a deep geologic repository. WIPP also  
19 profited from a demonstration approach, where  
20 they took contact-handled waste for the better  
21 part of a decade, and then, only then, started  
22 handling remote-handled waste.

1           The next slide is just questions  
2           that you teed up, so if you could, just go to  
3           my third slide. So with only ten minutes,  
4           what I've chosen to do is highlight a few of  
5           what I think are key drivers. They're not the  
6           only drivers associated with the repository  
7           siting process.

8           Earlier remarks, the program was  
9           making progress narrowing down from three  
10          sites, and then precipitously chose one. This  
11          is quite contrary to the adaptive stage  
12          management approach. I believe you've been  
13          briefed on this and have papers, and really,  
14          it virtually made it impossible achieving  
15          societal acceptance at that one accepted site.

16          Other countries, including Sweden  
17          and Finland, chose a different path. They've  
18          been more successful following the adaptive  
19          stage management approach, and I currently  
20          consult for some aboriginal people in Canada,  
21          and they are quite voiceful about seeking  
22          assurance that this adaptive approach will be

1 followed in the DGR in Canada. I believe  
2 you've had speakers from Canada that have  
3 addressed this.

4 Other speakers have articulated  
5 that regulatory standards were not in place.  
6 Having worked there, I was part of that  
7 process, and those standards were not in place  
8 and they continued to evolve for the better  
9 part of ten years. This is a serious problem  
10 in this type of an endeavor.

11 Performing regulatory reviews.  
12 Some of the times when Lake Barrett would  
13 submit us a report, we knew the standards were  
14 a bit of a moving target, but we had to  
15 implement what was on the books at the time.  
16 It's very hard to do that, for both the  
17 proponent and the regulatory staff to  
18 implement, with the standards not in place.

19 In looking at standards with other  
20 countries, the U.S. system seems to be much  
21 more prescriptive. I've worked on both Part  
22 60, Part 61, which is low-level waste, and

1 Part 63 over my career. Such prescriptive  
2 approaches make it difficult to get consensus  
3 on what those standards are.

4 They make it difficult to  
5 determine what the design acceptance is for  
6 various components, and it's also difficult to  
7 conduct transparent reviews with all of these  
8 standards. My experience for over ten years,  
9 working with the IAEA is that other countries  
10 use much less prescriptive approaches.

11 Regarding management control,  
12 there was constant turnover within the  
13 director level. Lake, as an acting Director,  
14 was a bit of continuity and I did at least  
15 enjoy that, the years that I was responsible  
16 for the program, and also the contractor, the  
17 management that ran the contractor also  
18 changed periodically. Basically ran about a  
19 four-year cycle where you had a new team.

20 It was difficult for that team to  
21 instill and maintain a nuclear safety culture  
22 with such turnover. Each new Director came up

1 with a new idea to address design changes and  
2 safety culture issues.

3 This was a source of repeated  
4 quality problems, and people in the field,  
5 like Barrett described, just were not  
6 following their internal procedures, which was  
7 a large part of the problems that I had to  
8 deal with when I was at the NRC.

9 Last slide, number four. So with  
10 that, what can you benefit in terms of the  
11 future? Setting standards prior to siting  
12 sessions is just mandatory. You just cannot  
13 proceed with this evolution process.

14 It's clearly necessary to follow,  
15 to set these standards and it's important to  
16 set the technical and the societal  
17 expectations that will take decades to  
18 implement.

19 Standards need to be succinct,  
20 understandable and implementable. You're  
21 going to likely need a clean sheet of paper.  
22 Having worked on 10 CFR Part 60, which is

1 still on the books, it has a very complex and  
2 prescriptive approach to it. I don't see how  
3 you can just pick that back up.

4 For example, there's three  
5 subsystem component standards in there that --  
6 each in their own right. We had to hire a  
7 contractor and staff to develop an  
8 understanding of how to implement those  
9 standards, one on groundwater travel time,  
10 another one on substantially complete  
11 containment. What is substantially complete  
12 containment? Then the third one was the  
13 engineered barrier system, which required a  
14 release-rate calculation.

15 Coming up with the models to meet  
16 those substandard systems didn't always  
17 integrate very well with the overall systems  
18 performance assessment.

19 So like I said, I think you're  
20 going to need to start out with a clean sheet  
21 of paper and take the lessons learned we've  
22 all been afforded over the years, and what's

1 going on there nationally.

2 Experience shows that use of a  
3 safety case analysis under the adaptive stage  
4 management approach can be effective. I would  
5 also use -- I would also recommend using such  
6 risk-informed techniques to manage the use of  
7 resources, not just the technical part, but  
8 the management of the resources.

9 Also, the what-is-enough question.  
10 The scientists like Barrett talked about all  
11 have a better idea on how to run tests, do  
12 research. Well, what's the payoff? There are  
13 risk techniques available that you can use to  
14 evaluate. Do I need to put another hole in  
15 and what data do I need to gather from that  
16 hole? There are techniques that can help you  
17 answer those questions.

18 Carrying two sites is expensive,  
19 but prematurely investing in one site and then  
20 not getting societal acceptance is obviously  
21 a big mistake that we've run into. When you  
22 have to retrack on something like that, it's



1 much more expensive. Geologic repositories  
2 are best characterized at depth.

3           Apparently, you went to Sweden,  
4 you saw this. It's, I think, mandatory that  
5 you get down. You really don't understand  
6 what's going on with the geology with  
7 boreholes alone. For example, we didn't learn  
8 about the chlorine-36 issue at Yucca Mountain  
9 until DOE went down there and opened up those  
10 repositories in full-scale drifts. So doing  
11 that is quite important.

12           I believe the experience at WIPP  
13 shows how beneficial it is to start out on a  
14 small scale, build confidence as you go.  
15 Repository development is clearly a decades-  
16 long process, a process that demonstrates  
17 disposal of DOE's high-level waste glass and  
18 the commercial fuel that we currently have.  
19 It's not a candidate for recycle.

20           Doing a demonstration process on  
21 that, I think, would be quite useful, and also  
22 the high-level waste glass that DOE is

1 producing is growing, and there is no  
2 disposition path in sight for that material.

3 The last item, the need for  
4 sustained management and budget control has  
5 been addressed by numerous speakers.

6 Inconsistent funding has clearly been a  
7 problem for both the proponent and the  
8 regulator at Yucca Mountain.

9 It's hard to keep talented people  
10 when your budget is uneven, the country is  
11 invested in the Southwest Research Institute,  
12 in that talent pool, and that talent pool, I  
13 think, now is in jeopardy based on what's  
14 going on.

15 Apparently, WIPP has not suffered  
16 from similar problems over the past decade of  
17 operation. Most of my experience has been  
18 with the Yucca Mountain process and  
19 international, but I, from a distance, have  
20 observed a number of positive aspects  
21 associated with its development.

22 So I tried to keep to ten minutes,

1 and I'd be pleased to hear what the other  
2 speakers have to say. Thank you for your  
3 time.

4 CHAIR HAGEL: Mr. Greeves, thank  
5 you. Dr. Anderson.

6 DR. ANDERSON: Thank you, Mr.  
7 Chairman. Sorry. I was asked to address  
8 whether performance assessment could be used  
9 as a tool for folks in science, and it indeed  
10 was at the WIPP site and at others as well.  
11 The bigger question, however, I think is  
12 should probabilistic risk assessment be used  
13 on large programs, and I think the answer to  
14 that right up front is that it's the only way  
15 that you can optimize the research, shorten  
16 the time scale and save the money.

17 I think that the discussions of  
18 how the science of performance assessment has  
19 developed over time is very critical. I'm  
20 only going to point out that the sub-seabed  
21 program, which I managed for about 11 years,  
22 set up the procedures for probabilistic risk

1 assessment, and the WIPP program which,  
2 George, you told me to get busy and focus on,  
3 in effect optimized those procedures that were  
4 used at WIPP, and then we used them at an INEL  
5 program, which looked at a different waste and  
6 a different geologic formation, and then again  
7 for the disposal of nuclear submarines,  
8 decommissioned nuclear submarines, the reactor  
9 vessels from them in the ocean.

10 In all the cases, the  
11 probabilistic assessment project that was --  
12 the science that was developed indeed worked  
13 there. What I'd like to do, if I may, is to  
14 have the second view graph.

15 This is in effect the performance  
16 assessment flow diagram that everybody has  
17 used, sometimes acceptably, sometimes not very  
18 acceptably, and -- is there a pointer or would  
19 it be better if I just got up to point out  
20 different areas? Do I have to be near a  
21 speaker?

22 CHAIR LASH: You've got to stay

1 near a microphone.

2 CHAIR HAGEL: We need a  
3 microphone, though, next to you. If you want  
4 to go over to the podium, it might be easier.

5 DR. ANDERSON: Okay.

6 CHAIR HAGEL: There's a microphone  
7 there.

8 CHAIR LASH: I think there's a  
9 pointer up there. The trigger is on the  
10 bottom for the raising point.

11 DR. ANDERSON: Okay. Let's see if  
12 we can --

13 CHAIR HAGEL: And you need to turn  
14 your mic on by the way there.

15 DR. ANDERSON: Okay.

16 CHAIR HAGEL: There you go. Thank  
17 you.

18 DR. ANDERSON: And the pointer is  
19 --

20 CHAIR LASH: Under your index  
21 finger.

22 DR. ANDERSON: Okay. The first

1 thing that you must do is develop a FEP list.  
2 This FEP list must be very, very complete, and  
3 as George indicated earlier, WIPP was very  
4 deeply involved in developing FEP list for  
5 different geologic formations. Why is this so  
6 very important?

7 CHAIR LASH: What's a FEP list?

8 DR. ANDERSON: Thank you.

9 Feature, Event or Process. Anything that  
10 happens at the repository site. What this  
11 does is give the management of the program an  
12 idea of how big the scope of the work is that  
13 will have to be addressed.

14 This FEP list -- Feature, Event or  
15 Process -- then, is addressed individually,  
16 and those that are found to be important are  
17 screened in -- oh, thank you -- are screened  
18 in, and as they're screened in, then the  
19 physics codes are developed to in effect allow  
20 you to do the calculations.

21 Those that are screened out,  
22 because either from regulation, from low

1 probability or low consequence, are put into  
2 the library and left.

3 So the only ones that are  
4 important are the ones that are left in.  
5 Physics codes are developed from each one of  
6 the FEPs, and then that code, whatever it may  
7 be, a sensitivity and uncertainty analysis run  
8 on that.

9 What that does is identify the  
10 most sensitive parameter or parameters, and  
11 allow you then to focus back to generating the  
12 raw data on only those parameters which carry  
13 the most uncertainty. For example, a code  
14 might have 20 parameters that are important,  
15 or 20 parameters that are in the code.

16 But when you do this uncertainty  
17 analysis, you find that all of the uncertainty  
18 lives in maybe five of those parameters. So  
19 in essence, rather than doing research on 20  
20 parameters, you only have to do research on  
21 five of them.

22 Then when you do each individual

1 subcode for each FEP, then you start combining  
2 the codes, doing a similar sensitivity  
3 uncertainty analysis on that, and what you  
4 find is that, indeed, there are very few  
5 parameters that are found to be -- to carry  
6 most of the uncertainty. So you decrease the  
7 amount of research needed again.

8 What you also find, in many cases,  
9 is some of the FEP subroutines are  
10 unimportant, and those could be -- no more  
11 research is needed to be done on those as  
12 well. So what you have done here is decrease  
13 the amount of research that you need to get  
14 for raw data, and you have also decreased the  
15 amount of computer power you need to run those  
16 analyses.

17 Now how do you be involved with  
18 the individual scientists, because the  
19 scientist almost invariably is going to try to  
20 pre-op the situation.

21 What you do at the beginning  
22 development of the code is that you involve



1 the scientist, the lead scientist, in that  
2 activity by identifying all of the parameters  
3 and all of the equations that are needed for  
4 that subcode, and then do the uncertainty  
5 analysis.

6 He sees indeed that there are a  
7 number of datasets that are important, but  
8 most of them are not, and there's no way that  
9 he can argue then that his data is the most  
10 important data, if it's already gone through  
11 the uncertainty analysis.

12 Likewise, where the subroutines,  
13 when you find a subroutine that doesn't carry  
14 very much of the uncertainty, you streamline  
15 the process and finally you end up with the  
16 analysis that goes into the final regulation,  
17 as well as guidance back to the management on  
18 the individual FEPs.

19 What happens if you have increased  
20 complexity, say, of the geologic formation or  
21 of the waste forms? The uncertainty  
22 sensitivity analysis, the importance of that

1       increases. The more complex, the more you  
2       need this uncertainty analysis.

3               The complexity of the geologic  
4       formation and the complexity of the waste  
5       form, the more complex, the less transparent  
6       it is and the less defensible it is.

7               Now, one very important step  
8       across all of this is that you only make  
9       abstractions for those parameters and those  
10      subroutines that do not carry much of the  
11      uncertainty. If it carries a high amount of  
12      uncertainty, don't do abstractions --  
13      abstractions meaning calculations, excuse me,  
14      calculations off to the side, where you put  
15      the data into a lookup table and make that  
16      analysis.

17              Okay. Could I have the next  
18      slide? How did we apply this to WIPP? Next  
19      slide. Okay. Do I need to control it? All  
20      right. Okay. We've got something in the  
21      middle of it. What we did on WIPP, for  
22      example, with a SECOFL, we did the --

1 developed the subroutine and do the  
2 sensitivity analysis.

3 We found that there were very few  
4 of the parameters in the SECOFL that were  
5 important. Likewise with the SECOFL  
6 transport, and I'm sorry, I don't know how to  
7 get that out of the way.

8 But overall, what we ended up  
9 doing with WIPP is the area in blue is the  
10 models, the subroutines that did all the  
11 calculations to produce the CCDF, to produce  
12 the show of compliance.

13 SANTOS, which was the -- a very  
14 complex code that showed the closing of the  
15 repository from where the waste was put in  
16 until it had collapsed on the waste form, we  
17 found that there was almost no, no uncertainty  
18 in that subroutine.

19 So it sat outside of the box of  
20 the calculations, and only was called upon as  
21 a data set when it was drastically needed.

22 Next slide. Oh, I got it. Okay.

1 Here we go. I went through my old history and  
2 pulled out a presentation that I gave to the  
3 National Academy of Science WIPP panel about  
4 at the end of the WIPP program, and what this  
5 was is how the PA process matured over the  
6 time that I was involved.

7 Pre-1989, we did not do any  
8 probabilistic analysis. In 1989, we had -- we  
9 were sampling on 12 parameters. In 1990, we  
10 were sampling on 29, and I'm not going to go  
11 through the rest of this because of the time.

12 Next slide. In 1991, we were 45.  
13 1992, we were 55. In the end, we were 56  
14 parameters that we were sampling on at that  
15 point in time. This in effect was the amount  
16 that was sampled over that time, where there  
17 was almost 5,000 parameters in the total of  
18 the program.

19 So we had cut down the program  
20 from a huge number down to a sampling of like  
21 56 at this point in time. As far as how do  
22 you use performance assessment and risk

1 assessment for site evaluation, all else being  
2 equal, choose the simple, most predictable  
3 uniform geology that you can find. Thank you.  
4

5 CHAIR HAGEL: Dr. Anderson, thank  
6 you very much. Dr. Lehman.

7 DR. LEHMAN: Good morning, and I'd  
8 like to thank the chairman and the Commission  
9 for inviting me here to speak about some of  
10 the issues with Yucca Mountain that we  
11 experienced during my time as a state of  
12 Nevada contractor.

13 Before we get started, I'd like to  
14 say that the views that I'm expressing today  
15 are not those of the state of Nevada. They  
16 are my personal views, and nor are they  
17 representative of any of my past or current  
18 employers.

19 Today, I was going to speak about  
20 the legislation and the funding that developed  
21 the state oversight regulatory environment,  
22 and some experiences while I was at the NRC at

1 Hanford, but because of the time constraints,  
2 I'm going to skip over this and go right into  
3 the state oversight of Yucca Mountain during  
4 the site characterization phases.

5 Then I'd like to end up with a new  
6 approach, which I think is very promising, for  
7 technical interaction that's being put forth  
8 by the DOE Environmental Management office,  
9 and their Office of Compliance.

10 Oops. I somehow got too far.  
11 Well, I think my slides are not in order here,  
12 but that's all right. What I was going to  
13 start out saying is that after the Waste  
14 Policy Act was developed, the states, tribes  
15 and local governments were given oversight and  
16 review authority.

17 In a way, this put quite a burden  
18 onto the DOE, because now they had to show and  
19 convince, basically, state regulators or state  
20 stakeholders, that this very highly technical  
21 -- these technical issues had to be  
22 communicated to a largely, to a lay audience,

1 and this was not an easy feat.

2 Early on in the site  
3 characterization process, the state technical  
4 experts started having disagreements with the  
5 Yucca Mountain project on technical  
6 interpretation of data.

7 They brought forth two issues to  
8 the DOE. One was on volcanism. This approach  
9 started developing with the University of  
10 Nevada at Las Vegas with Dr. Gene Smith. It  
11 turned out to be quite a lengthy argument over  
12 volcanism.

13 The second issue, which I'm going  
14 to talk about today, was put forth on the  
15 groundwater flow field. We had very  
16 different, differences of opinion on how that  
17 performed. Sorry about that.

18 The original groundwater flow  
19 field that was developed by the DOE and the  
20 USGS was one of matrix flow. It had flow  
21 moving from the west part of the mountain  
22 block to the east part of the mountain block,

1 discharging into the Fortymile Wash.

2 The state conceptualization was  
3 quite a bit different. We've envisioned it to  
4 be a structurally controlled flow field, where  
5 water was basically moving down faults and  
6 fractures. We used temperature data to help  
7 us determine that that movement was along the  
8 faults.

9 I will put this up here, and I  
10 will try to use this pointer, and see if I'm  
11 successful in doing this. What this is, I  
12 know it's hard to see, but it's a topographic  
13 map of Yucca Mountain area, and superimposed  
14 over that, this very fine line here, if you  
15 can see, is what we used to call "the  
16 porkchop," or the area where the repository  
17 was to be located on the mountain block.

18 Over that, we have major fault  
19 zones, which are shown here in the dark lines,  
20 and on top of that, what we call the  
21 potentiometric surface, which is the  
22 elevation, basically, of the water table under



1 the site. As I was saying, the DOE models  
2 early on were taking flow, moving across the  
3 block from east to west and discharging here.

4 The state had a different  
5 interpretation altogether. It started out,  
6 our first indication was some geochemistry  
7 data that was done at the water table surface  
8 by a researcher at University of Nevada-Las  
9 Vegas -- at Reno, sorry -- Nancy Matuska.

10 She determined that the chemistry  
11 of the water on the east side of the block was  
12 quite different than the chemistry on the west  
13 side of the block, and also different from  
14 that in the center of the block, which  
15 indicated that this was not a uniform flow  
16 field that went across the block.

17 Our second indication, the state  
18 did some research on water table oscillations,  
19 which resulted from earthquakes, and found  
20 that this separate flow field was supported by  
21 that data, because we had different  
22 frequencies on this side of the block, yet had

1 another frequency on that side of the block,  
2 and yet a third frequency on the center of the  
3 block.

4 So again, that did not support an  
5 uniform flow field across the site. We also  
6 then looked at temperature data, and this dark  
7 arrow along here is what we determined was the  
8 flow path based on chemistry, because it was  
9 colder water coming down, and it was actually  
10 a plume that followed exactly this outline of  
11 the Ghost Dance Fault.

12 So we urged the Yucca Mountain  
13 Project to use both temperature and the  
14 potentiometric surface data to calibrate  
15 against both of those and solve for both of  
16 those before they determined an actual flow  
17 path on which to base their dose calculations.

18 At first, they were very resistant  
19 to this idea and did not accept that  
20 proposition at first. It's my feeling that  
21 had they accepted that alternative conceptual  
22 model, that more relevant data could have been

1 gathered earlier in the program.

2 So site characterization phase  
3 began at Yucca Mountain without consideration  
4 of the structurally controlled fault system,  
5 and -- in their flow model. And, as I said,  
6 despite our comments and our comments on the  
7 site characterization plan, the state's ideas  
8 were largely ignored for a very long time.

9 Later developments, as John  
10 Greeves mentioned in the '95-'96 time period,  
11 when chlorine-36 was discovered in the  
12 fractures following the tunnel boring machine  
13 through the mountain, DOE could no longer  
14 ignore the prospect of fracture flow at the  
15 site.

16 The DOE and the USGS did set about  
17 trying to verify --

18 CHAIR LASH: I'm sorry, I have to  
19 interrupt you. I can't understand that  
20 statement, since I'm not a geologist and I  
21 don't know the significance of chlorine-36.

22 DR. LEHMAN: Okay, sorry. The

1       significance of the chlorine-36 -- it's  
2       created from exploding the bombs. It's a bomb  
3       tracer, basically, and as the tunnel machine  
4       moved through Yucca Mountain, Los Alamos  
5       researchers followed behind that machine and  
6       took samples of water that was dripping into  
7       the ceiling.

8                 That was water contained bomb  
9       pulse, chlorine-36, which indicated that it  
10      had reached the repository horizon in less  
11      than 50 years, which was not consistent with  
12      the models at the time that the project was  
13      using.

14                So that basically forced them to  
15      look at the fracture flow model. The DOE went  
16      back in and tried to verify this later. They  
17      did some remapping and they did tunnel  
18      sampling. However, because the tunnel  
19      ventilation system had been in effect for  
20      several years, all of that water that was  
21      coming in the fractures had evaporated.

22                The approach they took was a more

1 systematic regularly-spaced sampling along the  
2 tunnels walls, and that study did not show  
3 chlorine-36. My response to all of this was  
4 that they were both right, because if they  
5 were sampling the matrix they shouldn't have  
6 seen it, and when they were sampling the  
7 fractures they did.

8 In the end, the last few models  
9 that DOE created for the Yucca Mountain site,  
10 did have the faults and fracture zones  
11 included in those models.

12 While they were very much more  
13 complicated than the models that I did for the  
14 site, the flow paths that resulted were much  
15 more similar. In fact, they had a more  
16 southerly flow path as opposed to the easterly  
17 flow path that they started with.

18 So I believe that they were being  
19 very defensive of their early models, and that  
20 was actually costly to them, because they did  
21 eventually have to go in and try to  
22 characterize the site in terms of fractures,

1 and that led to a lot of uncertainty in the  
2 data set, that they went into licensing.

3 Now I just want to mention as a  
4 very positive aspect, the Department of Energy  
5 EM has had for years, trying to close their  
6 high-level waste tanks and develop disposal  
7 facilities, and under DOE orders that also  
8 requires a performance assessment.

9 So after years of doing these  
10 performance assessments in a vacuum, and then  
11 throwing them over the fence to the state  
12 regulators, we found that that didn't work,  
13 because, for example, at Hanford, on a sea  
14 area tank farm, we had about 1,000 page  
15 performance assessment which went over to the  
16 Department of Ecology.

17 We got back about 1,500 comments  
18 on why things were not right, and they didn't  
19 understand largely what we had done. So the  
20 Department decided, and the Office of  
21 Compliance decided a new approach was  
22 necessary.

1                   This approach, we call it the  
2                   scoping process, was largely due to the  
3                   efforts of Mr. Marty Letourneau, Bill Levitan,  
4                   Tom Crandall, Linda Suttora, which are  
5                   currently at DOE Office of Compliance.

6                   Much of the work is educational.  
7                   The way they start out is they offer -- they  
8                   develop a swim lane chart, what we call swim  
9                   lanes, and each swim lane belongs to each  
10                  regulator.

11                  For example, the Department of  
12                  Ecology would have one swim lane. The NRC  
13                  would be in another swim lane. Each swim lane  
14                  addresses only the decisions that need to be  
15                  made by that regulator. So the Department of  
16                  Ecology has no say in really what NRC's  
17                  decision are, and vice versa.

18                  What they did was they brought all  
19                  of the regulators that were involved in the  
20                  process together. They tried this at Savannah  
21                  River site first. So then they went over  
22                  exactly what was going to be in the

1 performance assessment.

2 Everyone got to ask the questions  
3 that they needed to make their decisions, and  
4 in the end, while it took about a year and a  
5 half to go through this scoping, when they  
6 actually wrote the performance assessment,  
7 everyone had the data they needed, the  
8 information they needed, and they were  
9 actually able to get through the whole process  
10 of review in record time.

11 So that really saved a lot of  
12 money and a lot of time for the Department.  
13 But more importantly, it resulted in a more  
14 informed state regulator and stakeholder  
15 community, and in the end they were very  
16 supportive of the closure projects.

17 So in conclusion, I would like to  
18 hold up the Office of Compliance model to  
19 follow for any future site investigations that  
20 the Department might undertake. Thank you.

21 CHAIR HAGEL: Dr. Lehman, thank  
22 you.



1 DR. LEHMAN: You're welcome.

2 CHAIR HAGEL: Dr. Andrews.

3 DR. ANDREWS: Yes. If it's okay,  
4 I'll stay here and if you can have my first  
5 couple of slides, if that's possible. But in  
6 the meantime, I'll say I'm Bob Andrews. I  
7 work for Intera right now. I'm probably all  
8 three of Lake's bullets.

9 I was an academic geologist, then  
10 went into consulting and contracting work. I  
11 was underground and doing surface-based  
12 testing at a number of sites, mostly in  
13 Europe, in Switzerland, and then worked for a  
14 utility doing regulatory work in support of  
15 Yucca Mountain.

16 For Yucca Mountain, I led the  
17 performance assessment activities, which Dr.  
18 Anderson talked about for WIPP, in the mid-  
19 90's into the 2004/2005 time frame and then  
20 transitioned that to Sandia, so they could  
21 complete the work.

22 If I could have -- just go through

1 to the third slide, because the second slide  
2 is just the questions that you posed to us.  
3 Trying to answer the first question on the  
4 drivers affecting the required scope of work,  
5 the first one up there clearly is the  
6 regulations.

7 Early on in the mid-80's, late  
8 80's, early 90's, the regulations were pretty  
9 unclear. Dr. Greeves has already talked  
10 about, the three subsystem performance metrics  
11 which are only metrics, they're only criteria.  
12 There weren't requirements per se, and not  
13 quite uninterpretable but almost  
14 uninterpretable from an implementation  
15 perspective.

16 I think NRC also realized that and  
17 Congress finally realized that in the early  
18 90's, and then went off with the National  
19 Academy of Sciences panel that led to finally  
20 the Yucca Mountain standards being developed  
21 in the late 90's.

22 But changing regulatory criteria

1 expectations were the major driver in  
2 affecting the science that was performed,  
3 because early on, the criteria were  
4 essentially to go out and do good science and  
5 investigate this site amongst many other sites  
6 initially, and then just this site.

7 But it was go do good scientists -  
8 - go do good science. So you had good  
9 scientists doing good science, and questioning  
10 each other on the science they were  
11 performing.

12 Most of that science was done by  
13 the national labs and the USGS for one good  
14 reason, and that is that -- because those same  
15 institutions had been investigating that same  
16 real estate since the mid-50's, early 50's,  
17 late 40's, for very obvious reasons, that 900  
18 underground nuclear tests were performed in  
19 that exact same real estate for this nation.

20 Those tests stopped in 1992. So  
21 even while this process was going on,  
22 underground nuclear testing was going on, and

1 the science associated with underground  
2 nuclear testing and the geology, hydrology,  
3 geochemistry and the residual contamination  
4 that's left from underground nuclear testing  
5 was still being investigated by those  
6 scientists, and they carried over that  
7 knowledge base to Yucca Mountain, just 20  
8 miles to the southwest.

9 The second issue that's been  
10 alluded to here is the -- that goes along  
11 with the regulatory requirements -- is this is  
12 nuclear waste, and nuclear waste and nuclear  
13 materials have very, very special quality  
14 assurance requirements.

15 Those quality assurance  
16 requirements and expectations, driven from  
17 what's called the quality assurance  
18 requirements document from a DOE perspective,  
19 which flows out of the regulations, are  
20 sometimes in conflict with the scientists and  
21 the science.

22 The scientists are generally not

1 used to working under a controlled nuclear  
2 culture, safety culture, at their labs, or the  
3 USGS for that matter.

4 So taking that culture of nuclear  
5 culture and nuclear safety culture and quality  
6 culture, and trying to embed it amongst the  
7 national labs and the USGS was a challenge,  
8 and led to a lot of rework in some cases,  
9 because they sometimes quite frankly didn't  
10 get it. So that led to a significant amount  
11 of the effort during that time period.

12 But it wasn't just regulatory.  
13 There were technical drivers as well. The  
14 design, as you might know, changed  
15 significantly throughout the process,  
16 including the last design. There was a design  
17 change -- the last before the final license  
18 application went in. That was a DOE decision  
19 to make it streamlined, simpler, safer from  
20 cradle to grave, if you will.

21 Perhaps a good decision, but  
22 affected by the science and affected the

1 analysis and it affected the cost and schedule  
2 associated with doing the work. But there  
3 were prior design changes to that, led by  
4 various decision-making processes within the  
5 Department.

6 Performance assessment, in fact,  
7 as Rip said, can be a major contributor.  
8 Understanding what's important, determining  
9 what's important, testing what's important,  
10 leaving aside what's less important and not  
11 focusing your dollars and effort on that, is  
12 a very useful tool and finally came to be used  
13 at Yucca Mountain towards the early 90's, mid-  
14 90's and on into the late 90's. But early on,  
15 it was not used as an evaluator criteria for  
16 Yucca Mountain.

17 The regulators and other  
18 stakeholders, including the state -- a very  
19 major stakeholder -- did affect the science  
20 that was undertaken at Yucca Mountain. A good  
21 example would be the regulator coming up with  
22 293 questions after the site evaluation, what

1 they called "key technical issues", that they  
2 felt needed to be evaluated.

3 Many of those questions were not  
4 particularly risk-informed. They were not  
5 particularly performance-based, but they were  
6 questions the regulator felt needed to be  
7 answered.

8 Many of those questions in fact  
9 were developed by DOE scientists in  
10 discussions with the regulator, saying  
11 "wouldn't it be good if we did X."

12 Well, of course. You know, if a  
13 DOE scientist says "wouldn't it be good if we  
14 did X," the regulator's not going to say "no,  
15 don't do X". So go do X and spend the money  
16 and time and resources to do X. Scientists  
17 can always find a little bit more that they  
18 could do and want to do, and that certainly  
19 happened in the Yucca Mountain project.

20 Technical reviews, there were a  
21 number of technical reviews, external  
22 technical reviews such as the Nuclear Waste

1 Technical Review Board. They certainly drove  
2 aspects of the science. They would say on  
3 innumerable occasions that they were not  
4 particularly risk-informed or performance-  
5 based, nor in fact, they would say, did they  
6 care about the regulations.

7 They cared about the science. So  
8 there was some science performed, not directly  
9 supporting the regulatory basis or the license  
10 application or the site evaluation, but  
11 performed because an external group, in this  
12 case the Nuclear Waste Technical Review Board,  
13 thought that would be a good scientific  
14 endeavor to go through.

15 And this was science. So it's not  
16 surprising that there would be unexpected  
17 results when you do science. One of those  
18 unexpected results, and I was going to use in  
19 fact the same example that Linda used, was the  
20 chlorine-36 example.

21 Discovered in the mid-90's, this  
22 bomb pulse indicating that the water got to



1 the repository horizon much faster than any  
2 scientist looking at Yucca Mountain had  
3 guessed or evaluated up to that time period,  
4 which was kind of a mind switch for the  
5 scientists.

6 About that same time, the USGS --  
7 there was a big rainfall year in about '94 or  
8 '95 -- and the USGS scientist charged with  
9 evaluating how water percolates through the  
10 mountain determined that maybe more water was  
11 percolating through the mountain than they  
12 thought up until that time.

13 Even though they'd been studying  
14 Nevada test site since the early 50's, and the  
15 amount of water that moves through underground  
16 nuclear test explosion areas since the early  
17 50's. So this was a mind shift that occurred,  
18 you know, in the early 90's, mid-90's, that  
19 affected a lot of ongoing work, affected a lot  
20 of the analyses models, the design, et cetera.

21 Just sticking on the chlorine-36  
22 issue, you might think, oh well, the Los

1 Alamos scientists proved, you know, that water  
2 go to the repository horizon in 50 years.

3 Well in fact not.

4 USGS disagreed; Lawrence Livermore  
5 National Lab disagreed; and in fact, after 15  
6 years of additional research, the answer is  
7 still unknown, whether Los Alamos' information  
8 is correct, verified, adequate or whether in  
9 fact another interpretation favored by other  
10 scientists, USGS and Livermore, is in fact  
11 more correct, which is there is no bomb pulse,  
12 chlorine-36, at repository horizons.

13 So after 15 years of study, the  
14 answer is still in the final document  
15 inconclusive about which one is correct. Of  
16 course, there are some management issues, in  
17 terms of what direction the project should go  
18 to minimize risk, to minimize public  
19 perception of risk, and those did affect the  
20 ongoing work.

21 Going on to your next question,  
22 the goal of any future site evaluations, I

1 think you first have to define what is that  
2 goal, and I wrote down what my definition of  
3 that goal would be: would be to characterize  
4 the relevant and significant natural and  
5 engineered features, events and processes that  
6 affect the ability of the diverse engineered  
7 and natural barriers, wherever the site is, to  
8 meet the performance objective of protecting  
9 human health in the environment.

10 All sites will have both  
11 engineered and natural features. They will  
12 all have different processes.

13 They will all have different  
14 events that could act on them to affect the  
15 performance, and the ability to characterize  
16 those in a meaningful way, and to reduce the  
17 uncertainty or evaluate the uncertainty in  
18 those features, events and processes is key.

19 I agree with several of the other  
20 speakers that the credibility of that process  
21 can be obtained by the objective review of  
22 both pre-licensing during the evaluation

1 phase, and licensing by these independent  
2 reviewers. Whether -- who they are paid for,  
3 that's somewhat immaterial. But they have to  
4 be independent from the ongoing work.

5           Going on to the design of the  
6 future site evaluation process, which I think  
7 was your second question, the first one I  
8 agreed wholeheartedly with -- I think Dr.  
9 Greeves said that we have to have right up  
10 front transparent and implementable regulatory  
11 objectives.

12           They have to be specified. We  
13 can't be having 15 years of guessing what are  
14 the metrics that we're trying to meet and  
15 we're trying to achieve. Of course, all  
16 stakeholders involved -- are involved in  
17 identifying those objectives.

18           The second one, having lived  
19 through QA issues for 15 to 20 years, is  
20 having a stable QA program. The QA  
21 requirements document went through 20  
22 iterations at Yucca Mountain. I think it's on

1 Version 21 right now.

2 That seems to be unacceptable and  
3 seems to imply that you can't get the  
4 requirements down so everybody understands  
5 them. If we can't get the requirements down,  
6 then how do we communicate those requirements  
7 to the scientists and engineers who are  
8 actually going to be performing the work to  
9 those requirements.

10 It also means having a stable  
11 staff that knows how to implement those  
12 requirements, and the ability to train and to  
13 identify appropriate roles and  
14 responsibilities for those staff, as they  
15 implement those requirements.

16 Having some design and initial  
17 site information is useful to generate an  
18 initial safety case, because a safety case and  
19 the initial performance assessments can help  
20 you drive and focus the program, as Rip  
21 mentioned.

22 I agree with Linda. It's good

1 being last, so you can agree with people and  
2 you don't have to say who you disagree with --  
3 that the involvement of stakeholders in the  
4 performance assessment is a very useful  
5 activity.

6 I think DOE has been doing that  
7 quite successfully over the last few years in  
8 South Carolina, because there is waste in  
9 South Carolina that's going to stay in South  
10 Carolina, and the performance assessments for  
11 those waste sites are being iteratively done  
12 with direct support from stakeholders.

13 I think they're taking that  
14 "lessons learned" if you will, and applying it  
15 now, as Linda said, up at Hanford, I think, in  
16 also a very successful way, where all people  
17 can get together and say okay, who do we agree  
18 we're trying to protect? What's our  
19 performance metric? What are our levels of  
20 protection that we're going after?

21 Finally, this is science in some  
22 ways, but science can be controlled. Science

1 can be controlled from a quality perspective,  
2 as I mentioned earlier with respect to quality  
3 assurance, and it can be controlled with  
4 respect to simply scheduled cost  
5 accountability performance.

6 That's very difficult to do with  
7 some of the scientists, as you can imagine,  
8 because they're not generally used to working  
9 under quality controls or schedule cost  
10 controls.

11 It's just something that you're  
12 going to have to keep struggling with, with  
13 respect to in particular the national labs and  
14 USGS, if those are the institutions that are  
15 going to continue in that vein.

16 CHAIR LASH: I suspect our  
17 questions will come back to this last point.  
18 I know many of us having questions about  
19 reducing the costs. Are you basically --

20 DR. ANDREWS: I am done. Yes,  
21 thank you.

22 CHAIR LASH: Good. Thank you very

1 much, and thank you to all six of you. That  
2 was extremely informative. We appreciate it  
3 very much. I know that my colleagues are full  
4 of questions. Mark, do you have a question  
5 you want to --

6 MEMBER AYERS: Not yet. I need to  
7 go through my notes.

8 CHAIR LASH: Okay. Per?

9 MEMBER PETERSON: Yes. I do have  
10 questions. So I'd like to start out -- one of  
11 the things that I found striking was a general  
12 consensus, first of all, of the importance of  
13 having some continuity and stability of  
14 management, to make this type of program  
15 successful, or this type of activity  
16 successful.

17 The other major element was the  
18 discussion, and I think fairly broad consensus  
19 about the importance of the standards that  
20 would be applied. So I'd like to focus a bit  
21 on standards and then how they're used.

22 My experience comes from reactor



1 development, and there's been a very large  
2 evolution on how we regulate the licensing of  
3 reactors, and in fact large improvements, I  
4 think, over time.

5 One of the things that strikes me  
6 is, you know, looking at repository standards,  
7 this tendency for the older ones to be  
8 prescriptive and deterministic. Even the  
9 statute does that.

10 I mean looking here at the Nuclear  
11 Waste Policy Act, it actually specifies that  
12 "The maximum size permitted for borings or  
13 excavations during site characterization shall  
14 not exceed a diameter of six inches." You  
15 know, having the statute be that prescriptive  
16 clearly is problematic.

17 What I'd like to do is to have  
18 members of the panel comment about what the  
19 most important characteristics of a good  
20 standard would be, and then also to provide  
21 recommendations on how one might get a new  
22 standard, and in particular what entity might

1 be best at doing that.

2           Would it be another National  
3 Academy study focused on something that would  
4 be more site-independent, EPA, NRC -- how to  
5 tackle that problem, since clearly the  
6 standards question is very important, and  
7 who'd ever like to start off, I'd just like to  
8 hear about that.

9           MR. GREEVES: Thank you for, well  
10 raising a number of questions, and one of  
11 which was the standard. This prescriptiveness  
12 issue is a problem, when you put things like  
13 six inches and anybody that's familiar with  
14 Part 60, which actually is a requirement; it's  
15 not guidance, it's not --

16           You have to do it. You pick up 10  
17 C.F.R. Part 60, you have to do those three  
18 subsystem performance objectives. Each in its  
19 own right created a cottage industry of  
20 analysts that chased each of the -- and I was  
21 part of that. I've learned a lot since then.  
22 I'm wiser. I've looked at what's happening

1 internationally, and so I think there's a way  
2 to get there.

3           Having the National Academy do  
4 another study? I don't think so. I think  
5 there's enough wisdom within the current  
6 regulatory bodies, if they get legislation  
7 that sets up expectations at a high level, and  
8 they're told do it right, be safe and  
9 basically follow the ICRP recommendations: .3  
10 millisieverts. That's the dose to the public.

11           You have to -- and that's for  
12 normal operations. You can do that.  
13 Internationally, that standard is out there.  
14 The IAEA puts it in their documents, and you  
15 also have to account for an off-normal  
16 performance, and some other standard about  
17 background and some levels near background.

18           But more prescriptive than that,  
19 and you set up the dynamic that I was part of,  
20 that takes 15 years to implement, only to get  
21 to where we are now.

22           So I think there's enough wisdom

1 out there already, with the good and bad  
2 experiences we've had in this country and  
3 internationally, to write such a standard. I  
4 think the regulatory agencies could do that  
5 without further studies.

6 CHAIR LASH: Just could you back  
7 up from standards to site selection criteria?

8 MR. GREEVES: Site selection  
9 criteria. I don't profess to be an expert on  
10 that. What I would -- site selection, and I'm  
11 speaking for myself. I've done this, I've  
12 done some things wrong and I've seen some  
13 things done right.

14 I think that the sites, you know,  
15 the best site is the enemy of one that's good  
16 enough. So don't, you know, set people off to  
17 find "what is the best site." I think a  
18 process that first to have a standard, an  
19 implementable standard; then look for multiple  
20 sites and, in parallel, use this adaptive  
21 stage management process to --

22 It truly is as much a societal

1 process as it is a technical process, very  
2 unlike reactors. So you have to go down both  
3 those roads and if you can find a site that  
4 has societal acceptance and meets a reasonable  
5 standard, that's the goal.

6 My experience is telling me you  
7 probably have to carry at least two sites  
8 along for a while. It's expensive; your  
9 question talked about the conflicts. One of  
10 those conflicts is, you know, how much can I  
11 carry? I think experience is carry at least  
12 two sites, maybe different geologic media  
13 along, and as I said in my presentation, make  
14 it a demonstration.

15 You know, this business of setting  
16 70,000 metric tons for Yucca Mountain, that's  
17 overly-prescriptive, and I think the WIPP  
18 experience showed that using a demonstration  
19 builds confidence and allows us to show that  
20 the standard is met, perfect those tools, and  
21 I don't really want to comment on site  
22 selection criteria because they become

1 actually a trap.

2           You write too many of those down -  
3 - and I think there are good sites out there,  
4 and maybe somebody else at the table's more  
5 expert at site selection criteria.

6           CHAIR LASH: Mr. Barrett looks  
7 like he's on the edge of his chair.

8           MR. BARRETT: Well no. I agree, I  
9 think, with what John just basically said  
10 here. I mean I think site selection is very  
11 different than the site standard, because to  
12 me it goes like this: any site has to be safe  
13 and meet the requirements for safety and  
14 environmental protection over a period of time  
15 that's appropriate.

16           To select the site -- that's what  
17 is a science safety line that must be met no  
18 matter what, where you are. Then there's the  
19 social side of it, the institutional side. It  
20 has to be a site that can work socially as  
21 well, and there are different tracks.

22           So you don't want to preclude

1 sites, you know, due to an overly-prescriptive  
2 site selection point of view. I think a flaw  
3 of the '82 Act was science was going to tell  
4 us the best site. That's not going to happen.  
5 There is no such thing.

6 So it's a safe site that is  
7 socially acceptable is the goal, and you're  
8 going to have the criteria, as John said, what  
9 is the criteria for a safe site, because you  
10 have to meet both. So safety is necessary but  
11 not sufficient, you know, as you do it.

12 I think this is a risk -- it needs  
13 to be risk-informed. I fully support the  
14 performance assessment, but this is going to  
15 be a risk-informed political decision. That  
16 was said at one of your other meetings. I  
17 think that's absolutely, absolutely true.

18 One of the things on Per's  
19 question is who's going to regulate it? It is  
20 a very critical up front policy question, and  
21 there is a very different culture between EPA  
22 regulations and NRC regulations. They evolved

1 from different places, they act very  
2 differently.

3 What happened in the case of  
4 Yucca, we had the worst of both. We had the  
5 EPA, in my view, will set a more policy-  
6 related standard, being sort of the way they  
7 are, but their implementation of it is not as  
8 rigorous and engineering-focused like the NRC  
9 does.

10 The NRC evolved, as Per said, out  
11 of reactor licensing. Very engineered, pumps  
12 and valves, and probabilistic, that kind of  
13 thing. EPA is a little more policy world  
14 about we're going to protect the ground water  
15 or not, and this kind of thing. But their  
16 implementation and in case of WIPP was not the  
17 rigidity of the NRC quality assurance that a  
18 reactor core design ends up with.

19 So we had the EPA setting this  
20 sort of standard that was overly-aggressive,  
21 and the NRC implementing that with an  
22 adjudicatory process that was almost proof



1 beyond a reasonable doubt, okay, which is a  
2 very, very strict way to do it, and it was the  
3 worst of all.

4 If the NRC was setting the  
5 standard and EPA was implementing it, we would  
6 have had this done, okay, at half the price  
7 and half the time. That would be my view. So  
8 you need, as the nation goes forward, if we're  
9 going to look for a new site, you need to kind  
10 of decide that up front, who's going to do it,  
11 and in my view, the way we have it -- give it  
12 all the NRC or give it all to EPA, okay.

13 I think George brought home WIPP  
14 very well, but he had one set to do it under  
15 and it was the WIPP, was the EPA approach.

16 CHAIR LASH: Mr. Dials.

17 MR. DIALS: Yes, I believe it's  
18 critically important that we begin with the  
19 end in mind, and that's an over-used phrase.  
20 It's a very simple supposition we began with,  
21 at the genesis of the waste disposal programs.

22 As I said in my presentation, it's

1 in my written comments, at their beginning,  
2 they were combined. It's very interesting.  
3 The radionuclides don't seem to know which  
4 program they're in, and they react in a very  
5 predictable scientific manner, in terms of  
6 half-lives and migrations through geological  
7 structures and ground water and so forth.

8 A tremendous scientific work's  
9 been done. But in the site selection  
10 evaluation, we should begin with that simple  
11 evaluation in mind. The goal is to remove the  
12 hazardous material from the biosphere, so that  
13 it poses no safety or health threat to the  
14 public or the environment, now and for the  
15 predictable future.

16 The problem comes when we try to  
17 prescribe the make-up of the site and the type  
18 of geological structure, and the type of  
19 engineering design barriers, both active and  
20 passive barriers that need to be implemented,  
21 and we got caught up in that, both at WIPP and  
22 Yucca Mountain.

1                   Fortunately at WIPP, we had a  
2                   demonstration project going on, so some of the  
3                   prescribed techniques early on really didn't  
4                   prevail.

5                   It found out they, one, were not  
6                   necessary, or they were not productive. With  
7                   Yucca Mountain, it seemed to be much more  
8                   prescriptive, that it needed to be largely  
9                   because the selection of the site was  
10                  prescriptive.

11                  We mandated the site. We didn't  
12                  really go through an evaluation and selected  
13                  in a site selection process. That was a great  
14                  mistake, because fundamentally we want to come  
15                  down to one, and the genre of this problem is,  
16                  and I believe he coined the phrase that I  
17                  heard in 1971 when I was studying with Dr.  
18                  Rose at MIT, and he was very interested in the  
19                  nuclear waste disposal problem, but also in  
20                  other problems.

21                  He coined the phrase called  
22                  "sociotechnological problems." In fact, I

1       took an elective course that he taught called  
2       "Sociotechnological Problems and Solutions,"  
3       which was quite interesting because we  
4       formulated the problem and then we tried to  
5       creatively, over a year's time, come up with  
6       approaches to them.

7                 Nuclear waste was one of those.  
8       This genre of problem is not conducive to  
9       merely prescriptive, scientific or technical  
10      solutions. It embodies social, political,  
11      ethical, moral, public evaluations that are  
12      complex in nature, but essential to allow an  
13      ultimate solution.

14                We have to -- one of the lessons  
15      learned, I think, in the comparative reviews  
16      of WIPP and Yucca Mountain, that we were much  
17      more successful, and I do think, John, we used  
18      the adaptive method, the decision-making  
19      process at WIPP and we didn't do that Yucca  
20      Mountain.

21                If you travel around Europe, you  
22      will find in countries where they're doing

1 that have been most successful. Those where  
2 they didn't do that have not had successful  
3 programs. So I think there are lessons  
4 learned that certainly would be beneficial as  
5 we go forward to address the disposal issue.

6 CHAIR LASH: Thank you. Did you  
7 have additional questions, Per?

8 MEMBER PETERSON: Yes. To follow-  
9 up in just a little bit more detail on this  
10 question of standards, I think that we're very  
11 much interested in the time line over which  
12 you could move through a process, and so Lake,  
13 you had mentioned that you thought that  
14 regulatory criteria might be established  
15 within a five year time period.

16 Is that a conservative estimate or  
17 might it be longer? What's the frame, what's  
18 the time frame in which one should have  
19 sufficient confidence you know what the  
20 standard is, recognizing that you may have  
21 some adjudication and other things, so that  
22 you could make reasonable decisions to move

1       towards site characterization and selection?

2                   MR. BARRETT: I used the five  
3       years because my realistic estimate, from when  
4       it says "go, you know, you people are to do a  
5       standard," to when a standard is issued that  
6       can be used by the implementing organization,  
7       whomever that may be.

8                   I assume it would probably be an  
9       EPA standard. EPA does take years to go  
10      through it. They have a process. They first  
11      have to evaluate it and do their work. They  
12      put a proposal out, they get comments, they  
13      have to address it, and it is a multi-year  
14      process right there.

15                  Then if you have NRC implementing  
16      it like we had before, they go through almost  
17      the parallel, parallel but a little bit of  
18      series. They overlap a bit.

19                  But nonetheless, if you look at  
20      history on these standards, it's been five  
21      years from start to finish or longer if you  
22      have litigation that goes with it and remands,

1 and if not every I is dotted and T is crossed,  
2 back it goes to square one.

3 So I think five years, if you look  
4 at the history -- and your staff can give you  
5 sort of a history -- I bet it's always been  
6 five years or more.

7 CHAIR LASH: Thank you. Mark, did  
8 you have a question?

9 MEMBER AYERS: Yes sir, thank you.  
10 Mr. Dials, you made the statement that the  
11 framework -- we need a framework that the  
12 public can understand and participate in, and  
13 that's been a topic of conversation all along.

14 You know, I really -- every time I  
15 hear that, I become more perplexed, because  
16 I'm inclined to think that the public or the  
17 social aspect, they cannot understand the  
18 science aspect of the process we go through in  
19 order to come up with the site selection.

20 Doesn't it really boil down to  
21 trust and confidence, because the public is  
22 never going to understand the technical aspect

1 of all this. I mean I've been sitting through  
2 these meetings, and I'm trying hard, and I'm  
3 a long ways from it.

4 MR. DIALS: Well, I appreciate  
5 that, Mark, and I agree with you in this  
6 context. The public will never in general  
7 understand the scientific details of, for  
8 example, what Rip Anderson was talking  
9 through, the system prioritization method we  
10 went through, that I had the opportunity to  
11 mandate and oversee, to decide which of all  
12 those questions the scientists want to ask  
13 really had some impact on the performance and  
14 the safety performance of the WIPP site.

15 Scientists are truth-seekers, and  
16 they understand the details and they want all  
17 the nitty-gritty details. You could explain  
18 that to the public until you're blue in the  
19 face and they would come away, as we might be,  
20 perplexed with what he really said.

21 This is no offense to him, because  
22 we've had this discussion over years, saying



1 why are we doing this and what does it mean.  
2 The public does, however, understand these  
3 relative risk assessment things. They do  
4 understand, for example, if you said a  
5 radiation exposure requirement, you say well,  
6 this is ten times lower than the radiation you  
7 got when you got your chest X-ray last week.  
8 They do understand that.

9 MEMBER PETERSON: Right.

10 MR. DIALS: And you've got to put  
11 it into comparative terms they appreciate.  
12 For example, the WIPP site and at Yucca  
13 Mountain we started doing this, is how many  
14 people, where's the material now, and if  
15 there's a risk of exposure or health benefits  
16 or health effects of safety risk, we think  
17 it's much greater with where the material is  
18 now, sitting on the surface in whatever  
19 storage configuration it is, or in pools of  
20 nuclear reactors or in barrels at the nuclear  
21 weapons facilities where the transuranic waste  
22 was.

1                   So we crafted this descriptive  
2 methodology, comparative methodology to say  
3 well, 50 mile radius circles around all those  
4 sites, you have so many millions of people.  
5 Now do you want to leave it there, or do you  
6 want us to move it someplace where it's in a  
7 safer configuration, and there are fewer  
8 people potentially exposed?

9                   They do understand that. We used  
10 that very effectively, for example, with the -  
11 - and I can remember giving the presentations  
12 to the Native American groups, the Pueblos  
13 around Los Alamos, who at first were opposing  
14 the transportation of the transuranic wastes  
15 on Trupaks through their reservations.

16                   And they have the right and the  
17 ability. They could almost, they could,  
18 certainly through protest, stop you or slow  
19 you down.

20                   We finally got them to understand  
21 that where the material was sitting up on the  
22 mesa at Los Alamos, just to give you a

1 specific example, there was much more  
2 potential risk to them than what we were  
3 trying to do, driving it through their pueblo  
4 to take it down and bury it half a mile  
5 underground 250 miles away.

6 They finally, they did get that,  
7 and when they got it it was liberating for us,  
8 because they quit opposing the transportation  
9 through their pueblo.

10 So you have to get it to terms  
11 where the public can understand these complex  
12 issues. They would never believe, for  
13 example, and that's why I said it's  
14 incredible, that you're going to guarantee the  
15 isolation of anything for a million years.

16 I don't believe it; do you? So  
17 why have a standard that's ridiculous, that's  
18 not credible and nobody will believe. Have  
19 one that you can document, demonstrate and  
20 communicate with them about it, that ends up  
21 being credible and acceptable. Ultimately,  
22 that's what it requires to get through the

1       licensing process.

2                   MEMBER AYERS: Thank you. Also,  
3       Mr. Barrett you indicated or said the cost in  
4       time for another site could be reduced with  
5       the lessons learned from Yucca Mountain, and  
6       I guess that begs the question, and I'm not  
7       being smart when I say that, but haven't we  
8       learned enough lessons in 42 years to do this  
9       right now?

10                   MR. BARRETT: We know what the  
11       challenges are after 42 years, you know, how  
12       you develop a standard. In many ways, what  
13       you're wrestling with is not terribly  
14       different that what the IRG wrestled with in  
15       1978. If we have the answer, like who's going  
16       to do the standard. Is it a million years, is  
17       it 10,000 years, is it 1,000 years?

18                   If you have the answers to those,  
19       I believe a new organization that can start  
20       afresh, not have to carry DOE baggage, okay,  
21       and not have to carry 1987 political  
22       decisions, has a better opportunity to do this

1 in a much better, more cost-effective and  
2 timely way.

3 That's not an easy thing to do, in  
4 my view. I wish I could tell you oh yes, it  
5 was just one mistake I made back in 1992, and  
6 that's the answer and if we'd fix that, we're  
7 all set. If life was that simple, we wouldn't  
8 be here.

9 MEMBER AYERS: Okay. Then one  
10 last question. None of you mentioned any  
11 standards or requirements, et cetera, on  
12 occupational safety and health. Some of you  
13 mentioned changing standards, which by  
14 implication are public health, environmental  
15 and technical, for example, corrosion of  
16 containers.

17 Did occupational safety and health  
18 standards change at the same rate for workers  
19 doing the work of site exploration,  
20 development and for future workers during  
21 operations?

22 MR. BARRETT: I'll start with that

1 one. No. We had DOE and all our contractor  
2 teams had, you know, very stringent, you know,  
3 OSHA health and safety aspects through the  
4 entire program from beginning to this current  
5 day. The work, the lost time workers and all  
6 of that time were an exemplary performance.

7 So those didn't change. You would  
8 find there's always issues when you're doing  
9 anything. For example, when you're  
10 underground, you know, you have to be very,  
11 very careful and we were.

12 I mean if you looked at the  
13 English Chunnel, 30 workers were killed in  
14 building those. When we did the 7-1/2 miles  
15 at Yucca Mountain, we had a very good record.

16 Now was it perfect? No. We had  
17 issues of zeolite and workers would take their  
18 masks off sometimes, and so we spent millions  
19 and millions of dollars dealing with that, to  
20 make sure the workers were protected. But the  
21 standards, I don't believe, we really the  
22 issue.

1                   You'd find in such an open and  
2                   transparent program, where we showed all our  
3                   data to everybody, those who opposed the Yucca  
4                   Mountain would seize on it and make press  
5                   releases and TV ads, especially in front of  
6                   elections, about how the workers were being  
7                   harmed and this was DOE who killed us when we  
8                   did, caused cancer and weapons testing and  
9                   blah blah blah, all of those kind of things  
10                  would ripple.

11                  So that if you watched TV in Las  
12                  Vegas and watched what the politicians said,  
13                  you got a different perception that was not  
14                  the, what I believe was an exemplary workforce  
15                  safety program.

16                  MR. DIALS:    Could I add to that?  
17                  As having been both in the DOE and responsible  
18                  for a site, we implemented a rigorous  
19                  occupational safety program at WIPP.  In fact,  
20                  we had the first volunteer protection program,  
21                  Star Site,  in the Department of Energy.  Then  
22                  as the M&O contractor at Yucca Mountain, we

1 had a tremendous emphasis, as Lake was the  
2 acting director when I was out there running  
3 the program, tremendous emphasis on  
4 occupational safety and implemented the  
5 integrated safety management systems and had  
6 the OSHA folks come in and began the VPP  
7 programs.

8 So an inordinate focus on the  
9 occupational safety is embodied in all these  
10 programs, and I think one of the lessons to  
11 carry forward with that is to continue that  
12 sort of focus, because the M&O, the DOE, of  
13 course, are motivated to maintain good safety  
14 standards, and M&O contractors are motivated  
15 and rewarded for maintaining excellent safety  
16 standards.

17 So that part of the program is  
18 very robust and I think worthy of note from  
19 other industries, come to our sites to see how  
20 we execute the programs.

21 MEMBER AYERS: Thanks.

22 DR. LEHMAN: If I might just add



1 to that a little bit, I think this is getting  
2 at part of the problem, at least in terms of  
3 public perception. The standards are not  
4 consistent between like CERCLA sites, DOE  
5 sites. For example, the standard for worker  
6 dose is at Hanford is like 5 REM per year they  
7 can have.

8 Yet for Yucca Mountain, it was 25  
9 millirems. For CERCLA sites, it's 15  
10 millirems, and the ground water piece of the  
11 dose is down to four millirem. So there's a  
12 big disparity on what the public thinks is  
13 safe.

14 It's safe -- five REM is safe for  
15 a worker to be exposed to it, but yet we can't  
16 go over four millirems in the ground water  
17 standard for a high level waste repository or  
18 any other disposal facility that we might  
19 site, here or on DOE sites.

20 So I think that disparity needs to  
21 be explained. Lots of states, at least out at  
22 Hanford, the state says "Oh, you can't even be

1 within 70 percent of that four percent, four  
2 millirem standard, or else you have to take  
3 some action." I think these standards are  
4 very low and in the public opinion, they don't  
5 understand that such a small dose is really  
6 safe.

7 MEMBER AYERS: Well, it becomes  
8 very confusing, as you say, for not just the  
9 public, but for the three million construction  
10 workers that I represent, trying to determine,  
11 you know, "What is the safe dose for me?"

12 DR. LEHMAN: Exactly.

13 CHAIR LASH: Senator?

14 CHAIR HAGEL: Jonathan, thank you,  
15 and thank you all again for your  
16 contributions. Let me go back to Dr.  
17 Anderson. You had your hand up on one of  
18 Per's questions, I think, and we maybe glossed  
19 over you very quickly. Did you want to come  
20 back to that and make a point.

21 DR. ANDERSON: Yes, if I may  
22 please. It seems to me like we have a perfect

1 storm situation that occurred at the Yucca  
2 Mountain.

3 We have a regulator that is  
4 terribly prescriptive; we have a geologic  
5 formation that is terribly complex, although  
6 I think it's totally acceptable, and the  
7 combination of infinitely complex geology and  
8 totally prescriptive NRC made a situation that  
9 was almost impossible to be successful in.

10 On the flip side of that, you had  
11 WIPP, with not such a prescriptive regulation,  
12 EPA, and you had a geologic formation that was  
13 totally uniform and predictable, which meant  
14 that the demonstration of success could be  
15 accomplished at a very much lower cost in time  
16 and schedule.

17 If we look at that, saying that  
18 NRC will probably be the regulator in the  
19 future, then the drive should be on site  
20 qualifications to the most simple geological  
21 formation that you can, all else being equal.  
22 What I mean by that is all the politics and

1 the acceptance of the people near the site  
2 being equal, you need to look for a simple  
3 geology.

4 CHAIR LASH: Senator, questions.

5 CHAIR HAGEL: Thank you. Let me  
6 use, Mr. Greeves, your fourth slide, which I  
7 thought was a really excellent six bullet  
8 point summary of answering the question on the  
9 future site evaluation process and so on.

10 Using that as kind of the model or  
11 the base, I would ask each of you are there  
12 additional points you want to make here, as  
13 you have listened to the conversation and each  
14 other, and as we've kind of drilled down in  
15 certain areas, and maybe we have not focused  
16 enough on some areas that you think are  
17 important that we've not touched upon?

18 So I would use your conclusive  
19 comments here on that slide of Mr. Greeves.  
20 If you'd like to define any more of those six  
21 points in any more detail, and we recognize  
22 that limiting each of you to ten minutes is

1       difficult. But in the interest of hearing  
2       from all of you, we had to do that.

3               But here's an opportunity to come  
4       back to some areas, if you think we've not  
5       spent enough time in an area.

6               MR. FRAZIER: We're bringing the  
7       slide up.

8               CHAIR HAGEL: Okay, and we'll  
9       start with -- thank you. And we'll start with  
10      your Slide No. 4, Mr. Greeves, on your six  
11      points. Thank you.

12              MR. GREEVES: Okay. While we're  
13      bringing it up, I only had ten minutes and  
14      I've tried and am pleased that you picked on  
15      it.

16              These were kind of the ones that I  
17      had some views on, and the only one that  
18      hasn't actually been discussed much here was  
19      the -- in detail was the management and budget  
20      controls. So I would just add, I've been to  
21      a number of your meetings, watched them on the  
22      presentations.

1                   And you know, this concept of  
2           having an administration department agency run  
3           a program like this and be torqued every four  
4           years is just, in my view, unacceptable.  Some  
5           sort of a fed corp, that's a term people have  
6           used, I think would stand a better chance.

7                   You've been to Sweden.  The way  
8           it's developed there is continuity.  I spent  
9           ten years at the IAEA and I saw the same  
10          people all the time, both the regulator -- one  
11          regulator, not two, and saw the developer, and  
12          I, you know, admired that type of an approach.

13                   So that's the one thing of the  
14          list of six items that hasn't received much  
15          attention here today.  I spoke to all the six  
16          and I'll just open the microphone to the rest  
17          --

18                   CHAIR LASH:  Since you brought put  
19          that question and responded before you got to  
20          your slide, so we did see that in Sweden and  
21          in Finland, especially in Sweden.  But in  
22          fact, it was not a fed corp; it's a private

1 corp.

2 MR. GREEVES: Terminology, choose  
3 what you want. But consistency in that  
4 process. Do not subject to either budget  
5 process, which we're witnessing now, or  
6 administrative change. It's you know, some of  
7 the speakers talked about combining the EPA  
8 approach with the NRC approach. We were set  
9 up for failure.

10 I think there's a way to come up  
11 with a standard in less than five years. It's  
12 out there. You don't have to do another  
13 study. It's just going to take assigning that  
14 responsibility to one entity, not two, and  
15 separately creating another entity to pursue  
16 the program, like you saw in Sweden.

17 I think it's essential -- I agree  
18 with those six points. But you cannot be  
19 successful without the public acceptance part  
20 of this. You have to have the sociopolitical  
21 aspect in here.

22 In Sweden and Finland and others,

1       they have very active public involvement  
2       processes, and actually either through a  
3       referendum process or a volunteer process, and  
4       that's what's going to be required.

5                To add to what Rip Anderson said  
6       about the perfect storm, the difference in the  
7       perfect storm at Yucca Mountain included also  
8       this very adverse political and not local  
9       regional opposition, but a sort of a  
10      manufactured distant opposition that played  
11      into the political decision-making.

12               So that's the other thing I would  
13      add as the seventh element, Jonathan, to that  
14      list that John Greeves came up with.

15               CHAIR HAGEL:  Anyone else want to  
16      not only stay limited to Mr. Greeves' outline,  
17      but yes, Dr. Anderson.

18               DR. ANDERSON:  One point to be  
19      made, in the past, sub-seabed, WIPP and even  
20      Yucca Mountain, we were in the process of  
21      building the computational codes that were  
22      needed.  We now have most of those available,



1 with slight modifications.

2           So the needs of the next  
3 performance assessment for whichever  
4 repository is chosen will require a different  
5 direction, in that you won't have to build as  
6 many codes; you will have to collect the data.  
7 But the codes will be available for a quick  
8 sensitivity uncertainty analysis, which will  
9 then help focus the research very quickly.

10           MR. BARRETT: I would add that I  
11 fully agree with John Greeves' six points and  
12 what George added to that. I would add more  
13 the host relationship between the implementing  
14 organization and the host. I mean to me, that  
15 is the most critical thing, much more critical  
16 than the science and the technological part.

17           On the question of an organization  
18 of the SKB versus what we're talking here, I  
19 use the word "private-public," because there  
20 is -- if you talk to the public, if you say  
21 it's a private corporation, people think it's  
22 a profit motive here. It is not a profit

1 motive in SKB, even though it's owned by the  
2 utilities. They are to do this thing.

3 So this is a corporation, I would  
4 like to call it private. But there's no  
5 profit in this. It's doing basically public  
6 good. So I use the word "public-private," and  
7 it's just what the average Joe out there is  
8 going to have to understand, that I can trust  
9 these people.

10 As Mr. Ayers said, if we don't  
11 have trust and confidence in the implementer,  
12 this is not going to work. When you step on  
13 an airplane, if you don't trust that know what  
14 they're doing on an airplane, you won't step  
15 on the plane. We also basically have that,  
16 and it's something we accept in modern  
17 society. So that's how I would look at that.

18 CHAIR LASH: Just a comment.  
19 Having spent four days with the people who  
20 manage SKB, they seem to have reached the  
21 conclusion that they have absolutely two  
22 driving objectives. First of all, they have

1 to maintain community support, that without  
2 that they know they can't go forward, and  
3 second of all, they have to have good enough  
4 science in order to get their license approved  
5 by the regulator, who's completely separate  
6 from them.

7 They will exactly that science in  
8 exactly that way that enables them to achieve  
9 those two objectives, and they will do it  
10 totally transparently. It was quite striking  
11 that they learned that lesson by making  
12 mistakes, and they just practiced it again and  
13 again and again.

14 MR. BARRETT: If I could comment a  
15 little on that, I absolutely agree. I've  
16 known the SKB people for 20 years and what  
17 they -- their hard times and what they've  
18 learned.

19 We in DOE try to do exactly that,  
20 but the cards were really against us. I mean  
21 we had a situation where the state of Nevada,  
22 because they had a legitimate grief of 1987,

1 anything we did was going to be kind of wrong,  
2 almost by definition, okay.

3 Even if, I think Mr. Loux, who  
4 used to run that program, was questioned in  
5 the hearings. If the site was perfectly safe,  
6 would you then back off? The answer is "No,  
7 because this is unjust", and I can understand  
8 their views on that.

9 So we could never, in the case of  
10 DOE with Yucca Mountain, all through the 90's,  
11 we could never over -- we could never bridge  
12 that, that huge chasm, and it's led to what's  
13 happened, which is to me unfortunate and  
14 wrong, but it is what it is.

15 So I mean we tried to do some of  
16 that, but there was never an opportunity under  
17 the existing policy laws, and frankly real  
18 politics, to bridge that gaps. The Swedes  
19 have done that.

20 But again, we are the United  
21 States of America, you know. If we're just  
22 DOE and Nye County or the locals, you know,

1 community, I think this would have been done  
2 with a much different outcome, but it isn't.

3 CHAIR LASH: Good.

4 DR. ANDREWS: Yes. I was going to  
5 agree with John's slides, but I would kind of  
6 link bullets 1 and 4, that is, developing the  
7 site-specific standards and having multiple  
8 sites, because having a standard that's not  
9 site-specific, having worked through Yucca  
10 Mountain, is pretty difficult, because you  
11 have to answer the question, and I think all  
12 the stakeholders have to answer the question  
13 who are you trying to protect, what population  
14 are you trying to protect, what individuals  
15 are you trying to protect.

16 Where are you trying to protect  
17 them and what other resource, if any, are you  
18 trying to protect? Because the resources will  
19 be different from site to site. The people  
20 will be different from site to site, and  
21 understanding who and what and when you're  
22 trying to protect them will vary, you know,

1 from site to site.

2 You might want to protect that  
3 fisherman on the Columbia River if you chose  
4 a Hanford repository. That's probably not  
5 that relevant for Yucca Mountain, quite  
6 honestly, or any other, you know, arid site in  
7 this nation. So I think -- and going back to  
8 Lake's comment of he hopes you could get a  
9 rule in five years.

10 Well, he knows the difficulty of  
11 developing the rule that was developed, not  
12 just the legal aspects of it and the  
13 contentions that occurred after the fact, but  
14 just all of the interagency discussions,  
15 because of the three agencies, and all of the  
16 technical and scientific discussions.

17 It was not an easy process to get  
18 a site-specific rule for Yucca Mountain, nor  
19 would it be for any other site when you add in  
20 all of the interested parties, which there  
21 will be many, for any other multiple sites  
22 that are investigated.

1           I think it's fair to say that  
2 going back to the discussion that we had a  
3 little bit earlier, this is on a slightly  
4 different topic but it kind of relates to the  
5 six bullet that is associated with the  
6 management aspects, there's the technical  
7 aspects and the scientific aspects of this  
8 too.

9           The scientists that worked on  
10 Yucca Mountain and WIPP, many of them have, of  
11 course, left. Some of them are still  
12 involved, but many of them have left. By the  
13 time this process starts again, most of this  
14 table will be gone, and probably most of this  
15 room will be gone.

16           So those scientists have a little  
17 bit of a learning curve be retrained, to take  
18 their scientist hat off and become a nuclear  
19 safety person. That will take training of  
20 that next generation. You know, maybe it's my  
21 grandkids, I don't know. I'm a little more  
22 pessimistic than Lake, quite honestly.

1                   But that will take some more  
2                   training of those, that group, wherever they  
3                   are, whoever they are.

4                   CHAIR HAGEL: Mr. Dials, did you  
5                   have --

6                   MR. DIALS: The only point I  
7                   wanted to add, and Lake and I looked at the  
8                   list and said well, the budget stuff's in  
9                   there. But it's critical, to avoid the  
10                  perfect storm in the future, that you take the  
11                  funding for the program off the annual budget.

12                  But the money is there, you know.  
13                  It's in the trust fund, so to speak. Plus the  
14                  IOU is there, the money's not there. Senator,  
15                  you know that. But the money's been provided  
16                  by the utility, just like it is in Sweden, but  
17                  the management structure's not in place.

18                  It needs to be a not-for-profit  
19                  off budget that's funded, that has a  
20                  responsibility for carrying this forward and  
21                  will give it the best opportunity for success.

22                  CHAIR HAGEL: Did you have --



1                   MEMBER PETERSON: I'd like to  
2 follow on a bit on this question of who should  
3 develop and implement standards, because we  
4 have the success at WIPP. But a big  
5 difference is that at WIPP, DOE regulates the  
6 materials until they get to WIPP, and then I  
7 guess EPA.

8                   So I'm interested in where the  
9 interface occurs between who regulates the  
10 materials at the facilities that generate,  
11 versus who regulates and where does the  
12 transfer of responsibility occur when you get  
13 to the disposal facility?

14                   In the case of civil materials, of  
15 course, you've got NRC. It would seem to me  
16 that it's logical for NRC to regulate  
17 everything up to at least the surface  
18 facilities, because that's a very standard  
19 thing that they'd be competent at.

20                   So I guess the question is, is the  
21 -- when you get to the interface of what  
22 happens underground, is that a place where you

1       might transfer to EPA? And then is it, do you  
2       let NRC regulate the operational aspects of  
3       emplacement, but EPA is the long-term  
4       performance or does EPA do everything?

5                       Where is this interface or do you  
6       -- I'm hearing that you don't want to have two  
7       different agencies trying to co-regulate, you  
8       know, in terms of the way we've done it on  
9       Yucca Mountain. So should there just be a  
10      clean break at some point in this system?

11                      CHAIR HAGEL: Go ahead.

12                      MR. GREEVES: Well first, I think  
13      I'll just punctuate. We need to get the  
14      standards right before we lose this group.  
15      You're going to lose us, and somehow I think  
16      the country needs to get the standards right.

17                      The question of two agencies, in  
18      the commercial world, EPA sets the standard.  
19      NRC implements. So for Yucca Mountain, it was  
20      the NRC would be regulating the processing  
21      materials, as they do on the reactors and  
22      everything else, and the implementation.

1                   My understanding, which is not  
2 perfect of what happens at WIPP is the  
3 Department of Energy self-regulates those  
4 materials, and the materials that are at the  
5 various sites, they come to WIPP under an NRC-  
6 certified cask system. All NRC does is  
7 certify that cask.

8                   Then what happens at WIPP, and  
9 George correct me if I'm wrong, is the EPA  
10 goes through a certification process, and they  
11 periodically recertify every five years, and  
12 Rip and others do the calculations. But  
13 effectively it's controlled by the Department  
14 of Energy and their contractors in large part.  
15 So George, did I have that right?

16                   MR. DIALS: Yes. You have it  
17 right. It's a little more complex. DOE self-  
18 regulates the storage of the transuranic waste  
19 where it is now and mandates the kind of  
20 configuration and the kind of containers it  
21 goes in, the kind of drums you put it in or  
22 DOE self-regulated determined activities.

1                   But DOE has also volunteered to  
2                   fall under the EPA requirements for hazardous  
3                   waste. So then we follow the mandates of the  
4                   requirements for dealing with the hazardous  
5                   waste components of the mixed waste, and then  
6                   the waste are characterized, both just the  
7                   transuranic waste and then the mixed waste, in  
8                   a way that is consistent with the requirements  
9                   of the EPA as the regulator and as defined in  
10                  the compliance requirements.

11                  Then they document the  
12                  characterization. They do put it into  
13                  containers and put it into NRC certified  
14                  shipping containers and configurations. It  
15                  goes on the highway that is regulated by the  
16                  Department of Transportation in compliance  
17                  with NRC standards.

18                  It gets to the site. It is  
19                  evaluated at the site and says this complies  
20                  with the EPA requirements for disposal, and  
21                  then it's disposed and the site, the facility  
22                  has to comply and document compliance with the

1 EPA's standards, and it's recertified every  
2 five years. So that's how it works.

3 So there is more than one  
4 regulatory agency involved in the process, but  
5 there are agreements in place for both EPA and  
6 for the Department of Transportation  
7 requirements to be met by under DOE programs.

8 CHAIR LASH: Per has one more and  
9 then I'm going to ask a couple and then we'll  
10 wrap this up.

11 MEMBER PETERSON: Okay. Another  
12 important issue for regulating repositories or  
13 disposal facilities is whether or not you  
14 establish capacity limits, in particular say  
15 statutory limits.

16 Capacity limits play an important  
17 role, I guess, from the perspective of  
18 providing some assurance that there's not an  
19 open-ended obligation to take an infinite  
20 amount of waste into a facility, which I think  
21 is maybe politically and socially difficult to  
22 swallow.

1                   On the other hand, prescriptive  
2                   statutory-imposed capacity limits also have  
3                   bad issues associated with them too. So this  
4                   goes to the question of perhaps maybe the same  
5                   way to achieve this basic goal of making sure  
6                   that there's not an open-ended obligation to  
7                   take an infinite amount of waste might be to  
8                   go with the certification, recertification  
9                   process that requires that you recertify that  
10                  the facility remains safe and is acceptable  
11                  for continuing to accept and dispose of  
12                  materials, and try to avoid prescriptive  
13                  capacity limits.

14                  Does that make sense, and  
15                  basically how should we deal with this  
16                  question of capacity limits that are non-  
17                  technical limits on a site?

18                  MR. BARRETT: I can start with  
19                  that one. My view of that are two different  
20                  things. One is safety and one is social-  
21                  political, okay, an equity matter, okay. I  
22                  would say there ought to be a standard, and in

1 my view it ought to be .3 millisievert  
2 standard.

3 Dealing with EPA versus NRC, I  
4 would have just NRC do it and EPA can give  
5 them advice, and that will take care of the  
6 split, you know, in the shaft, who gets the  
7 difference. Regarding the capacity limit, I  
8 want to say it's the safety standard or the  
9 safety standard doesn't matter how much you  
10 put in there, okay.

11 Now in the agreement that the  
12 implementer would have with the host, it would  
13 say I have a contract with you, okay, and the  
14 contract says I'm going to accept this much  
15 waste and it's phased.

16 I want to start off with a little  
17 bit of waste. You prove to me you're a good  
18 partner with me in my community and we're all  
19 doing the right things, I will increase that  
20 as time goes, and this is a --

21 Just like you work for a Mercedes,  
22 doing a new auto plant in Mississippi or

1 something. You negotiate that between the  
2 entities, between the hosts, and let that grow  
3 as it needs to grow, as they would wish it to  
4 grow. It's not forced on anybody, okay, is  
5 you can make that kind of agreement.

6 Because it really is a social  
7 equity matter, is what is the host willing to  
8 do and what demonstration does it want, and  
9 what is the implementer really willing to do,  
10 and that's how I think you can deal with it,  
11 through a market-driven approach, with a  
12 basic, with a fundamental safety floor to it.

13 MR. GREEVES: Let me just add, to  
14 follow on what Lake said. This really is a  
15 social and a technical process, and as I  
16 stressed in my remarks, having a demonstration  
17 is a tool to help bring the public along.

18 I have a lot more confidence in  
19 the public, you know, that they can actually  
20 grasp. But just don't, you know, do it too  
21 quickly. You go with a demonstration facility  
22 and let them be involved in the capacity



1 question over time.

2 This notion of doing evaluations,  
3 it's standard practice internationally to  
4 repeat performance assessments at least within  
5 a five-year time frame. So they're updated.  
6 Smart people like Rip Anderson here, they will  
7 be doing those things, and that will help  
8 inform any capacity limits.

9 Don't write in a regulation or  
10 legislation what the capacity limits are.  
11 Allow that to evolve with a demonstration  
12 facility.

13 CHAIR LASH: So I have a question  
14 that's an immediate follow-up on that one. As  
15 we've heard different testimony, but in the  
16 full Commission and this subcommittee, it has  
17 certainly come across that there's universal  
18 respect for NRC's expertise, best in the  
19 world, and capacity to do these kinds of  
20 analyses.

21 At the same time I'm hearing from  
22 this panel and I've heard from others that in

1 terms of NRC's process and culture, it might  
2 have difficulty implementing a staged adaptive  
3 approach. I'd be very interested in your  
4 response, and assuming there is a new entity,  
5 and that NRC is regulating, how will you do  
6 that?

7 MR. GREEVES: I speak for myself.  
8 I worked there for 30 years, I retired. I can  
9 make observations but I certainly don't speak  
10 for the agency. I don't think it would be a  
11 problem for NRC, because the adaptive staged  
12 approach is holistic, and it requires an  
13 independent regulator, and that's all the NRC  
14 or the EPA would be.

15 The mistake is to have two of  
16 them. You need one of them, and the resource  
17 issue is a valid issue, and having spent a lot  
18 of time there, and I don't mean to be self-  
19 serving, but the NRC has set up a world class  
20 ability to do the kinds of calculations that  
21 Rip was talking about. They can do them  
22 themselves. They can review them.

1           A concern I have is they may lose  
2           that capacity with this lull in the process.  
3           Fortunately, the very same people that do the  
4           calculations on Yucca Mountain are actually  
5           working on many of other difficult questions  
6           like this, the one that Linda raised out at  
7           the WIPP facility, the very same model.

8           They're looking at the incidental  
9           waste issue, which by the way is one of your  
10          definitional problems. So the capacity is  
11          there. You're in danger of losing it.

12          The independent Southwest Research  
13          Institute that the NRC has as a captured lab,  
14          I have concerns about how can that survive and  
15          that had to be set up, and Lake remembers  
16          this, because NRC would get expertise and that  
17          expertise would go to the bigger paycheck.  
18          They would leave the NRC family and go work  
19          for the DOE. So that lab was set up to help  
20          NRC.

21                 CHAIR LASH: Any disagreement with  
22                 that?

1                   MR. BARRETT: Yes. I agree with  
2 all he said, and I would go and add a little  
3 bit. I believe the NRC can do it in a phased  
4 approach. It is unique though for a regulator  
5 in the federal world to do this, and you'd  
6 have to help clear some underbrush to empower  
7 them to do that.

8                   I believe they can do it and it's  
9 the right way to go. But for example NEPA  
10 rules, okay, where you segment. They could --  
11 somebody's going to oppose whatever's being  
12 done, and that's just a given, and they'll use  
13 NEPA law to do it. There's always a way to do  
14 it. You didn't dot the I and cross the T.

15                   So you'd have to basically free  
16 them from segmentation issues, because the  
17 phased, evolving approach is exactly the  
18 opposite of what NEPA law case generally is.  
19 So you'd need to empower the NRC to do this,  
20 and I believe that's the right way to go, and  
21 I believe you are the body that can do that.

22                   Because whatever we go forward,

1 it's going to take legislation to empower  
2 this. So just put that on your "to do" list.  
3 It needs to be done to empower the NRC.

4 CHAIR LASH: So just one more  
5 follow-up on this, because it's a very  
6 important, very immediate question for us.  
7 Can the NRC change its processes so they are  
8 more open and easier for people to participate  
9 in for this purpose?

10 MR. GREEVES: I'm not sure what  
11 prompts the tone of your question. NRC's  
12 process is very open. They participate, even  
13 more so in the last decade.

14 CHAIR LASH: Let me change the  
15 tone of my question and try to be clearer.  
16 The EPA tends to have in its rulemaking  
17 processes, a process in which it is very easy  
18 for people with limited resources to  
19 participate.

20 It's my perception that the NRC's  
21 processes, because they are formal  
22 administrative proceedings, require people

1 with a higher level of resourcing to  
2 participate effectively. Do you think I'm  
3 mistaken?

4 MR. GREEVES: No. You know, to  
5 participate in a reactor hearing process  
6 requires resources, but even those  
7 proceedings, the public gets an opportunity.  
8 It's a question of how effective they can be.  
9 So I'm struggling with how to help you with  
10 that. I'd like to think about it a bit more  
11 and perhaps provide some follow-up. That is  
12 a difficult point.

13 But the proceedings themselves are  
14 quite open. The NRC takes questions. They  
15 are an independent regulator, which is not  
16 always the case in some of these activities.  
17 So I'd have to think about how to help that  
18 process. I'm just not an expert on figuring  
19 out ways to enable the public to participate.

20 I'm actually consulting for a  
21 group in Canada, the aboriginal community, and  
22 there's -- it's like the committee here.

1 You've got to figure out a way to bring  
2 everybody up to at least a minimum level of  
3 understanding of what's going on, because that  
4 way they will be able to have some input into  
5 the process.

6 CHAIR LASH: We'd welcome that  
7 from any of you, and one piece of the solution  
8 that we saw in Scandinavia is the willingness  
9 to fund participation. I know DOE has done  
10 some experiments with that, but they do it  
11 quite extensively.

12 So if a community sees someone who  
13 has systematic questions, they will say we  
14 welcome you to participate, and we'd provide  
15 some funding for you to get expertise.

16 MR. GREEVES: Let me just  
17 punctuate that. The topic that Linda Lehman  
18 brought up about these scoping meetings, which  
19 I did participate both in South Carolina and  
20 out at Hanford, my observation is they are  
21 quite effective in communicating, because the  
22 public in that environment gets to see the

1 Department of Energy in a room, answering  
2 questions from the Nuclear Regulatory  
3 Commission, the Environmental Protection  
4 Agency and the State Department of Encology.

5 It's a very healthy process. It's  
6 like pre-licensing consultation, and it  
7 happens before the technical document is  
8 delivered, and having those in the open public  
9 arena I think was very effective, as Linda  
10 raised.

11 MR. DIALS: And I might add that I  
12 think there's some lessons learned from the  
13 peer review process that went on with the WIPP  
14 project. We did informal reviews, where the  
15 public were invited, EPA participated as the  
16 regulator, in terms of hearing the public.

17 The public were invited, the  
18 public participated. There were in fact  
19 funded opposition groups like Concerned  
20 Citizens for Nuclear Safety, the Environmental  
21 Policy Institute and others who participated  
22 and were welcome to participate. It was a



1 very open process.

2 Then when we went to the formal  
3 peer review process, which took a bit more  
4 resources, they had been informed about the  
5 issues ahead of time. I think we did eight  
6 peer reviews; seven of them were done  
7 nationally, and then we had one international  
8 peer review that I mentioned earlier.

9 But in each case, the public were  
10 enabled to participate. Their speakers were  
11 provided access and opportunity, and it was  
12 really meaningful in terms of tabling issues  
13 and having a full discussion about it.

14 Those who, in the dedicated  
15 opposition groups didn't always come to terms  
16 and say okay, we accept, we agree with you  
17 now. But they did come to terms saying we  
18 were heard, and we were able to participate.

19 That went a long way to giving  
20 credibility to the transparent process we were  
21 trying to do, and having the regulator there  
22 in an interactive way was really an important

1 part of that early on.

2 MR. BARRETT: If I could add, I  
3 believe the NRC could do it, and I believe the  
4 new implementing organization could do it very  
5 well, as utilities do, working with their  
6 communities around their reactors.

7 In the case of Yucca Mountain,  
8 over half a billion dollars was given to the  
9 state and the counties to do oversight. It  
10 really didn't communicate as well as we all  
11 would have liked it on both sides. Yes, some  
12 good science that Linda talked about was done  
13 very nicely by the state and counties.

14 But there's a -- you need to go  
15 more than that, and the evolution when I was  
16 at DOE to 2002, we made their public meetings  
17 much more effective.

18 For example, NEPA scoping meetings  
19 are very formal, legalistic meetings, where I  
20 would sit in the front and get hollered at in  
21 front of the TV cameras. So when the TV  
22 cameras were gone, everybody was gone, and

1 communication was terrible, okay. It was  
2 negative communication, in my view.

3 At the end, we evolved these  
4 things to have breakout rooms, where an honest  
5 citizen -- somebody could go who cared and sit  
6 and talk with the scientists and talk with the  
7 regulators as well, and actually have  
8 communications.

9 Things really improved, because if  
10 I was a third party citizen coming in, what  
11 this all about and sat in the back of the  
12 room, I'd say what a disaster this was. We're  
13 missing those people, who are critical. Many  
14 of those were workers in the union, all of  
15 them.

16 So I think the, everyone has  
17 learned a lot of this, and I think you can  
18 establish good communications along the lines  
19 of both what John and George both said, in a  
20 room, and if we can find ways to do the legal  
21 requirements that we have to do, but also be  
22 able to communicate with people and listen and

1       respond back, not just listen, but to actually  
2       do things. We can have a much better, a much  
3       better path going forward.

4               CHAIR LASH: I'd like to thank all  
5       of you. I actually have three or four more  
6       questions, but I'm not going to ask them. I  
7       may catch you during the break. This was  
8       extremely helpful. These are of course  
9       exactly the issues that we need to address in  
10      this committee.

11              I think that there is a consensus  
12      that we have a problem that we have to  
13      address. We've been through our period of  
14      making mistakes now, and we need to find a way  
15      that will work for all of the parties  
16      concerned and for the national interest and  
17      you've contributed to that. So thank you very  
18      much.

19              We will come back at 11:15.

20      Thanks very much.

21              (Whereupon, the above entitled  
22      matter went off the record at 11:00 a.m. and

1 resumed at 11:17 a.m.)

2 MR. FRAZIER: Okay. We're going  
3 to go ahead and get started. Senator?

4 CHAIR HAGEL: Tim, thank you and  
5 we this afternoon or almost this afternoon  
6 welcome our next panelist. He is Gary Gates,  
7 who is President and CEO of the Omaha Public  
8 Power District.

9 I have worked with Mr. Gates over  
10 many years as -- well, as all who are  
11 associated with the Omaha Public Power  
12 District since I once upon a time had a job  
13 that connected me rather directly to Omaha,  
14 and Nebraska.

15 Gary Gates began his career at  
16 OPPD in 1972, became its president and CEO in  
17 2004. Mr. Gates is a member of the boards of  
18 several industry organizations, including the  
19 World Association of Nuclear Operators,  
20 Institute of Nuclear Power Operations, and  
21 American Nuclear Society. He's also chairman  
22 of the Nuclear Energy Institute.

1 Gary, we are grateful for your  
2 input, your thoughts. What we'd like to do is  
3 hear from you on what you think are the  
4 important points that would enhance and  
5 contribute to our mission, which you know  
6 about and clearly understand.

7 Then we'll open it up and have an  
8 opportunity to discuss some of the things that  
9 you said and some questions that we have and  
10 further detail. So welcome.

11 Implementation of Nuclear Waste Policy

12 MR. GATES: Thank you very much,  
13 Chairman Hagel and Chairman Lash, and  
14 distinguished members of the Disposal  
15 Subcommittee and the Blue Ribbon Commission.  
16 I really appreciate this opportunity to visit  
17 as a practitioner.

18 I heard part of the previous  
19 presentations, and I'm here as a utility  
20 representative. I guess we're producing the  
21 spent fuel that you're all talking about on a  
22 daily basis.

1           I appreciate the introduction as  
2 well, Senator Hagel, and really have an  
3 opportunity to serve on a lot of boards that  
4 influence a lot of the decisions going on in  
5 the nuclear power industry.

6           First, just a quick description of  
7 my utility. It has some unique pieces to it.  
8 It is a publicly-owned utility in Omaha, and  
9 by that, I mean we have an elected board of  
10 directors. We are owned by our customers, so  
11 direct link to the customers. They are the  
12 shareholders of the utility.

13           We serve a population of about  
14 765,000 people in the eastern part of  
15 Nebraska, and we own and operate a single  
16 nuclear unit, Fort Calhoun Station, which  
17 began commercial operation in 1973.

18           The decision for our utility to go  
19 nuclear was made in 1966, and it was based on  
20 studies showing that it was a great way to  
21 produce electricity, and helped our mix of  
22 generation, which we have every kind of

1 generation that you can have, including hydro,  
2 wind, coal and gas and a nuclear plant, and  
3 the nuclear plant produces about 35 percent of  
4 our energy on a daily basis.

5 In 2003, we got our first  
6 extension of life at Fort Calhoun 20 years to  
7 2033. The 40-year life time from 1973 would  
8 have expired in 2013. The NRC granted that  
9 extension. They assumed that we would operate  
10 the plant safely, and that includes all  
11 aspects of the plant, including our management  
12 of the spent fuel.

13 But we're in it for the long haul.  
14 As a matter of fact, Fort Calhoun is going to  
15 be a pilot plant for 80 years of operation  
16 with EPRI. So we're going to go 20 more, and  
17 I would hope that plant would run until 2053.  
18 I assume someone else will worry about that  
19 operation than myself at that point.

20 We have, we talk about assemblies  
21 at the power plant, as I'm sure you know, on  
22 our spent fuel. We do understand the metric



1 tons uranium piece. But today, we have 323  
2 assemblies in dry cast storage at our  
3 facility. We have 553 assemblies in our spent  
4 fuel pool.

5 We expect the policies and  
6 programs to manage commercial use fuel that  
7 were established in the Nuclear Waste Policy  
8 Act of 1982 to be implemented. That's what  
9 we've been operating under that assumption.

10 As the president of the company,  
11 and also my role as chairman of the board of  
12 the Nuclear Energy Institute, I concur that  
13 the principles, that the nation must have a  
14 durable policy to manage used nuclear fuel is  
15 critical to what we're doing going forward,  
16 and we must have a plan for ultimate disposal.

17 Now our utility, you've got John  
18 Rowe on the Disposal Committee, I would say  
19 representing the largest nuclear utility, and  
20 Sue Wallace is here that can support that.  
21 You've probably got in front of you one of the  
22 smallest.

1                   But I can assure we're aligned on  
2                   those issues from a utility point of view, and  
3                   to give you some perspective, for our utility,  
4                   which is again a smaller utility, to date  
5                   we've spent \$110 million into the waste fund.  
6                   We put about a million dollars a quarter into  
7                   that fund or \$4 million a year.

8                   That is an impact on our  
9                   customers. That's about a two and a half  
10                  percent rating for us to support that. We  
11                  don't complain about putting the money into  
12                  the waste fund, assuming it will have a good  
13                  use at the end of the day, and will provide a  
14                  product for us, but to give you some  
15                  perspective from the utilities' point of view  
16                  of what that money is and where it goes.

17                  As you discuss solutions, and I  
18                  heard some talk this morning, an ideal  
19                  technical solution is not required to begin  
20                  implementation of the policy, in my opinion.  
21                  The direction can be evolutionary as opposed  
22                  to revolutionary, and advances in technology

1 can be incorporated over time.

2 This problem is not an urgent  
3 issue. In other words, we have time to  
4 develop a proper plan and to go forward. Non-  
5 proliferation goals must be met, as well as  
6 storage safety. Successes and failures of the  
7 past, as I heard this morning, need to be  
8 listened to and heeded, and I believe you are.

9 Generally, as I heard discussed  
10 also, the hallmark of projects that have good  
11 acceptance and support at a local level are  
12 the most successful, especially if that also  
13 continues to the state level with the  
14 governor, federal level and beyond.

15 I can cite a local example of how  
16 extremely important support and acceptance is.  
17 Now this example deals with low level waste,  
18 but has all the same attributes. The central  
19 interstate low level radioactive waste compact  
20 in U.S. ecology purchased plan about two miles  
21 west of Butte, Nebraska in Boyd County, and  
22 the time frame was the early 90's, with the

1 intention of placing a facility there.

2 There was extensive controversy  
3 over this decision, and the waste site was  
4 eventually removed from consideration.  
5 Citizens and factions throughout Boyd County  
6 where Butte is located fought for over 15  
7 years about the placement of that disposal  
8 site.

9 As a matter of fact, a governor  
10 that was heavily involved probably cost the  
11 reelection for that individual going forward.  
12 Nebraska was officially removed from the  
13 compact after a series of long court battles  
14 that ended in 2004, 1990's until 2004, and the  
15 state had to pay a very high settlement to  
16 other states because of that contract.

17 So that local acceptance on the  
18 failure side really made it clear in Nebraska,  
19 on a local level, that that's important. In  
20 the area of support and acceptance, the Blue  
21 Ribbon Commission is encouraged to keep that  
22 recommendation simple and outcome-based as

1 much as possible.

2 I think other examples, and I'm  
3 sure you've heard about them, but a good  
4 example, I believe, are the new nuclear plants  
5 at Vogtle 3 and 4 in Georgia, and Calvert  
6 Cliffs 3 in Maryland, are great examples of  
7 how that local Congressional support can work.

8 As a matter of fact, I think  
9 Calvert Cliffs 3 is really an interesting  
10 example. Once Constellation backed out due to  
11 inability to negotiate and accept a loan  
12 guaranty and subsidy fee with DOE, the  
13 governor, Congress and the community leaders  
14 went to work to figure out a way to make it  
15 work.

16 I think that's the typical process  
17 that you might see if it's accepted. Other  
18 examples of successful acceptance are the  
19 URANCO USA uranium enrichment facility at  
20 Eunice, New Mexico; the Areva enrichment plant  
21 in Idaho. Although not yet built, it has a  
22 lot of local support.

1 I heard you talk about WIPP this  
2 morning and the local support that was gained  
3 there. As a matter of fact, as I understand  
4 it, that has been so successful that the  
5 community has sought other nuclear facilities  
6 as well.

7 You talked a little bit about some  
8 foreign experience, both in Sweden and  
9 Finland, that have local support. There are  
10 differences in our country that I think you  
11 should learn from, and particularly the way  
12 the government is organized with the states.

13 We have state government that has  
14 a lot of power. They have a township, so it's  
15 much more local. Those are factors that need  
16 to be factored in as you put together your  
17 process, in my opinion. Also, their uniform  
18 geology is a physical attribute that is very  
19 important there.

20 There are many examples of  
21 unsuccessful acceptance. I think Yucca  
22 Mountain is one that you know well and

1 everyone has talked about, where there was  
2 some local acceptance and state non-acceptance  
3 of that, and delayed the project or eliminated  
4 it.

5 The private fuel storage facility  
6 in Utah has a similar history, where it was  
7 accepted at many levels and then not accepted.  
8 So that difference going forward is very  
9 important. I would also say on the technical  
10 side of keeping it very simple, that that is  
11 an effort that should continue.

12 For example, rather than perhaps  
13 specifying exact geology, specify outcomes,  
14 and what the desire would be for the storage  
15 life, as opposed to specifying directly how  
16 you get there, and let the individuals get to  
17 that point.

18 We do need an integrated used fuel  
19 management strategy that consists of the three  
20 major elements that you have been briefed on  
21 before. Long-term managed storage of used  
22 reactor fuel, preferably at centralized sites

1 and volunteer locations; development of a  
2 permanent disposal capacity; and development  
3 of advanced fuel cycle technologies.

4 For the short-term, however,  
5 managed storage at nuclear power plants is a  
6 workable plan; centralized interim storage  
7 should be considered as another short-term  
8 solution for used fuel management. Used fuel,  
9 as has been stated, can be safely stored at a  
10 central storage facility for at least 60  
11 years.

12 Going back to my previous example  
13 of our plant, Fort Calhoun runs until 2053,  
14 and you add 60 years to that. It's going to  
15 put us into the 2100's of storage. I do  
16 believe there are workable solutions. I  
17 pointed out evidence of those solutions for  
18 site selection, and that could avoid some of  
19 the issues of the past.

20 I'd like to share, and perhaps not  
21 directly on your agenda, but some thoughts  
22 around international perspectives and the role



1 of the United States. Specifically, should we  
2 accept spent fuel from reactors in other  
3 countries, and how would that factor into your  
4 decisions.

5 Will or should the United States  
6 be a player in the global fuel cycle. My  
7 experience on the governing board of the World  
8 Association of Nuclear Operators has provided  
9 an opportunity to see impressive growth in  
10 nuclear power around the world.

11 There are approximately 62 new  
12 plants under construction, 24 in China alone.  
13 Over 30 countries that have never had a  
14 nuclear power plant have expressed interest in  
15 constructing one or are constructing ones,  
16 such as the United Arab Emirates.

17 Should the U.S. have a role in how  
18 waste is handled in these countries? To  
19 provide a complete picture, should the U.S.  
20 consider shipping spent fuel to another  
21 country?

22 Another important consideration is

1 around small, modular reactors. They are  
2 gaining popularity, they're gaining interest,  
3 particularly for a utility of our size.

4 When you can add increments of 145  
5 megawatts to 200 megawatts, all the components  
6 are made in the United States. They can be  
7 shipped by rail. The design is underground  
8 and eliminates many of the accident analysis  
9 that are required, and can be located in  
10 remote locations.

11 They will provide a resource that  
12 will not be overlooked, in my opinion, but  
13 they will provide many more sites than the 104  
14 we have. Currently, the large plants are co-  
15 located typically with existing power plants.  
16 Small modulars will be located all around the  
17 country, and will have the potential of having  
18 many, many more sites for spent fuel than what  
19 we're dealing with today.

20 And lastly, I know you've talked  
21 about this, I believe, in previous meetings,  
22 but India is projecting using the thorium fuel

1 cycle when the uranium process runs short for  
2 them. They have a 250 year energy plan. When  
3 I was there in January and saw that slide  
4 presented, I questioned several times the  
5 scale on the bottom. I thought it was months.

6 But it was years in their  
7 direction, and they have the cycle going from  
8 uranium to thorium and then recycling. So as  
9 we look at those different fuel cycles in this  
10 country, and what that will mean to the waste  
11 stream, how will that factor in?

12 Because I'd encourage you as a  
13 commission, as a utility representing the  
14 customers, the people, we're looking for a 50,  
15 100, 150 year type of solution. I think  
16 that's what it's going to be out of this  
17 commission.

18 In summary, nuclear power is  
19 poised for growth to meet America's energy  
20 needs, and environmental goals. But we need  
21 a plan and a path to manage used fuel. The  
22 greatest service the Commission can render to

1 the nation is to develop that used fuel  
2 management policy in a timely manner.

3 We do have time to do it right,  
4 but we need a direction. We are counting on  
5 you from the utility point of view to provide  
6 that direction, and our commitment to you is  
7 to manage our current spent fuel safely until  
8 we have that direction, and I really  
9 appreciate the opportunity to speak here today  
10 and I'd be available for any questions. Thank  
11 you.

12 CHAIR LASH: I appreciate that  
13 very much. I'm tempted to go off and follow  
14 up on your comments about inherently safe  
15 modular reactors, but it's not really within  
16 our mandate, so I will resist that temptation.  
17 I hope Per will also.

18 (Laughter.)

19 MR. GATES: I threw the bait out  
20 there, but I was going to --

21 CHAIR LASH: I could tell, and I  
22 could hear him chomping. A question about

1 process and institutions.

2 One of the key questions we face  
3 and certainly raised by the panel before you  
4 was the question of whether to create a new  
5 entity, or to recommend to Congress to create  
6 a new entity to carry out this process that  
7 would be single purpose, have a mission focus  
8 on safely disposing of waste, and could  
9 presumably have the authority to spend the  
10 money that you put into the fund without going  
11 through the annual appropriation process.

12 I welcome your reaction to what  
13 kind of institutional arrangements should be  
14 set up and how expenditures out of the fund  
15 should be reviewed. I think we share a sense  
16 that it hasn't worked well so far.

17 MR. GATES: Thank you for that  
18 question. I do believe there should be a  
19 separate entity set up that is independent  
20 from any cycles, either election or others.  
21 The expenditures of that money would be driven  
22 by, in my opinion, in three components.

1 I think there should be a  
2 component for R&D. I think there should be a  
3 component for the practical piece of  
4 installing or building facilities if they need  
5 that, and I think a third component should be  
6 an education and education of the public.

7 So those three areas of  
8 expenditure, to answer your question. That  
9 type of system works in many cases, and I'll  
10 give you an example on a state level.

11 In the emergency preparedness  
12 area, that is a staff that we worked with  
13 consistently, no matter what administration or  
14 governor may be there, and that staff has  
15 provided then continuity.

16 If we ever have to implement it,  
17 and it doesn't have to be on the nuclear side.  
18 We have some things called tornadoes in the  
19 Midwest that can deal us fits, and when we  
20 have to implement it, we're going to back to  
21 the same people that we've practiced with,  
22 that we understand and that we know how to

1 respond with.

2 That's the biggest advantage, I  
3 think, of having this separate entity as a  
4 utility. It would be the consistency of who  
5 we're working with.

6 CHAIR LASH: And just a brief  
7 follow-up. Should the board of the entity  
8 have sole control over the expenditure of the  
9 funds, or should Congress have some review and  
10 who should be on the board?

11 MR. GATES: The board should have  
12 control of the expenditures. On the board, as  
13 it's been proposed earlier, I agree with. I  
14 think it was a nine-member board, without  
15 about half of those being from the utility  
16 side, half from other resources. I would say  
17 it's a good check and balance, because it's  
18 the fundamental basis of our country.

19 But those expenditures should be  
20 reviewed at the Congressional level on some  
21 time frame. I don't know if it's three or  
22 four years, but there should be a check and

1 balance there in any system. Just in my life,  
2 I think that's been important, that there's  
3 some check and balance.

4 But on an individual basis, yearly  
5 basis, it should be at the discretion of that  
6 board.

7 MEMBER AYERS: I'm going to show  
8 how little I know, but I'm going to tie this  
9 incorrectly about small, modular reactors.  
10 What are the waste characteristics of the  
11 small modular reactors?

12 MR. GATES: Waste characteristics,  
13 as far as, you know Mark, not to get into the  
14 isotopic detail, but it's very similar. If  
15 they're a white water model to what we have  
16 today, there wouldn't be any difference in the  
17 actual waste.

18 The size of it would be different,  
19 the amount of it generated, and my point, and  
20 not trying to draw you in a conversation on  
21 small modulars necessary, was just to say if  
22 they would become a viable entity, there's



1 going to be more of them around and they'll be  
2 smaller, and your locations will multiply that  
3 you'll have spent fuel at.

4 MEMBER AYERS: Well, the only  
5 reason I bring that up, I just left a Disposal  
6 subcommittee meeting in Chicago two days ago,  
7 and I think that will come into play as we  
8 address the need for interim storage, regional  
9 interim storage, if the small modular reactors  
10 take off, because there is going to be a waste  
11 component there.

12 MR. GATES: That's right. You're  
13 exactly right.

14 MEMBER AYERS: Or transportation  
15 and storage, I'm sorry.

16 CHAIR LASH: Per.

17 MEMBER PETERSON: There's a tough  
18 policy question that we're likely to have to  
19 grapple with, which is the taxpayer liability  
20 under existing contracts, DOE contracts to  
21 accept spent fuel.

22 I guess the policy dilemma is that

1 as soon as we do get and we need to get  
2 centralized storage established, as well as  
3 disposal capability, if we were to do what  
4 would be in the best interest of the  
5 taxpayers, which would be to comply with, as  
6 rapidly as possible, these contracts we would  
7 start taking spent fuel not from say  
8 decommissioned reactor sites but from places  
9 where actually technically and economically,  
10 it really wouldn't be logical to take it  
11 first, in order to minimize liability on the  
12 contracts.

13           Conversely, if we were to use that  
14 centralized storage capacity in the most  
15 logical way technically, we would focus on  
16 first of all cleaning out decommissioned  
17 sites, but then the taxpayer liability could  
18 be higher.

19           So how do we, once we have  
20 capacity to take spent fuel into centralized  
21 storage address, in some equitable way, what's  
22 logical from the perspective of the economics

1 and technical priority to focus on  
2 decommissioned reactors, yet not leave the  
3 taxpayers with the liability that really, in  
4 the end, we should try to -- I think at least  
5 personally, we should internalize the costs of  
6 managing waste into the cost of the power  
7 that's generated.

8 MR. GATES: I think that's a great  
9 question. We have had some conversations  
10 about that internally as utilities, in today's  
11 framework, not in a future framework.

12 I think there's always a solution  
13 to come to the table with, and that has been  
14 historically they precedent. I think through  
15 NEI and through other current EEI and other  
16 organizations that exist, those are the tables  
17 to go to and work out a solution.

18 Utilities are very pragmatic  
19 individuals. We have our shareholders in some  
20 cases, and we all have them. I've got them.

21 They happen to be directly  
22 customers, which can be a good shareholder

1 base, that we would have to negotiate that.

2 But we understand practicality in many  
3 situations, and I think that would have to be  
4 hammered out once we saw what the update  
5 capacity is.

6 It's going to be the flowthrough  
7 that's going to be the first thing. You know,  
8 how many assemblies or metric tons can you  
9 start taking? I mean if you have many, not  
10 many, but more than one centralized location  
11 that from a good old industrial Engineering  
12 point of view you know you've got more lines;  
13 you can get more through to it.

14 So I think that would help. But I  
15 think as you look at this or when I look at  
16 this, it's how much can you take per year, and  
17 that can be balanced pretty well, I think, to  
18 really solve that problem. I think you could  
19 almost formulize it.

20 CHAIR HAGEL: Thank you, Gary.  
21 You had noted that you heard some of the  
22 discussion this morning from the previous

1 panel, and a considerable amount of that  
2 discussion revolves around regulatory  
3 agencies.

4 I would like to hear your  
5 reflection on regulatory agencies, not just as  
6 an operator but open it up to the larger  
7 universe of what we're grappling with here or  
8 what you heard this morning. Obviously, EPA,  
9 NRC specifically. But then the DOE standards  
10 and DOE's obviously not a regulatory agency.

11 But nonetheless, the governmental  
12 dynamics and oversight capacities and  
13 responsibilities that play into all of this  
14 that need to, and as an operator, you're  
15 dealing with all of it and you can keep going.  
16 OSHA and then the state regulatory agencies  
17 and so on.

18 Give this subcommittee some  
19 reflection on regulatory agencies. Should we  
20 streamline them? Should there be one or two  
21 or is it a problem, anything that you want to  
22 offer in that area.

1 MR. GATES: From our experience,  
2 and as a utility, our preference would be to  
3 have one single point of contact. For us, it  
4 would be the NRC. We understand the logic and  
5 what my view of that would be if a standard is  
6 to be set by DOE or another and it's science-  
7 based, the certainty is what we look for.

8 We would love to engage in the  
9 conversation and understand that. But the  
10 certainty. What is it, and we'll meet it,  
11 because it should be based by science or fact  
12 that you can meet it. So that standard, once  
13 it's set based on science, the implementation  
14 and checking and review of that by the NRC is  
15 very adequate.

16 NRC is an extremely professional  
17 organization. They're not -- they're tough,  
18 as they should be. You need a tough  
19 regulator. We know that in this industry.  
20 Absent that, you're going to lose a lot of  
21 public confidence.

22 So it is a tough regulator. It's

1 a fair regulator, and that would be to our  
2 preferred, from my point of view, the single  
3 point of contact, fed to them the standards  
4 that they're inspecting or implementing based  
5 on science, and give us certainty, and we'll  
6 meet them.

7 CHAIR HAGEL: Let me go back to a  
8 point you made on the international front,  
9 which you, in making a point, mentioned that -  
10 - I think you said there were over 60 new  
11 nuclear power plants under construction or  
12 soon to be in the world.

13 I think you said 24 in China, and  
14 if I remember what you said, 24 new countries  
15 that had not had or have not had nuclear power  
16 before.

17 Here's the question. Based on  
18 those numbers, and what you said today and  
19 what you heard today and your knowledge of the  
20 industry, is America in a position where it is  
21 going to be left behind in nuclear power  
22 capability, leadership in the world if we do

1 not start sorting out some of these big  
2 issues?

3 I mean that seems to be a pretty  
4 significant number of new nuclear power  
5 plants, especially when you focus on, if I'm  
6 correct, 24 new countries. Obviously India  
7 has got some of those in that over 60, I know.  
8 Then what kind of consequences would that  
9 present for American leadership in the field  
10 of energy?

11 MR. GATES: I think the answer to  
12 that question is we have the potential of  
13 falling behind. I think it's pretty commonly  
14 recognized.

15 With all the development  
16 occurring, most of the development, not all.  
17 We have some development here, but being in  
18 other countries overseas. What I've seen in  
19 my five-year tenure on that governing board is  
20 that the manufacturing capabilities are not  
21 here for the larger reactors.

22 I've seen a shift in the vendors



1 to not in this country. I've seen an interest  
2 of new plants obviously focusing on other  
3 countries. I have seen though a consistent,  
4 to this day, view that we're among the best  
5 operators of nuclear power plants still to  
6 this day, our 104.

7 I think more than you may realize,  
8 there is a real look at the world and what  
9 you're doing, because they have reprocessing  
10 in countries, as I'm sure you're well aware  
11 of. They're looking at different fuel  
12 cycles.

13 They still want to watch what the  
14 United States is going to do, but they're not  
15 going to keep watching for very much longer.  
16 They need to move ahead. They have their  
17 programs moving. The countries that have  
18 never had a power plant before are really  
19 looking at what this Commission is doing and  
20 what the NRC is doing as a model to this day.  
21 I don't know how long that will last.

22 I'm not -- this isn't just

1       commenting to your importance as a committee,  
2       but it is -- I mean I hear it. I was just in  
3       Hong Kong in a governing board meeting two  
4       weeks ago, over in India in January.

5               The United States, we have a seat  
6       at the table. We're not a player to the  
7       extent in the new plant construction, which is  
8       where the focus is right now.

9               We're still a major player in the  
10       operation, and we're a huge player in how we  
11       regulate and how we handle things like waste,  
12       and that is still there, but it is  
13       diminishing.

14              CHAIR LASH: I have a very mundane  
15       question compared to that large-scale one.  
16       One of the things we saw in Sweden was they've  
17       made the decision not to go with dry cask  
18       storage.

19              They keep spent fuel in pools and  
20       then tend, at centralized storage, to keep  
21       them in pools much longer in order to cool the  
22       fuel more before they move it into their long-

1 term waste disposal.

2 I didn't get a chance to ask them.  
3 I'd be very interested what the cost  
4 differential is if there's -- we make a choice  
5 to keep waste until it's cooler in pools? Is  
6 that a much more expensive way of storing  
7 waste?

8 MR. GATES: Yes, it is, and here's  
9 the basis on it. It's just a capacity issue.  
10 Pools in existing plants are a defined size.  
11 At Fort Calhoun, we've re-racked our pool  
12 three times. We started out with a capacity  
13 of around 200 assemblies, and our core has 133  
14 in it. So we had about room for one and a  
15 couple of reloads.

16 Then we re-racked to about 380  
17 assemblies. Now we're up to 900 that we can  
18 store there. But it's taken a tremendous  
19 amount of computational ability, changing the  
20 fuel racks is obviously a difficult thing to  
21 do when you have fuel in there.

22 So we've got that about capacity-

1 maxed. We can't do it again. So we're into  
2 the dry cask storage piece. So the real  
3 expense is if you had to expand spent fuels  
4 wet, spent fuel pools, it would be extremely  
5 expensive. The economics definitely swing in  
6 the favor of dry cask storage at that point.

7 CHAIR LASH: What about at a long-  
8 term storage facility at a separate location,  
9 a centralized storage facility?

10 MR. GATES: A centralized storage  
11 facility, in my opinion the dry cask, is still  
12 the favorite type of storage, because its  
13 handling is easier. When you handle remotely  
14 under 40 feet of water, there's just inherent  
15 difficulty in doing that. It's doable, but  
16 it's, you know, it's something that is not  
17 easy to handle as dry cask storage.

18 CHAIR HAGEL: Gary, thank you. We  
19 know you took a day out of your schedule to  
20 come out from Omaha, and we appreciate it, and  
21 we may have follow up questions which if it's  
22 okay, we'll get back to you and staff. But

1       you have contributed to the effort, and we  
2       appreciate it.

3                   MR. GATES: Thank you. Thanks for  
4       all you do.

5       Public Comments

6                   CHAIR HAGEL: Thank you. We are  
7       at the point in the schedule for public  
8       comments, and we have two individuals who have  
9       signed up, and to begin the public comment  
10      portion of our agenda, let me ask the first  
11      individual who has requested some time, Steve  
12      Frishman from the state of Nevada, if he would  
13      come forward, and we would each of the  
14      individuals if they could limit their comments  
15      to five minutes. Steve, welcome. Good to see  
16      you again. Thank you.

17                   MR. FRISHMAN: Thank you, Mr.  
18      Chairman, co-chairman and members of the  
19      Subcommittee. After listening to the panel  
20      this morning, I think it was inevitable that  
21      I had something to say, and --

22                   (Off mic comment.)

1                   MR. FRISHMAN: I hope so. I want  
2 to go into this area that was talked about  
3 pretty heavily this morning and not very much  
4 substance that was really brought out, and  
5 that's this question of how you bridge between  
6 societal understanding and the understanding  
7 of the technical and the scientific people,  
8 and where do you bring society to the point  
9 where acceptable decisions can be made, both  
10 to them and to the technical community.

11                   It's a difficult one, and we've  
12 been playing with it for decades. But it  
13 brought to mind one area that I think probably  
14 needs some exploration, because expectations  
15 on the side of society seem to be quite  
16 different from the expectation on the  
17 technology end, and there are some  
18 interlocking elements, just as there are in  
19 everything else we talk about here.

20                   But it starts with this idea of  
21 multiple barriers and defense indepth. The  
22 expectation of the concept of multiple

1 barriers, which is actually embedded in the  
2 Nuclear Waste Policy Act, is that it provides  
3 confidence because what multiple barriers mean  
4 is redundancy, and that's the expectation.

5 In the case of Yucca Mountain, we  
6 have had to make a lot of excuses, or I  
7 haven't, but a lot of people have, and that's  
8 the multiple barriers are not for the sake of  
9 redundancy, but for the sake of making the  
10 system work.

11 In the case of Yucca Mountain, it  
12 became apparent, as Linda talked about and  
13 others have agreed, that once the hydrologic  
14 model came into question, then the necessity  
15 for the engineered barrier becoming an  
16 integral part of containment or isolation was  
17 there.

18 And I think sort of the proof of  
19 that is in the arguments over how long a  
20 regulatory period should go. Yucca Mountain  
21 sort of created some new ground. The EPA's  
22 answer for why you shouldn't go beyond about

1 10,000 years is that uncertainty increases  
2 through time.

3 Well, in the Yucca Mountain case,  
4 because of the reliance on the engineered  
5 barrier, uncertainty actually decreases  
6 through time, because the vast majority of the  
7 uncertainty in the early time is the  
8 uncertainty about the effectiveness of the  
9 engineered barrier.

10 So people's expectations are that  
11 the multiple barrier is for redundancy. In  
12 reality at Yucca Mountain, it became an  
13 integral part of providing a solution that  
14 otherwise would not have been a solution. Now  
15 linked to that is John Greeves' sort of  
16 disdain for subsystem performance requirements  
17 and the cottage industry it produced.

18 Well, that's another sort of  
19 function Yucca Mountain, and it's a function  
20 of it in terms of if you look at the question  
21 of what does substantially complete  
22 containment mean? Well, in the original EIS



1 for geologic disposal, substantially complete  
2 containment was an outgrowth of the idea of  
3 multiple barriers, where substantially  
4 complete containment for the first thousand  
5 years was that you needed that redundancy to  
6 make sure, absolutely sure that the fission  
7 products were not going to be released to the  
8 environment in the first 1,000 years. That  
9 was the original idea.

10 But now we've ended up with a very  
11 complicated site, and I think Rip has it  
12 right, and that's that the more complicated  
13 the site, the less likely it is that  
14 performance assessment is going to do much  
15 more than give you large uncertainties, or  
16 expose the large uncertainties.

17 So in the case of a reasonably  
18 simple site, and the idea of some system  
19 performance requirements such as substantially  
20 complete containment, such as a very tight  
21 requirement for understanding ground water  
22 travel time, these are the demonstrators.

1                   These tell you that you -- if you  
2                   can demonstrate this with very little  
3                   uncertainty, it tells you you understand that  
4                   site, and in the case of understanding that  
5                   site that well, that allows you to maybe get  
6                   away from this idea of looking out at million  
7                   years.

8                   If that site's going to work for  
9                   the first 10,000 and with very high certainty,  
10                  then that tells you something. It tells you  
11                  that you understand the site sufficiently well  
12                  to make a less rigorous projection out to a  
13                  million years. You should be able to do it  
14                  anyway, but make a less rigorous one.

15                  So this bridge is expectations on  
16                  the part of society, that you actually will  
17                  achieve isolation, as opposed to expectation  
18                  on the part of technology or the technology  
19                  side, which is you do essentially the best you  
20                  can with the site that you have.

21                  So I think that's sort of a  
22                  concept that you need to look at, but it's

1 from the technology side, I'm talking the  
2 technology language.

3 We need to sort of get a language  
4 that is accurate and that is representative of  
5 what the technology and science thinks, but is  
6 understandable to the societal side, where if  
7 you say "waste isolation" you mean waste  
8 isolation. You don't mean it doesn't leak  
9 anymore than the regulation says it can.

10 So I'll leave it there. I could  
11 go on much longer on this particular topic.  
12 It's interlocked, but I think I'm trying to  
13 point out that people's expectations need to  
14 be responded to. They don't need to be  
15 educated. The expectations need to be  
16 responded to in a way that makes technical  
17 sense and societal sense at the same time.  
18 Thanks.

19 CHAIR HAGEL: Steve, thank you, as  
20 always. I appreciate it. Judy Treichel, who  
21 is the Nevada Nuclear Waste Task Force. Judy?  
22 Nice to see you again. Welcome.

1 MS. TREICHEL: Thank you. I know  
2 that you may feel that you're hearing way too  
3 much from Nevada, but after we did this for 30  
4 years, and we sit and we listen to what people  
5 have to say about it, it makes you think about  
6 a lot of things.

7 This opened up with George Dials  
8 and Lake Barrett talking about WIPP being a  
9 success and Yucca Mountain was a failure.  
10 Since your trip to Sweden and Finland, what  
11 would have happened if the government of  
12 Sweden had decided that one of those  
13 communities that they had talked to, who said  
14 no, we don't want any part of this, what would  
15 have happened if they'd have decided that was  
16 the place they wanted to go? I think you  
17 would have seen the same sort of failure.

18 The idea about public  
19 understanding is almost offensive, because we  
20 think we really did understand what was going  
21 on, and as time went on, we became pretty much  
22 able to understand everything, whether it was

1 technical or whatever was being thrown at us.

2 We just had to.

3           You couldn't fight a war like this  
4 if you didn't understand anything that the  
5 other side was doing, and we did. George or  
6 Lake were right when they said that it was  
7 regional in and it's a problem, and it was,  
8 because Nevada and Utah had attended the  
9 school of hard knocks for a very long time  
10 with the Nevada test site.

11           We had been through lawsuits with  
12 victims of atmospheric nuclear testing, and  
13 after those long, drawn-out lawsuits, they  
14 lost. Even though the victims had presented  
15 really compelling cases, and the judge was on  
16 their side, and he told them at the very end  
17 I can't decide in your favor because the  
18 government here has sovereign immunity. It  
19 has discretionary function.

20           They can make decisions that hurt  
21 people, and there's really nothing you can do  
22 about that. So we were familiar with that.

1 We had already seen that, and we had made the  
2 decision not to jump into another case where  
3 that could have happened again.

4 As I say, it's offensive when it  
5 appears that people who agree with what DOE  
6 wants to do somehow understand. They're just  
7 a little brighter than those that keep  
8 opposing, and then there's also that third  
9 group, and that's what you see a lot of in the  
10 Nye County area, the Lincoln County area,  
11 which are people who think it's inevitable.

12 They think their opinion really  
13 doesn't matter, so they can be a supporter or  
14 an opposer, but it's going to happen anyway.  
15 So where's the lemons that we can make into  
16 lemonade, and those become people who then  
17 somehow understand.

18 I can't give you any advice. As  
19 long as I'm here and as long as I think about  
20 it and I talk about it, I can't give you  
21 advice for how to turn an opposing community  
22 into one that somehow becomes in favor of the

1 project, because it's not my experience, and  
2 I don't think it will happen.

3 But when you start looking at and  
4 going through the list of problems that DOE  
5 says that they have, or particularly the slide  
6 you used that John Greeves had presented,  
7 where it showed things that could be fixed, I  
8 think you should be very aware that some of  
9 those are not things that would have been a  
10 problem if you'da had a willing host, or a  
11 voluntary+ site.

12 So when you look at fixes that  
13 need to be made or things that have to be  
14 tweaked, I don't think you should look at that  
15 with the idea of fixing something so that you  
16 can win, or that so you can defeat someone  
17 who's in opposition to a project, because it's  
18 just not going to work that way.

19 If you start out with an opponent  
20 and the opponent stays. They talked about  
21 changing management at DOE and changing rules  
22 and changing stuff, we didn't change. Bob

1 Loux's office stayed the same for well over 20  
2 years, and those of us that were there, Steve,  
3 me, others, we were always the same people,  
4 and we got better at it.

5           And yes, there were problems that  
6 they had and we used every one of them in  
7 order to do this. So we don't feel that we  
8 were a failure. We think we had a success,  
9 and I think you should, you know, factor that  
10 in too and not try and overcome opposition,  
11 but rather make a system that will work with  
12 a willing community, and then you'll have a  
13 success. Thanks.

14           CHAIR HAGEL: Judy, thank you, as  
15 always. We have a third individual who  
16 requested some time, Alex Pavlak with the --  
17 where is he? Okay, good. Alex, welcome.  
18 Thank you.

19           MR. PAVLAK: Good morning. My  
20 name is Alex Pavlak. I'm an independent  
21 consultant. I'm an engineer. All my degrees,  
22 all my experience has been in engineering. My



1 area of expertise is system architecture. I  
2 understand how to create systems, and when I  
3 look at the BRC, it leads me to some  
4 puzzlement.

5 I see the Commission as  
6 functioning as if it were a fact-finding  
7 commission. But that's not the charter. The  
8 charter is to recommend policies and that  
9 confuses me. Also in the world of  
10 architecture, we would view that charter as a  
11 conflict of interest or has the nature of a  
12 conflict of interest, because you're mixing  
13 value judgments with objective technology  
14 judgments, and there's a risk that the  
15 Commission imposes its own values on the  
16 judgments that are subsequently made.

17 A classic example of this is cost  
18 and performance, where do you draw the line.  
19 Do you recommend a system that is the lowest  
20 cost competent system for managing the fuel  
21 cycle, or do you spend a higher price on a  
22 higher performance system that minimizes the

1 environmental footprint?

2           There's a whole list of these  
3 value judgments that I've been making a list  
4 of as we're -- I'm listening to folks speak  
5 today, and I think this conflict between  
6 objective judgments, technology and societal  
7 judgments, values, is the -- is a real core  
8 issue behind a lot of what I've heard going on  
9 here today.

10           Now the way architects manage the  
11 problem is that you separate the two. You  
12 separate values from technology, and you set  
13 up a clean and invisible interface between  
14 them, and this becomes an iterative process.

15           So what this leads me to is a  
16 degree of puzzlement. I do not understand  
17 what the Commission is eventually intending to  
18 deliver, and how you expect to pull all of  
19 this together. I think this is an extremely  
20 important topic. I agree with the comment  
21 that the world is looking at the Commission  
22 for guidance, and I would feel a lot better

1 about this if it were more clear to me how the  
2 processes are going to work. That's the  
3 extent of my comments. Any questions?

4 CHAIR HAGEL: Thank you. I would  
5 only respond by saying that we appreciate your  
6 thoughts. But we do intend to go forward,  
7 this Subcommittee, and deliver to the full  
8 board a set of recommendations, as you had  
9 noted is our charter.

10 But those recommendations, I hope,  
11 I think it is the will of all the members of  
12 this subcommittee, will be based on facts.  
13 That's why we have put a lot of time into  
14 hearings, meetings, both in the United States  
15 and outside. We'll continue to do that.

16 As to your concern about or, I  
17 guess the way you expressed it, puzzlement  
18 about what we are doing or how we're going to  
19 do this, I would go back to a statement I made  
20 at the opening of the hearing this morning,  
21 when I said that this would be the last  
22 subcommittee meeting for the year, unless

1 something comes up.

2 But I also said that the  
3 Subcommittee will now take time to process the  
4 received information and facts, and we'll have  
5 additional hearings and so on and so on.

6 So I think I understand what  
7 you're saying, but if I can give you any  
8 reassurance, that we think we're on track with  
9 fulfilling the objectives and the mandates  
10 which we were given. So I appreciate your  
11 thoughts, and thank you very much.

12 MR. PAVLAK: Thank you.

13 CHAIR HAGEL: Meeting adjourned.

14 (Whereupon, at 12:05 p.m., the  
15 meeting was adjourned.)

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