

1 EWING: It's my pleasure to welcome everyone back to the
2 second day of our workshop. In case you weren't here
3 yesterday, my name is Rod Ewing. I'm the Chair of the Board
4 of the Nuclear Waste Technical Review Board.

5 Let me say just a few words about what we learned
6 yesterday, and then I'll turn the podium over to Nigel Mote,
7 the Executive Director for the NWTRB. And he'll outline the
8 day's activities, which you'll know from yesterday, this is
9 the day where we really get to interact and argue over what
10 we should do with these packages, canisters of spent fuel, as
11 they accumulate around the country.

12 So I think we were, in fact, very privileged to
13 have the presentations that we listened to yesterday, because
14 they, in a very explicit, almost frightening way, outlined
15 the scale of the problem that faces us.

16 (Pause.)

17 So the scale of the problem. What we learned
18 yesterday is, already around the country we have some 1,500
19 dry storage systems that are in use. Most are metal welded
20 containers. There are 26 welded metal canister designs. At
21 the 12 shutdown sites we have 17 canister designs, 8 storage
22 overpack designs, and 8 transport overpack designs. So we
23 have a wide variety of canisters or packages of different
24 dimensions and different mass. And to add to that
25 complexity, some are and some are not certified for

1 transportation. And so to move them from the site to an
2 interim storage facility or to a repository seems to call out
3 for repackaging.

4 So in that context we had presentations on what
5 repackaging means, what is the scale of that effort, and we
6 learned that it's a lot of packages, and it will cost a lot
7 of money, roughly speaking many billions of dollars. Even if
8 we want to embark on this expensive and large-scale effort,
9 we have dry storage canisters on sites which no longer have
10 the facilities for handling or repackaging those materials.
11 And even for dry storage canisters on sites with operating
12 reactors there are operational constraints on what can be
13 done in the context of ongoing reactor operations. The
14 mechanical process, the physical process of opening the
15 welded packages is not only expensive, it's not only
16 complicated, but one has to consider exposure to workers.

17 So with all of that complexity, the next thought
18 is, well, why can't we just move these large packages
19 directly to a repository and leave them there? That skips
20 over the complexities that we face. We had an introduction
21 to some of the implications of, let's call it, direct
22 disposal of these dry cask packages. And the introduction
23 focused mainly on the size, moving these large objects
24 underground, and the heat load and the impact of the heat
25 load in the context of different geologies. And so in this

1 case the higher thermal conductivity of salt makes salt an
2 attractive possibility.

3 But I'd like to suggest where we fell short a
4 little bit yesterday, mainly due to limitations in time, is
5 we didn't ask the fundamental question at the disposal end:
6 What is the role of the waste package in terms of the barrier
7 functions that we need for the successful long-term
8 performance of a geologic repository?

9 If we look around the world, it seems to me that
10 the message is that the waste package and the materials we
11 use in the design of that package is quite important. And
12 I'm thinking of the copper canisters with the small number of
13 fuel elements in each kept to a low, low temperature. This
14 would be the case in Sweden and in Finland.

15 Also, recalling our experience with the Yucca
16 Mountain project where over time the waste package became
17 very important, and we passed through a number of different
18 designs and finally ended up with a package made of a very
19 corrosion-resistant material, an alloy, supplemented by drip
20 shields. So the near field containment, the physical
21 containment of the waste seems to be very important to the
22 long-term performance.

23 There are other questions that have come to my
24 mind, thinking of salt as an example, and just to try to
25 stimulate some of the discussion. In salt the main failure

1 mode is human intrusion; that is, just drilling through the
2 repository. So a simple question--probably the answer is
3 complicated--is: Is there a difference between drilling
4 through a very large waste package with lots of fuel elements
5 versus a much smaller one? Does that affect the long-term
6 performance of the repository and its ability to comply with
7 regulations?

8 And then, finally, a question that goes well beyond
9 what we can do in this workshop but finally is mainly the
10 more important issue: How do we harmonize or blend the
11 difference perspectives? The utilities have a problem today,
12 which they're trying to deal with and solve. There will be
13 some organization in charge of waste management, and they'll
14 be dealing with the waste and applying for or submitting a
15 license on performance that will extend for hundreds of
16 thousands of years. So there has to be, for us to move the
17 whole system forward, in my opinion, some compromise, some
18 blending, some sense of what the final or long-term purpose
19 of these activities actually will be.

20 And this blending is not very easy, because it
21 depends on the time frames. The time frame for utilities is
22 today, this year, next year, the next ten years. The time
23 frame for geologic disposal is hundreds of thousands of
24 years. And the role of the package in those two time frames
25 is one of the subjects we want to or I hope we address today.

1 So I'll stop with that bit of introduction and a
2 few thoughts, and I'll turn this over to Nigel, who will
3 explain to you the logistics and also the goals of what we'll
4 be doing for the rest of the day. Thank you.

5 MOTE: Good morning, everybody. Sound okay? Okay.
6 Hands up everybody who had nightmares last night about the
7 number of canisters and the potential for repackaging.

8 I'd like to start right now by being even more
9 informal than yesterday. I've got a lavalier on, because I'm
10 going to have to walk down the room. And you'll see there
11 are three wall charts here. That's going to be part of what
12 I'll talk about. During the two breakout sessions we'll
13 actually have those down the walls of this room and the other
14 room, which I'll come to in a minute. But I put those up
15 just for examples that I'll come to. So if you're wondering
16 what they are, they're part of what I'm going to talk about
17 now.

18 Before I start on this formal session, I'd like to
19 say that the overheads I'm going to use have not been
20 printed. There are not copies that you can take away,
21 because we revised them during some of the dry runs
22 yesterday. They will be available, as will all of the
23 overheads, on the Board's Web site, nwtrb.gov. You can find
24 that very easily by Googling the Board's name. All of the
25 overheads will be on the Web site, we're thinking, the first

1 couple of working days after we get the workshop finished.

2 I'd like also to point out for those of you who may
3 never have seen it that there are two cards like this
4 available on the table outside. They are different, and you
5 may not realize they're different unless I point that out.
6 One of them is to let you ask questions in the breakout
7 sessions that we're coming to shortly. And that is, there
8 will be some people who do not want to ask questions for fear
9 of exposing their lack of knowledge, which is absolutely
10 immaterial here, because we all lack knowledge in the areas
11 that we're not familiar with, and we do want to share as much
12 as possible between the expertise of the groups and the
13 representation from organizations and the individuals who are
14 here.

15 So, please, if you have a question and you don't
16 want to ask it yourself, please fill a card out and give it
17 to any of the staff or Board members, and they'll make sure
18 that it gets worked into the system somehow. We are going to
19 be limited on time, so it may be something that we get dealt
20 with in the Board considering it when the report is written,
21 but we would like all the input that we can have.

22 The second card is one to put your name on the
23 Board's registry of people who receive e-mail notices about
24 meetings and reports. You can select what you receive, you
25 can select how you receive it, whether it's electronic or in

1 hard copy; but if you would like to be on the Board's mailing
2 list for something, please fill a card out and leave it on
3 the desk outside.

4 This session and the two breakout sessions that
5 we're coming to are very informal, and we'd like to have them
6 as inclusive as possible for everybody to say things, ask
7 questions, clarify, and so on. We are trying to identify the
8 issues. This was said yesterday by Rod a couple of times.
9 We do not have time to resolve them. I'm sure most of the
10 people who do these things like techies, and most people here
11 being techies, would have looked at the number of options on
12 some of the charts that you saw yesterday, and you'll know
13 that well, let me start by walking around.

14 This chart down here on the side wall, for those of
15 you who can't see it clearly, you'll see there's a diagonal
16 and there's a bunch of squares. And each of those squares or
17 cells represents a potential area where there will be issues
18 in what we're talking about. And if you do the math, you'll
19 see that there's over a hundred squares, and we have 180
20 minutes, so that works out to 1.8 minutes per square. If we
21 try to stop and resolve everything in all of those cells,
22 rather, not squares, it's an impossible task. So we're not
23 trying to resolve anything; we're trying to identify issues
24 in the areas that we are considering here. We're not trying
25 to resolve them.

1 The Board has a mandate, and the mandate, as most
2 people will know, is technical. That's why "technical" is in
3 the name, the Nuclear Waste Technical Review Board. So
4 normally we don't deal with cost and policy and those sorts
5 of things. We cannot do that as an organization, but we can
6 record things that are said in the sessions, and we will do
7 that in the report that we'll prepare.

8 We're looking at spent fuel management at different
9 stages, all the stages from cask canister loading at the
10 utility sites are. Storage, which could be an independent
11 central storage installation or at the utility site,
12 certainly includes transportation. In one of the cases it
13 would include repackaging, which could be at a central
14 storage facility. It could also be at the utility site. It
15 could be at the repository site. If there is a central
16 storage facility, there could be further storage. There
17 could be further storage at the repository site at a separate
18 storage facility.

19 After central storage facility, there would be
20 further transportation. There may need to be overpacking for
21 disposal if there isn't direct disposal of the containers.
22 There's emplacement in the repository. And, as Rod just
23 said, postclosure is an issue which often gets short-
24 circuited, because it isn't an operation that people think
25 about. You're not actually doing anything active over the

1 next hundred thousand years, but postclosure is a very
2 important part of this, and we need to be sure that we
3 include that in the discussion.

4 Those are single issues, single items, single
5 operations. And the other thing that the Board has always
6 been very insistent on is that everything in this area needs
7 to be considered on a system basis. So we're not looking at
8 stovepiping certain areas and operations. We need to examine
9 the interactions between all these stages and operations, and
10 that's what that chart is that I'll come to in a minute.

11 The logistics for the day, we have two sessions,
12 and at the end of this presentation I'm going to ask for a
13 show of hands, because this room will be used for one
14 breakout session. We have another room which will be used
15 for the other breakout session, and that room is the Embassy
16 Room? I think it's the Embassy Room, and it's across the
17 other side of the breakfast area. And that room is smaller
18 than this; it's about half the size. So why we want a show
19 of hands is that whichever breakout session is going to have
20 more people wanting to go to it will stay here, and the
21 smaller population will go to the other room.

22 And so we will separate that way. And we need a
23 few minutes to set up when we've decided which room is which,
24 because we have different wall charts for the two sessions,
25 and we need a few minutes to put those on the walls.

1 We can move between sessions, but yesterday when we
2 had a dry run and we were talking to the facilitators who
3 will be involved heavily in the two breakout sessions, they
4 said they thought from experience it would be potentially
5 disruptive if we have people moving from one to another and
6 raising issues that came up in one in the other session,
7 because each will have its own dynamic, its own flow. And so
8 if you do move between sessions, we would ask you to be, not
9 restrained, but careful not to come in with ideas from one
10 and derail the discussion that is going on in the other
11 session.

12 We have three hours until the lunch break. That
13 closes the session, but it doesn't close input. And I'll
14 come back to that in a minute.

15 There will be facilitators in each session, one in
16 each session, and they are to guide, encourage, cajole, keep
17 control on target, keep on the time scale. They are to tease
18 out the discussion and, one of the main points, not let the
19 discussion get into trying to resolve the issues, but stay on
20 what are the issues, how do you define them, what are the
21 fundamental points, and what is it that comes from that that
22 needs to be recorded in the report that will come from this
23 meeting.

24 There are flow paths and interaction matrices.
25 They're the diagrams I'll come to in a minute.

1 Two Board members will be in each of the breakout
2 sessions to take notes. And I don't mean like a secretary,
3 but each pair of Board members have interests and expertise
4 in the areas of concern to the relevant breakout session that
5 they're in. And so we have two nuclear engineering Board
6 members who will be in the repackaging session, for example.
7 They know what this is about, and they will be recording not
8 just the words, but the interpretation of what's coming out
9 of the discussion so that we catch the essence of what the
10 issue is and the background. When we come to write the
11 report, which will be a staff issue, the Board members will
12 be there, having had the involvement of recording this with
13 their own expertise so that we catch it the correct way.

14 Also, in the afternoon they will give feedback into
15 a joint session, which will be back in this room, on each of
16 the two sessions. So the session on repackaging will have
17 two Board members who will feed back into the plenary this
18 afternoon the essence of the discussion that came out of the
19 issues on repackaging; similarly, for the breakout session on
20 direct disposal. And that will allow everybody who didn't
21 sit- in one session, and that will allow everybody to hear
22 what happened in the other session. And so that's the
23 opportunity for cross-fertilization. So if you're in the
24 breakout session on repackaging and you want to bring
25 something into the discussion about direct disposal, the

1 afternoon is the best place to do that.

2 This is being transcribed; yesterday was
3 transcribed; both of the breakout sessions will be
4 transcribed. And that allows us to rewind. That means that
5 we can go back and revisit a discussion to try and make sure
6 that we capture the points correctly.

7 The flowcharts, I'm going to walk down the room in
8 a minute and point some issues out here. The first session,
9 the breakout session, is a session that includes repackaging.
10 As we heard yesterday, there's why, where, when, and whom.
11 They're all variables; they're all important. We will not be
12 trying to resolve that. We will be saying, what are the
13 issues and what's affected and where might the repackaging
14 occur, what are things that might affect it, but not trying
15 to resolve any of those issues.

16 In the repackaging session, we've got to be looking
17 at a large number of flow paths. This is the flowchart that
18 the staff put together for the repackaging discussion. And
19 you can see this is the spent fuel pool at the reactor, this
20 is an independent spent fuel storage installation at the
21 reactor site, this is an interim storage facility, this is
22 the repository site. And I know you can't all see that.
23 That's why we've got multiples of these to put down the walls
24 so everybody can see one of these during the discussion.

25 What we have here are the flowcharts. The blue

1 lines are bare fuel. Some fuel is there in dry storage casks
2 now; and so even though this is focusing on repackaging, some
3 of the fuel will not need to be repackaged because it isn't
4 yet packaged. It's bare fuel assemblies in bolted spent fuel
5 casks. And so the blue, for example here, is bare fuel. The
6 green is large storage containers. And you can see that this
7 is a complicated diagram. We've put that together to
8 represent what we think the primary material flows.

9 And so there are many flow paths. There may be
10 many more than we have there. We're not trying to limit it.
11 This is to stimulate the discussion. So we're looking for as
12 much involvement as possible; and if there are issues that
13 come from flows that are not shown on there, we certainly
14 want to identify those as well.

15 In this scenario, after repackaging you're looking
16 at smaller containers, so potentially transportation is
17 easier. I'm saying that with some reservation. Easy is a
18 strange word to use in this context, but it doesn't have some
19 of the challenges that you do with trying to move the large
20 storage containers. And so the consequence of having smaller
21 containers is you have many more of them, so there's
22 implications there for transportation.

23 And I'm only picking a few here for example. This
24 is not to try and steer the discussion this afternoon.

25 In the other session, direct disposal of large

1 canisters, you're not looking at repackaging. This is the
2 workshop that's over there, and you see it's a much simpler
3 flowchart to the extent we have delved into this. Again,
4 this is the reactor site with a reactor pool and independent
5 spent fuel storage installation. This is the central storage
6 facility if there is one, this is the repository site, and
7 potentially you can see this is a much simpler flow diagram
8 than the Session 1 flow diagram.

9 For the consequences, you have no repackaging.
10 There is some packaging to do, because some of it is in bare
11 fuel. And that's the blue lines on that chart. Less flow
12 paths, but there may also be more than we have shown there.
13 And, again, we're not trying to limit it to these. We're
14 trying to be as inclusive as possible. And the consequence
15 is that you've got hot and heavy all the way: large
16 containers, larger heat load, obviously more fissile
17 material, more radioactive material. And we're looking at
18 taking that all the way through to the repository and then
19 looking at what happens underground in the long term.

20 So that's what we tried to capture on the
21 flowcharts that we'll be using.

22 And then we have the other set of wall charts. I
23 have one of them pinned up down there. And I hope those of
24 you at the back can see enough of that to be able to read at
25 least the principles. And I'm going to put a couple up in

1 just a minute, but before I do, let me go through some things
2 here.

3 What we're trying to do is to make sure that we
4 cover all the bases. We're not going to go through those
5 interaction matrices cell by cell. The discussion will take
6 its own path through the issues that we're going to have
7 under discussion. The rapporteurs will make sure that the
8 conversation keeps moving and doesn't get stuck, and we're
9 trying to cover as much as we can on that. We will be open
10 for comments afterwards, so don't think at the end of today,
11 if you haven't got your point through, that's the end. And
12 I'll come back to that point in just a moment.

13 On the matrix, each of the matrices, you go along
14 the diagonal from top left to bottom right. You're following
15 the flow of the path of materials that we have with the
16 arrows on the two wall charts there. Above the diagonal,
17 what we're looking at is the impact of a later stage on
18 actions at an earlier stage. And I'll come back to that in
19 just a moment. Above the diagonal is impact on later stages.
20 Below the diagonal is impact on earlier stages. And we are
21 looking at the interaction, the dynamics, as much as
22 possible, not just individual operations.

23 So, as an example, this is the process and I
24 apologize for the quality. We've tried very hard to get this
25 clear, and for some reason it doesn't happen. But I hope you

1 can see enough of this to understand where I'm going. This
2 is the diagonal; this is spent fuel in the spent fuel pool at
3 the reactor site; this is canister loading; and these are
4 operations all the way through to disposal. You cannot see
5 the color very clearly. This is the same pink color as we
6 have on the flowchart, meaning the reactor site; this is
7 transportation in white; this is meant to be the same color
8 as the light green for the central storage facility; and this
9 is the repository site.

10 And the others on here are meant to show you where
11 the discussion can go, encouraged by the facilitators. If
12 you look at this cell, which is canister loading, B-2, and
13 this one here, which is E-5, transportation, the words there
14 say, "What is the impact of canister design on
15 transportation?" So that discussion would be, you've made
16 decisions about the canister loading. That includes the
17 design of the canister, the operations, the materials. And
18 the question to be answered is: What is the impact of that
19 design, that decision, on transportation operations away from
20 the reactor site? And the facilitators will encourage the
21 discussion in that way.

22 This question here is: What is the impact of
23 canister design on disposal? That is, the canister loading
24 operation takes place there. This is disposal. And I'll
25 follow Rod's lead and say, we have also fallen into the same

1 trap and said disposal, and that must include post-disposal
2 performance of the package, looking at engineered barriers,
3 the type of geology, and the impact that has on the
4 performance. And so this disposal cell down here is
5 particularly important in both of the scenarios, but it's
6 going to be a big focus on the discussion of differences with
7 the large containers.

8 The arrows down here, we've gone back the other
9 way. This is transportation away from the reactor site.
10 This is canister loading, as we said before. So that arrow
11 will stimulate the discussion: What is the impact, and that
12 is what it says here, what is the impact of transportation
13 requirements on canister loading? So if you're going to
14 transport something away from the site, what does that tell
15 you about things that you need to take into account during
16 the canister loading operations, planning for decision
17 making, licensing?

18 So that is the dynamic that we're trying to get
19 from the decision matrix, which is one example on the wall
20 over there.

21 And I should say, I started out by saying this is
22 meant to be the start of being very informal. If you have
23 questions, please ask me. If I'm not getting the point
24 across, please ask me. This is trying to set up the
25 discussion in the breakout sessions, and I want to be sure

1 that I'm getting the discussion points across.

2 So these are examples of the question, I've been
3 through some of these, how does the spent fuel storage in the
4 utility pool impact canister design? And that would be the
5 path from A-1 to B-2, which is there. That's a different
6 example from what I just said. A-1 to C-3 is that one. And
7 we could go through that, and these are just example
8 questions.

9 Like I said, these will be on the Web site, which
10 maybe is not going to help. We wanted to have this printed
11 but couldn't find anywhere to do that overnight. So
12 apologies, but we don't have that printed.

13 This is, again, to show you not something to be
14 dealt with now, but an example of how we will record this
15 discussion for comment later and later input on the Web site.

16 This is a Word table. We have all of the dynamic
17 flows. In this case it's Cell A-1 to Cell B-2. The example
18 here is from Cell B-2 to Cell E-5, let me go back to here, so
19 B-2 to E-5. So that one there, as one example of an issue
20 that we put down just to tease out the discussion, is that
21 soluble boron is used in criticality analysis as the basis
22 for canister loading. This is an issue that came up, I
23 think, in Rob Howard's presentation yesterday.

24 If the loading of the storage cask is based on an
25 assumption that there is soluble boron in the pool water,

1 then that will be taken into account in the criticality
2 analysis for cask loading. And if that is used as a basis
3 for cask loading at utility sites, the possibility exists the
4 canister may not meet the criticality requirements for
5 transportation, because if during a transportation accident
6 the cask were breached and there was water ingress, then the
7 water that got in would not have the same soluble boron that
8 was used to meet the regulatory requirements for loading the
9 cask in the spent fuel pool.

10 I'm not going to go through all of that. That's an
11 example of how this would be recorded by the two Board
12 members in each of the breakout sessions so that we capture
13 the points for the report.

14 I want to keep this fairly brief so that we can
15 move into the breakout sessions, but these are other
16 essential points. We are looking at commercial fuel
17 primarily, not by desire, but because it's the right thing to
18 do. It's the majority population of spent fuel in storage
19 casks, and it is the main focus of attention, has been in the
20 industry for a long time. DOE has its own spent fuel in
21 containers that may need to be repackaged. And what we don't
22 want to do is to look only at the commercial spent fuel and
23 not take account of the fact that there may be a repackaging
24 requirement for DOE spent fuel.

25 So this part, it's out of sight, because we don't

1 have information on that at this workshop. It's not out of
2 mind, and we will try and find a way to fold that in during
3 the preparation of the report. Certainly DOE EM, which is
4 the majority owner of DOE spent fuel, know that we're doing
5 this and that we're in discussion with them about how to
6 handle that.

7 I'd like to ask that you help the rapporteurs.
8 They have a difficult task. If I go back to this example
9 here, this is what they're going to be trying to capture,
10 maybe not in that length of discussion for today, but in
11 order for them to be able to capture the points correctly,
12 some of which will be outside their own areas of expertise,
13 what we'd ask is that you help them by giving them time. The
14 facilitators will work with them on this. But if they need
15 to clarify things, they're going to need to ask that and make
16 sure they capture things correctly.

17 Not everything can be reduced to sound bites.
18 Maybe that's a little trite, but what that's meant to say is
19 that there are some issues where there's going to need to be
20 discussion about how to capture things correctly, and one of
21 the best times to do that is going to be during the sessions.
22 Nowadays there tends to be a focus on reducing things to very
23 few words and make things very quick. This workshop we need
24 to not do that, but to record things fully.

25 The workshop ends at 5:00, but the door remains

1 open. What I mean by that is, we will close promptly at
2 5:00. We know the people, particularly who live in D.C.,
3 will want to get away to travel home. We will take comments
4 and input after the workshop. The Web site is open, and
5 we'll be looking for input to the extent anybody wants to
6 give it. There is an e-mail address, november2013workshop@
7 nwtrb.gov. For those of you who registered, it's the same
8 e-mail address that you used there. If you want to e-mail
9 things in, questions, comments, answers, documents, you can
10 do it that way. So that is the open door afterwards.

11 We will record the logs that the Board members
12 take, the rapporteurs, these logs. We will post those on the
13 Web site. Target will be early December, the week after
14 Thanksgiving. If we have comments before then, we'll take
15 account of the comments before we post those records, so
16 we'll take account of those.

17 And then the final, and final doesn't mean the end,
18 but it's the final ones that we will post on the Web site.
19 Those we'll try and get posted by the 16th of December,
20 taking into account any other comments that come in during
21 that period.

22 The transcript we would expect to post by about the
23 16th of December. That's the transcript from the workshop as
24 a whole. And we're looking at a Board report during the
25 first half of 2014.

1 So that, I hope, sets the scene for not only the
2 breakout sessions, but where we're going with the report
3 after that.

4 So there are the end of my slides.

5 Can I ask for any questions or input or comments?

6 And, like I said, this is free range. The start of the
7 breakout sessions is now, and we'd appreciate any input from
8 anybody.

9 (Pause.)

10 Having no questions, okay, then to the next thing.
11 Can we have a show of hands, please, Breakout Session Number
12 1 is the one that includes a discussion of repackaging with
13 this flowchart here. How many people want to be in that
14 session?

15 (Pause.)

16 Okay. And how many people want to be in the direct
17 disposal of big containers session?

18 (Pause.)

19 I think the direct disposal is going to be in the
20 other room, but not by a large margin. I would say that was
21 45-55 or 40-60. All right? Okay. Well, what we'd like is
22 about ten minutes for the staff to be able to put the wall
23 charts up, get everything set up, let the Board members get
24 set up. So I'll look forward to everybody being back here
25 after lunch. Thank you.

1 (Whereupon, the meeting was adjourned for a recess.)

2

3

AFTERNOON SESSION

4

1:00 p.m.

5 EWING: All right. If you would take your seats,
6 please, we'll get started in just a moment. Well, this
7 afternoon the plan is to join together and hear from the
8 rapporteurs about what happened in each of the two sessions.
9 As you know we had two Board members in each session taking
10 notes, trying to capture the wisdom that was expressed during
11 the discussions. So I'll just turn it over immediately to
12 Board member Lee Peddicord who will give his summary, and
13 then we'll have a facilitated discussion. The same
14 facilitator who was in the session will lead us through the
15 discussion. And this is, again, another important
16 opportunity for you to provide input to the discussions. So
17 I really encourage you to do that.

18 All right, Lee.

19 PEDDICORD: Thank you, Rod.

20 So good afternoon. Am I on here? Can you hear me?
21 Okay. So I am Lee Peddicord. I am a member of the Board. I
22 am also a Professor of Nuclear Engineering at Texas A&M
23 University.

24 SPEAKER: Moo.

25 (Laughter.)

1 PEDDICORD: There can't be that many Longhorns in the
2 room, really. I want you to do a better job here though.

3 And I want to introduce my co-rapporteur, Professor
4 Paul Turinsky, from North Carolina State University. So Paul
5 has asked me to share that anything that I'm going to be
6 talking about this afternoon with which you disagree is all
7 things that he has put into the program.

8 So the intent here is to go through our endeavors
9 in the breakout Session 1 which dealt with the possibilities
10 including repackaging. So note that that's this diagram here
11 on the left. It's so much more complicated and challenging
12 than the diagram over here on the other side, on your right.
13 And so they have a really nice presentation. I'm afraid that
14 mine doesn't meet that standard, but we're going to go
15 through this.

16 So what we as rapporteurs were doing was working
17 off the matrices that we had been provided with the idea of
18 trying to link the different elements in the matrix and those
19 connections and the issues, the technical issues that relate
20 to one another. I can report at the outset that I failed
21 miserably in that endeavor.

22 You know, that I'm very charmed by that television
23 commercial that talks about people, what they really would
24 like to do, you know, and this is what you do in retirement.
25 You want to be a pilot, you want to be a gardener, things

1 like that. I have discovered that in retirement I'm not
2 going to be a court stenographer after sitting there for
3 three hours trying to type, well, you're going to see the
4 results of this.

5 And times are tough and budgets are tight in higher
6 education. Being down in Texas, I want all of you to plan a
7 lengthy road trip over the Christmas holidays so you use up a
8 lot of petroleum from the Permian Basin and we get the
9 severance taxes from that to continue to support us in the
10 way that we're accustomed to in Aggieland.

11 So we're going to go through this. One of the
12 things as a professor I'm going to want to do is make some
13 homework assignments. Okay? So what I have attempted to do
14 is capture the remarks that were made in our session. And
15 very quickly I started labeling these in terms of the
16 chronological order because we're going to have the
17 transcript of the session as well. And I started putting
18 labels on there of the people that made the remarks, and
19 you're going to either see a name or your affiliation. So if
20 we go according to the game plan, this is actually going to
21 be up on a website at some point, and you can dive in and put
22 it right, of what you really wanted to say as opposed to my
23 version of what I thought you said. So I hope you'll have
24 that opportunity and feel free to do that.

25 Now, to accomplish this, we were working off a

1 template that looked like this. You hadn't seen this, but
2 this was a connection again of the various elements of that
3 matrix to each other. So if we started off with A1 over
4 there in the top, upper corner, there were elements then that
5 would link it to B2 and all the way down to K11 which was
6 final disposal. And in a perfect world, which I would have
7 to report we didn't quite accomplish this morning, in a
8 perfect world we would have all the sets of comments that
9 would have filled in just as Nigel had outlined connecting
10 the boxes of that matrix. I tried to do that for about the
11 first five, okay, and then it went off the tracks. So what
12 I'm going to report to you then is the summary of remarks
13 that by and large fall under the other category of additional
14 comments because I wasn't quite sure where they plug into
15 this nice matrix of things.

16 So I'm going to kind of go through these. Of
17 course we saw there were overarching comments that really
18 bound a lot of things together. And I think those are a lot
19 of the main points. But there was a lot of interesting
20 detail and technical details as well. So with that basis, I
21 hope you will endeavor to sign onto this. And let's kind of
22 go through this. And I hope you're going to be seeing this.
23 Is this officially readable to you all? Okay. Well, that
24 blows the second part of my plan out of the water.

25 Can you make that bigger, Bill?

1 HARRISON: Maybe. I think it's a little blurry.

2 PEDDICORD: Can you make it unblurry too? Bigger and
3 unblurry, that's my aspiration in life, bigger and unblurry.
4 There we go. Now do we have everything? Are we going to
5 pretend that's it?

6 Okay. So how are you doing back there? You were
7 the one shaking your head no, you couldn't read it. Still
8 can't read it?

9 You know, I am teaching the freshman in Nuclear
10 Engineering at Texas A&M University, and I don't let them get
11 away with this stuff, you all camping out in the back of the
12 room on your laptops plugged into the wall and things like
13 that. It used to be in earlier years I would throw erasers
14 at them, but we don't have erasers anymore. So it's hard to
15 come up with punitive measures for the freshmen to kind of
16 get them to pay attention. So you guys are lucky back there.
17 You're settled in. You're plugged in. And all I can do is
18 hope to blind you with my laser pointer here.

19 So, okay. So on this basis let's kind of walk
20 through this. Now, what we won't be able to do is kind of do
21 realtime editing on this. We don't have the time. I don't
22 have the energy, and so on. So we're going to try to step
23 through this. And as I say, the main thing I want you to see
24 is where there is the links back to whomever made these
25 comments and so on and an invitation then to jump in and

1 within the next couple of weeks, I think, to make them right.

2 Dr. Zoback, there's room up here. Come on up.

3 Come on up.

4 DANIEL: There's seats up here if anybody wants to move
5 up here.

6 PEDDICORD: Yeah. If you're going to sit there and
7 squint.

8 DANIEL: There's four seats right here.

9 PEDDICORD: --and make me feel badly, you're going to
10 have to relocate to the front of room.

11 DANIEL: We can put chairs up here. We'll accommodate
12 anybody who wants to move up.

13 PEDDICORD: So either--

14 DANIEL: Diane, there's a seat here.

15 PEDDICORD: So either no sitting there and squinting, or
16 get up here.

17 DANIEL: What we're trying to do here is we want to run
18 through these comments or these issues, and if there's
19 something that we can add, you know, briefly that will help
20 refine the issue or to make it more complete, we want to
21 capture that. And Dr. Turinsky here is going to do that in
22 longhand. Like Lee said, we're not going to do it in
23 realtime, but we want to capture that additional thought.
24 Okay?

25 PEDDICORD: You guys are going to look so good.

1 DANIEL: So if there is something, don't hesitate.
2 Raise your hand. We'll bring you a microphone, and we'll get
3 that information. And as, again, as Nigel said and Lee also
4 said, there's going to be a period of time after you leave
5 here if you want to add something else based upon a
6 conversation tomorrow or a week from now, you can still do
7 that. Okay?

8 So go ahead, Lee.

9 PEDDICORD: Okay. So let's give this a try. So we're
10 starting out, again, these numbers here are the order in
11 which the comments were made during the session if that will
12 help you think back. It's certainly going to help once the
13 transcription is available and so on.

14 So we started off, and I don't know if I have this,
15 this was to link A1 to B2 over here. And I don't even know
16 if that's in the right spot. But we started off with this
17 discussion at shutdown plants without a spent fuel pool, the
18 need for repackaging and so on. Nigel Mote Nigel, where are
19 you? Hand up. Okay.

20 Nigel interjected some of the experience in moving
21 into dry casks and so on. We heard from Areva about the
22 possibility of the mobile repackaging and so on. And the
23 fact that three options are under consideration for this, not
24 necessarily well-developed.

25 I don't remember who made these comments. I don't

1 know. This was somebody sitting over here. And so again, I
2 apologize. I didn't get them linked back properly to you
3 all.

4 But then, Bob Einziger, where are you? So we had a
5 lot of input from him on assumptions of what could be done in
6 terms of this repackaging and so on.

7 It was noted several times, and there are some of
8 these things that are quite recurring, that on the chart over
9 here where we have multiple loading and unloading functions,
10 the whole issue of standardization, again, this became a
11 theme very much to our conversations and so on as did this
12 next one of how one step in the process very much links back
13 to other steps as well with the real bottom line being it's
14 very challenging until we have really a definition for the
15 requirements of the repository because this will feedback
16 will the way up into virtually all the previous steps.

17 And this was from Rob Howard.

18 Rob, where are you?

19 Okay. There he is, sitting in the back of the room
20 as well too.

21 So this is an indication of the identifiers you'll
22 find in the remarks.

23 Bill, let's start scrolling down.

24 Yes?

25 MAKHIJANI: This is Arjun Makhijani.

1 PEDDICORD: Okay. Paul--

2 MAKHIJANI: Some of this is not quite how I remember it.

3 And--

4 PEDDICORD: Okay. What would you add, Arjun?

5 MAKHIJANI: Could we go down? Could we go back up?

6 PEDDICORD: Back up, Bill.

7 MAKHIJANI: So for instance, in the first bullet I think
8 it was Dr. Einziger who said that the mobile, or he also said
9 mobile option, it's very important. They're not three dry
10 transfer options as that would imply. One is completely
11 theoretical, the mobile one.

12 PEDDICORD: Well, let's ask Areva. That's their
13 section.

14 MAKHIJANI: That's correct. So my memory is, although
15 I'm getting on in years. Then it was also said that the cost
16 of the dry casks would be very high not in the--of the
17 transfer system if you're going to do because hot cells would
18 be required. They'd be very expensive. And the cost may be,
19 you're thinking tens of millions, maybe a zero might be
20 added.

21 So the second bullet, only one vendor is reloading
22 damaged fuel. That's actually not accurate. They that only
23 one, in my memory, only one reactor site is loading failed
24 spent fuel, loading high burnup fuel in failed fuel cans for
25 dry storage. It's completely different than what's been

1 written there.

2 And so I'm a little, I'm pretty uneasy about what
3 I'm seeing in these notes.

4 PEDDICORD: Well, that's why it's going to be up on the
5 website for further comment.

6 MAKHIJANI: Okay. Well, think--

7 PEDDICORD: So Paul, did you get that?

8 MAKHIJANI: --my comment would be that you please verify
9 these bullets against the transcript before you post them as
10 anything official. Because I think that they're pretty
11 inaccurate.

12 DANIEL: Yeah. And we're definitely going to do that,
13 Arjun. So thank you.

14 PEDDICORD: And some of these other things did get
15 captured later on. You'll see the points you were making
16 because they arose later in the conversation, not at this
17 point.

18 MAKHIJANI: But the second bullet is really inaccurate.
19 It's not what was said. So what's written there is not
20 correct. And that's the only point I want to make. I'm not
21 trying to redo the conversation.

22 PEDDICORD: Okay. So we've got that down.

23 MAKHIJANI: I just hope that the notes will be accurate.

24 DANIEL: We've got it captured. Thank you, Arjun.

25 LOMBARD: Okay. Thank you. Mark Lombard, Nuclear

1 Regulatory Commission. I'm sorry I wasn't here this morning,
2 but if you get out of the box a little bit when you talk
3 about dry transfer options, I think we're looking at above
4 ground dry transfer options. And you may look at below
5 ground or grade level where you actually dig a hole and start
6 moving the fuel actually at the grade-level type. So we need
7 to be a little creative as we look forward. And the
8 collective "we." When I say "we," I mean a collective we.
9 As you know, NRC only independently regulates.

10 The second note, bullet number four, I mean, NAC
11 has given us information that they are loading all high
12 burnup fuel into cans. So I'm not sure Bob meant reloading
13 damaged fuel, but there's, yes, there are some fuel
14 assemblies that are damaged, other fuel assemblies that are
15 high burnup fuel that are not damaged that are still being
16 loaded, not reloaded, but loaded into cans by NAC.

17 PEDDICORD: And the above grade/below grade comment
18 didn't surface this morning, but that's a good one to add in.
19 And, please, ask Bob to dive in because his name shows up a
20 lot in this.

21 ZOBACK: Mary Lou Zoback, Board. What's the experience
22 in Iraq with high-level waste that I don't know about?

23 PEDDICORD: Well, you may want to go offline with this,
24 but--

25 ZOBACK: Okay.

1 DANIEL: Let me find that. I got one.

2 MOTE: Nigel Mote, staff. I don't think it needs to be
3 offline. After the first Gulf War, NAC packaged spent fuel
4 from the bombed Iraqi reactor. And that was all done using
5 dry transfer. I made the point, it's a refinement, and we
6 didn't catch all of this. The small assemblies, the research
7 reactor assemblies, I don't know what the burnup was. But in
8 terms of demonstrating that you can use dry transfer for
9 spent fuel, that was done. It was done as an exemption, so
10 this is not something that was done programmatically. But in
11 terms of technically demonstrating that you can handle dry
12 fuel and perform dry transfer operations, that has been done.

13 ZOBACK: Okay.

14 MOTE: Different fuel, different time, different
15 circumstances, but technically, it's a significant data
16 point.

17 DANIEL: Folks, if when you talk in the microphone,
18 don't forget to give us your name and your affiliation if
19 you're affiliated with a group, and then slide the
20 microphones to the center so we can grab them quicker after
21 you speak. Thank you.

22 Go ahead, Lee.

23 PEDDICORD: Going on, we are now going in chronological
24 order.

25 Earl, where are you? My name is Earl, Earl Easton.

1 Are you back there?

2 Then was asking some questions about some
3 regulations and how it's determined who does the repackaging.
4 Marvin Resnikoff, is he still with us? Yep, there he is.
5 Okay.

6 Start delving into the standard contract, this came
7 up quite a bit in various forms over the course of the
8 discussion. This was one of the earliest point in times; it
9 was raised in the morning. This is what I captured to this.

10 We were talking about the motivation for the
11 utilities going into large canisters, how this relates to the
12 standard contract. And because this was meant to try to fit
13 into the matrix, we had the comment from Areva who is our
14 representative on these implications on dry storage
15 retrievability and so on. And again, I encourage all of you
16 to edit these when you have the chance. This was the first
17 cut at this.

18 LOMBARD: Mark Lombard, NRC. I just to want provide a
19 little clarification. Yesterday, the gentleman from DOE from
20 Washington, D.C., did provide some feedback on Part 72. And
21 his recollection of Part 72 is that it may cover repackaging
22 activities. And I took a look at 72 this morning. And you
23 look at 72.2, the scope, and it says, "72-A1. Power reactor
24 spent fuel to be stored in a complex that is described and
25 constructed specifically for storage of power reactor spent

1 fuel."

2 Later on in 72-A2, the term "monitored retrievable
3 storage installation" or MRS is derived from Nuclear Waste
4 Policy Act. Obviously, it includes any installation that
5 meets this definition. If you go further into 72, the
6 definition of an MRS, then this, I think this is where some
7 of the potential confusion may come up in 72, that "An MRS is
8 a complex design constructed and operated by DOE for the
9 receipt, transfer, handling, packaging, possession,
10 safeguarding, et cetera, of storage of spent nuclear fuel."

11 Later on in Part 72, it talks about the emergency
12 planning requirements and says if there's repackaging, that
13 there will be specific emergency planning requirements placed
14 upon that facility.

15 So again, Jeff, we've got to delve into 72 a little
16 bit more. It's not exactly clear. I didn't get a chance to
17 look at the statements of consideration on it. But it deals,
18 still needs a little bit more analysis to determine what
19 scope 72 will actually cover.

20 PEDDICORD: Okay. So if we move along a little further,
21 we get into a set of comments that again are relating final
22 disposal to other parts of it.

23 So, Arjun, these were comments that you were
24 inserting, and so I encourage you to take a look at them and
25 see if you want to modify any of these in terms of the

1 repository and the characteristics and how it dictates the
2 answers to some of the earlier questions. That again was a
3 theme that came up several times in the course of the
4 discussion.

5 Peter Swift from Sandia talked about designing a
6 generic canister, some of the possibilities. And there is
7 work underway at Sandia.

8 And Diane--

9 CURREN: Diane D'Arrigo or me, Diane?

10 PEDDICORD: I think it's you. I think this was some of
11 the questions you had about a standardized canister for all
12 disposal sites. And again, Peter Swift amplified on that a
13 bit as well too. So again, rather than go through this in
14 detail, please, take advantage of the opportunity to go to
15 the website and if you want to expand on these and other
16 comments and points you've raised as well too.

17 And then Nigel Mote had also contributed to this
18 discussion in terms of it would be good to know what the
19 geology is that we're going to go into.

20 Do we have a microphone?

21 CURREN: This is Diane Curren. I have a process
22 question. Are you going to go back and go through the
23 transcript and revise the notes?

24 PEDDICORD: Uh-huh.

25 CURREN: Because frankly what I'd rather do is wait for

1 your more complete version and then comment on that rather
2 than all of us doing the same thing.

3 PEDDICORD: Well, let me ask Nigel what the order of
4 march is.

5 MOTE: I'd rather not be the arbiter. I think it's
6 whatever the group feels is the best use of their time.

7 PEDDICORD: So we had a--so the comment was to reconcile
8 this with the transcript before inviting further comment.
9 Did I say that correctly?

10 MOTE: One of the intentions of this session was to let,
11 in this case the participants of Session 2, know some of the
12 main points that came out of Session 1 so that there's an
13 opportunity to say well, we didn't hear that one in our
14 discussion; but, you know, it's relevant to ours as well.
15 Not that's something that the Board can take on but maybe not
16 as completely as if the participants here have a chance to do
17 the same thing.

18 Right. You look like you're about to make a
19 comment.

20 EWING: Just to add to the discussion and maybe the
21 confusion. In my view, the purpose of these, of this
22 afternoon's session, is to allow everyone to get a taste of
23 what was discussed in the session that they weren't in. It's
24 probably not possible or useful at this stage to be
25 necessarily correcting and worrying about comparing things to

1 the transcript. You should certainly speak up if you think
2 things aren't--the conversation's not captured. What we need
3 to know is what was the nature of the conversation. And it
4 certainly fine to continue the discussion and arguments in
5 this afternoon's session.

6 So what we want to do is be sure that you've had
7 every opportunity to participate in or hear a report from
8 both sessions. And we're not writing a report right now. So
9 we needn't get every detail correct.

10 Nigel, is that fair?

11 MOTE: Yes. Absolutely.

12 EWING: Okay.

13 PEDDICORD: Bill, let's steam on.

14 CURREN: And I don't mean to go--I think for a minute I
15 just need to go back and understand better what the overall
16 process is here. And I understand what you're saying about
17 this afternoon. But I was assuming this group is going to
18 prepare some kind of summary report of what were the findings
19 and recommendations and share that with the relevant
20 authorities. And that's really what I'm interested in having
21 some further opportunity to comment on and say, okay, did you
22 capture such and such. And you don't have to take any
23 comment, but to be able to give it to you, will that be part
24 of this process?

25 DANIEL: That's what we should--

1 CURREN: Well, but I really mean, I'm, no offense, but
2 this is really hard to do. I think you did as best you could
3 summarizing long comments by people, by many different
4 people. And it's difficult to capture the complexity of a
5 discussion like this. And I don't think that what's
6 happening now is going to get at it. If this is what we're
7 using--if there is what you're going to--the corrections here
8 and the main thing you're going to use, and I, frankly, I
9 don't want to have to do it myself. I want a chance to see,
10 well, what do you really think did happen here today on a
11 piece of paper and comment on it.

12 DANIEL: Diane, let me try to address your concerns a
13 little bit. We want to be sure that we generally captured
14 the essence of what was said earlier. And that's what we're
15 trying to portray here. We're not going to be able to
16 capture every detail of what was said. And when the report
17 is written or as a draft report is written, they're going to
18 refer back to the actual transcript of what was said. But
19 for this purpose or what we're trying to do now, we're trying
20 to generally characterize what was discussed so that
21 everybody can hear. And if there is anything else that might
22 be added.

23 We're not try--this is not like the final "this is
24 what it's going to say" or whatever. That's going to come
25 has yet to happen. So just generally speaking, Lee is going

1 to talk about the general essence of what we discussed
2 earlier. If somebody sees some glaring problem, something
3 missing, or some distortion, we want to have that brief
4 discussion now and move on. Does that help?

5 LESLIE: And Rick, this is Bret. Now, I'm not the
6 facilitator. I put my staff hat on. And this is what we
7 presented in the other room which is really the next steps.
8 And I think it's a process, this was the first effort of the
9 folks, the rapporteurs, to try to capture things realtime.
10 By December 2nd we're going to use the notes we have and put
11 that on the web so that people can better understand what the
12 issues are.

13 The people who've participated today, if we've
14 mischaracterized, we're looking for feedback by the 16th of
15 December. Kind of, if you see these things and we're not on
16 the right page, that's an opportunity to do it. That's the
17 process in terms of how we're trying to get some additional
18 feedback. Again, what Rod said and Nigel said, today, right
19 now, this session is so that everyone can hear what the other
20 session heard. And if we're way off base when Lee goes
21 through or when Jerry goes there, send us an e-mail or write
22 it down on a card and help us to get something posted earlier
23 on that's more fitting with what you tried to say.

24 PEDDICORD: Arjun.

25 MAKHIJANI: You know, I'm Arjun Makhijani. Really now I

1 think it would be--first of all I don't think December 2nd or
2 December 16th is enough time especially if we get the
3 transcript on December 16th. We wouldn't have a chance to
4 consult it before and refresh our memories as to what was
5 said. So I would suggest that we carry this over at least
6 into early January. We have also got NRC deadlines on
7 December 20th.

8 Secondly, you know, for me, this--I echo what Diane
9 said--this is not useful to try to say what's really
10 inaccurate because I'm going to want to talk about every
11 single item because my understanding of what was said is
12 different than everybody else's. And we can have an endless
13 discussion about what was important without trying to
14 recapture all the details. I want to hear what the Board and
15 Board members and staff got out of the discussion so I have
16 an understanding of what you got out of it and what you're
17 taking to the report writing. And I hope that you will
18 really seriously consult the transcript and fix this thing
19 because right now in its current state it's not--you know
20 there was an Arjun-related comment. I didn't jump up and say
21 anything because it would take me five minutes to fix that.

22 Now, I really think that it would be better if we
23 hear what the NWTRB got out of the two sessions and then have
24 a discussion out of that. My suggestion.

25 DANIEL: Thank you, Arjun.

1 You know, oh, go ahead.

2 EWING: So speaking out consulting the Board and with
3 all due respect, I think the Board would not want to say in
4 some general way today what we got out of it. What we're
5 doing is trying to get information. Now, it may be the way
6 we're capturing the information and the discussion is not
7 satisfactory. I share your frustration. But the main
8 purpose is to get as much input as possible so that when we
9 look at the transcript, when we look at these records,
10 important topics aren't left off. But to get realtime
11 response from the Board I would say is inappropriate.

12 DANIEL: All right. So we're going to move on. We're
13 going to attempt to go through these issues. Lee is going to
14 attempt to talk about them. Again, if we see glaring gaps or
15 something or you think we can better characterize something,
16 please, speak up. And as Rod said and Nigel has mentioned
17 that there's going to be transcripts that compare to the
18 issues. These will be written in much finer detail, and
19 they'll be available to you at a later date, soon.

20 EWING: So to everyone, I would say that particularly in
21 the sessions that you participated in, as we scroll through
22 these topics, there's perhaps not much satisfaction in simply
23 listing "X said something on Y." But if they're important
24 topics that you think were discussed to advantage or not
25 discussed well enough, then this is the time to bring that up

1 and to our attention so that it's not left out.

2 GREEVES: John Greeves. Just you're time limited here.
3 Can somebody just tell me what the five issues that rose to
4 the top were?

5 PEDDICORD: Okay.

6 GREEVES: That's what I was expecting. I didn't attend
7 a session, but if you could just present what were the high
8 points? You don't have to formulate an opinion on them, just
9 what did you sense were the issues of concern to people?
10 What were those fives?

11 DANIEL: I'm making up five.

12 PEDDICORD: Well, I'll endeavor to do that and probably
13 will go to somebody else and we'll have five others. So a
14 number of things emerged. As I say, at the top level I think
15 one of the really important points is that as you look at
16 this diagram, that matrix, and so on, until you have
17 characteristics of your repository find, it's difficult then
18 to define a lot of the parameters around these earlier steps.

19 Conversely, if that was known, if you knew what
20 kind of geology you were going to go into, even more
21 specifics about the site and so on, it would help immensely
22 in defining the requirements for many of these other steps in
23 the process. So if there was kind of an overriding point, I
24 think that was one of the most compelling.

25 Then as you drill down, there was a lot of

1 information in terms of what are the various regulations, and
2 looking to our NRC colleague again, in terms of perhaps
3 inconsistencies because you have different regulations,
4 whether it relates to thermal load, criticality, and so on.
5 As you move from an initial storage, say a spent fuel pool to
6 transportation, interim storage, disposal, and so on, some of
7 these are not defined yet; but even now there are
8 inconsistencies in these. And it was reported to the group
9 that these are things that are under study. But differences
10 between Part 71 and Part 72 and so on, so that's an ongoing
11 effort, but it's also affected by this first comment I made.

12 GREEVES: That's two. I expected them.

13 PEDDICORD: Okay. Well, you wanted the top five. Then
14 yes, then we got into a lot of discussions on the
15 transportation, the modes of transportation, and what things
16 are going to look like that are going to be transported, what
17 are going to be repackaging requirements to satisfy various
18 elements of the transportation infrastructure, if you're
19 going up--

20 Just a second. I'm getting prompted here. Whisper
21 louder.

22 Size of casks, for example, and so on--

23 You weren't even in our session were you? Oh, were
24 you? Where were you sitting? I missed you. Okay. That's
25 right. Wish you sat closer. You could have typed all this

1 stuff in. It would have been better.

2 So the transportation as it fits into this, and of
3 course we've got two elements in this particular scheme of
4 the transportation piece of it as well too. Some discussions
5 can eliminate one of those. Could you do something at one
6 point? Because it might also eliminate a repackaging
7 element.

8 Another thing that was brought up is, both on a
9 location sense and a temporal basis, where you do the
10 repackaging. Because we're talking about the storage at
11 various possibilities of some significant length of time,
12 maybe many decades, maybe 100 years, and so on. And so as a
13 result, it depends on where one chooses in this progression
14 of events of where to do that. Again, it impacts things
15 later on; and where you do it, it impacts things again
16 earlier.

17 LOMBARD: Sorry, Lee. Mark Lombard again. I appreciate
18 what the Board has done because this is really complicated,
19 it's at least a three-dimensional issue. And you've taken
20 this two-dimensional table and have used it to try to put it
21 in a three-dimensional space. But I think you've touched
22 upon a key point here. It's really almost a flow chart, a
23 decision flow chart. And, you know, depending on where the
24 repository is or what geological make up it may have takes
25 you down one path or another.

1 So it's--I appreciate what you're trying to do.
2 It's really difficult to do it in even a two-dimensional,
3 three-dimensional-type table. A flow chart might help us see
4 it a little more easier. But then again, it becomes more
5 complicated as far as trying to roll that up in a report.

6 PEDDICORD: Okay. How many have we gotten so far?

7 DANIEL: I think we're on--

8 SPEAKER: You said four.

9 DANIEL: That's--

10 PEDDICORD: We're at four? Okay. I only need one more,
11 huh.

12 SPEAKER: Maybe five. I don't know what you did.

13 PEDDICORD: So Peter Swift points out--

14 Thank you all here in the front row. Step forward
15 here.

16 So the other element that comes in, although less
17 of an element for the Board because of our technical focus,
18 is the issue of cost and so on. But we're talking about, and
19 again, depending on the choices that were made, very
20 significant costs and being directly affected by the design
21 of this and so on and the cost.

22 There was another one I wanted to mention and it's
23 skipped my memory at the moment.

24 TURINSKY: Lee, you want me to pick up?

25 DANIEL: Yeah.

1 PEDDICORD: Yeah, oh, Paul--

2 DANIEL: Paul's going to pick up here--

3 PEDDICORD: He's got the notes.

4 DANIEL: --and maybe add a couple things.

5 Go ahead, Paul.

6 TURINSKY: Yeah, I have the advantage of having notes in
7 front of me. Some of these probably Lee has said already.
8 One thing was basically the conflict of interest, the way
9 we're structured between the people who store the fuel, the
10 utilities, and those who are responsible for basically
11 transporting it and eventually placement in the repository
12 which is the government. And they have each their own
13 objectives, and sometimes those objectives don't align when
14 you look at the overall life cycle of the fuel. And that's
15 different than let's say in Sweden.

16 Another thing was how, it was mentioned in more
17 detail by the NRC, but I would generalize it, how is safety
18 factored in over the whole life cycle of the fuel. So things
19 you may do now which may be beneficial for safety may
20 actually have some adverse effects later on that overwhelm
21 the savings that you had near term in the safety arena. We
22 didn't talk that much about safety. I was glad that someone
23 finally brought those points up. Okay.

24 Impact to transportation on upstream/downstream.
25 And this upstream/downstream impacts everything on it. And

1 when the final downstream step is undefined, what the
2 implications are that are--it's--you're making basically
3 decisions in a much larger space, possible space, than if we
4 did have a back-end-defined, final repository. But we don't,
5 and that's the reality that we have to live with.

6 Inconsistencies between storage and transportation
7 in particular in critical requirements was raised, and
8 actually Gene was well aware of that problem. It's already
9 reflected in his write-up.

10 The diversity of basically the canisters and casks
11 throughout the whole system, whether it's shipping,
12 unpacking, et cetera, they were going to basically repack at
13 a consolidated fuel storage facility. These folks are going
14 to have to handle maybe 30 different designs there, and that
15 has implications, obviously, in investments and in court
16 practices in that regard.

17 Where to repackage and when to repackage, I think
18 Lee mentioned that already. Are we doing it at reactor
19 sites? Are we doing it at the repository? Are we doing it
20 at a consolidated fuel system, and when do we repackage? If
21 we're going to basically consolidate storage, do we repackage
22 on receipt? Do we repackage when we're shipping out again to
23 the repository?

24 Pros and cons of dry and wet storage in regard to
25 basically fuel long-term behavior in the repository, the

1 thermal cycling effects.

2 DANIEL: All right. Is that--is that it, Paul?

3 TURINSKY: And then this overall thing that decisions we
4 make in the near term may have very adverse or beneficial
5 effects in the long term.

6 DANIEL: Okay. Thank you very much.

7 Diane.

8 CURREN: Yeah. This is Diane Curren. I want to follow
9 up on that last comment about the long term versus the short
10 term. And Lee, you know you said one of the most important
11 issues, and I agree, is that we don't have the repository
12 characteristics, and they should have an effect on the
13 decisions that are being made today about storage. But by
14 the end of our meeting it was said that the decisions we are
15 making today could foreclose choices about a repository. So
16 it works both ways. That--

17 DANIEL: Can you say that again, Diane?

18 CURREN: People are making decisions today about methods
19 of spent fuel storage that could end up driving or limiting a
20 decision about what's a suitable repository. I thought that
21 was pretty amazing.

22 PEDDICORD: One other thing that in my list of five that
23 I thought was very interesting is a lot of discussion of very
24 long-term storage. And again, Bob Einziger from the NRC
25 pointed out that the NRC does not license for long periods of

1 time, infinite periods of time, it's usually a 40-year basis.
2 And as we move forward and get to more and more reactors that
3 have been shut down, it raises a quite interesting
4 possibility that if they would come up for relicensing but
5 don't meet the relicensing criteria, what kind of situation
6 do you have there? What kind of pickle are you in at that
7 point?

8 I'd say it's not something I hadn't thought of
9 before, but that's incredibly interesting that we get into
10 this conundrum of having fuel on sites that don't meet the
11 relicensing criteria because these are going to come up
12 periodically. And as we are talking for many, many decades,
13 there may be through--one or two or three of these needs for
14 relicensing.

15 So the devil can be certainly in the details on
16 this. And that was really an important point as we kind of
17 refocused our thinking on what reality means there in the
18 regulatory space.

19 RESNIKOFF: Marvin Resnikoff. I'm unclear about the
20 timing of it all. If a repository will--finding a repository
21 will take another 20 or 30 years. Then how is that going to
22 influence the cask design? The utilities are right now, you
23 know, proceeding with filling up dry storage casks, so that
24 decision is already going to be made for us. I'm confused
25 about the timing.

1 PEDDICORD: I don't have any particular answer on that
2 either. I think you're right. I mean, yeah, I think you've
3 hit it spot on.

4 Rod, are you--you're sitting there poised.

5 EWING: Just a comment. First to bring something from
6 the other session to this discussion.

7 I think Diane, it's important to realize that in
8 the other session there was I would say strong advocacy for
9 the idea that actually the large casks should drive the
10 selection of the geology in the repository. And people can
11 speak to the issue, but the point was that this is the
12 problem in front of us today, and this is the initial
13 condition that we have to deal with. And so somehow let's
14 deal with it, and then the repository will have to fit the
15 decision that we make today.

16 Now, my counterpoint to that is that if we limit
17 our options on geologic disposal by early decisions of that
18 type, it's not clear to me that we'll have a repository. And
19 so those are two points of view. But the dilemma is how to
20 reconcile them because we're talking about risk over two very
21 different time frames. And so as a Board member this is
22 quite a challenging question. And we have to get it out, I
23 think, to policy makers so that they realize the pros and
24 cons of decisions at either end, from looking from the
25 repository perspective or looking from the perspective of the

1 utilities.

2 DANIEL: Adam.

3 LEVIN: Yeah, Adam Levin. As I sat and listened to the
4 discussion today, I have a very different take-away. And my
5 take-away is that I'm not--it's not clear to me that there's
6 things that we're doing today that are going to preclude
7 disposal options in the future, particularly if we have a
8 facility, a centralized facility whereby we can repackage
9 spent fuel into disposal-facility-appropriate canisters. So
10 in my view I think the appropriate question here is are we
11 pursuing activities today that preclude decisions about
12 disposal later? I think that's the right question.

13 DANIEL: Okay. Mark.

14 LOMBARD: Thank you. Mark Lombard, NRC.

15 Paul, I would--you have great notes about the
16 safety aspects and that they need to be holistically carried
17 throughout the whole back end or the middle of the back end
18 or the front of the back end. But also don't forget security
19 requirements. Because as fuel, depending on how long it
20 sits, this fuel may get to the point where it's below the
21 level that it's self-protecting. You know, that's defined in
22 Part 73. So you've got to keep that in mind as well.

23 And Adam brings up a good point. It depends on how
24 long the spent fuel is in storage, and waste confidence looks
25 at repackaging every 100 years. If spent fuel sits for 60,

1 80, 100 years, then you may be repackaging anyway depending
2 on the robustness of the dry cask storage system that it's
3 sitting in. So again, it's part of that flow chart that
4 takes you down different paths.

5 DANIEL: Any other issues, comments on Session 1,
6 repackaging of spent nuclear fuel?

7 Arjun?

8 MAKHIJANI: Yeah. Arjun Makhijani. There was a call
9 for defining what failed spent fuel is at one point, and that
10 surprised me a little bit actually. And then there was a
11 comment made about the difference between the U.S. and France
12 where in France they do failed fuel transfers only in pools.
13 Whereas here, failed fuel does not include fuel that is
14 damaged with pinhole leaks, for example. Whereas abroad it
15 might be considered damaged. So that in ordinary storage,
16 this is what, I believe Bob Einziger said this, is that here
17 we have spent fuel in storage that has pinholes and other
18 types of damage which are not regarded as damaged. And so
19 the question arises are we going to identify these? Are we
20 going to maintain spent fuel, spent fuel pool infrastructure
21 for repackaging given, and the point that I raised was that
22 in 2001, before all of this happened with Yucca Mountain
23 being off the table, or at least temporarily off the table
24 possibly, I don't know, nobody knows, that the NRC said we
25 don't worry about how we're going to transfer damaged spent

1 fuel from one canister to another. We'll know it when we
2 come across the problem and we'll deal with it at that time
3 in a formal petitioned response. And I think the time for
4 that is now and maybe the NWTRB might politely nudge the NRC
5 in that direction that they need to deal with this.

6 DANIEL: Thank you, Arjun.

7 Robert in the back.

8 SANCHEZ: Thank you. Robert Sanchez with GAO. I think
9 I made the point, and I think several other people have made
10 the point in this session that although this is a technical
11 conference looking at technical issues, there are a lot of
12 nontechnical drivers that may be making or forcing a
13 selection of the different technologies that we have. They
14 may be cost drivers; they may be social, political drivers.
15 The utilities are going to be--you know, many of the reactors
16 retiring at the same time. There's going to be a lot of
17 different things that are nontechnical issues that may force
18 certain decisions based on cost, based on what's certain and
19 what's not.

20 And overriding all this, we have a consent-based
21 approach which is going to involve the stakeholders, local
22 and state governments. And that may have an impact as well
23 that are nontechnical issues but may very well drive some of
24 our decisions.

25 DANIEL: That's a good point because Tito, that was

1 something you brought to me about your group over there,
2 similar discussion. Yeah.

3 Okay. Any other comments?

4 Diane. Let me grab you a microphone.

5 D'ARRIGO: Diane, Nuclear Information and Resource
6 Service. I raised a request that there be a technical review
7 of the various options for managing the fuel at the reactor
8 site at the long term without assumption that there would be
9 transportation.

10 LOMBARD: Sorry. Mark Lombard, quick comment. So one
11 of the, in my mind the biggest nontechnical issue, is since
12 there is no place to put--there is no repository that is a
13 result--resulting in over 1800 dry cask storage systems
14 around the country right now. If you look at the biggest
15 issue in my mind it's we don't have, we haven't implemented
16 the key pieces of the Nuclear National High Level Waste
17 Storage and Strategy that was issued in January of 2013.

18 PEDDICORD: So we haven't had the opportunity to browse
19 through the remaining 63 comments here that were recorded
20 from this session. But I think you're going to have that
21 chance. So again, please dive in, provide the input, get
22 them sharpened up so they reflect the sorts of points you
23 were wanting make and so on. And whatever order and process,
24 these will start coming together, and this will form the
25 basis, I think, of what the Board ultimately turns out of

1 this process, concludes, recommends, and so on.

2 DANIEL: Any other comments on Session 1? All right.

3 Marvin.

4 RESNIKOFF: I wanted to lay out a heretical point that
5 follows what Diane D'Arrigo said which is perhaps it may be
6 better not even to have a repository. In other words, some
7 of us may consider a repository just the Earth, an imperfect
8 container compared to continual management of spent fuel
9 where it is. I know that's not part of our discussion.
10 We're always looking at how are we eventually going to get
11 this material into the ground safely. But there is another
12 alternative which is we don't get it into the ground, we just
13 leave it where it is or in a centralized storage location
14 forever.

15 DANIEL: Okay. All right. Thank you, Mark.

16 Okay, folks, that concludes feedback from Session
17 1. I'm going to turn it over to Bret Leslie from here to go
18 through Session Number 2. Thank you for your participation.

19 LESLIE: So we'll begin on Session 2 here in a second.
20 We kind of did something different, and hopefully it's going
21 to be received a little bit better. But let me--well, we did
22 as best as we could trying to capture things as quickly as we
23 could. And our rapporteurs were Sue Clark and Jerry Frankel.
24 And Jerry's going to go through what we've kind of tried to
25 distill.

1 One of the things we tried to do in that session
2 was to kind of feedback maybe 35 minutes, 40 minutes before
3 the end what the rapporteurs had heard so that we could
4 adjust things. And so with that I'm going to turn it over to
5 Jerry.

6 FRANKEL: Thanks. Thanks, Bret.

7 Yeah, what I would like to do is report is in
8 Bret's words, the smaller but better session. That how he
9 started it out this morning. You know, in my day job, I'm at
10 Ohio State University, a Professor of Geoscience, I spend a
11 lot of time trying to make sense out of, like, disorganized
12 comments from graduate students. And then I do a lot of
13 editing and writing and making PowerPoint slides and, you
14 know, spreadsheeting. So I always thought I was really
15 qualified to be an executive assistant to someone, but I
16 think this morning we disproved that notion. So I am going
17 to do the best I can.

18 Unlike my colleague, Professor Peddicord here, I'm
19 going to take full responsibility for everything that I say
20 here. Yeah, I do want to thank Sue Clark and Bret Leslie and
21 also Roberto Pabalan and his staff, a Board staffer who
22 helped us out this morning in organizing things. But this is
23 really more or less my view of things.

24 As Bret indicated we're going to do this a little
25 differently and not go through the laundry list of all of the

1 comments. They were captured, but try to make a little sense
2 out of it, and well, we'll see how well that works.

3 Really what we tried to do is envision a world
4 where there was a goal of, you know, plan for spent fuel.
5 And the plan was to do direct disposal. So what would that
6 look like and what would be involved with doing that? And I
7 think everyone in that room agreed that what the rest of you
8 were talking about was kind of crazy. You know, so I mean,
9 the idea of cutting open these packages and, you know,
10 repackaging it, it's complicated, it's expensive, risky, you
11 know, there's a lot of exposure risk. And it can be done,
12 but just use that as the rationale to move forward.
13 Obviously there are a lot of risks and complications with
14 direct disposal, and in the end maybe repackaging wasn't.
15 But this was kind of what was framing our discussion is that
16 we need to think about direct disposal.

17 And as was discussed here a few moments ago, you
18 know, the lack of a plan really impacts everything. So it's
19 very hard to talk about all of this without knowing where the
20 waste is going. But let's try to do the best we can.

21 All right. In this matrix, which, by the way, I
22 should say that those of you who are in the room, you'll
23 notice I spent the first half typing on the computer and was
24 trying to fill out this form that Lee showed to bin all the
25 comments into the right matrix. And we pretty much realized

1 that wasn't going to work, so I gave that up. Although, it's
2 an interesting exercise, it didn't really capture a lot of
3 discussion that was going on. So I'm not going to frame what
4 I have to say there except for the fact that you could, you
5 know, you could do this backwards arrow from that bottom
6 right diagonal cell into everything. And so it limits what
7 we can talk about. But let's just ignore that for the moment
8 and move forward.

9 The other thing is that we had a discussion about I
10 would say, you know, I like Rod's comment about
11 harmonization. You know, there's this discord that exists
12 with the stakeholders. All right? And it seems that by, if
13 we could in our idealized view of the world where a decision
14 is being made for direct disposal, if that decision could be
15 made, then it might be possible for all of the stakeholders,
16 the Department of Energy, the regulators, the utilities, and
17 the interested other parties to allow the discussion to move
18 forward so we can frame things and make decisions and move
19 forward. So that even making that one strategic decision, it
20 would really help the whole program move onward. So I
21 thought that was interesting.

22 Yes, Diane. I already learned your name.

23 D'ARRIGO: Diane. Nuclear Information and Resource
24 Service, D'Arrigo. Can you tell us what direct disposal
25 implies or what that, what you exactly mean by that? Is it

1 going from the utility to the disposal site or what are you
2 all assuming that means?

3 FRANKEL: Yeah. I guess that isn't really captured in
4 any of the upcoming slides. So yeah, I discussed some of it,
5 but yeah, okay. Yeah.

6 Well, yeah so, can I put that off for a moment?
7 And, please, come back to that question if it isn't answered
8 by what I described coming up. Okay?

9 D'ARRIGO: Okay.

10 FRANKEL: Yeah. It's probably best to do that.

11 Okay. I think the last background issue is the one
12 that Rod mentioned is that if this decision is made for
13 direct disposal, that could limit siting options. And that
14 might be a bad thing, that we end up with no site that is
15 suitable. Or maybe it's a good thing some people, that again
16 by making these decisions, that allows us to move forward.
17 And limiting options might be a good thing, but there could
18 be an impact there. Okay, those are the background issues.

19 So the other comment here is that we might in this
20 world of direct disposal try and separate out these two types
21 of canisters, those that are existing already and those that
22 will exist. And so with that you might want to, you might be
23 able to handle them separately. So we have this situation
24 where we already have canisters, and so maybe to answer your
25 question, we might want to take those canisters and move

1 them, well, maybe we have a consolidated storage facility
2 where they're held. Or if they aren't, that doesn't happen,
3 move them right into a repository. So that would be without
4 cutting them open and putting them into another canister.

5 D'ARRIGO: Direct means not recontainerizing?

6 FRANKEL: That was Diane again. And direct would mean,
7 right, without removing the fuel assemblies and putting them,
8 moving them from let's say these existing ones, removing them
9 from where they exist into another canister that's suitable
10 for a repository. Okay? There might be some modifications
11 that are made. There might be some of modifications that are
12 made with an overpack, and I'll talk about that.

13 BAHR: Jean Bahr. All of the discussions were that it
14 wouldn't be the canisters or the casks that would go
15 directly into the repository but that there would in fact be
16 an overpack on top of them. It's just that they wouldn't be
17 unloaded into something else.

18 FRANKEL: Right. So we'll talk about that.

19 D'ARRIGO: This is Diane. I'm just trying to understand
20 when, I am sorry if I'm repeating, but what would be, what's
21 direct and what's indirect? It sort of implies we were doing
22 indirect in here and you guys were doing direct.

23 FRANKEL: Well, I don't think that direct means that
24 there's indirect. It's direct as opposed to repackaging.

25 BAHR: This is Jean. Yeah. It's either repackaging,

1 either taking the fuel rods out of one package and putting
2 them in another, or taking the package that the fuel rods are
3 in and putting them into the repository. But probably
4 putting something else around them before they go--

5 D'ARRIGO: Is that direct?

6 FRANKEL: Right. So I would say it's repackaging or not
7 repackaging. Maybe that's a better way to say it.

8 BAHR: Yeah.

9 LESLIE: So again, as a facilitator for that session, we
10 did not look at repackaging. We looked at what are the
11 implications of the 1700 on terms of getting it to disposal.
12 Now, it could be stored at an interim storage facility, but
13 it wouldn't be repackaged. It would be then transported to a
14 repository. And so we framed the discussions and kind of the
15 things there with that.

16 And it came out very quickly that you could try to
17 capture this in two types of streams, those that we've
18 already repackaged that could be directly disposed, and if
19 you think about things differently, you might directly
20 dispose some of the existing inventory that's going to be
21 repackaged or packaged in the future, thinking about, yes,
22 we're going to do direct disposal of these new higher burnup
23 fuels for example. So we, the session, really looked at not
24 repackaging the fuel.

25 FRANKEL: Right. Let me just say that my presentation

1 is not very long, and so really, maybe if you just let me
2 take five to ten minutes to do it and then we can have the
3 discussion, it would be a better use of our time.

4 So, right, so the idea is that we have existing
5 packages and those that will exist, so something like 1700.
6 And there are a lot of designs. And these are relatively hot
7 and heavy so the utilities are packing them in a certain way
8 because of safety considerations, because of economic
9 considerations. But they are what they are.

10 And the other thing associated with that is because
11 of the many designs the regulators would have a complex job
12 if, in fact, those were not to be repackaged and were to be
13 put into a repository. It would be hard for them. But some
14 thought, well, so what; they can handle that. But that is
15 something that would come from that.

16 Okay. And then if we separate out those and say
17 then let's look in the future, there's a possibility once we
18 make the decision in our ideal world of direct disposal that
19 we could change things, might optimize the canisters. And
20 maybe this could be through regulation or through site
21 selection criteria, some way that there are specific designs
22 for those canisters that are required. And they may be
23 suitable for storage, transportation, and disposal or not.
24 And I'll talk in the next slides about what some
25 modifications might be. But maybe you just put them into a

1 canister that's suitable really to go right into a repository
2 after storage but that wouldn't have to be handled again.
3 It's a possibility. Okay. But then the question is really
4 who pays for the higher costs that are associated with this
5 optimized canister?

6 All right. So we really had the good luck to have
7 had a very nice presentation made yesterday by Tito Bonano.
8 And Tito listed three technical issues to which we added a
9 fourth that was really brought up in the discussions. So
10 weight, size and weight really, thermal effects, criticality
11 effects, and then this fourth one, environmental stability
12 effects. And in the following slides what I hope to do is to
13 just mention issues associated with each of those, a lot of
14 which were brought up yesterday but I think also captured the
15 discussion we had today about these issues.

16 So size and weight, of course there's difficulties
17 associated with the transport handling and emplacement and
18 retrievability, I'll say I'll mention that later, of large
19 heavy canisters. But then you might think that engineering
20 solutions are possible. This is just size thing. So the
21 Egyptians built pyramids for god's sakes, big things, and so
22 maybe there are simple engineering solutions to handling big
23 things in reasonable ways.

24 And then furthermore, the future canisters, maybe
25 they're designed differently, so maybe there are size

1 restrictions that are put on them because we're focusing on
2 direct disposal. And so the Swedes have smaller packages
3 that allow them to handle them differently. Of course that
4 leads to trade-offs in number, we can have more packages,
5 there's more risk involved with more numbers. But some
6 assessment can be made, an informed assessment about the
7 right size to handle these kinds of things.

8 There was some discussion and there was no
9 agreement about this, but a statement was made that storage
10 canisters, they're not certified currently for transport, but
11 maybe they could be was the comment, although, others thought
12 that there were certain canisters that just never could be.
13 But the idea is that it might simplify things a lot if you
14 didn't even have to worry about putting them into canisters
15 that would transport them, so, just reporting on the
16 discussion here. I'm not taking any sides, but an
17 interesting notion.

18 So that first was size and weight. The second was
19 thermal effects. Well, the canisters that exist, some of
20 them are hot. And so this will influence if it were to be
21 done, influence the repository design. That means the
22 geologic formation type, the drift spacing, and the canister
23 spacing. So if you're dealing with hot canisters, of course
24 you'd have to allow for that. And so there are costs
25 associated with that. There are siting implications, a lot

1 of implications. But it seems to me anyway, personally, that
2 that could be handled through the right design and selection.

3 We talked about a lot about predisposal storage and
4 cooling. And so this would have to be done in a smart way,
5 and maybe for a long time. So, you know, it was said let's
6 just never put them underground. Well, anyway, you might
7 want to hold them above ground for a while, let them cool off
8 more, and then that would impact the repository design if
9 they could be cooled. So there was a lot of discussion on
10 this, doing this in a smart way and allowing direct disposal.

11 So high burnup fuel has implications. Maybe longer
12 storage is required because they're hotter. There was some
13 discussion about transporting it at the right time, so
14 there's this ductile to brittle transition having to do with
15 hydriding of the cladding. So again, you have to do this in
16 a smart way. Cool at the right place at the right time,
17 transport at the right time. And again if we have a perfect
18 world where we can specify canister design, well, then we can
19 do it maybe in a way that allows for handling of these
20 thermal effects.

21 Criticality, well, there was discussion about the
22 need for better analysis of the existing canisters, the
23 details of the fuel history, what's in each canister, and
24 then making an informed decision. I'm not sure I captured
25 all of that comment correctly. And just give me a minute and

1 you can clarify that.

2 Future canisters might be altered to limit
3 criticality, so again, a smart canister might have neutron
4 absorbers embedded in some way, so again, separating what we
5 have from what will come in the future. So I guess this was
6 part of it, assessment of criticality in performance
7 assessment. How you deal with criticality and form an
8 assessment could affect the design. So, you know, how that's
9 considered.

10 LESLIE: So whether it's screened out just on
11 probability or whether the regulation under Part 63 allows
12 criticality potentially to be screened out on a risk argument
13 based on probability and consequence.

14 FRANKEL: Right. Okay. The last of the four was the
15 environmental stability in the repository. And really Tito
16 didn't cover this, but I think the underlying assumption was
17 that we can we can deal with it. So we have at this point
18 unknown repository conditions, environment that is. So maybe
19 it's saturated, maybe it's salt, maybe it's clay, maybe,
20 whatever it is, that will be decided at some point.

21 And this actually is my specialty by the way, so my
22 area is corrosion. So you might rely upon the expertise to
23 come up with some smart overpacked design that will give you
24 the required lifetime in whatever the repository environment
25 will be. So direct disposal, I think to get to what Jean was

1 saying here, direct disposal would probably require some
2 protection against the environment. And Yucca Mountain
3 really is an example where the engineered barriers allowed
4 you to deal with all of the conditions that might or do exist
5 within that mountain.

6 And in fact one of the things that came out of that
7 was that Alloy 22 is a pretty good material, and we might
8 consider that it's suitable for the environments like Yucca
9 Mountain where as there are other environments being
10 addressed around the world, and a lot of work has gone into
11 the appropriate solutions to deal with the environmental
12 resistance that's required in those situations.

13 So I think this is my last slide to try and capture
14 some other things that came out. There was this issue of
15 retrievability. And there was some discussion about well,
16 what retrievability means. So is it canister based? A fuel
17 assembly based? Retrievability related to disposal? How are
18 you going to pull out heavy packages? Is there engineering
19 solution to that?

20 There was some discussion about how handling of
21 these heavy canisters could lead to gouging, galling, and
22 scratching of the surface which would then not meet the
23 requirements according to some regulations. And that could
24 be an issue as these heavy packages get handled. It's going
25 to be hard not to alter their surfaces. That was a comment

1 that was made.

2 Yeah, and I guess this point really could have been
3 brought up previously as we have this, at least when I talked
4 about separating from past or existing and future, but the
5 possibility of multiple repositories might allow us to design
6 them specially to handle different types of waste. So this
7 could be existing versus future canisters or also maybe
8 handle the DOE spent fuel or high-level waste differently, so
9 bring up this issue of commingling. If you decide not to
10 commingle, it gives you some design flexibilities that will
11 allow a smart way to handle direct disposal.

12 So again, I hope that I captured the important
13 thoughts that were brought up. There were a lot of other
14 things. You know, I encourage those of you who were there to
15 mention the comments that I didn't include that you felt were
16 really important.

17 LESLIE: Jerry, that was great.

18 And I appreciate the audience allowing him to kind
19 of walk through and get through his slides. And I'm sure he
20 and everyone else in our session will be happy to answer
21 questions or if there's clarifications needed. And so at
22 this point I'm going to need my runners if people have
23 questions or comments.

24 Rod?

25 And don't forget to identify yourself for the

1 record. And I'm Bret Leslie.

2 EWING: Okay. Rod Ewing, Board. So first, this was a
3 very nice and fair summary. I was there, and you've captured
4 the major points. But still I'd like to offer a
5 counterpoint. And I voiced this along the way, but perhaps
6 not in a very articulate way.

7 So going back to your first slide, the rationale
8 for direct disposal was that repackaging is complicated,
9 expensive, and risky. So what I'd like to suggest is that if
10 we look at--

11 FRANKEL: That was my own opinion by the way. I'm sorry
12 if that didn't capture, probably didn't capture the crowd.

13 EWING: Yeah. So this is something to discuss. And
14 what I want to say is if we look at geologic disposal, you
15 know, licensing a repository, first I would say it's also
16 very complicated, in fact, much more complicated than
17 repackaging spent fuel. If you look at the performance
18 assessment or the science that's required to support the
19 performance assessment, you find models that go from the
20 atomic scale to the scale of tens of kilometers. And we
21 tried to roll all of those processes up into an analysis and
22 then extend that over a one-million-year period.

23 So making, building, licensing a successful
24 repository, that's complicated. Expensive? Well, I think
25 building repositories or studying them and failing is very

1 expensive. It's on the scale of 10 to 15 billion dollars.
2 And remember that in order to successfully move forward with
3 the license, we have things like titanium drip shields for
4 which there's considerable expense, certainly comparable to
5 the expense of repackaging.

6 And then risky, well, this is a problem of what is
7 risk today versus the longer term or from the perspective of
8 geologic disposal. But I'd suggest that putting tens of
9 thousands of metric tons of spent fuel in the ground at
10 pretty shallow depths, 300, 500 meters, that's somehow risky
11 and requires careful attention.

12 And then finally, it could be that repackaging for
13 the repository performance, for enhancing repository
14 performance, that may be the key to success for closing the
15 fuel cycle, building a repository. So I think these are
16 difficult things to weigh, but repackaging versus ensuring
17 that you have really a robust set of barriers in your
18 repository system, we have to analyze those trade-offs.

19 LESLIE: Thank you, Rod.

20 Are there other questions or comments? Okay. I'll
21 go to Mary Lou and then to Ernie.

22 ZOBACK: Mary Lou Zoback, the Board.

23 And Jerry, you did a great job of capturing things.
24 One thing that I felt dropped out maybe a little bit with the
25 organization was the emphasis on the system's approach. And

1 let me give one example that kind of came up in the other
2 session.

3 The rationale that was given to, in our discussion,
4 for the larger and larger, dual-purpose canisters was that
5 it's less expensive and involves less risk to the workers.
6 But the reality is if that then means a whole lot of
7 repackaging in a system's approach, there may be far more
8 risk with the repackaging as the fuel rods have decayed and
9 things like that.

10 So we've got to keep the risk in perspective, you
11 can minimize risk for one factor at one part of the cycle,
12 but ideally we can optimize a solution that minimizes risk
13 throughout and benefits the nation rather than any individual
14 stakeholder.

15 LESLIE: Thank you, Mary Lou.

16 And Ernie. And before you do it, I'm looking for
17 hands or a motion and then that way I can kind of guide the
18 proceeding. Thank you.

19 HARDIN: Ernie Hardin, Sandia Labs. I agree with the
20 presentation. Thank you. And I wanted to add something to
21 it which is that there was some discussion in our session
22 about whether it was a good idea to look for a site for a
23 geologic repository that favored direct disposal. And I
24 wanted to point out to you that the same characteristics that
25 make that site amenable to direct disposal also make it a

1 good site for any geologic disposal purpose and for purpose-
2 designed and build repackaging. So really I don't see a
3 discrepancy there at all.

4 LESLIE: Thank you, Ernie.

5 Jean, and then we'll go to Arjun next after that.

6 BAHR: Jean Bahr, Board member. You referred in most of
7 your slides to sort of optimizing future packages. And I
8 think that one of the things that I heard in the session was
9 that while that's maybe a laudable goal, I think there's a
10 lot of institutional barriers to that actually happening.
11 And it gets back to the lack of system-level approach and
12 incentives to work at the system level that Mary Lou referred
13 to. And I don't know how we overcome that in the way the
14 system is structured now.

15 LESLIE: Thank you, Jean.

16 Go ahead, Arjun.

17 MAKHIJANI: Yeah. I really agree with the Chairman's
18 sentiments here about repackaging and repositories and in
19 part because not all risks are equal as we sit here. I think
20 we have benefited to some extent from nuclear energy. It's
21 in our grid, and we turn on the lights, and we get the
22 photons. And when we look at, you know, even for those of us
23 who don't like nuclear energy which is my well-known
24 position, we still turn on the lights and we get the photons.
25 I think so this is not just a matter of saying minimize risks

1 or optimize risks in some way. I think it's who's going to
2 bear the risks for the benefits that we got, and who's going
3 to bear the cost for the benefits that we got?

4 And I do think the properly ethical position, at
5 least in my world view, is that the closer it is in time and
6 cost, properly done, and I do support a repository program,
7 is much better than kind of kicking the can down the road so
8 to speak and saying okay, future risks are the same as
9 present risks. This is sort of a reverse discount problem.
10 I think future risks are much worse than present risks.

11 Now, within the present generation how we excite
12 equity, this is a very complicated question.

13 LESLIE: Thank you, Arjun.

14 I've got Diane. Are there other people who have
15 comments? Okay. We'll go to Judy after Diane.

16 Go ahead, Diane.

17 D'ARRIGO: Diane D'Arrigo. I thought it was interesting
18 that you hinted that there's a point in time where it's the
19 best window to move the fuel. There's a time between when
20 it's really hot and it has cooled down and then when it's too
21 late maybe. And I wondered if you could elaborate on that a
22 little bit.

23 FRANKEL: Well, I can give you my understanding which is
24 really limited. So we saw yesterday how this cladding
25 material can hydride, and so this is a little bit in my area

1 that zirconium, when it corrodes, the reaction connected with
2 the oxidation of zirconium would be the generation of
3 hydrogen. Hydrogen is absorbed into the zirconium and it
4 forms a compound. It's zirconium hydride that is unlike
5 metal. It's a chemical compound that doesn't have good
6 ductility. It's very brittle and can crack.

7 So it's not a good situation for the integrity of
8 the fuel assemblies to have a rod to be stressing them on the
9 condition, say subjecting them to a situation where they
10 might be stressed and a condition where that stress would
11 cause them to easily crack.

12 D'ARRIGO: How much time is there? When is that window
13 is the question.

14 FRANKEL: Okay. Good question.

15 D'ARRIGO: And I guess for high burnup it's later.

16 FRANKEL: Right. So Diane--

17 D'ARRIGO: And so what you would want is to go to a
18 final, do you want me to stop?

19 LESLIE: I want to try to get an answer for you. You're
20 asking a question, and let me try to expand a little bit.
21 The person who actually was raising this had to leave to go
22 back to NRC. So I'm looking for someone--

23 And, Peter, if you want to take a crack at it, why
24 is there this window kind of thing?

25 And then we'll come back to you to see if that

1 scratched your itch. Okay, Diane?

2 SWIFT: Peter Swift, Sandia National Laboratories. And
3 there are others here who actually are expert in this. The
4 point I would like to make is to caution against the idea
5 that there's a point in time at which it is too late. We do
6 believe that it does, the cladding will increase its
7 brittleness as it ages, as it cools. It may turn out that
8 it's quite transportable, even at very low temperatures.
9 There's no particular reason to say there is some window out
10 there at which point we will no longer be able to transport
11 it. So and the other side, yes, it definitely does become,
12 we believe it becomes more brittle as it cools.

13 Now, is there someone here who actually wants to
14 add to that? Brady Hanson?

15 LESLIE: Peter, I'm going to, my rapporteur asked me to
16 add to this as well.

17 Judy, we will get to you.

18 TREICHEL: Just to clarify what was said in the session,
19 no one in the session ever said it was too late, it's just
20 whether or not it's easier or more difficult depending on
21 what point in time you're in. So the statement that it's too
22 late actually came from an individual who was not in the
23 session. And so that doesn't reflect what was said.

24 LESLIE: Diane, did that clarify things for you a little
25 bit?

1 D'ARRIGO: The title of this whole day and a half
2 included transport, and I think that we didn't really get
3 into the risks of transport. And I want to make sure that
4 it's reflected that at least some attendees feel like that is
5 a significant factor and that just adding extra steps and
6 more transport steps is a significant risk that should be
7 factored in.

8 LESLIE: Thank you, Diane.

9 We'll go to Judy. Are there other people who are
10 going to want to comment? Go ahead, Judy.

11 TREICHEL: On your third bullet, Judy Treichel, Nevada
12 Nuclear Waste Task Force. On your third bullet you talk
13 about the direct disposal helping to harmonize. In our
14 session, and maybe it was only me that was concerned about
15 it, we talked about an integration of the whole thing and
16 perhaps some entity that was over the, you know, the nuclear
17 waste god that was coordinating both what happens at
18 utilities and what happens at the end. And obviously we
19 don't have that now.

20 And right now the utilities are in charge of making
21 the waste and deciding what to do with it, and choosing the
22 packages that they like the best. And then everything else
23 is supposed to fit itself into that. And it's a really
24 difficult thing when you look at it. Are you working in the
25 right direction? Or are you just setting up problems for

1 yourself now that get bigger and bigger and bigger that you
2 have to have more and more hurdles as you go along?

3 And there's been a lot of talk about whether the
4 back end drives the front end or the other way, but right now
5 we definitely have the front end in charge. And I think that
6 is an overriding issue that has to be looked at here that
7 will have a lot to do with how expensive, how risky, and how
8 complicated everything else becomes.

9 LESLIE: Thank you, Judy.

10 I got Mark Lombard up here. Again, just feel free
11 to catch my attention and I'll make sure I get to you.

12 LOMBARD: Mark Lombard, NRC. I want to be clear that
13 there's a lot of analyses, lot of research ongoing now about
14 high burnup fuel. And it's not conclusive whether or not or
15 if it is possible or if it does occur at what temperature
16 that that would occur. There's a clear indication that there
17 is a ductile brittle transition temperature for high burnup
18 fuel, and it depends on how high the burnup is. But it's not
19 clear exactly when that occurred.

20 So it's something that we're continuing to analyze.
21 We're analyzing it. DOE's analyzing it. We're doing some
22 work together. So it's not clear what time in the life
23 cycle, if there is a ductile to brittle transition
24 temperature, that it results in a degree of cladding failure.
25 And again, that degree of cladding failure is not defined yet

1 because the analysis is not completed yet. But it's not
2 clear when that would occur. It might occur at 20 years. It
3 might occur at 50 years. It might occur at 100 years. So
4 we're continuing to look at that.

5 I just want to make it clear that it's more of a
6 may, you know, may occur. Cladding failure may occur. Or
7 there may be a mechanism that may cause cladding failure.
8 And even if it does occur, we're still not sure yet what
9 percentage it might cause of cladding failure. Even if,
10 there's the other side of the safety issue here, even if you
11 had, and this is if, big if, I want to be clear, if you had
12 gross cladding failure, it's not clear, and we're doing
13 research on this end as well, it's not clear that that would
14 create a safety issue.

15 If you had what we call rubblization in the bottom
16 of the canister, it's not clear that that would be a safety
17 issue. And matter of fact a lot of folks are saying based on
18 what we've done so far, that would not be a safety issue. So
19 I want to just make sure we put this in the proper context.

20 LESLIE: Thank you, Mark.

21 And I've got one in the back, and then I'll come up
22 to Lee here in a second.

23 SANCHEZ: Robert Sanchez with GAO. Just a couple of
24 observations. I was not in this particular group. I was in
25 the other one. But I have done a little bit of work on some

1 of the social and political issues on the site, sort of
2 outlined factors on this. And one of them is that if you are
3 planning to do direct disposal, leave the spent fuel in the
4 current canisters that they are, what's the incentive to do
5 anything? There may be not much incentive to do anything.
6 You could just leave them as they are. And, in fact, that
7 kind of has been the current case for a long period of time.
8 Kind of I think as someone mentioned as kicking the can down
9 the road.

10 Another thing that I think is just a general
11 observation with these charts is, and then granted, this is a
12 technical conference. It does leave out the cost and
13 social/political factors that really may be drivers behind
14 some of these technical issues. And in particular one, for
15 example, time frames.

16 If you leave the canisters just sitting where
17 they're currently stored, time may dictate repackaging just
18 over degradation over a period of time, and you may not have
19 a choice. So there may be some other factors that may come
20 into play that unless you think about some of these
21 nontechnical issues, may have an impact on the technical
22 issues.

23 PEDDICORD: Lee Peddicord from the Board. Question to
24 Mark or maybe Jeff or DOE or lab folks if you're looking into
25 this.

1 In terms of the ductile-brittle transition, have
2 you all been able to characterize the advance clads, ZIRLO,
3 the other ones, in terms of these characteristics?
4 Ultimately, when we get to the end of lifetime of these
5 reactors, the inventory may be in fact made up of the
6 majority of the advanced claddings as opposed zircaloy.

7 LESLIE: Lee, thanks for your question.

8 I think Brady.

9 HANSON: Yeah. Brady Hanson from Pacific Northwest
10 National Lab. And in this case I'm responding as I lead the
11 experimental program for the storage and transportation work
12 under the Used Fuel Disposition Campaign, so I report to
13 Peter on this.

14 The answer is a very most definite yes. You will
15 see in Mike Billone's presentation tomorrow that the DOE has
16 continued the work that NRC started doing these ring
17 compression tests on cladding. What Mike will present will
18 show that we have looked at ZIRLO and M5. You will see that
19 it is very much a characteristic of the cladding type.

20 What happens, and I want to echo what Mark said
21 that, you know, I want to caution people that what has been
22 done so far to date has been performed with what we call the
23 radiohydride treatment at very high temperature, meaning
24 400 degrees C. I want to remind people that that is the peak
25 clad temperature that NRC allows without the applicant having

1 to jump through other hoops. And I can most definitely
2 assure you that when you look at design basis for canisters
3 and what their heat is, the companies, the fabricators, the
4 utilities are very conservative in their models when they go
5 to NRC with what temperature did we get to because they want
6 to make sure they are well within those bounds.

7 What that means is you'll see people putting out
8 that we've--here's what design basis is. When you don't load
9 to design basis, your temperatures are actually much lower.
10 You didn't even get into the region where this hydride
11 reorientation is an issue. Similarly, when you see Mike's
12 presentation tomorrow, you'll see that the issue comes about
13 when you have very high hoop stress in the 120 to the 140
14 megapascal range.

15 There's an effort going on right now, so let me
16 step back. So we have efforts as does NRC on defining what
17 are realistic temperatures. Let's not all assume that
18 everything is at 400. It most definitely is not. We have an
19 effort going on and EPRI does as well right now to look at
20 what are realistic end-of-life pressures in high burnup fuel
21 rods. If it's not anywhere near as high as what it is to
22 create these very high hoop stresses, again, then this is not
23 a real issue.

24 So as Mark says, the testing was done at very high
25 levels, near the regulatory limits, let's say. It did

1 identify that yes indeed, the hydrides can reorient. It can
2 lead to brittleness. And like I say, tomorrow you will see
3 that it's a function of what temperature did it go to? What
4 pressure was it at? What cladding type is it?

5 But again, as Mark said, what's the consequence?
6 When you see the pictures tomorrow, you're going to see it
7 basically looks like a through wall, very small crack. It's
8 really no different than if you have a pinhole or hairline
9 crack in the existing cladding.

10 So I want to caution people against jumping that
11 this is really bad. I also to want throw in one other really
12 neat thing. In the last few years both Japan and France--and
13 we're starting a program at Oak Ridge this fiscal year to
14 look at the effects of radiation damage in cladding because
15 we all know that that reduces ductility. But the French and
16 Japanese have shown that in the time frames of dry storage,
17 meaning greater than a year and at the temperatures we're
18 talking about, you would anneal out much of that radiation
19 damage, and you've restored ductility. That's something that
20 none of our models beforehand have taken into account.

21 So I just want to emphasize that within the DOE
22 program under Peter, we have a very what I would call
23 comprehensive testing and modeling program looking at all
24 these aspects together including what are the loads during
25 transportation? How much degradation can I have and still

1 remain intact during normal conditions of transport? So I
2 think you'll be happy when we're done. Just make sure we get
3 enough money.

4 LESLIE: Thank you.

5 Other questions? Okay. Deborah, right in front of
6 you. Right behind you.

7 PHILLIPS: Chris Phillips of Energy Solutions. I just
8 wanted to come back on the comments made by Judy here and
9 others about the utilities calling the shots for what size
10 canisters they use, and rightly so because they want to
11 minimize their costs. They want to minimize their work and
12 radiation dose uptake. And they're not required or compelled
13 to look at the overall system.

14 I would suggest that even when we had a repository
15 in plan and an overall plan, it was hard enough then to get
16 the utilities to take a different view. Without a repository
17 at the moment and without a plan, I would venture to suggest
18 it's virtually impossible. I mean, we've got to accept the
19 fact that the utilities will do what is best for them to
20 generate electricity, protect their workers, and indeed
21 protect the rate payers who take the electricity.

22 So it's a question that we discussed this morning,
23 but there was an overall factor there. I think you've got to
24 just, we just have to accept that. It's not a very nice
25 conclusion, but it's one I think we need to bear in mind

1 until something changes and there's an overall plan that
2 gives a rationale to go back to the utilities and say, "Well,
3 now we want to talk to you about doing something different,
4 and we're probably going to pay you to do something
5 different." We're not going to get them to do something
6 different.

7 LESLIE: Thank you, Chris.

8 And then Nigel.

9 MOTE: I hesitate to get in the middle of the other
10 discussion, but one addition to that I think, and Adam can
11 tell me if I'm speaking generically or there may be special
12 cases. The utilities are in fact required to minimize their
13 costs.

14 The public utility commissions and the public
15 service commissions would take a dim view of any utility
16 saying, "I'm going to go for small packages because 50 years
17 from now, 100 years from now, 200 years from now, DOE or the
18 implementer might decide that was the right thing to do. But
19 I'm making the decision against my better commercial
20 interests." I think the PSCs and the PUCs would not let them
21 do that.

22 Adam, do you have something to add that?

23 LESLIE: Thank you, Nigel.

24 Other questions or comments on any of the slides
25 that Jerry presented.

1 BADER: Was there any discussion, sorry Sven Bader from
2 Areva, was there any discussion on how large these things
3 can get?

4 LESLIE: No, actually. I'll answer. I don't think we
5 talked about that at all. Only in the sense of looking,
6 again, this bifurcation, looking at what's happened and
7 what's stored and then saying if you're going to do direct
8 disposal, is there some decision framework for figuring out
9 what that is.

10 Ernie, and then we'll go to--

11 HARDIN: Very quickly. I mean, we stand on the numbers
12 that Tito presented yesterday for size and weight.

13 LESLIE: Right. But I'm not okay. And let me reframe,
14 he's saying did you talk about how big it could be. Well,
15 and I think that was his question.

16 BONANO: So I think, this is Tito Bonano from Sandia
17 Labs. Right now some of the bigger packages are holding 36
18 to 37 PWR assemblies. When you start with the package
19 itself, the DPC, you're talking about 50 metric tons. By the
20 time you're at the overpack, you go up to about 70 to 80
21 metric tons. Then when you take the shielding, you're
22 basically doubling that size, so you're now talking about
23 maybe about 140, 160 metric tons. And then if you have to
24 put it down a hoist and the weight of the car, so it's about
25 175 to 180 metric tons. So these are big honkers. I don't

1 know how else to describe them.

2 LESLIE: Thank you, Tito.

3 Others questions? We'll go back and then come to
4 you, Peter. All right?

5 LANTHRUM: Gary Lanthrum, NAC. Yesterday I think it was
6 Tito presented some information that showed the thermal
7 limits as a function of the geology, it's not of the
8 packages, and looking at how various repositories, whether
9 it's salt or sedimentary formation or hard rock, how they
10 would perform under various temperatures. And I thought that
11 was a major constraint. And in your slide you showed
12 yesterday, you showed there would be a very long period of
13 cool-down time for the large packages to be able to directly
14 dispose of them. Did your group talk about that and the
15 implications of even longer storage to meet the thermal
16 limits of some of the rock formations?

17 LESLIE: Yes. The group did talk about that. We talked
18 about it in a trade-off some. And I'll let anyone else that
19 was in the session talk about it some more. But let me go to
20 Peter first, and if there's anyone else who wants to expand
21 upon what I just said, please do.

22 SWIFT: Peter Swift, Sandia National Laboratories. I
23 was not in that discussion this morning. I was in the one in
24 this room, but to some extent you could offset that thermal
25 limit by going for larger and larger and larger spacing.

1 There are other variables you can adjust in that. But--

2 Tito, you wanted to add to that?

3 BONANO: Yes. This is Tito Bonano. So in the
4 presentation yesterday, yeah, I remember the slide that
5 you're mentioning, Gary. I also showed another one that
6 shows that the thermal conductivity of the geologic medium is
7 a big factor in dissipating the heat.

8 A secondary factor in that analysis was the spacing
9 between the waste packages. And I think very quickly when I
10 was talking about the different disposal concepts, the
11 different types of geologies, I looked, you know, I mentioned
12 assuming 10,000 packages, give or take, by the year 2050 in
13 the sole repository because of the heat dissipation
14 capabilities, you look at maybe nine square kilometers of
15 underground space. When you go to a hard rock, you're
16 probably looking at about 14 or 15 square kilometers. When
17 you go to a sedimentary rock, then you have to go to about
18 20 kilometers.

19 So you can manage the heat by spacing, the spaces
20 between the waste packages and the spacing between the
21 drifts. But the trade-off is, then you have a much more
22 bigger aerial extent of the underground. So you have a much
23 bigger chunk of real estate for the repository site. So
24 those are some of the trade-offs that have to be dealt with.

25 LESLIE: Okay. If it's responding directly to Tito,

1 then we'll take it. Otherwise, Peter has another one that--

2 LANTHRUM: It is.

3 LESLIE: Okay. Sorry.

4 LANTHRUM: Gary Lanthrum, NAC again. I'm just curious,
5 because as you grow the footprint, not all rock formations
6 are homogeneous. And you get fractures and other things that
7 may, your actual extent may be much larger just because
8 they're trying to find good homogeneous rock.

9 BONANO: Tito Bonano from Sandia.

10 Gary, you're absolutely correct. And I made a
11 statement this morning that at this point in time you're only
12 looking at generic geologic formations. You know, there's a
13 big difference when we go to a specific site, when we have to
14 characterize the site. So we may get surprises. At this
15 point again I want to reiterate the fact that we're looking
16 at generic geologic formations, not a specific site. And
17 when we go to a specific site, the ball game may be
18 completely different. So you're absolutely right.

19 LESLIE: Okay. Thank you. Rob, is this on the same
20 topic?

21 HOWARD: It is.

22 LESLIE: Okay. We'll get back to Peter.

23 HOWARD: Yeah. One of the things that wasn't
24 necessarily presented--

25 LESLIE: Your name?

1 HOWARD: Rob Howard, Oak Ridge National Lab.

2 --that wasn't presented yesterday. I mean, we
3 talked about these thermal conductivities and the so-called
4 thermal limits, but there was no correlation between these
5 thermal limits and the safety of the entire repository
6 system. So I've analyzed systems where, yeah, we've talked
7 about high temperature issues. But then when you ask well,
8 what's the safety implication? How does it affect the
9 performance assessment? The way it affects the performance
10 assessment is in the analyzability of the problem.

11 So if you have the data and the models to deal with
12 it, that's another thing that you could adjust rather than
13 saying well, we can make the drifts wider or space out the
14 waste packages in a greater distance.

15 So I think we've ported the issue. We talked about
16 it yesterday as well, we need to look at the entire system.
17 Well, here's a case where we need to at least look at the
18 entire repository safety system before we start talking about
19 well, this is a hard thermal limit.

20 LESLIE: Thank you, Rob.

21 Peter, you want to--

22 SWIFT: Peter Swift, Sandia National Laboratories. The
23 point I was going to make was that, the one we had up here on
24 the slide when Jerry had the discussion of the smart
25 engineering, things like the right overpack for the right

1 geologic environment. Those observations apply equally to
2 repackaging, what I'll call, and you'll hear me call it
3 tomorrow, purpose-built canisters as opposed to the DPCs.

4 If you were to try to design a standardized
5 canister now and then hopefully put a geologic
6 environment-specific overpack on it 50 years from now, that
7 might be--that's essentially the same as the smart
8 engineering observations you came up with in the other room
9 also.

10 LESLIE: Thank you, Pete.

11 Are there other questions or comments?

12 Arjun.

13 MAKHIJANI: Arjun Makhijani. You know, a lot of this
14 discussion, I really like a lot of this discussion. It's
15 very technically based. It's very factual. All the
16 questions are, you know, we may not agree, but at least the
17 questions are getting on the table.

18 One thing that disturbed me yesterday which I don't
19 see coming up today is that we've now, at least as I heard,
20 the DOE transitioned the idea that site selection will be
21 consent-based. I didn't hear the idea that it would be
22 science-based. And what we're talking about is the
23 repository that is science-based which is connected to
24 canisters choices, packaging, overpacks, repackaging. These,
25 in my opinion, are the right kinds of considerations. But I

1 see, starting with the BRC report but degrading somewhat from
2 that, the Department of Energy talking about consent-based.
3 And in my opinion, you can't actually have informed consent.
4 You can have money-induced consent but not informed consent
5 without doing the science first.

6 And what I would really love to see the NWTRB do is
7 to lay down some parameters for a science-based process so
8 that the other side of this governmental process can have
9 some guidelines for how to go about this. Because some of us
10 who support a repository but not a finite stream of waste
11 would have, and also our concern about economic and social
12 and environmental justice, would have a very, very hard time
13 supporting a process that starts with consent. Because the
14 recipe, and I told the BRC this, this is a recipe for
15 environmental injustice.

16 And it's not theoretical. We've already seen the
17 nuclear negotiator going around Indian reservations and so
18 on. And they have their rights, but we need to reflect a
19 little bit more. And I hope that the spirit that's animating
20 this discussion can be brought outside the NWTRB.

21 So this, I really am happy with the kind of
22 discussion that we're having.

23 LESLIE: Thank you, Arjun.

24 John, I'm going to go to Rod first.

25 EWING: Well, just to respond to Arjun. The Board has

1 noted the difficulties with informed consent and what
2 mechanisms might be available to communities so that they can
3 really exercise judgment that's in their best interest, not
4 their immediate economic interest. So this is a topic we're
5 struggling with. And we've gone so far as to look at other
6 countries which have practiced this process and tried to
7 understand what parts of the process might be transferred to
8 the U.S. So this is a subject under active consideration and
9 discussion.

10 MAKHIJANI: Thank you very much. Arjun.

11 LESLIE: Yeah. Arjun said thank very much.

12 John.

13 GREEVES: Yeah. Just John Greeves. There's really two
14 consent-based processes. So I think Arjun was referring to
15 consent for a repository. Well, there's also a consent-based
16 process for interim storage which is, let's say, less
17 complicated than a repository. And my view is the science is
18 brought to the issue with the licensing. All the science is
19 going to have to be addressed in the licensing process. And
20 the decision of a site has to go through two prisms, one is
21 consent-based with some new legislation and a science-based
22 process. So I'm comfortable it's going to happen. The hard
23 part as many people have said is the consent-based process
24 may be even harder than the science-based.

25 So I just wanted to clear the air on that. There

1 really are two consent-based opportunities. And the first
2 one I hope is less difficult than the second.

3 LESLIE: Thank you, John.

4 Other comments or questions? Just kind of where
5 we're at, we're rapidly diminishing and coming up to a break,
6 but we're not going to break early if people have questions.

7 Yes. Can you--thanks.

8 MAKHIJANI: I'd like to respond to that a little bit.
9 Sorry I'm holding the stage a little bit more than is my due.

10 You know, we had a lot of discussion in the
11 repackaging about high burnup, about failed fuel assemblies,
12 and how much we don't know. And so I would suggest that
13 saying simply that we should transport this stuff to a
14 consent-based site and that all will be okay because we know
15 how to build dry canisters, this is jumping the gun a little
16 bit on a lot of issues out there. I mean, the NRC I think
17 has listed, if memory serves me right, I'll say 20-odd issues
18 of which around 20 were high priority research issues in
19 relation to burnup that just in relating to burnup to which
20 we don't know the answers.

21 Maybe the answers will all come out saying
22 everything is hunky-dory. But today I don't think you can go
23 to a community and say, "We're going to transport this.
24 We're going to store it here for some indefinite period of
25 time, 60, 50, 100, 200, 300 years, and then it's all going to

1 be hunky-dory because we know that the fuel will be in good
2 enough condition to be repackaged and disposed of." I don't
3 think we know that.

4 And so to seek informed consent, even for,
5 especially as we authorize high burnup fuel without really
6 looking down the line, I think it's a little bit more
7 complicated than what has been presented.

8 LESLIE: Okay. Thank you, Arjun.

9 Any other questions or comments? Okay, bringing it
10 back to the process. I know we all appreciate your patience
11 this afternoon as we struggled to try to capture things and
12 reflect back to you what we heard. I appreciate your
13 patience in allowing Jerry and Lee do as much as they could.
14 And we also heard early on in the first session the concerns
15 about the timing. And one of the reasons we need to take
16 this break is so that the Board staff and the Board Chairman
17 can talk a little bit about, although this is the next steps
18 that we had laid out earlier today, what seems to make sense.
19 So that's one of the things that's going to happen in the
20 break.

21 And so let me tell you kind of what's going to
22 happen going forth. We're going to break as soon as I
23 finish. The break is actually a half hour. And that's
24 because we have to kind of even distill what we heard here
25 with some take-away messages. We want to leave you with a

1 good feeling about what you've heard and what the next steps
2 are. So at this point we're going to break until
3 4:00 o'clock when Nigel will come back with kind of the
4 take-aways and moving forward. So thanks again for your
5 attention and participation.

6 (Whereupon, the meeting was recessed for a short
7 recess.)

8

9 LESLIE: If we could have people take their seats so
10 that we can start this next portion of the meeting, first
11 off, I hope everyone had a chance to enjoy your break. We
12 took it as an opportunity to show that we're listening to
13 what you all had to say. And so we're actually changing the
14 agenda a little bit, and Nigel will kind of talk through some
15 of the things that we heard, including what we had put up
16 previously as the next steps.

17 So, I guess, with that, Nigel, why don't you do it
18 and explain what we're going to be doing?

19 MOTE: Well, don't let it ever be said that the Board
20 does not respond to circumstances. We learned from the
21 sessions this afternoon and the sessions this morning that
22 capturing things our way doesn't necessarily capture things
23 the right way for the mood of the participants here.

24 So instead of us giving feedback on the takeaways,
25 what we'd like to do is to record the takeaways from the

1 perspective of the participants. Instead of us putting our
2 ideas down in the way that we had foreseen that and putting
3 that on the Web site, we'd like to capture them in the way
4 that Bret did as a facilitator in the other session.

5 We will then tidy those up, present them, and put
6 them as a record of the takeaways on the Web site. And
7 that's something that you can comment on, also comment on the
8 transcripts when they're out, to make sure that issues that
9 you have close to your heart or you heard discussed are
10 recorded in the way that you think is appropriate to capture
11 those points. That's not to say we'll change the transcript;
12 but if you want to write in and say, There's a point
13 recorded, and I think there was another aspect to this or
14 there's an extension or I heard it another way around, you
15 submit that to us, and we will record that as input to the
16 record from the workshop.

17 So what we'd like to do is to, as I said, record
18 the main takeaways from the body of the meeting. We will
19 take comments on that for, we didn't define the date, but
20 maybe a month afterwards. We'll try and get those on the Web
21 site in the next week. The transcript will be on the Web
22 site before the end of December, hopefully by the middle of
23 December, and we would like comments by the middle of January
24 on both of those documents, which will help us with the Board
25 and the staff to write the report, that will take into

1 account the input that we have from the workshop.

2 So can we start with overarching issues?

3 LESLIE: So before we do that--

4 MOTE: Go ahead.

5 LESLIE: --the facilitator always wants to make sure
6 that the process is understood.

7 So the first microphone, I think, is to Diane,
8 because I think she's got a process question.

9 CURRAN: This is Diane Curran. Thank you, Nigel. I
10 really appreciate the discussion and the process. And this
11 is my first meeting of the Nuclear Waste Technical Review
12 Board, so I want to honor what process you use.

13 But I want to tell you what I think would be most
14 helpful to me as a representative of Eureka County and
15 environmental organizations interested in the waste
16 confidence issue. I am assuming that this body is going to
17 do a report and make some recommendations, and I really
18 appreciate the opportunity to participate in this part of it.

19 Right now I can't remember all the things that we
20 talked about today. And even after I read the transcript, I
21 would prefer not to be the one with the job of going through
22 it and figuring out what all the points are. I'd like to ask
23 the staff to do, to look at what we say here today, add what
24 you think was important, and let's use that list and not just
25 depend on the outside participants to come up with a list.

1 We really want to comment on what you're presenting. We want
2 to participate in that by putting feedback in at the front
3 end and also looking at whatever is some draft along the way
4 saying, okay, did you get everything?

5 That's my comment.

6 LESLIE: Okay, thank you, Diane.

7 MOTE: I think there's a need to clarify some things
8 here. The Board has a limited mandate. Limited doesn't mean
9 that it can't do anything, but we have not discussed, in the
10 staff we've discussed, but the Board has not discussed,
11 making recommendations. But that's something that the Board
12 would not normally do under this sort of circumstance.

13 The recommendations have an implication of defining
14 who does what and when, and that's something that is beyond
15 the scope of what we intended here. In the framework
16 document that was in the briefing notes, what we said was
17 we're trying to capture the issues, because resolving those
18 and recommendations or what leads to resolution will take
19 years, maybe decades. It will involve not the Board, but the
20 implementer, the utilities. There will need to be extensive
21 actions taken to make progress on these issues. And I think
22 it's beyond the Board's mandate, beyond the Board's reach, to
23 be able to do that.

24 So recording the issues doesn't mean that it won't
25 lead to any action. Congress reads reports; the Department

1 of Energy reads reports; but we would not be expecting to
2 make recommendations. But I'll ask Rod to comment on that.

3 EWING: First I should say I'd hesitate to contradict
4 the Executive Director, because he's been doing this longer.
5 But, in fact, in our reports we do make recommendations. But
6 what's important to our process is the Board has to meet and
7 discuss and go over everything, and we just haven't had that
8 opportunity. So as much as I appreciate that you would like
9 to know what we think, there is no Board position at this
10 moment.

11 And so this is an opportunity for us to get
12 information and one last effort at soliciting what you think
13 are the important issues and our ideas to put those issues up
14 on the Web so that you see them all together again. And it
15 doesn't mean you have to go back to the transcript and see if
16 the transcript has some hidden issue. It's what you think is
17 important, and the transcript is there in case you want it.

18 So we're just getting as much information as
19 possible. We, the Board and the staff, will prepare draft
20 reports that then we'll circulate among ourselves, and then
21 the Board will finally issue a report. So we won't issue a
22 report for review, a draft report.

23 LESLIE: Thanks.

24 EWING: I think that's our procedure; right?

25 MOTE: That's the procedure, yes.

1 LESLIE: So any other questions on the process?

2 BAHR: Just maybe, this is Jean Bahr, another
3 clarification. We issue a report, and it will be a synthesis
4 of what we've learned with all of your input. It won't be a
5 report that says that the public thinks this. So we're not
6 going to issue a report that will have your names on it as
7 authors that you have to sign on to this, but what we're
8 trying to do with this process is to learn as much as we can
9 about all the perspectives so that we can come up with an
10 informed decision. Is that a fair--

11 LESLIE: Correct. Okay. Other process questions, and
12 then I'll open it up--

13 LOMBARD: But I would imagine that you would capture in
14 the report the diversity of opinions that you had
15 participating in the input that was given.

16 LESLIE: Yes.

17 LOMBARD: I'm sorry, Mark Lombard, NRC.

18 LESLIE: Thank you. So now the floor is actually open,
19 and what I'm going to try to do, and this is you know, you
20 went through, you had some background yesterday that informed
21 your discussions in your breakout sessions. We came back and
22 reported. You might have heard something and changed your
23 understanding. Maybe you heard the same issue described in
24 each of the sessions, but now is your opportunity to kind of
25 say, well, king for a day, this is the thing that I think is

1 one of the things that drives it. And it might not be any of
2 the things that was summarized, but it could be something
3 that was summarized.

4 And so what I'm going to do as a facilitator is be
5 directing traffic. And for those of you who were in my
6 session, you'll know that I'll be taking notes as I'm
7 directing traffic and trying to capture things. And, again,
8 I'll be writing up my notes, and we'll be capturing all these
9 and putting on the Web what you think are the takeaways.

10 So people with hands up will get microphones.
11 Jerry, you're first and then Mark.

12 FRANKEL: Jerry Frankel, Board member. There was a
13 comment that I forgot to make, probably several that I forgot
14 to make. An important one, and maybe it's a good way to
15 start off this discussion, and that is that today we
16 considered direct disposal or repackaging. And the comment
17 that was made in our session was that it's not necessarily
18 either/or, that there are maybe some packages, canisters that
19 are suitable for direct disposal of the type that we talked
20 about and others that would be better handled by repackaging.

21 LESLIE: Okay. Mark.

22 LOMBARD: Mark Lombard, Nuclear Regulatory Commission.
23 I think overarching, and this is my personal opinion, not an
24 NRC position, just to be clear, that to get this whole
25 effort, and I mean the whole effort, off top dead center and

1 to get it moving forward, we have a high-level waste policy
2 now or waste management strategy that was issued on January
3 13, 2013. If we had the impetus of approval or direction to
4 move forward on that, implementing that high-level waste
5 policy, that would certainly make a lot of these pathways a
6 lot easier to see how we could get to the end point.

7 LESLIE: Thank you, Mark. Other people who have
8 questions or takeaways that we want to capture or that you
9 want us to capture? Or are you guys all just so tired and
10 want to go--

11 MOTE: Well, let me start by stimulating one. I think I
12 heard in the feedback from Session 2 the same comment that we
13 had in Session 1, and that was to do with the dichotomy where
14 there are different interests at different parts of the
15 management operational program. Does anybody want to pick
16 that one up? Because that one seemed to be a hot issue in
17 both sessions.

18 LESLIE: Okay, I do have one. Jean, are you going to--
19 okay, Ernie and then--

20 HARDIN: This will be quick. Ernie Hardin, Sandia Labs.
21 Yes, my takeaway is that things are steadily getting more and
22 more difficult to manage. The canisters are getting bigger;
23 the analysis methods for criticality and thermal are getting
24 more sophisticated, leaving less margin in there that we can
25 play with for disposal; and the materials and construction

1 design of the canisters are changing.

2 I learned today that Holtec has come up with a
3 basket design, which is entirely made of aluminum, which
4 might make a lot of sense.

5 SPEAKER: Metamic.

6 HARDIN: Okay, Metamic. But for corrosion purposes it
7 behaves a little like aluminum, maybe not so well. So that's
8 my sense of where this is going.

9 LESLIE: Thank you, Ernie. Jean and then--anyone else?

10 BAHR: Jean Bahr. I'm just responding to Nigel. One of
11 the things that I heard related to these different interests
12 in different segments is that there isn't a clear path that's
13 going to harmonize those interests, and I don't know where we
14 go.

15 LESLIE: Okay. And I think it was Robert that's back
16 there that--

17 SANCHEZ: Robert Sanchez with GAO. It seems to me from
18 looking at these issues for a period of years and listening
19 to people here today that themes are still the same, and that
20 is there are uncertainties. And although there are technical
21 uncertainties, it doesn't seem as though any of those are
22 real showstoppers. The real showstoppers are the non-
23 technical uncertainties.

24 And I guess I'm revisiting this theme over and over
25 again, but it seems to be one of those things that's kind of

1 important, that there's not, it doesn't seem to me, hearing
2 everybody here, there are solutions to the technical problems
3 and challenges; but it's the non-technical ones that are the
4 real drivers. And although it's great that we're all talking
5 about the technical solutions, somewhere there's got to be a
6 bridge between the technical approaches with the non-
7 technical, I guess, the whole process, the whole siting
8 process to consent-based--all that is non-technical, and that
9 may be a pretty strong driver for a lot of the technical
10 solutions.

11 LESLIE: Tito.

12 BONANO: Tito Bonano, Sandia. Robert, you're absolutely
13 right. Unfortunately, right now we can't talk about site-
14 specific issues, you know, we're not allowed to do that. But
15 having said that, one of the things that we're doing at
16 Sandia working with Hank Jenkins-Smith and his group at the
17 University Oklahoma is understand how public preferences
18 about specific technical issues could impact the technical
19 work, the technical solutions, that we're looking at, and at
20 the same time how can we do technical work that could help
21 inform the public about those issues.

22 So I think, you know, we have recognized that at
23 Sandia we have a joint center set up with the University of
24 Oklahoma specifically for that purpose. And, you know, we do
25 an annual survey that understands what the technical issues

1 are and how the public may understand them or what are the
2 concerns they have. So I think we have recognized that, at
3 least in our shop, about an important component of the whole
4 process.

5 LESLIE: Other folks? I hate to pick on people, but
6 this is your opportunity. Rod, back there.

7 McCULLUM: I'll try this. My takeaway is, oh, my name
8 is Rod McCullum from NEI. I guess I want to say that this is
9 the right issue for the Board to look at. This is an
10 important issue. We have the reality of waste management
11 today in the United States, which is the 1,700 loaded
12 canisters, the ones we're going to be loading every day from
13 now until there is a repository, and we need to be solutions-
14 oriented.

15 Before today there were exactly two parts of the
16 Nuclear Waste Policy Act that were still functioning. One
17 was this Board, and the other was the collection of the fee.
18 The Court, as I think everybody in this room is aware, has
19 now ruled that the collection of the fee is no longer
20 working. And, indeed, the Secretary has been ordered to make
21 a recommendation to congress to make a proposal to congress
22 to change the fee to zero. That, perhaps more than anything
23 else, might trigger action. I don't want to say "will"
24 trigger action, because I've been at this too long. But
25 there will be something before congress which is very

1 significant with respect to all those things that impact the
2 technical.

3 This Board's charter is technical, so you are the
4 last remaining element of the Nuclear Waste Policy Act. What
5 are you going to tell congress as it visits that question of
6 whether to actually move forward again with that act or do
7 something else? And I think this issue is so important.
8 That's why you heard such a range of views. I look forward
9 to your report.

10 LESLIE: Thank you, Rod. Other questions or comments?
11 Right here? And don't forget to identify yourself.

12 BURK: Sandy Burk, Idaho National Lab. I know that we
13 discussed a lot about timing. When is going to be important.
14 And we look at that as the really long-term. But what if we
15 had to anticipate doing something more immediate? How does
16 that affect the whole repackaging or handling or what we're
17 going to do? If we have a site that for whatever reason,
18 goes down, maybe it's an orphan site, maybe it's another
19 site, and we have to move fuel out of there, what is the
20 plan, and is that part of this discussion? I know that we've
21 been talking about long-term, but what would we do if we had
22 an emergency and we had to do something today?

23 LESLIE: And I'm going to, unfortunately, pick on NRC.
24 And, Sandy, could you restate it so Mark could try to address
25 the issue? And I'm assuming you were talking about

1 commercial.

2 BURK: Right.

3 LESLIE: Okay. So, Sandy, could you restate it for
4 Mark?

5 BURK: So, Mark, you probably already know, but I guess
6 I'm just thinking, if there was, for whatever reason, I don't
7 know what it could be. There could be an accident, there
8 could be, you know, bankruptcy, there could be whatever it
9 is. You have a site that has fuel, and now you're going to
10 have to or the federal government is going to have to take
11 responsibility, perhaps move it, I don't know. I mean, I
12 don't know how that's affected in terms of what we're looking
13 at here in terms of repackaging, transporting, whatever. But
14 it's just something to consider.

15 LESLIE: Thank you.

16 MOTE: Sandy, maybe I can add a point to that. There
17 was a discussion point, and I don't know that it was generic,
18 but it is a specific issue that relates exactly to that. And
19 that is, right now Jeff Williams yesterday in his
20 presentation said that there is no fuel in canisters on the
21 stranded sites which cannot be transported. There will come
22 a time when economics says that one power station shuts down
23 where there's fuel in canisters that cannot be transported.
24 And that's part of the same issue, the time dependency of
25 closing out solutions.

1 BURK: I guess I would just say in terms of transport, I
2 mean, I don't think that's all worked out yet either. So,
3 yeah, the fact that maybe they're in a canister that can be
4 moved is--

5 LESLIE: Okay, thank you. Mark. And then let me go
6 back to Gary.

7 LOMBARD: Just to be clear, I don't want to, Mark
8 Lombard, Nuclear Regulatory Commission. I wanted to be
9 clear, and I don't want, this may sound to some like punting
10 it, but, really, our main function is to make sure that
11 whatever is done is done safely and securely. So if it lands
12 within the bounds of the certificate or license for that
13 particular site, we would keep a close eye on it.

14 But, as Nigel pointed out, Jeff and crew have done
15 a very good job of documenting the fuel at the stranded
16 sites. And there are certificates that are coming up for
17 expiration in a certain time period, and we'll deal with
18 those, each one of them, re-evaluated on its own merits.

19 LESLIE: Thank you, Mark. I appreciate you allowing me
20 to do that. I was having trouble trying to capture Sandy's
21 point. So Gary.

22 LANTHRUM: Gary Lanthrum, NAC. Two things. One, if
23 there were a crisis of some sort, even though the canistered
24 fuel at the stranded sites is transportable, none of it could
25 be transported for several years, because the infrastructure

1 does not exist. There are no transport casks for that. Even
2 though designs have been certified, they don't physically
3 exist; and there's a long lead time to procure them.

4 One of the takeaways that I got that is important
5 is that when you do a systems-wide analysis of overall risks,
6 you get different conclusions about what might ought to be
7 done. It could be different than what is done. And the
8 differences are driven by the fact that there are incentives
9 for people at the beginning of the used fuel cycle when it
10 first goes into dry storage that have different drivers for
11 what they do than folks at the end of that cycle. And if you
12 do a systems-wide analysis, you might find that it is worth
13 developing different incentives to align all of those
14 parties.

15 Right now there is nothing that's driving that
16 alignment, and each party is allowed to pursue their own
17 special interests. And it may, in fact, be worthwhile coming
18 up with incentives that would drive alignment if you did a
19 systems-wide analysis.

20 LESLIE: Thank you, Gary. I had someone up here.

21 SALTZSTEIN: This is Sylvia Saltzstein from Sandia
22 National Labs. It would be wonderful if the Board could
23 think creatively about what steps can be taken even if
24 congress doesn't make any decisions. Personally, and this is
25 not Sandia's viewpoint, this is Sylvia Saltzstein's

1 viewpoint, congress is not going to act on this any time
2 soon. This is not a burning platform for them.

3 What can be done in light of the fact that that
4 ties DOE's hands and NRC's hands for us as a community to
5 move forward?

6 LESLIE: Thank you, Sylvia. And I'm trying to catch up
7 and will turn around and see who has their hands raised.
8 Okay, Jeff.

9 WILLIAMS: This is Jeff Williams, DOE. I just wanted to
10 comment on a couple things. First, Nigel, you talked about
11 how I said the canisters at the shutdown reactors are
12 packaged such that they could be moved. They do have
13 certificates for transportation and storage. And Gary is
14 right that you need to go out and buy transportation casks,
15 except for Humboldt Bay, which you can just get impact
16 limiters, which still takes two years, and you need to put a
17 seal on the top. So that's fine.

18 But the other thing I wanted to say, you brought up
19 the fact that there are nine reactors that have fuel that's
20 not in transportable storage casks, Oconee, Calvert Cliffs,
21 and so forth, and they're not certified for transportation.
22 What happens when those shut down at some point in time?

23 And we talked in the other session about the
24 possibility of certifying those casks for transportation, and
25 that could possibly be done; however, they weren't designed

1 for that. They don't have the structural capabilities or the
2 neutron absorbers and so forth to meet the transportation
3 regulations.

4 In any event, I just wanted to bring that up as an
5 issue, which would then go to NRC. Would NRC allow them to
6 decommission their pools the same way as other reactors have
7 done or not? But it will be NRC's job to determine what's
8 safe under those situations. That's all.

9 LESLIE: Thanks, Jeff.

10 MOTE: Mark does not have a mic, so I'll say that NRC
11 said maybe.

12 LESLIE: Okay. Yes, right behind you. John.

13 GREEVES: John Greeves. Just observing what I heard
14 yesterday and today, the high burnup fuel issue,
15 transportation, as I understand, there are no certificates of
16 transport for high burnup fuel. Is that a roadblock, and
17 what's the path forward on getting high burnup fuel certified
18 for transportation? That's a question. Maybe you can't
19 answer it today, Mark. But is it a barrier, and what's the
20 path forward?

21 LOMBARD: Mark Lombard, Nuclear Regulatory Commission.
22 I'm trying to remember the response that we made to the SONGS
23 coalition, and I think we did say, and I'm not a hundred
24 percent sure on this, that there are one or two packages that
25 are approved for transport of high burnup fuel, but I'd have

1 to verify that.

2 LANTHRUM: A clarification, Gary Lanthrum from NAC
3 again. For those canisters that have been loaded with high
4 burnup fuel in damaged fuel cans, those are transportable as
5 is. And so it's only the ones that have been loaded bare
6 fuel. But there are ones that have been loaded in damaged
7 fuel cans, and there are no transport impediments for those.

8 GREEVES: John Greeves. I'm talking about the whole
9 fleet. High burnup fuel transportation, I think, is a
10 problem and what are the barriers in the way of solving that
11 problem. To me, they run through NRC.

12 LESLIE: Okay, thank you, John. And thanks, Gary, for
13 clarifying that point. And I guess Mark will come back to
14 this.

15 LOMBARD: Mark Lombard, NRC. You are correct. The
16 burden of certifying those or approving those packages for
17 transport does lie in us. As we talked earlier, there are
18 several research projects that are ongoing on transportation
19 of high burnup fuel. We have a project going on at Oak Ridge
20 right now that's showing some very promising results relative
21 to the transportation of high burnup fuel. We're not ready
22 to roll those results out yet, but I think by the time we,
23 and I use it collective, we as a nation are ready to have a
24 place to put that high burnup fuel, whether it's an interim
25 consolidated storage facility or a repository, we'll be ready

1 to approve those for transportation.

2 LESLIE: Yes, Marvin.

3 RESNIKOFF: Marvin Resnikoff. My recollection after
4 looking at the certificate of compliance for the NUHOMS
5 container is 62,000 megawatt days per metric ton is the limit
6 right now that's been certified.

7 LESLIE: Okay, thank you.

8 RESNIKOFF: And some fuel at SONGS is up to 67,000
9 megawatt days.

10 LESLIE: On the mic if you're going to--

11 WILLIAMS: This is Jeff Williams again. I think that's
12 for storage, not for transportation.

13 RESNIKOFF: Yeah, for transportation it's worse.

14 LESLIE: Thank you. All right. Other questions and
15 comments. And, kind of, just where we're at, we have about
16 15 more minutes before we're supposed to go to the Board
17 Chairman. But I'm checking in with you to see how you're
18 feeling. Don't want to rush anything, but at the same time I
19 don't want to drag anything out either. So are there other
20 takeaways?

21 MOTE: There's one back there.

22 LESLIE: Okay, thank you. Sorry I didn't see you.

23 CUMMINGS: Kris Cummings, NEI. I look around the room
24 and see the people participating in this meeting, and I see
25 we have a lot of non-governmental organizations, DOE,

1 obviously the Board. One of the observations I'd make is
2 having the Board engage with the industry, the nuclear power
3 plants. There are some cask vendors here, not all of them,
4 giving them an opportunity to give presentations, simply
5 because they're the ones who deal with these issues on an
6 every-day-every-year basis. They're the ones that go to the
7 NRC and have to provide the safety case for them being able
8 to say, yes, these are safe.

9 So that's the observation I wanted to make was to
10 get all the stakeholders, especially the nuclear plants, and
11 I want to thank the people in the nuclear industry who did
12 come and support this meeting today. But I don't think
13 that's an accurate representation of the industry here. So
14 just an observation.

15 LESLIE: Thank you, Kris. Looking around. Oh, yes,
16 sorry. And I'm glad that, Hitesh, make sure you identify
17 yourself.

18 NIGAM: Hitesh Nigam from Department of Energy. I was
19 just listening to Gary and Jeff sing about the transportation
20 issue. Just for everyone's information, Department of Energy
21 continues to transport DRR and foreign research reactor fuel
22 into its facilities. So I know it's not happening with the
23 commercial fuel, but certainly Department of Energy is
24 receiving fuel from all over the world, including all the
25 research reactors, domestic and university research reactors

1 in the United States and Navy.

2 LESLIE: And it's one of the things-, and again I'm
3 looking around, but one of the things that Nigel opened up, I
4 think, this morning, which is we did not have a lot of
5 discussion about DOE spent nuclear fuel. And I don't see
6 Beatrice right now, but oh, she's back there. But let me
7 kind of summarize. It's not out of sight and not out of mind
8 for at least some of the community, and so there was some
9 discussion. It was captured a little bit by Jerry, but I
10 just wanted to let you know that I think, if you go back to
11 the transcript, there will be some things there that maybe
12 didn't get explained real well this afternoon.

13 But, Hitesh, thank you for reminding me to talk to
14 the DOE spent fuel.

15 MOTE: Maybe we can ask Hitesh. Are there any features
16 of the DOE spent fuel systems that are markedly different
17 that would warrant different inputs to discussion of the
18 potential for repackaging?

19 NIGAM: That's a tough one. Just for everyone's
20 information, basically we're storing spent fuel at four
21 different states, Colorado, Idaho, Hanford, and Savannah
22 River site. And basically we are under status quo. We're
23 really not doing much with our spent fuel. Most of our fuel
24 is at Hanford by weight, and it's sitting in dry storage over
25 there. Most of our fuel at Idaho is also in dry storage

1 where we are required to move that fuel by 2035 in about 20
2 years or so, but it's sitting there right now. We really
3 haven't made much progress.

4 We have some fuel sitting in wet storage at
5 Savannah River site in South Carolina. That's where we have
6 just started to process some spent fuel, if you're not aware.
7 We're processing aluminum clad fuel that's in our inventory
8 over the next four or five years or so. We still have this
9 facility called H Canyon processing facility that is
10 operational. They're doing a lot of activities over there,
11 including processing spent fuel to try to eliminate some of
12 our inventory. But, of course, processing spent fuel
13 generates liquid high-level waste that we're trying to
14 manage.

15 I'm not sure if that answers your question. But
16 we're really not doing too much at this time.

17 Go ahead, Jeff.

18 WILLIAMS: I'd like to say the largest difference
19 between their fuel and these guys' fuel, the utilities' fuel,
20 is that theirs is sitting in vaults in small packages that
21 have lots and lots of flexibility, which you don't have at
22 the utilities when you put the fuel in 37-assembly welded
23 canisters that you're stuck with, the issue that you've been
24 dealing with. If you go to Idaho, you can see there's
25 vaults, Savannah River vaults and pools, and so forth. Lots

1 and lots of flexibility. You don't have that flexibility
2 with the utility systems.

3 NIGAM: And I also want to just reemphasize some of the
4 points that Robert Sanchez made. I know this whole meeting
5 we've been focusing on technical issues, but there are a lot
6 of non-technical issues that probably would drive many of the
7 technical issues that we've been discussing here.

8 And, you know, after being here for a day and a
9 half or so, this is just me personally talking, not
10 Department of Energy, seems like we're not going to make much
11 progress over the next decade or two on this issue. I think
12 the best scenario for us is status quo and trying to
13 safeguard and secure our material that's sitting in our
14 existing facilities. Again, that's more personal than my
15 departmental opinion.

16 LESLIE: Thank you, Hitesh. Okay, I've got Marvin.
17 Anyone else? Go ahead, Marvin.

18 RESNIKOFF: I didn't want to let this go by without also
19 saying that DOE is going to accept liquid highly-enriched
20 uranium slightly irradiated from Chalk River reactors in
21 Canada. There will be several hundred shipments coming down
22 I-81 to Savannah River plant.

23 LESLIE: Okay, thank you, Marvin. Other questions or
24 takeaways on what we've heard over the last day and a half?

25 Thank you, Judy.

1 TREICHEL: You're welcome, Bret. Judy Treichel, Nevada
2 Nuclear Waste Task Force. If you've noticed that there is a
3 kind of lack of comment from people who comment all the
4 Time, Bea, me, others, it's because we're really here to get
5 to the point where they're not making waste. The one thing
6 that's not stopping, of course, is producing more and more
7 waste. And as we see from all the charts, the problem is
8 getting bigger, and we're being asked to solve a problem or
9 think of things to make the problem smaller. And nothing is
10 going to do that until you have a system that, as Nigel
11 pointed out, the beginning end of it is profit-driven, so you
12 do everything that makes money. And then by the end of it, a
13 lot of those decisions that made more profit wind up costing
14 more and making it far more difficult.

15 So there is not a lot for people like me to say
16 about this, and I certainly am not going to stop
17 participating, because I have an active interest, and so does
18 Nevada. But it's very difficult to look at something that
19 seems to be going in the wrong direction.

20 LESLIE: Thank you, Judy. Arjun. We'll get you a mic
21 here.

22 MAKHIJANI: I just want to follow up a little bit on
23 that. But I note that the most advanced repository program
24 and one I've tried to learn as much from as I can is the
25 Swedish program, and I thought it has gone about as well so

1 far as any other example anyway, in my opinion.

2 And I think it hasn't been much remarked that their
3 program matured in the context of a moratorium on nuclear
4 power. And the interaction between that moratorium and the--
5 because initially they had public resistance, as they have
6 had everywhere else. And I think the interaction between
7 that moratorium and the success of their program, at least so
8 far, is worth examining. I know that recently they have kind
9 of, there's some question as to whether there's going to be
10 new nuclear power plants in Sweden or not, and that question
11 is being reopened.

12 But the repository program matured in that, and my
13 personal interest is to see how the end of nuclear power in
14 Germany affects that. You know, it's been a very difficult
15 debate in Germany, perhaps more difficult than anywhere else,
16 and perhaps at least the question should be put on the table.
17 I certainly don't have a view on--a studied view on what
18 impact it has had, but it might have an impact.

19 LESLIE: Okay, thank you, Arjun.

20 MOTE: Well, maybe we can ask our German visitor to say
21 whether he senses any difference in the receptivity for a
22 location of a repository in Germany or easing in the
23 development in the same way that Arjun is saying there may
24 have been that impact in Sweden, although it's very early
25 days in Germany, and there have been several changes, so

1 maybe it's not stable enough yet.

2 BERLEPSCH: Thilo Berlepsch from DBE Technology in
3 Germany, obviously. At least up to now, I don't see any
4 difference in the reactions of the public against the
5 repository programs we've got in Germany. I think this will
6 change once the last nuclear power plant is really off line,
7 not any earlier. But maybe directly to the comment which--I
8 forgot your name again.

9 MAKHIJANI: Arjun.

10 BERLEPSCH: Arjun. Sorry. What I saw in Sweden is that
11 the public opinion was for quite a long time in favor of
12 nuclear power, and it was only the policy which changed
13 afterwards. And when you already talk about Sweden, then
14 there's another Scandinavian country, which is Finland, and
15 they have been in favor of nuclear for a very long time. And
16 I think they're even more advanced in their repository
17 program than Sweden is. They have got a license for the
18 repository, and they are actually constructing it already.

19 LESLIE: Thank you, Thilo.

20 So kind of at this point I'm going to wrap up this
21 discussion, and I'll remind you the process is that once this
22 week is over and I can actually come up for air, because the
23 Board has a public meeting tomorrow, and then we have some
24 Board business the following day, that the summary of these
25 bullets, in my words, I'm not relying on any sort of

1 transcript, will go up as kind of what we heard in this
2 session.

3 And, again, we're not requiring you to take any
4 action now. I know that there are a number of public comment
5 periods right now. There's the waste confidence that the
6 community is working on. There is the high burnup test plan
7 that's out for public comment. But if you want to, you can
8 comment on these things; and also after you see the
9 transcript, you can send in clarifying questions.

10 And I think at this point, if people are clear on
11 the process, then I'm going to turn it over to Rod to take us
12 out into the end. Thank you.

13 EWING: So normally at this point in our meetings we set
14 aside time for public comment, and I just checked. No one is
15 signed up to make public comment. I think that's because we
16 have given everyone ample opportunity to speak. So we can
17 move on to a few closing statements.

18 First, as the last functioning part of the Nuclear
19 Waste Policy Act, I'd like to invite you to our open meeting
20 tomorrow. It'll be in this room at 8 o'clock. There is some
21 overlap of the topics, but it's not meant to be a follow-up
22 to the workshop. But I think the topics will be of great
23 interest, and I think you can get the agenda from the table
24 outside.

25 I want to thank particularly all of the

1 participants. This style of meeting is new for the Board.
2 It wouldn't have worked without the presentations,
3 particularly on the first day, very high-level and also
4 thoughtful presentations from Pete Lyons, Allison Macfarlane,
5 and others. But the interactions have been, I think,
6 extraordinary, at least in my experience in this field.

7 This is our first effort at what I would call a
8 participant-oriented meeting. You've seen us scrambling;
9 you've seen us change the format as we moved along. So I'd
10 ask you to let us know how we did and how we can improve. Is
11 this the type of meeting that is useful and constructive?
12 I've learned a lot, but it's a meeting for everyone. So
13 please give us your thoughts and advice on that.

14 So the last comment is to tell members of the
15 Board, we will meet at 7:30 this evening in the Embassy Room
16 and begin to discuss and digest what we've learned at this
17 meeting.

18 So, again, thank you all.

19 Nigel.

20 MOTE: Cards.

21 EWING: Oh, I need to be prompted. So if you want to
22 stay in contact with the Board, there are cards outside.
23 Please fill it out with your address and e-mail, and we'll be
24 sure you get all of our materials. That reminds me to say
25 thank you to our staff again. This was an extraordinary

1 effort by our staff, and so we're very grateful, all of us.

2 LOMBARD: I'm sorry, Rod. Mark Lombard with the NRC. I
3 want to give kudos to the Board for even setting this up. It
4 was a very different format. I think there was a lot of
5 great interaction, and thanks to you all for setting it up
6 and hosting us. Thank you.

7 EWING: Thank you. And we're adjourned.

8 (Whereupon, the meeting was adjourned.)

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Federal Reporting Service, Inc.

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17454 East Asbury Place

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Aurora, Colorado 80013

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(303) 751-2777

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