BLUE RIBBON COMMISSION ON AMERICA'S
NUCLEAR FUTURE

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MEETING
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DAY 1
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THURSDAY,
MARCH 25, 2010
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The Commission convened at 11:00 a.m. in the Ballroom of the Willard Intercontinental Hotel, located at 1401 Pennsylvania Avenue, Northwest, Washington, D.C., Lee Hamilton and Brent Scowcroft, Co-Chairs, presiding.

MEMBERS PRESENT:

THE HONORABLE LEE HAMILTON, Co-Chair
GENERAL BRENT SCOWCROFT, Co-Chair
THE HONORABLE PETE DOMENICI
THE HONORABLE PHIL SHARP
MR MARK H. AYERS
THE HONORABLE VICKY BAILEY
DR ALBERT CARNESALE

MS SUSAN EISENHOWER
MR JONATHAN LASH
DR ALLISON MacFARLANE
DR RICHARD A. MESERVE
MR JOHN ROWE
DR PER F. PETERSON

ALSO PRESENT:

TIM FRAZIER, Designated Federal Official

STEVEN CHU, US Secretary of Energy

MARK HOLT, Congressional Research Office

MATTHEW CROZAT, Office of Nuclear Energy

FRANK MARCINOWSKI, Office of
Environmental Management

JOHN McKENZIE, Office of Naval Reactors

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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

11:00 a.m.

MR. FRAZIER: Thank you. My name is Tim Frazier. I'm the Designated Federal Officer for the Blue Ribbon Commission on America's Nuclear Future. I'd like to welcome you all today for the first public meeting.

What we're going to do, the Secretary of Energy is going to come and make some comments. He's running a little behind. So we're going to go into opening comments from the Commission Members until the Secretary arrives, starting with General Scowcroft.

Let me make a statement for the Commission Members. You have to press and hold the button to speak, and then let go and it will turn the mic back off.

General?

CHAIR SCOWCROFT: Thank you, Tim.

First, I'd like to welcome all of the Members of the Commission, and thank you

very deeply for your volunteering your time and your expertise to what is not only one of the most important problems facing the United States but a critically difficult problem to solve.

I believe that if our country is to continue to progress in terms of adequate energy, dealing with the environmental issues, nuclear energy has to be a vital part of that. As a part of that, we have to figure out what we do with the residue from nuclear activities in a safe and responsible way. And that's what we're about. That problem has vexed us for decades now. And that's what we have set ourselves to do.

It will be a challenging job. The field is wide. We need to know not only the technical aspects but the public opinion aspects of it. And I just want to welcome all of you and say it's going to be tough. But thanks for joining us.

CHAIR HAMILTON: Okay. I think by

way of instruction, I might say to the Commissioners that in order to speak from these microphones, you have to press down the button in front of you. A red light will appear, and you keep it on. You have to keep pressing it while you speak.

I want to reiterate, of course, what a great pleasure it is for me to work with General Scowcroft. General Scowcroft is in any measure one of the great public servants of our generation, perhaps any generation. And his contributions to the betterment of the country are well known to all of us. And Brent, it's a very high privilege for me to work with you on this Commission.

The assignment that we have is a daunting task. Pete Domenici and Phil Sharp and I can remember debating this issue 20, 30, maybe 40 years ago in the United States Congress. Indeed I think since the beginning of the Manhattan Project, which was as I

recall back in the 1940s, the management of waste has never been satisfactorily resolved. And as a nation, we have really struggled with this issue. The President and the Secretary of Energy have challenged us to conduct a comprehensive review of the policies for managing the fuel cycle, and to recommend new plans. We accept that challenge.

We will investigate a very wide range of issues, including as the charter sets forth, fuel-cycle technologies, options for safe storage of used nuclear fuel, options for permanent waste disposal, and arrangements for the management of used nuclear fuel and nuclear waste. We'll also make recommendations on the Nuclear Waste Fund and the fees that are currently being charged to nuclear energy rate-payers.

Brent Scowcroft and I are extremely pleased and fortunate to be joined by an extraordinary group of Commissioners who have been selected, I might say, with an

enormous amount of care. They have a remarkable degree of expertise on this subject. And I, more importantly the Secretary and the President and General Scowcroft, are deeply grateful to each of the Commissioners for their willingness to step forward here and to accept this challenge. I have every confidence that we will succeed because of the quality of the Commissioners that we have.

Likewise, I think it's impressive that we have a good many people from the public sector present. It is a sure sign, I think, of the seriousness and the interest in the work that this Commission is addressing. We welcome the participation, and we deeply appreciate the participation of the public.

The issue that we confront is hardly the exclusive purview of this Commission, or for that matter the Department of Energy. Nuclear energy and its future has an impact as the General has suggested for all

Americans and for generations yet to come.

We're very grateful to Secretary Chu. We're very grateful to the Department of Energy and their remarkable colleagues that he has assembled for providing the necessary financial and administrative support that this Commission needs. We've already benefitted from that support as was obvious this morning.

But having said that, I think it's important to note that this is an independent Commission. It is independent by law, and it will be independent in fact.

We will listen carefully to the advice and the counsel that is extended to us by the Department of Energy, certainly by many, many other public sources. But at the end of the day, the report, the analysis, the conclusions, the recommendations will be ours and ours alone.

We are due to submit a draft report to the Secretary of Energy 18 months after January 29 of this year. And we are due

to provide a final report two years after that date which was the date the Presidential Memorandum called for the establishment of the Commission. General Scowcroft and I, as we've already discussed with the Commission, want to meet our goals on an even shorter timetable, if that is possible.

So we look forward to the challenge ahead. We will approach our work with great seriousness. We have been told again and again by a variety of people that the stakes are high here for the country.

I thank all of you for joining us today, and we will open up the platform for just a moment for any further comments from the Commission Members. General, you may have an additional comment while we wait for Secretary Chu.

CHAIR SCOWCROFT: I would just like to add while we wait for the Secretary what an honor it is for me to work with my Co-Chairman Lee Hamilton. He and I have

encountered each other over a great many years. He's a Democrat. I'm a Republican. He's from the legislative branch. I'm from the executive branch. But we've always surmounted those differences and I think had a very fruitful relationship. And I am confident that difficult though this problem is that we or the outstanding representatives that we have as Members of the Commission can deal with this problem in a manner worthy of the American people.

Now I know that Senator Domenici wanted to comment. He had to excuse himself for a moment.

Is there anyone else who would like to comment?

HON. MR. DOMENICI: Mr. Chairman, did you call on me?

CHAIR SCOWCROFT: I called on you. And you rose to the occasion.

HON. MR. DOMENICI: I'm very sorry, everyone. You have to hold it while

you talk?

CHAIR SCOWCROFT: Yes.

HON. MR. DOMENICI: Oh, boy. This is really modern.

(LAUGHTER.)

HON. MR. DOMENICI: We can really solve these technical problems.

(LAUGHTER.)

HON. MR. DOMENICI: Well, first I want to say I was in the Senate for 36 years. I just left a year and three months ago. I think some of you know I left not voluntarily and they didn't throw me out. I left because I wasn't well. Turns out I was a little more well than the doctor thought. So I'm still around, and enjoying it.

And I want to say for starters that there are a lot of commissions here in the nation's capitol. And they get a lot of coverage and they do a lot of work. And it's been my observation that they also and in great quantities find themselves and their

reports in the wastebasket. And it's been an employment for some people and a good time for others and work for others. But nothing got done.

I'm firmly convinced that we don't have that kind of Commission. We don't have that kind of Chairman. We're not going to work for a year, a year and a half to have a report to throw it in the basket. From what I can tell, there's a genuine understanding that we have signed on for a real job -- a job that means we're going to help the United States decide on what to do about nuclear power in the future.

I just want to remind everyone today there are 57 nuclear power plants under construction in the world. And there is one in the United States, and it's sort of a half a one. We have one that's received a loan guarantee and everybody's very excited about that.

But the truth of the matter is we

are far behind because we don't want to make a decision on what we do with the used fuel. And I believe we made a big mistake when we decided not to go on with reprocessing. Whenever that was and under which President, it doesn't matter. It happened. We did that because we said the world will stop if we stop. We stopped, they did not. That's what happened.

So today, there was a time when our country was the unquestioned leader. But most of the world's new reactors are built overseas, non-U.S. companies. Today it is possible for a country to order a Korean reactor, purchase uranium from Kazakhstan, have the uranium enriched and fabricated in Europe, and never once be dependent upon support from the United States or subject to U.S. non-proliferation programs.

It's obvious if we are going to be successful we have a different rule here at home, and we will have some impact in the

world with reference to the issues I have just raised. I am hopeful, however, from what I can tell, we have a real chance to do that.

Now I want to close by saying that I have observed one permanent repository for nuclear waste. And people don't even know it exists. But the United States does have one. It's in Carlsbad, New Mexico.

It's in the salt domes there. They have not moved for 40 million years. And 2100 feet under the ground in that salt, there are thousands of tons of transuranic waste, long-life, low radiation dose in that. It is as safe as anything that you could ever do. Not one accident in ten years of operation either in transportation or in the evolution of the mine underground.

I cite that to you for two reasons. One, I think we ought to see it as a team, and see that we can do something positive that is difficult, and we can get the citizens to understand and ultimately be for

something like that. And secondly, we would have an opportunity to see something that really works.

So I took too long. But I thought maybe and since the Secretary wasn't here that I could abuse you with a few of my ancient remarks -- remarks of an ancient mariner.

I would say that we are moving ahead in America. But much is dependent upon what we recommend to the President of the United States and the Congress of the United States after we exercise our due diligence.

Thank you, Mr. Chairman, for letting me speak a moment, and for letting me be here at your side. Thank you, Brent.

CHAIR SCOWCROFT: Thank you very much, Senator Domenici.

Mr. Secretary, the two Co-Chairs have made introductory comments. And we welcome you to the podium.

SECRETARY CHU: So I apologize for being a little late.

The first thing I want to say is how much I appreciate the willingness of this very distinguished committee to do this work, particularly General Scowcroft, Congressman Hamilton, for being willing to take on the Co-Chairs, but the entire committee. It's a very distinguished committee. And it's very important work.

So let me just convey some thoughts about the formal charge before you. You have the President's letter to me and also the charge. And let me just talk about some of those things.

We're in a different place than we were some 25 years ago. I think 25 years ago, we were not anticipating a renaissance of nuclear technology in the United States and the world. Twenty-five years ago, the constraints -- the legal constraints -- were different than they are today based on a Supreme Court ruling.

And right now, I think it's fair

to say there's not only a possibility but perhaps even a likelihood that we will be restarting the nuclear industry in the U.S. And not a likelihood, but a certainty around the world that that will be increasing. So in many respects, what you do in your committee will in large part have the attention of the world as well.

In looking towards how do we deal with the back-end fuel cycle, I ask you to look deeply at all the things that we know now today and we'll know in the coming decades. And that would and should inform you of plotting a strategy forward.

Let me give you a small technical example. Today if you look at the energy content of the uranium we dig out of the ground and how much of it we actually use to generate electricity, it's less than one percent. I do know that with modest designs in talking with some of the people in the community -- the scientists doing these

simulations -- that with even modest designs with current light-water reactors and fuels, you could possibly double that or even increase that by more. But if going to more radical things you can increase that by a factor of ten, 20, 30, with a single cycle, so let's say we increase it by a factor of ten. That's ten times less waste for the same amount of electricity.

We in the Department of Energy will be looking at research and how to reduce waste even further. But by potentially closing the fuel cycle, we don't now know if this is going to be commercially viable -- things of that nature. We are going to be doing research in that area.

And so, the people in the Department of Energy you can use as an asset as well as the wider scientific community as to what people are thinking about and talking about. And that again should feed into your plans and recommendations of what you would

recommend to me, the President and the Congress on the back-end of the fuel cycle. And in so doing, that would also influence some of the issues regarding what we are going to do about storage -- storage in the coming decades and storage over longer periods of time -- and final disposition.

And so those are all questions before you. I just want to emphasize a few more things that this is not a siting commission. It is not to pick spots in the United States for repositories. It is to look at all the science and technology and all the other things that would influence how we deal with the back-end of the fuel cycle.

I'm just trying to think if there's anything else.

Let me stop now and ask the Commission whether you have any questions that clarifies both the charge that you've received, the letter from the President and the charge you've received from me. I just

wanted to throw that open for a few minutes.

CHAIR HAMILTON: Mr. Secretary, I think all of us recognize that it was your vision which brought about the Commission. And we're grateful to you as General Scowcroft and I have both said prior to your arrival for giving us the opportunity to serve the country.

One of the comments that came up in our discussion earlier today was that the title, Blue Ribbon Commission on America's Nuclear Future, is very, very broad. And there's been an enormous amount of emphasis at the same time on the more specific problem of what do you do with nuclear waste. Maybe you can help us understand our mandate a little more clearly with respect to that.

To what extent do we focus on this very broad question of America's nuclear future, and to what extent on the more specific question of nuclear waste?

SECRETARY CHU: You have to have

some reasonable projections. Again, it doesn't have to be cast in concrete because quite frankly, one can't really tell what technologies will be available to us 50 and 100 years from today. And so that also weighs in your decisions on what to do -- or even 150 years from today. But you want to step back and take a wide look at it.

The focus is definitely on the back-end of the fuel cycle. But if you consider again where we are today, where we are now in a once-through cycle where if we continue let's say at even 20 percent production of electricity by nuclear power that would create huge demands on repositories.

And in designing a strategy for the back-end of the fuel cycle, one also has to say okay, how do we set up things so as the technology progresses we can look at it. For example, quite frankly, the Department of Energy will be committed to looking at ways of

greatly reducing the amount.

There's spent fuel. And then eventually there will be fuel where there will be no economic value, and you don't want to have the access to it anymore and you just want a final disposition of that material. And so, in understanding that there are going to be these categories, one will have to make reasonable conjectures as to how technology will be developing.

The NRC has made it very clear that dry-cask storage above ground could be safe for decades. And indeed, Chairman Jaczko has made remarks saying in terms of above-ground storage whether it's going to be 50, 100, 200, 300 years. So let's take the low end as a minimum. We have 50 years to develop things. We probably have more. And so, part of your recommendations will say -- you'll ask what is the strategy and how to deal with this knowing that we will be in a different place another 25 years from now than we were 25

years ago. And we'll be in even a different place 50 years from today.

So does that help?

CHAIR HAMILTON: Yes. That is very helpful. Any other questions?

CHAIR SCOWCROFT: Mr. Secretary, you made two very interesting comments among your many. One was about possibly closing the fuel-cycle. Another was that we use less than one percent of the energy value of the uranium that we mine.

Now, our major task as you said is the back-end of the fuel cycle. But what you do with the front-end of the fuel cycle has a lot to do as you have just said on the back-end. I just wonder how comprehensively you want us to look at the whole thing.

SECRETARY CHU: Well, again you're going to have for example the world researchers are looking at whether it's going to be commercially viable, safe to develop a generation of fast neutron reactors that can

burn down the waste -- long-lived actinide waste -- that gives you this million-year issue, as well as attract more of the energy content out of the uranium we use.

While we do not have, it's safe to say no one is claiming that we are ready to put shovels in the ground and to start building these fast spectrum neutron reactors. Your committee should be looking at these possibilities because if you can reduce the lifetime of the waste by factors of hundreds to thousands, if you can reduce the amount of the waste by factors of tens to hundreds, that also can change things. And what you do in the interim is then an open question.

So these are all questions for you. You're very smart people. I don't want to tip any weight anywhere on what you do. And so it's to the extent that you decide. And you can form subcommittees to give you detailed scientific input as to these questions. And then that will then effect

what you're here for and to make recommendations to me, to Congress, the President, on what to do with the back-end of the fuel cycle.

But I think it's safe to say unless you step back and look at it all, if you just focus on just a tiny portion, we probably will not get to the wisest path.

CHAIR SCOWCROFT: Thank you.

HON. MR. DOMENICI: Mr. Secretary, it is good to see you again. Good to have you with us. I understand you're on a tight schedule.

There is much discussion in the news about Yucca Mountain and its future. So to be clear for everyone, you gave us a charter. But you also gave us certain instructions regarding Yucca Mountain. Could you tell us so the record will be clear and the public will understand, is it correct that we do not have Yucca Mountain within our jurisdiction? It is not to be considered as

part of our study approach to the future of nuclear power for America?

SECRETARY CHU: It is correct to say that we are going to look to the future and we're going to look to see what we can do going forward. And so what I don't want the committee to be going is just spending time and saying by looking at past history was Yucca Mountain a good decision or a bad decision and whether it can be used as a future repository.

MS. EISENHOWER: Mr. Secretary, in the charter that was --

SECRETARY CHU: Can I just interrupt?

So looking to the future, we want to go forward. And so again your recommendations of all future repositories just have to fold in -- interim storage, temporary storage, permanent disposal -- all those things. It's a generic. This is not a siting commission. And so it's mostly that.

It's not a siting commission.

MS. EISENHOWER: Yes. Mr. Secretary, in the charter that was distributed to us, the word "options" relate to many things with regard to the back-end of the fuel cycle. To what extent do you expect this Commission to view these options going forward in the context of cost and political feasibility?

SECRETARY CHU: I think if, for example, right now if you take a snapshot today in time, the cost and feasibility of some of the things we just were speaking about like full recycling or things are not there yet it's safe to say. But I'm mostly asking you to look towards the future -- 25, 50 years from today, 75 years from today. And so things will change.

And so again, it's an assessment and where there's guarantee of what will be economically viable and safe. We also want to develop nuclear technology in a way that is

definitely proliferation-resistant. And so there are no guarantees on what will happen. And then you have to fold that into your assessment.

CHAIR HAMILTON: My understanding is the Secretary has to leave.

Dick, you have a question. Commissioner Meserve?

DR. MESERVE: Mr. Secretary, I have a much more mundane question than the ones you've been tackling.

And I understand from the charge that the intent is that we focus attention on used nuclear fuel. But there is also reference to disposal of other materials derived from the operation of commercial reactors.

There are many categories of low-level waste for which at the moment there is no disposal process. And I'm curious whether low-level waste is intended to be within the scope of our deliberations or not.

SECRETARY CHU: Yes. That was an easy one. As far as I know yes, that it's back in.

But I mean, we also have -- it's not on the nuclear civilian side -- we also have an issue with the military side.

The Department of Energy has responsibilities and legal mandates and we fully intend to keep those. And so this committee is also here to give us advice on all those responsibilities that we have and will try to adhere to as best we can.

CHAIR HAMILTON: Those of us accustomed to sitting in Congressional hearings appreciate these direct responses, don't we, Mr. Secretary?

(LAUGHTER.)

CHAIR HAMILTON: I'm getting the signal here from your folks that it's time for you to go on. Let me thank you very, very much for stopping by and giving us the opportunity to serve on the Commission.

Thank you, Mr. Secretary.

SECRETARY CHU: Thank you.

And again, let me thank the committee once again for be willing to do this. It's very time consuming.

The eyes of the world will be upon you. But you're a terrific committee. And so, if there's any way we can assist in the information and things of that nature, but you're the people who are going to be making these recommendation. Thank you.

CHAIR HAMILTON: Now I think under the agenda we have a few minutes to have discussion among the Members of the Commission. And I know that General Scowcroft and I would appreciate any input from the Commission with regard to how we might proceed, what kind of hearings we should have, how frequently, what witnesses -- anything you want to comment on with regard to the processes of the Commission.

As I've indicated previously to

you, we've only hired two people with regard to the staff at this point. We anticipate that we'll be hiring a few more. But we really don't know how large a Commission staff we're going to need.

But the floor is kind of open at this point for general discussions or comments or remarks by Members of the Commission.

DR. MESERVE: I wasn't intending to launch forward with an opening statement, but let me offer my perspective on the context within which I think we should proceed with our work.

It is I think apparent to all of us on the Commission that we need to define a strategy to deal with used fuel, that there's a compelling obligation because as material is accumulated, it needs to be handled. But I think it's also important to recognize -- and I'm picking up on a point that the Secretary made -- that this is not a crisis. We have a situation today in which we can safely and

securely store these materials for many decades, and that we don't have to have a public concern that this material is somehow severely at risk over a period as we think about how we proceed.

Secondly, I think I would add that -- and this is something which the Commission will have to reach its own conclusion -- but that there are a number of studies including some from the National Academy of Sciences that have found that deep geologic disposal is sufficient to isolate these materials for the long term. That's not to say that any particular site is necessarily good for that. Obviously, not every site is going to be appropriate. And I'm not making a comment about any site. It's just that it is within the technical capability of the country to find an appropriate site that will be able to handle these wastes for the long term.

So there is a solution that is available if it were necessary. And beyond

that fact, as the Secretary also emphasized, there may be some other approaches that he mentioned -- reprocessing, recycling -- that could provide a way that would make the problem of waste disposal different and easier. If that doesn't pan out to be the case, we still have a solution that is available which is deep geologic disposal.

So I mention all this to say that this is a problem we need to solve. It is a solvable problem. And there is no crisis and urgency in having an answer today or tomorrow that is we're ready to implement. What I think as I've understood the Secretary, we want to launch on a path that will take us to the stage of appropriate resolution of these matters.

Now there are some who might argue that while you haven't found a way to deal with the spent-fuel and therefore we ought to start shutting down reactors or we ought not to build reactors. I disagree with that point

of view. I disagree with that point of view for the reason that the fact that we're producing an increment more of spent-fuel does not change the character of the problem. The solution that is we have to solve the problem dealing with used fuel one way or another. We can solve it. And the fact that there's an increment of used-fuel that is produced doesn't change the nature of the problems. So the solution is one that we will have to find. But it doesn't mean that our immediate path should be that we turn away for that reason from nuclear power.

So I think that is for me a context of which we're approaching a very important problem. But it is one that is not at a crisis in which a thoughtful, measured approach is appropriate.

CHAIR HAMILTON: Thank you, Dick.

All right. Jonathan, and then Allison.

MR. LASH: A brief comment from a

somewhat different starting point that Dick's.

Most of the people around this table genuinely qualify as what we were described as in our appointment papers -- experts. But among that group, I don't include myself. This has not been an issue that's occupied most of professional life. I run an environmental think tank.

If there is one reason that compelled me to agree to participate in this process, it is the vision that we're making a set of decisions that are potentially enormously important in a larger consideration set of considerations -- how we move into a carbon-constrained world. John and I have spent a great deal of time discussing that.

I hope that as the Commission moves forward and as we answer the Secretary's request that we understand what we're doing in a broader context that we spend some time talking about that context -- what we expect of this industry, how we'll produce the energy

that's necessary for the country to operate faced with increasing carbon constraints, and how we do that within the context of our desire to lead the world in restraining nuclear proliferation.

Thank you.

CHAIR HAMILTON: Thank you very much, Jonathan.

Allison?

HON. MS. BAILEY: Thank you, Mr. Chairman.

I just want to respond a little and maybe enhance a little Commissioner Meserve's comments. I agree that there's no urgency to move forward tomorrow with a solution to the problem of spent nuclear fuel. There may be a case to be made for those reactors that have fully decommissioned to move their fuel somewhere to some central site. I think that is something that we should consider.

But I would like to make very

clear from the outset that no matter what kind of management option we consider, whether it is a direct disposal or whether we are considering even a fully closed cycle, we need some kind of geologic repository. We cannot escape that fact.

It doesn't have to be a mined repository. It could be a borehole. And we should be open to that as well. But we cannot escape that fact. And we will have to deal with that.

And then if we do consider other options besides direct disposal, we need to keep in mind that we're not just dealing with high-level nuclear waste, that there are numerous waste streams that we have to account for, not only in terms of the technical aspects, but in terms of as Commissioner Eisenhower pointed out, the political and economic aspects.

So, just want to be clear with that.

CHAIR HAMILTON: Thank you, Allison.

Vicky?

HON. MS. BAILEY: Thank you, Mr. Chairman.

I guess, in also taking off a point from Commissioner Meserve, there may not be a scientific crisis. And I too am not an expert on the science of these issues. But to the extent there is a crisis of confidence, I think there exists.

If we agree that nuclear power should continue to be a viable part of the supply portfolio in this country, our inability to address this issue is an impediment in my mind. If we want to grow domestically vendors who will construct nuclear plants, if we want students to enroll in nuclear specialties, I think this is an issue that if we are serious about the growth of nuclear power that we have to address.

As a former state and federal

regulatory, we often found ourselves on the front lines of decisionmaking. And as state commissions make resource decisions and commit ratepayers to meet the supply needs in their state, and as the industry makes resource commitments and financial commitments, they need confidence that there is a direction in place for managing the end of the nuclear fuel cycle, one that gives clarity and one that gives certainty.

This is how I believe we show that we are serious about promoting the growth of nuclear power in this country. And I want my participation -- I hope my participation on this Commission puts some building blocks in place so that we can do that and build that confidence.

CHAIR HAMILTON: Thank you, Vicky.

Al?

DR. CARNESALE: Thank you, Mr. Chairman.

I just want to point out, there

were two related issues, but they're not the same. One is the one that we generally talk about which is what are we going to do with the radioactive waste in the fuel cycle. And the other is issues associated with reprocessing. These are -- they overlap substantially, but they're not the same. For nuclear power to be viable, it's got to be safe, it's got to be economic, it's got to be acceptable to the public -- all three of those.

Much of the debate we've been having in recent years and the concerns of people has been about radioactive waste. And generally, much of that argument would be the people do not consider whether it's to be reprocessed or not. And then reprocessing which does have a bearing on radioactive waste also has many other implications -- economic, safety, proliferation and the like.

And while it is essential for us to consider both of those issues, I believe

it's also important for us not to conflate them. The latter -- proliferation -- has a substantial international dimension. So this committee, while our advice is on what the United States should do, is very much in an international context as it relates to proliferation and other matters as well.

CHAIR HAMILTON: Thank you, Al.

Per?

MR. PETERSON: I am Professor and Chair of Nuclear Engineering at the University of California at Berkeley, and therefore have been deeply involved in many of the elements of the technology and questions both on the civil side as well as on nonproliferation and arms control side of the issues that we face here on this Commission. I think it's important to note that a lot of things -- important things -- have changed over the last 25 years, and that we have an obligation to identify those changes and to clearly report them in our report because we are in a

different position now -- much different -- from where we were back then.

I would note that our current Nuclear Waste Policy Act has not proven to have the level of flexibility to adapt well to these changes, not just in technology, but also substantial changes in our security environment, and in nonproliferation, the Nuclear Waste Policy Act was developed back in the midst of the Cold War. And so for this reason, I think we have an obligation to look at approaches that would have a greater degree of long-term flexibility and responsiveness so that we can adapt to additional changes we know that will happen.

Another thing that I think that is important is to emphasize that we also face the need to perform environmental remediation at defense sites which were involved in the efforts to develop nuclear weapons. And this is an obligation that the government carries and that needs to be taken seriously as a part

of the Commission's work in addition to the questions associated with energy.

And finally, I think that we want to make sure that we advocate for a policy framework such that we have high assurance that future actions in terms of the deployment technology will meet the highest standards for safety, security and nonproliferation, and again to have a sufficiently flexible policy framework that indeed we can evolve and adapt as new challenges come before us. And I believe that that can be done because of things that we have learned about how to regulate this technology over the last 25 years that have actually resulted in impressive improvement by all empirical measures in the safety of operation of nuclear reactors.

So I think that this is a very good time for us to revisit the set of questions. And I appreciate the opportunity to do so.

HON. MR. DOMENICI: Professor, would you yield for a moment?

I just wanted to say for the record, your great cerebral qualities probably have a lot to do with genetics. But I want to lay claim to the fact that you were born in New Mexico.

(LAUGHTER.)

HON. MR. DOMENICI: And I think it had something to do with that marvelous climate and sunshine that you got in your early childhood.

MR. PETERSON: It's a bit of an accident that I was born in Las Cruces, New Mexico. I grew up in Nevada.

(LAUGHTER.)

MR. PETERSON: But I have to say that my father and my family get the primary credit for how I grew up and what my values are.

HON. MR. DOMENICI: We're going to have display Las Cruces' claim. They're very

happy.

(LAUGHTER.)

CHAIR HAMILTON: Okay. John?

MR. ROWE: Thank you, Mr. Chairman.

As the Commission Members know -- but not all the public present may -- my company owns and operates 17 of the nation's 103 or so nuclear power reactors. So it will come as no surprise that I agree with General Scowcroft and Senator Domenici that nuclear power must play a significant role in the future if we are to deal with the nation's twin goals of more secure energy and cleaner energy. And especially I agree with Commissioner Lash's point about the need to have a lower carbon energy fleet.

It may come as more of a surprise given our role in the nuclear industry however that we are not among the nation's leaders in developing a new nuclear facility. And while there are many reasons for that, one of them

is that this nation has not yet come up with a credible approach to dealing with spent nuclear fuel.

Like Commissioner Meserve, I know this is not an immediate crisis. But I do feel it is a major impediment to the development of new nuclear sites. And while we don't have to do anything quickly to keep the public safe, we do have to do something decisive to have public credibility.

I tell my nuclear team it's the cocktail party test. It's a matter of when you can look your neighbor in the eye and say we know what will happen to the spent fuel and do it without flinching. And it's terribly important. We need this technology, but we need an approach to the nuclear waste problem that is real.

For many of us when our children or grandchildren were small, we read them a book called The Velveteen Rabbit in which a stuffed rabbit wishes to become real and

becomes so by being beaten and infected. Well, our nuclear policies have been beaten often enough. But in the area of spent fuel disposal, they have not yet become real enough. And the challenge for this Commission is to do something that we can look at each other in the eye and say this is real, and then go out and look at our neighbors and say this is real.

CHAIR HAMILTON: Thank you very much, John.

Are there further comments from any of the Commissioners? Phil?

HON. MR. SHARP: Mr. Chairman, I certainly won't review why this is so important and critical. The Secretary's done that and several of our Commissioners have done that. But I think we all feel that very heavily.

I think there are two broad ways in which we're going to make a contribution. And I think many of us are intent on making

it. And one is the way in which we deliberate because part of what we hope to do as we have to educate ourselves, even though many have rich experience in this field, it's an opportunity for public discourse of the first order in this country, and there can be no doubt in this society today how critical that need is, and it's very critical on this issue to have serious conversations about serious issues.

The second is of course what several of our Commissioners are driving for that we must drive for actionable recommendations. That is not just recommendations about what's good for the next century without being specific. It means things that decisionmakers can actually make decisions about and not dumping in their laps 45 potential options that they might take. That doesn't really help. Many of us here have been on the decisionmaking end of some of these issues.

So I think that's what we want to drive for, and I think we'll be most effective if we sort of serve these two goals of heightening the deliberation in America and also coming forth with actionable recommendations.

CHAIR HAMILTON: Thank you, Phil.

Further comments? Yes, Mark?

MR. AYERS: Thank you, Mr. Co-Chairman.

It's very evident that our nation must have a diverse energy portfolio that includes hydro, wind, solar, geothermal, coal, oil and gas and certainly nuclear. We cannot meet this nation's energy needs without nuclear generation. And we all know that it's a carbon-free generation.

I agree with everyone else. There certainly is no crisis at this point. But there is an urgency to allay the concerns of the world. And as Dr. Chu stated, I think the world will be looking to the United States to

thoughtfully adopt a responsible approach toward waste management. And with that charge, I know that everyone on this Commission is ready to do that very thoughtfully and as expeditiously as we can.

HON. MR. DOMENICI: Mr. Chairman, I -- Co-Chairman, I want to just comment for a moment and extend an invitation.

Commissioner MacFarlane, you mentioned we need a repository -- geological repository. And I want to say everyone -- I just touched on it -- but in New Mexico in some very extensive salt -- salt domes -- there exists a permanent repository for transuranic military waste. Now it's not high level because it's just defined to be transuranic. And that's what we put in there. You don't put high level but you put transuranic. It is a kind of radiated excesses -- gloves and everything like that.

It is 2100 feet under the ground in salt. It's existed for ten full years

without a single accident. It has its own trucks who travel the highways day-in and day-out. Not a single accident in ten years. And I think if we are going to conduct field hearings or trips, I think we ought to go see it because I think it would give Members who wonder whether what we talk about is really doable, it would give them a real opportunity to see that reality.

I also wanted to say there's another aspect and that we've touched on it. And that is what do the people think about what we're talking about. Are they for it, against it? Are they -- well, you will find in that community and the surrounding areas an informed citizenry. They will question you as hard as anybody else. You tell them something about nuclear, you'd better know what you're talking about because city counselors, commissioners -- everybody knows. They're smart. They are in favor of what is going on. I think that's also part of what is being

discussed. And Commissioner, you alluded to it too. We need to make sure that the public -- what we come up with -- the public believes is safe and are participants in talking about it as it evolves.

And so, I extend that, and place it in the record because I know of no other way to do it. And I might not see you for a month or so, Co-Chairman, and I don't want to forget to put this request to you today.

CHAIR HAMILTON: That's very helpful indeed. All of the comments by the Commissioners have been very helpful this morning.

Are there any further?

MR. PETERSON: I would add just one related comment which is to emphasize regardless of future approach on geologic repositories, gaining experience at smaller scale through activities such as have been conducted at WIPP I think is a vital element of scaling up to address the larger problems.

And in fact, if you look at the nuclear industry from the perspective of the operation of reactors, the most important thing that has changed over the last 20 years that has resulted in dramatic improvement in the reliability of those operations and reductions and forced outage rates is the proactive application of corrective action programs where you identify problems at a minor scale and then systematically and effectively address them so that they disappear. And the effects of that are quite evident.

The current policy that we have actually calls for a massive effort to move a lot of stuff very rapidly. And that's not a way to build up a base of experience that gives you confidence that it can be done well and safely. So indeed, I think that this type of experience is very important and in forming an approach forward on the set of questions we have to work on.

CHAIR HAMILTON: Thank you, Per.

We have Vicky, and the Allison. Vicky?

HON. MS. BAILEY: Thank you. One of the things I meant to add to my comment is actually a question as a nonscientific individual.

As we look at storage -- maintaining storage -- and this is scientific from the standpoint of Commissioner Meserve -- if we look at this as being able to maintain where it is now in the storage facilities and at the different sites, but I guess in my thinking they were not necessarily designed to be maintained longer I guess maybe than 30 or 40 years. But this possibly might mean we would maintain them even longer.

So one of the things that would be helpful for me in looking at this is the ability to maintain them. Were they constructed? That was not the initial intent. But do we really have the scientific ability, reliability and safety and environmental

issues? Obviously if a utility -- Commissioner Rowe can address this -- is running out of room at a certain facility, obviously there's the ability to build dry-cask storage -- that kind of thing. But I just need to understand the option of maintaining it, where it is if we do nothing and just leave it there, what are we looking at.

CHAIR HAMILTON: Thank you, Vicky. And Allison?

DR. MacFARLANE: Thanks. I just want to go back to comments made by Commissioners Domenici and Peterson.

I think we do have to spend a little bit of time understanding the lessons learned from the failed nuclear waste process in the United States so far. And I think we will find that a significant portion of the failure has been due to it's been on political grounds. And I think we would be well served by looking at where that's working. And where

that's working is Sweden and Finland. And I think we may be well served by visiting there.

The localities where the Swedish waste site is going to be developed, the municipality has an over 80 percent approval rating for the repository there. There's a lot that we can learn from them. So I'd just like to throw that out.

CHAIR HAMILTON: Dick?

DR. MESERVE: Thank you. Let me respond a little bit to some of the comments that have been made.

I hope that my statement that we're not in a crisis was not understood to mean that this is not a problem that we need to deal with now. We need to define a path forward. If that path happens to involve several decades of work but is a credible path that is optimal, that is something that we can deal with.

But I fully agree with several of the comments that we need a repository

certainly and we need to make progress on having a credible and believable route forward for all the reasons that Vicky and John and others have mentioned. And I certainly didn't intent to suggest anything different.

With regard to the storage question, I know that the NRC licenses these dry-fuel casks -- I believe it's for 40 years -- with the prospect of them being renewed. And I think that is something that we certainly ought to look to and examine as the back-up for the duration of time as has been indicated by the Secretary that the Chairman at a recent conference talked about storage being perhaps satisfactory for considerably longer than a century. Of course, if you needed to re-pack the materials, you could.

So in any event, I fully agree that if storage ends up being part of the responses, I believe it's going to be we need to satisfy ourselves with regard to how long we reliably can deal with that. And as

Allison has indicated, there are going to be some issues with decommissioned plants which would like to get the fuel off the sites. And I didn't make any comment about where the storage should take place.

I would like to reinforce as a final point an issue that Dr. Carnesale mentioned in passing. And that is that you can't look at any one piece in isolation. And all the pieces have to be looked at in light of a large number of factors.

If we're going to consider anything that has to do with nuclear technology, first you have to certainly evaluate and be satisfied as to safety, security, nonproliferation, economics, extension and availability of fuel and probably five other factors. And they all interplay with each other. They all need to be considered. And beyond that, what you do with the waste and think about with regard to the waste needs to be factored into your

consideration about how the whole system has to work together, that you need a production of fuel, reactors all need to work in synchrony with each other in a total system.

And so this is a very complicated problem that we're embarked on. It involves many factors that in defining an optimal path is important and going to be challenging.

CHAIR HAMILTON: Mark, and then Susan.

MR. AYERS: Yes. Very briefly.

Our broader mission is also to contemplate America's nuclear future. And in doing that, I think that we really have to look very closely at where our reactors are manufactured, where our fuel comes from and recognize that we must get away from foreign reliance on our reactors, our components, on our fuel and clearly make this a domestic project.

CHAIR HAMILTON: Thank you, Mark.

And Susan?

MS. EISENHOWER: Well, I think many very important points have been made. I'd just like to reiterate I think the value of this Commission meeting at various places throughout the country because this has become a very, very contentious issue. And while we have some running room technically, we don't have a lot of running room with respect to garnering and sustaining public confidence.

But I'd like to add not only to the idea of best practices and seeing how small our operations can scale up, but I'd like to associate myself with Commissioner MacFarlane's comments about the international community. I know many of us have been aware of the fact that the international community is deeply interested in the outcome of the results that will be advanced by this Commission. And I think just as it's important that we demonstrate to the American public that we're aware of their views and we understand the significance and the impact

that our deliberations will have, I think the international community needs to be addressed in the same way. The issue of nonproliferation and other things is an international issue.

And I was certainly aware of the fact -- I've read it in foreign newspapers -- that the policies of some of these other countries will be affected by what is decided through this Commission. So I think we should view actually getting outside of Washington as a really positive thing.

CHAIR HAMILTON: Thank you, Susan. Any further comments? Phil?

HON. MR. SHARP: Mr. Chairman, not an area of my expertise, but if you and General Scowcroft and Susan Eisenhower and others here see these international impacts, and my impression is the question is not only the example that we set may or may not affect others, but it is what role the United States ought to take in the international

deliberations over the security and supervision of power plants around the world and what is the international regime -- the IAEA and the various elements. I don't know how far we'd want to go with that, but I think we have to recognize that choices that we make may well be advice to the United States President and State Department about certain policy elements that ought to be part of the American agenda. I'm not recommending that. I just suggest we think about that.

CHAIR HAMILTON: Thank you, Phil. Further comments?

May we begin this morning by saying that the challenge is daunting and I think the comments of the Commissioners would reinforce that all the way. They've really been extremely thoughtful comments. And I know Brent and I are most grateful to you for starting us off on the right foot.

We're going to adjourn at this point for lunch. The Commissioners will meet

in the Fillmore Room.

I just want to say that the real substantive part of the Commission's work where we begin to learn a lot will begin this afternoon. Basically we'll be focused on how we got where we are, discussion of the Nuclear Waste Policy Act and other matters, and then we will be looking specifically at the magnitude of the waste problem both civilian and military.

So we'll have a very stimulating afternoon. Until 1:30, we are adjourned.

(Whereupon, at 12:09 p.m., off the record until 1:28 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:28 p.m.

MR. FRAZIER: If I could have your attention, please. According to my watch, it's 1:30. Congressman Hamilton likes to run things on time, so we are going to get started again for the afternoon session.

Should make just a comment about this afternoon's session is that it's going to be essentially where we are, how we got to where we are, the magnitude of spent nuclear fuel and defense high-level waste issues, as well as some projections. Then we're going to talk about the EM fuel. So it should be a data-filled afternoon.

So General Scowcroft?

CHAIR SCOWCROFT: Thank you, Tim.

Before we get started with the where are we and how did we get here, I'd like to make one comment about tomorrow's schedule.

It's come to our attention that there are a significant number of people who

would like to deliver oral statements to the Commission. As the agenda shows tomorrow, we had included 15 minutes for public statements as called for in the Department's implementing procedures. But there's no way we can accommodate anywhere near all the people who want to speak within the 15-minute window.

In light of that, we plan to allow one hour tomorrow for oral statements which each one of which we will restrict to three minutes. And that will be an absolute restriction.

We also would like to comment that those who wish to make an oral statement to the Commission might consider instead submitting written testimony which will be included in the record just like an oral statement. This can be done by the Commission website which is being established now and will be up and running in early April. Or it can be emailed to Tim Frazier of the Department of Energy.

Please also keep in mind that we plan to conduct a series of public meetings during the course of our deliberations. So this is not by any means the only opportunity for you to make a statement if we are unable to accommodate your oral statement today.

And finally, I just want to note that the Commission will not be responding to these oral statements, and that we will have a brief media availability after we adjourn tomorrow.

And with that, let us start on the afternoon's discussions beginning with how we got here. And to explain that to us, we have Mark Holt who is with the Congressional Research Service as a Policy Analyst specializing in nuclear energy which he has done since 1988. He was head of Research Service Energy and Mineral Section in the Resources Science and Industry Division from 1997 to 2008. He has numerous articles dealing with advanced nuclear power, fuel

cycle, nuclear energy policy and waste disposal.

Before joining Congressional Research Service, he covered energy issues for four and a half years with the Environmental and Energy Study Conference, a bipartisan, bicameral Congressional caucus. He was a reporter for Washington-based publications from 1980 to 1983.

Mr. Holt graduated from the University of Maryland/College Park in 1980 with a B.S. in journalism.

Mark, the floor is yours.

MR. HOLT: Thank you, General Scowcroft, Members of the Commission. Thank you very much for inviting me here today to provide this brief overview called How We Got Here that's essentially an overview of the history of nuclear waste policy. And I think you will find the history -- those of you who are not already very familiar with it -- very instructive and hopefully useful for your

deliberations.

I just briefly want to say a couple of words about my office, the Congressional Research Service. We're an organization within the Library of Congress that provides objective, timely and confidential information and analysis specifically for Congress.

And the point I want to emphasize is the CRS does not advocate policy. We do not take any positions on any policy regarding any of the public issues. And of course, in the area of nuclear waste policy which is highly, highly contentious, this can be sometimes a very challenging undertaking to make a presentation that does not appear to advocate any policy. There are fundamental disagreements among the policy analysts and interest groups throughout the nation about even the basic facts regarding nuclear power and nuclear waste, even interpretations of history and even the very terminology that one

uses can sometimes be problematic.

So that said, I will do my best to present an unbiased overview of the relevant information throughout history that should be useful for this Commission.

So the things we'll talk about, as I was requested, we'll go back to the beginning really of nuclear waste with historical background, highlighting key waste studies along the way that may be useful to the Commission to look at, and of course move into more of the modern era, the Nuclear Waste Policy Act, the debate over the Act, how it was implemented. And then I will discuss at the end current inventories of nuclear waste. I will have a few points about that.

The format of this session I am told is to be as interactive and informal as possible. So it's really to the extent that any points that I bring up may raise comments, questions, insights from the Commission, or just engender some discussion within the

Commission, that is encouraged. So please feel free to break in at any point.

Especially given the Members of the Commission, we're talking about nuclear waste history. We have so many Members of the Commission who were major players and actors in this history. I'm sure that they'll be many insights that the Commissioners themselves may want to raise as I go along. And I certainly encourage that, that the time is built into the session to allow for that.

My expertise is as a policy analyst covering the nuclear waste/nuclear energy issues for almost my entire career starting in 1985. So I did have the opportunity to closely observe the implementation of the Nuclear Waste Policy Act. Although I wasn't there for the actual debate, I do rely on colleagues at CRS who were there for the earlier decades, and of course on the vast resources of the Library of Congress which have been very useful in

providing all of the source documents that we didn't necessarily have right at our fingertips. And I can recommend certainly many interesting books.

I did want to mention a very recent book by J. Samuel Walker, the NRC -- Nuclear Regulatory Commission historian was very useful for the early history. That's the most recent. There are a lot of good books on nuclear waste history that are interesting and informative.

So let's start with the early history.

Going back to the Manhattan Project in World War II which of course produced the first nuclear weapons. And I'm going to talk mostly about high-level waste. Of course all types of waste were produced in these huge industrial operations. But the way the high-level waste is produced in nuclear weapons production is that uranium fuel is put into a nuclear reactor. The uranium splits in

the fission process releasing neutrons that turn some of the uranium into plutonium. The split pieces of uranium and some of the plutonium becomes intensely radioactive during the process. And of course to make the weapon, you then have to extract the plutonium. That's done by dissolving the spent fuel and acid and separating the plutonium chemically. And that was done at the Hanford site in Washington State starting in World War II. And that process did produce the Nagasaki bomb.

The high-level waste resulting from that separation -- that's basically the waste product -- is intensely radioactive. That's called reprocessing when the spent fuel is taken out and dissolved. And of course, from the very first there was a need to do something with the large amounts of that waste. And that was put in underground steel tanks that were created for that purpose underground to shield workers and any other

humans from the intense radiation from the waste. And there was additional waste, of course, at other locations. Later, naval reactor spent fuel was reprocessed at Idaho and then eventually at Savannah River as well.

So the first planning for what to do with this waste that was being stored in tanks, it was recognized from the very beginning that this was not a permanent solution. The pictures here show what the tanks look like. These are tanks under construction. These are actually replacement tanks much later in the '70s and '80s after the original tanks began to leak. These are double-shell tanks. But this shows what they look like underground. They're huge and of course covered with dirt.

But from the very early on, national security was the top priority. Certainly during World War II, there was a crash program to produce the weapons for World War II, and then the Cold War after that. So

in general, waste management was not the top priority of the Atomic Energy Commission. Even though they recognized that they had a problem, the underground tanks were expected to be sufficient until a long-term solution could be found.

But after World War II and throughout the '40s, the Atomic Energy Commission did continue looking at the waste problem and did finally issue a report in 1949 that was the result of some of the public controversy that had arisen over the waste produced by these very large industrial operations producing radioactive materials for the first time. And this 1949 report is very interesting because it's worded very, very carefully and cautiously. It was a report meant to be disseminated to the public, which it was, recognizing that there is a potential problem and that the waste management undertaken by the AEC could be better, but that the practices that were being undertaken

were considered safe for the public and for the environment. So that was the message from this report.

One interesting quote was that "better means of isolating, concentrating, immobilizing and controlling wastes will ultimately be required." So it's recognizing that things that had been done so far were not the permanent solution.

So that's defense waste. And of course, there was no commercial industry yet at that point.

So the Atomic Energy Act of 1954 created a legal framework for the creation of a commercial nuclear industry in the United States. Before that, all nuclear materials were controlled by the Atomic Energy Commission. So this envisioned that there would be at some point some commercial waste to deal with as well.

Commercial spent fuel, just like the defense spent fuel, was expected to be

reprocessed to extract the plutonium, which was believed would be needed to create the ultimate commercialization of nuclear power which was expected to be fast-breeder reactors which required plutonium. There was not expected to be enough uranium to fuel a large fleet of such reactors. So therefore, that would create the similar high-level liquid waste as the defense waste. The volume of the commercial high-level waste even at that time was expected to be much greater than the defense waste by 2000, which did turn out to be an accurate prediction.

And these commercial reactors were expected to be designed for reprocessing. That meant that the spent fuel taken out of the reactors once we could no longer efficiently sustain a nuclear chain reaction would be stored temporarily in water, actually water pools that are literally designed as part of the reactor building, until perhaps for a few years before it would be taken away

to be reprocessed. It would not stay at the reactor sites. That was the vision.

So that brings us to one of the key studies I was mentioning -- the famous 1957 National Academy of Sciences Waste Disposal Study, essentially trying to answer the question what can be done with all of this waste that is expected to be produced by not only the defense activities but by the new commercial industry that was just then starting up. The very first commercial reactor at Shippingport was just starting up.

So the key finding is the first bullet point. "The Committee is convinced that radioactive waste can be disposed of safely in a variety of ways at a large number of sites in the United States." That was a very important finding. It set the scene for really nuclear waste policy since was that yes, this can be done. The scientists have agreed that it is possible. Keeping in mind, as I said, the caveat that about everything

that I say can be disagreed with by some.

They found that salt deposits appeared to be the most promising method for disposal, and there was a large chapter of the report which is available -- I think it's actually online -- describing the salt deposits and how that might be done.

Interestingly, their reactor waste was expected to be liquid at that time for both transportation and disposal. But the Academy did point out that solidification would be advantageous. Certainly in the case of transporting for long distances, they noted that because this liquid waste could be hard to transport that reprocessing facilities and maybe even reactors could be affected as far as what locations they might be at, that the availability of underground formations may be important for locating some of these types of facilities.

This is from the salt chapter. And you'll see the cover of the report which

we actually have. And that's what it looks like. The salt chapter did show this map of the salt deposits throughout the country, which certainly set the scene for some later activities.

So with that report in hand, AEC set about looking for potential repository sites. And the focus was on salt formations. And actual experiments were conducted in salt mines and with solids and liquids to see how salt would react with these various types of potential waste.

And AEC started to explore solidification methods, thinking that that might be a better way to deal with the waste. And actually deep injection as envisioned by the '57 report was considered at various tank sites, the fact that maybe the waste could just be injected in the ground into deep formations right at the reprocessing sites. And in fact, the first commercial reprocessing plant did open up during this period in 1996

in West Valley, New York producing the first commercial liquid high-level waste.

So after all these searches, the AEC finally appeared to have found a suitable site in Lyons, Kansas in 1970. AEC announced that it would investigate an abandoned salt mine in Lyons for a disposal demonstration project, and that there plans today seem somewhat optimistic that it would take six months to investigate the site to see whether it was suitable. And the plan was that low-level plutonium waste -- that's the transuranic waste that Senator Domenici mentioned earlier -- could begin disposal at the site in 1974. And high-level waste -- that's the intensely radioactive tank waste -- could begin by 1975.

However, the site ran into problems immediately. There was very strong opposition throughout the state. Congressman Joe Skubitz of Kansas was leading the opposition in Congress. And he had an

interesting comment that has been repeated in many forms throughout history in the future from this. "The federal government cannot compel a sovereign state to do itself and its citizen possible irreparable injury if its officials refused to be stampeded." And in fact, they did refuse.

And it very quickly became clear that there were serious problems with the Lyons site. It was very close to another salt mine, for instance -- and especially considering that they were still thinking of liquid waste -- the many oil and gas wells, many not mapped. Some of these gas wells had struck pressurized brine which shot out to the surface which was alarming. There was a lot of undocumented solution mining. That's just injecting water underground to bring out the solution of salt and water. So they didn't even know where these places were. And the Kansas State Geologist had a comment. "The Lyons site is a bit like a piece of Swiss

cheese." And that was what finally pretty much removed the site from consideration. And AEC formally issued a statement in 1974 that that site was no longer under consideration.

And here's another salt site about the same time in '74 that we've heard a little bit about already. This is a picture of the actual operating -- a diagram of the actual operating repository today.

But in 1974, another salt site in Carlsbad, New Mexico was selected for exploratory work, actually volunteered by the local population that was economic distress because of the shutdown of potash mining in the area. And so they invited AEC to come in and look at their site.

And the initial plan was for high-level waste and defense transuranic waste much like the Lyons site. But after a great deal of back and forth and much history which the Commission may want to look into as a separate topic because this is a very interesting story

of how the WIPP site came to be. So the high-level waste was dropped is the bottom line. And President Carter actually proposed abandoning the site altogether. But Congress in the end had authorized the site for defense waste only in 1979. And then only 20 years later, the first waste was shipped. So that was a pretty rapid progress in the world of nuclear waste.

There is still local support for today. We still get occasional messages, letters, meetings with Carlsbad people who would like to expand the mission of WIPP. But my understanding is that the State of New Mexico and the Congressional delegation would still strongly oppose an expansion of the WIPP mission at this time. But that issue is out there.

And again, feel free to interrupt me at any time if you'd like to comment on any of these things.

HON. MR. SHARP: Excuse me. You

say to expand it. Is the argument to expand it to high-level waste? Is that what you're saying?

MR. HOLT: Correct. And some of the I guess the DOE contractors in the area, I know they've written magazine articles and things that do a technical analysis of why the site could technically be a good site. So there is significant interest at least in the local people. And as you will see as we go along, that is a common pattern that the local people tend to support some of these waste sites, but the states as a whole do not. That's certainly what happened in the case of WIPP.

So in 1974, the AEC in its last year of existence issued a draft environmental statement. It was not called an environmental impact statement. It was just a draft environmental statement on developing permanent repositories and storage sites.

The reason for this was after the

abandonment of the Lyons site, there was some criticism that AEC was backing away from a permanent solution. So this report specifically said that AEC denies complete reliance on perpetual storage in manmade surface structures, and in fact was anticipating a geologic disposal pilot plan. And it said the AEC would continue to evaluate geologic formations at conventional depths. That's a standard, mined geologic repository as we think of today.

Liquid waste would be solidified. They were no longer thinking of disposing of liquid waste for transportation storage and disposal. And they actually named some sites. The Hanford site, the Idaho Reactor Test Site where they're doing reprocessing of naval reactor spent fuel, and the Nevada Test Site were named as surface-storage candidates at that time. We're not talking about repositories for them.

The same statement looked at some

of the unconventional repository ideas that had been brought up. And these ideas continued to be studied repeatedly, some much more intensively with international efforts than others, some not much study. But they usually are brought up for completeness, I think.

So they looked at polar icesheets, seabed disposal which had a major international program, very deep boreholes and walls which are still I think considered an interesting option. Melting in lava was not looked at much. Outer space did get a fair amount of study. and in fact we still do see proposals for various methods of that. But all of them were found not viable at that time.

So AEC and now it's newest successor agency, the Energy Research and Development Administration which took on both the AEC mission and a larger variety of energy technologies, continued the site search in the

1970s. The bedded salt sites like Lyons and WIPP were looked at. Salina Basin in Lake Erie in lower Michigan got a pretty negative local response, so that was dropped. But the others continued -- Paradox Basin in Utah, Permian Base in Texas, the salt domes which are salt that wells up from lower beds of salt in Mississippi and Louisiana, the basalt at Hanford, Welded Tuff at Yucca Mountain, and the projection or expectation -- I wouldn't even call it a projection -- that was mentioned in a 1976 ERDA technical report which is a very detailed report -- that they were expecting a repository demonstration by 1985 at that time.

MR. PETERSON: Mark? A quick note. I think you've missed the crystalline salt. We did have an office of crystalline rock repository development as well. You'll mention that?

MR. HOLT: Right. That will show up later. This is not my personal

recollection but my research indicated that that project started in 1979. Does that sound about right? There was a specific --

MR. PETERSON: And then ended in '82.

MR. HOLT: Yes. But you're right. This was not I guess specifically -- well, this is a little bit later -- a little bit later, but important.

HON. MR. DOMENICI: Sir?

MR. HOLT: Yes.

HON. MR. DOMENICI: Can you just in simple but specific terms quantify those salt deposits? Is that a lot of room of very stable salt that America owns there?

MR. HOLT: Right. I think I have yet another slide on salt. But yes, they're huge areas. They cover multi-state areas. And they're very thick.

The salt domes are a little more focused because the bedded salt is like the beds of ancient seas.

And I think I'm going to defer to geologists at some point here. But the salt domes then are extruded from these beds up into weak spots higher up. So they're actually closer to the surface. But they're also huge masses of salt also.

Do we have any comment from the geology front on the salt?

DR. MacFARLANE: No. That's right.

MR. HOLT: Okay. So yes. But they are important and big.

Any other comments or discussion before we move to the next chapter?

Okay. So these are the areas that were being investigated at that time. And now we do come to an exciting chapter change -- the major policy change in nuclear waste history.

The AEC had started what was called the generic environmental statement for mixed oxide fuel. This is for plutonium fuel.

And this started in 1973. This is the use of plutonium fuel as I mentioned earlier which was expected to be used in commercial reactors. Not in fast reactors, but this case it was for using mixed oxide so-called fuel in conventional light-water reactors which are the regular reactors that we have today. And it's done in some places throughout the world. It's essentially replacing the fissile component of uranium -- the U-235 with plutonium -- and making fuel that can be used by conventional reactors. So that process began in 1973. Basically that was an environmental impact statement-type process.

It immediately raised tremendous controversy, mainly over nonproliferation, the concern that commercial separation of plutonium -- which of course the original purpose of plutonium was for weapons -- that this could lead to widespread availability of plutonium throughout the world and cause a potential expansion of nuclear weapons

technology throughout the world. And the 1974 India nuclear test heightened this concern considerably because they in fact did use commercial technology that had been provided by the West, at least commercial reactors. I guess they did their own reprocessing to make plutonium for a nuclear explosion, which they described as a peaceful explosion at the time. But it was very alarming throughout the world.

This issue continued to be very contentious until the point -- well, you can see it was right in the middle of the Presidential election. October '76, President Ford announced a deferral of commercial reprocessing at that time. And in fact, it was a campaign issue. Future President Carter had campaigned very strongly on that issue. And once elected, he extended the deferral indefinitely in 1977, making the following --

DR. CARNESALE: Excuse me. Can I just for clarification? I'm trying with my own recollection.

Was it a deferral of all commercial reprocessing, or was it a deferral of federal funds for reprocessing of commercial fuel?

MR. HOLT: Well, it was a little vague. If you read the actual statements, it's not exactly clear what was being done. But it was certainly interpreted as stopping everything.

DR. CARNESALE: I think it was actually the latter. But there was no contest. No one in the commercial sphere was interested in spending their own money on it.

MR. HOLT: Right. And in fact, the actual GESMO process was really outside of the President's control because that was now being done by the Nuclear Regulatory Commission. But the Nuclear Regulatory Commission after studying the issue and taking note of the Administration's position did terminate the GESMO process on its own. I don't know what kinds of pressures may have

been brought to bear. But that's what happened.

And so yes, the funding was very important. In fact, interesting -- I can make a sideline I'm not going to mention -- but of course President Reagan did reverse that policy. But there was still no reprocessing because President Reagan also did not think that federal funds should be provided for that. And so it didn't happen.

Actually, while President Carter was still in office, I think Congress did continue funding for the Barnwell reprocessing plant. And so it stayed alive until finally the Reagan Administration when it wouldn't provide money, the private sector finally decided there was no future in the near term for that.

DR. CARNESALE: The Reagan Administration reversed the deferral but continued not to provide funds.

MR. HOLT: Right. Exactly.

Although the Reagan Administration did restart the breeder reactor program, which was later killed by Congress.

So, as you can sort of get an idea from this conversation, there is a huge amount of history that we're not even going to get much of a chance to touch on. But certainly, any points that I get to that are of interest, let's stop and discuss them. That's certainly no problem.

So President Carter's policy was to develop alternative designs for breeder reactors that essentially stopped the breeder program. Focus on nonweapons material fuel cycles could be relevant for today, and initiated a study of spent-fuel storage needs. And as I mentioned, the NRC did terminate GESMO given the policy. So the implications of this change were pretty strong.

As I had mentioned, the commercial power plants were designed to hold spent fuel for only a short time before it would be taken

away for reprocessing. And some of it had been taken away to the West Valley site in New York that I mentioned, and also to a facility in Morris, Illinois built by GE that did take some spent fuel but never operated as a reprocessing plant.

But for the most part, this new policy meant that spent fuel is going to stay at the reactor sites and not be taken to reprocessing plants. So President Carter proposed away-from-reactor storage to alleviate that problem.

Another issue arose that was suddenly a change in what was going to go into these repositories. There was no longer going to be high-level waste which is defined as reprocessing waste. But instead it would be actual spent fuel which is unreprocessed spent fuel. And the reason that's significant mainly is because the spent fuel have much higher amounts of long-lived material, mainly plutonium, which was supposed to be extracted

in reprocessing, at least the vast majority of it, so that the high-level waste would not have so much long-lived material, that the fission products that I mentioned earlier. The splitting products of the uranium and plutonium which create most of the radioactivity are actually much shorter-lived in general. And it's really a different technical problem of how to dispose of them.

So that caused some issues. And as a result, President Carter created the Interagency Review Group to look at spent-fuel policy as it was affected by the change in reprocessing policy. So that's another group that may be of interest to the Commission -- how that operated and what it resulted in. It was, of course, not an independent group. It was an interagency group. It was made up of heads of various agencies. So it's not exactly analogous. In fact, the report was greatly rewritten. And those are all available. You can see what was done.

Actually in the end, the final report did not have a lot of what was discussed earlier as the actionable items really. If you look at the whole thing, it's hard to find actual recommendations. But there were a few.

And Carter policy which was announced in 1980 did have a few points. One, which a repository site should be chosen from several qualified alternatives, and also, the State Planning Council was established that made further recommendations largely about how this selection of the repositories should be dealt with by the states -- what kind of control states should have over the repository process and that type of thing.

So that brings us to the Nuclear Waste Policy Act.

Yes?

HON. MR. DOMENICI: Wasn't that passed by statute? You mentioned that as Carter policy. Wasn't that statute law where you mentioned what was happening to the

country? When you mentioned Carter policy, wasn't that statutory?

MR. HOLT: The Carter policy? Was it statutory?

HON. MR. DOMENICI: Wasn't that passed into law?

MR. HOLT: It was an input into the Nuclear Waste Policy Act debate. And in fact, at that point from the historical record evidently not a major input because at that point other things were happening. And of course, the Administration changed in the middle of the debate also.

But obviously, some of these ideas did end up being in the Act. But Carter's policy was not enacted.

So, the Nuclear Waste Policy Act grew out of this. As I mentioned the change in reprocessing policy, it was seen at the time that there was potential storage crisis at reactor sites and that Congress would have to act to deal with that. And of course, that

was the away-from-reactor storage. I guess you could say that away-from-reactor storage did end up in the monitored retrievable storage concept later.

And then of course, the AEC/ERDA and finally now by this time the Department of Energy's difficulties in finding sites was an indication to many that some kind of Congressional mandate was needed specifically to move forward, that this could not be done administratively under the authority of the Atomic Energy Act which is very general authority.

And of course, during the debate there were a lot of concerns by the potential host states that had to be addressed which had of course been addressed by the State Planning Council partly. So this debate went on for at least two Congresses, and I think it may have overlapped three -- approximately four years of debate. Late 1982, and then it was actually signed in '83. The Nuclear Waste

Policy Act did become law setting in motion the next set of events.

So the Nuclear Waste Policy Act set up a search for repository sites. It was really the heart of the Act. And the basic idea was that a technically-driven process or a scientifically authoritative process -- with the emphasis on process -- that would be considered so fair that the state that was ultimately selected would agree that the process had been fair and would accept the site.

So a compromise during the Act was that there would be potentially two repositories in different regions of the country so that not one region would take all of the waste. A first repository site was to be chosen from these sites that had been investigated up to that point, which we mentioned. The second repository site was to use a different geologic media. But it was not authorized to actually open that second

repository without further Congressional approval. But the site search was required. And that became the crystalline rock repository -- granite.

And the first repository was limited to 70,000 metric tons until the second repository was licensed. So that's where the 70,000-ton limit comes from.

Of course, there were many other provisions. The Office of Civilian Radioactive Waste Management was created within DOE because of the perceived need for an office that would focus specifically on this problem and have no other mission, known as OCRWM. The Department of Energy was required to -- well, authorized -- to sign contracts with utilities to dispose of waste with a deadline of 1998, and return for fees paid by the nuclear utilities -- a fee on nuclear power. And so that was in the form of an enforceable contract, which becomes important later.

The monitored retrievable storage site, which is sort of the away-from-reactor storage idea -- a site search was authorized, but not the actual construction in the original Act. And then in case of emergency, a federal interim storage site was authorized basically at some existing site. It wasn't envisioned to be a huge site. But if a nuclear utility really was in danger of shutting down its plants because of a lack of storage space, it could pay extra -- basically pay the costs of this program and get storage at an existing federal site.

There were grants for state oversight of the process so that the states that were being examined would have the expertise to know what was happening to them. And the so-called state veto -- the authority for a selected state to disallow a repository in its territory with the option of expedited Congressional procedures to override that veto. It's not really a term. It's an

approval resolution to basically disallow the veto.

The waste facilities were to be licensed by NRC using Environmental Protection Agency environmental protection standards.

And I think we're getting to the part where a lot of people may remember.

HON. MR. SHARP: Mark?

MR. HOLT: Yes?

HON. MR. SHARP: I don't know how useful it is but there are two things in this regard. One was the division of two sites for the country was clearly a major concern especially among westerners that most of the waste was being generated by where most of the reactors were in the east, and they wanted to make sure the pain was equally shared. And so it was a political compromise clearly. But it was based on that concern that everything would be shipped out of the east to the west where there was much more of it.

The other thing is that I'm not

sure the way you said it whether it's understood. This was called a site characterization process in which it was still recognized none of these places were selected. The goal was to test out scientifically multiple sites in multiple media recognizing that they weren't going to all pass muster, or at least there would be some preference to it.

One of the issues we'll get to next is how much characterization it takes, how extensive that is, and how costly that becomes that will trigger parts of what happened in the next decision.

MR. HOLT: That is exactly right. That's exactly the types of insights that I'm encouraging here. I mean, this is a rare opportunity to get insights from the actual participants in a talk like this. So I do encourage that.

And you're absolutely right. And my understanding is that's correct that the two repositories was viewed as a fundamental

compromise in the creation of the Act, which will become important in a few slides from now.

HON. MR. SHARP: But there is one enduring proposition in that. And that was almost universal agreement that deep geologic storage was the way to go. At least everybody involved in the decisions on a superficial level thought that was the case.

MR. HOLT: Yes. And the Act specifically referred to repositories except in the case of -- I think there was sub-seabed storage even in the original Act authorized, and later continued to be authorized as a possible alternative.

But in general, the procedures that were set up were for the location of conventional mined repositories.

HON. MR. SHARP: Carry on. But that's a critical concept politically because you had an unusual coalition of some of the environmental critics of nuclear waste along

with the industry who at least could agree upon this as the fundamental thing to do. Of course, then everything falls apart later.

MR. HOLT: Yes. And so that led to how to implement this law. And so here's how it happened.

DOE was required under the Act to select five sites -- five candidate sites -- from the ones that were under consideration that were considered potential repositories. Those are the nine sites that I think I previously mentioned, although it's going to come up in another slide here. This does exclude WIPP specifically because that was already named as a defense site.

The three sites that were chosen -- the three sites from the five -- were then to be chosen for full characterization. That's intense, site-based studies -- actual drilling, geologic samples and everything else. So all three would be studied and ultimately one would be selected. This is the

first repository site -- the one that's being selected from the pre-existing candidate sites.

DR. MacFARLANE: And Mark, those three, I think I recall they had to be in different rock types, right?

MR. HOLT: I'm not sure. I know that the second repository had to be. That may be true. They were, in fact. Yes, that would be one of the considerations in the ranking.

Now in the ranking in the Multiattribute Utility Analysis -- which is just a way of saying looking at all the different criteria and trying to quantify them and give a numerical ranking to them, which was done -- I don't think that was a factor in that. But DOE was very clear in saying the Multiattribute Utility Analysis was not the decision. It was a decision-aiding methodology. It was in fact in the title of it because they didn't want to imply that the

results of this analysis were going to be the results, which in fact they weren't.

But the ranking was Yucca Mountain was first. And then you'll see the other rankings -- the Richton Dome site, the Deaf Smith County, Davis Canyon and Hanford. That was the order that they came out after all the different criteria were looked at.

HON. MR. SHARP: Mark, you left out a very important political development. I doubt that it comes later because I think it's in 1992 right before the election in which the eastern sites are ruled out.

MR. HOLT: Yes. Yes.

HON. MR. SHARP: Is that coming with your next slide? Okay.

MR. HOLT: That's coming. Yes.

HON. MR. SHARP: It has major ramifications for what happens.

MR. HOLT: Anything political that I leave out, please feel free to comment on. We are reluctant to comment on political

motives or anything else like that. But that's certainly open to discussion.

HON. MR. SHARP: If I can follow up then, are you not going to address that? Is that what you're saying?

MR. HOLT: Yes. When the comment comes up, then we can open.

HON. MR. SHARP: I don't want to cast blame or anything.

MR. HOLT: I'm reluctant to say too much about why the second repository was canceled. But we will get to that in a second here.

HON. MR. SHARP: Okay.

MR. HOLT: But we've got another crisis on this slide. But DOE after going through this analysis selected Yucca Mountain, Deaf Smith and Hanford, which of course upset Nevada, the Northwest and Texas, immediately initiating law suits and all other kinds of controversy.

And here are the other sites.

This is from the Multiattribute Utility Analysis -- a little map -- showing the nine sites and then the five that I mentioned that were selected. And of course the three ended up all being in the west. And actually, two of the nine sites were sort of the east or in the south at least -- three of the sites in the south.

HON. MR. SHARP: Mark, but I think you're still missing -- there's something, and I don't recall the events. But there were some northeastern -- at least one or two sites that stimulated intense opposition. And for electoral reasons -- oh, that --

MR. HOLT: Yes. That is coming up in two slides. That's very important. Yes. I remember it like yesterday.

So the second repository -- this is the other repository that was to be a different type of rock and/or sites that were rejected from the first repository. And that's the crystalline rock program that did

-- anyway, the research that I found was begun in 1979 -- a survey of the country to find potential crystalline rock that's basically granite -- formations --

DR. MacFARLANE: It doesn't have to be granite.

MR. HOLT: It doesn't have to be granite. No. I certainly did not know what crystalline rock was before we started this.

DR. MacFARLANE: It could be something called gneiss.

MR. HOLT: Okay. Yes. It's the G-N-E-I-S-S gneiss. Right.

So a national screening was begun of this type of rock. And DOE after the Nuclear Waste Policy Act was enacted did come up with methodology for narrowing this national survey down -- a very objective-type process. That was the intention. And in 1985, issued the methodology and then used the methodology to issue in 1986 the Draft Area Recommendation Report. And this is what sort

of caused a lot of consternation, which was interesting because in fact these sites had been publicized by DOE for some time. So it shouldn't have been a huge surprise. But nobody really seemed to be paying attention until this report came out.

So there are 12 candidate sites in seven states, mostly in the east and upper midwest, and eight additional candidate areas as shown in this slide. This is from the original report. And this is what people saw. And you can sort of get an indication of what type of reaction this was met with.

MR. PETERSON: I think as a point of information, it's useful to note that at this point both Sweden and Finland have successfully sited repositories in crystalline rock. Interestingly, they're right on the coast which allows the repositories to be in the saline water from the ocean where nobody would put a well.

So it is interesting. There has

been success in this area, but certainly not in the United States.

MR. HOLT: Right. I think it was a negative public reaction for the most part. I don't think the scientists were up in arms. But the public was concerned.

So as I said, immediately DOE had to go out to the actual locations and have public meetings. Evidently that was not a popular mission among the DOE officials to go to these meetings. And very large crowds, they would stay all night, all kinds of opposition.

The host states fought the project and Congressional delegations fought the project. And so this led to what Congressman Sharp has mentioned -- the suspension of the second repository in May 1986 by Energy Secretary Herrington.

The reasons given were that there were lower spent fuel projections at that time. In fact, the mid-'80s was sort of a --

there were no new plant orders in sight. The expansion of the nuclear power industry was not expected. And in fact, at that time it was considered more likely that plants would shut down prematurely than there would be new plants. Although in actuality, the projections from the plants that existed and the plants that were still coming on line would have exceeded the 70,000 tons. But that's a legal limit, not necessarily a physical limit.

And there certainly were rising cost projections for the costs of characterizing all these sites as we will see in coming forward, that characterization process far from costing a few hundred million dollars is certainly far higher than that. So those were the justifications.

But at this point, things got very controversial. And certainly anybody with political insight, feel free here.

The methodology of ranking the

sites for the first repository was certainly attacked since Hanford for example had come in last in the five sites and was chosen as one of the three. The northwest people didn't like that. Of course, the cancellation of the second repository really upset the western states. As I said, they considered that to be a fundamental part of the Act.

Meanwhile, Tennessee had been chosen by DOE for the MRS. And another similar pattern was Oak Ridge which is one of DOE's major nuclear sites. But the State of Tennessee as a whole strongly opposed that.

And the bottom line was that there were so many states and regions at this point that were concerned about becoming hosts that the program essentially threatened to paralyze it. And really the appropriations process was really almost paralyzed only five years into the Act.

Maybe the only good news was that the emergency federal interim storage was not

needed after all because dry storage technology was demonstrated successfully in the interim. And so, no reactors had to shut down for lack of spent fuel storage.

Here is Congressman Udall's take on what had happened. Of course, he was I believe the actual sponsor of the legislation that ultimately became the Nuclear Waste Policy Act, and he was the Chairman of the Interior Committee.

This was his statement on the floor. "We created a principled process for finding the safest, most sensible place to bury these dangerous wastes. Today, just five years later, this great program is in ruins." And he went on to say, "Potential host states no longer trust the technical integrity of the Department of Energy's siting decisions." So that was Congressman Udall's sort of indictment of how the program had been implemented.

So because the program basically

had no support anymore, that led Congress to act again with the 1987 amendments. And this is definitely not a political consideration I will comment on too much.

But the bottom line was that Congress after a great deal of deliberation on how to solve this deadlock did end up actually naming Yucca Mountain as the only repository candidate site. And the way this was supposed to work was that the site characterization would be sequential rather than three at once. So the idea was it'll save a lot of money because it was becoming clear at that time that the characterization was much more expensive than it was thought that it would be. So we'll do one at a time. If the first one isn't accepted, then under the Act Congress would have to name another site. And that is still the law. There is no alternative site.

But in fact, I think that the members were fully expecting that Yucca

Mountain would have been chosen, and Yucca Mountain was acceptable because it had come out on top in these technical reviews at that time. But of course, there was a large political dynamic in the fact that naming a single site eliminated all the other potential sites from consideration, which presumably would eliminate a lot of the opposition that had stalled the program.

And I don't know if there's any comment on that at this time. How was that decision made?

HON. MR. SHARP: Exactly.

MR. HOLT: Okay. But obviously the State of Nevada did not like it.

As an aside, I do recall watching day after day in the Senate Senator Reid who was a junior Senator on the floor opposing this. And of course, he has now risen to much greater power today.

The amendments also eliminated the second repository.

DR. MacFARLANE: It didn't really eliminate the second repository.

MR. HOLT: It caused a study which was done.

DR. MacFARLANE: Yes. And the Department of Energy was supposed to report on the need for a second repository by 2010.

MR. HOLT: Yes. And they did. Yes, that's a good study. Everybody should take a look at that. It'll be an interesting study anyway. And that's online too, I believe.

It's surprising how much of this is online now. Certainly anything related to the Nuclear Waste Policy Act -- a lot of these original documents -- are online.

Rescinded the MRS site selection which made Tennessee happy. And did actually authorize an MRS which had not been authorized before. But the catch was that the MRS was tied to the actual operation of the repository.

The concern about the MRS had been that once a storage site began operating, that would eliminate all pressure for the repository, and then the MRS site would be stuck with the waste forever. So the law as it now stands is that no waste can be shipped to the MRS site without the -- I think it has to be a construction permit for the repository. And if the repository ever stops operating, all the waste has to be shipped away. And there's also pretty severe limits on the amount that can be put at the MRS.

HON. MR. SHARP: Mark, I just think it's a lesson worth focusing on for a moment. I mean, today one of the issues I'm sure we'll consider is whether we need an MRS or not. And it's clearly forbidden or it can't happen under the law right now.

But the thinking at the time was precisely as you say, that how do you keep the pressure up politically and legally to move this nation ahead on the deep geologic thing?

And one of the concepts here was that. It had the added political benefit of getting Tennessee off the hook.

I believe there's also a provision of law -- and correct me if I'm wrong -- that it could not be located at the Nevada site, which was in theory sort of a gift to Nevada.

MR. HOLT: And that becomes important later.

HON. MR. SHARP: But the issue is that -- and those of us that have been in the legislative process know how difficult it is to design policy things that force action. You can set deadlines. You can do all kinds of things. But as we can see throughout this, well, almost none of them worked.

MR. HOLT: Right. That's definitely been the pattern.

And then other provisions in '87 that were thought that might help solve the problem, there were benefits packages -- pre-defined benefits packages offered to the host

states if they would agree to accept waste repositories.

And then a completely different approach proposed by Congressman Udall was the nuclear waste negotiator. An office was established to actually go around and try to find voluntary host sites and just reach any kind of agreement that the negotiator could. So really, just about anything was potentially on the table with the nuclear waste negotiator, and with the catch that whatever was negotiated, the agreements would not be binding until approved by Congress. So there was obviously some ultimate control over what might be offered.

And then finally, the Nuclear Waste Technical Review Board was established in response to the criticisms that the DOE technical program no longer had credibility. The idea was to create an independent board that would not be beholding to the Department of Energy and would have technical experts in

its own right who could call DOE or basically publicize -- raise an alarm -- if the Department of Energy's technical program was not accurate.

I believe Congressman Sharp was the originator of that idea.

HON. MR. SHARP: I offered it in the House bill.

MR. HOLT: And that Board is still in existence today.

HON. MR. DOMENICI: Mr. Chairman, might I ask a clarification question?

Sir, could you tell us today what is the policy of the United States regarding reprocessing? And when was an Executive Order issued and when was it done away with and by whom?

MR. HOLT: It's a convoluted history.

It was not really an Executive Order by President Carter. It was a statement and a National Security Directive which was

rescinded by President Reagan. So President Reagan said reprocessing is okay. And that continued under the first President Bush.

And then President Clinton issued a statement that we would not reprocess. But there was no Executive Order per se. And then the second President Bush actually made reprocessing an essential part of his nuclear energy policy starting with Vice President Cheney's report in 2001 -- the National Energy Policy Group -- which emphasized reprocessing.

And as far as President Obama's position, the only way to I think glean that is from the budget requests which state that a science-based program of research should continue on reprocessing technology. But he did explicitly reverse in his budgets the previous Administration's path toward actually building commercial reprocessing facilities or demonstration facilities. So he backed off from that. But the budget is still about the same as it was. And so it's for fundamental

research.

So that seems to be where things stand right now.

HON. MR. DOMENICI: Thank you very much.

CHAIR HAMILTON: Mark, you've got about 25 minutes to go here. So you can judge your time accordingly.

MR. HOLT: We'll zoom through the recent history.

So how were the 1987 amendments implemented? Immediately there were delays -- all kinds of problems on the DOE side with quality control. Nevada was not interested in the benefits and began actually denying permits to DOE to do some of the characterization. And in fact, the Yucca Mountain was found to have trouble meeting EPA's general repository standards, which could have been a serious problem.

As a result, the Energy Policy Act of 1992 included provisions specifically

requiring EPA to issue new standards just for Yucca Mountain based on a National Academy of Sciences' study. And that has been done.

Language was offered originally to get at the State permit problem. But I think the State sort of backed off a little bit, and that was dropped from the final bill.

This is an example of Nevada's ongoing opposition. This was in a monthly newsletter from the State Project Office that would generally criticize the program. It's just an example of how Nevada was not interested in the benefits.

The nuclear waste negotiator got started, and as I mentioned was authorized to offer pretty much anything, and in fact became an important part of the program because it was becoming clear by the early 1990s that DOE was not going to be able to meet the 1998 deadline that's in the contracts.

And I know that people within DOE at the time were thinking that that might be

the best chance for finding -- they weren't planning to open a repository by 1998 -- but they thought they might be able to find a volunteer site for a storage facility that could begin receiving waste. And that's all that was required by the deadline to receive the waste by 1998.

And so that went forward. DOE offered grants. And some localities were interested in meeting with the negotiator. But in every case, state governments blocked it.

In the case of Indian tribes, they were outside of state control. They could not be blocked. And some of these projects did seem to be moving forward. But the state delegations then stopped the funding for those projects at that time. So that program pretty much ended.

However, what grew out of that was one site that one Indian tribe in Utah did move forward with on its own outside of this

process because under law, anybody can apply for a waste storage site to the NRC. And so they did. This is the PFS -- Private Fuel Storage Venture -- which did get an NRC license but was ultimately blocked when the Interior Department denied some permits for it. So that has not opened.

MS. EISENHOWER: I just would like to go back to this for a second.

You said there's sort of a trend that localities tend to be interested and their state governments tend to resist.

MR. HOLT: That's been the pattern.

MS. EISENHOWER: Could you say something about the dynamics of that?

MR. HOLT: A lot of people have looked at that and commented on it and why is that the case, and I guess generally thought that the localities have the most benefits economically from these projects even though they also bear the most risk presumably. But

the state as a whole often apparently does not consider the benefits to outweigh the risk. And so the pattern has been in repeated cases the states as a whole oppose the sites.

HON. MR. SHARP: I think the added issue always comes up in the debate over transportation. To get the stuff to the local area, it has to go through other communities and things like that. There are multiple interests that people raise, but that's certainly one of them.

HON. MR. DOMENICI: If I might say, all of these were raised in the innocence of Waste Isolation Pilot Project. The federal government funded highway expansions, highway extensions, highway widenings because these trucks had to go through cities that had two-lane highways. But all of that was worked out once the community decided that it was a good project. Then the Department and the cities worked most of these out very well.

I believe the next time the United

States is involved in this that the Waste Isolation Pilot Project will be a living example of how it should be done. And I surmise there will be more than one if the economy of the United States remains as flat as I presume it will for the next ten years -- excuse me -- 15, I think. But that's just my pessimism.

But anyway, I think cities are going to want something like an underground storage facility that is safe, sound and brings in many good jobs. I think there's a different attitude out there. Right now there's similar projects that ten years ago would have been opposed that localities are asking for from the Department of Energy.

HON. MR. SHARP: If I could, I think it's worth recognizing the importance of this Senator's leadership in making all of this happen. Because all the kind of negotiation, all the kind of controversy, all the problems that arose that had to be

resolved, he was certainly in the forefront of trying to find a solution to. And it requires that kind of persistence and that kind of leadership to be successful. Since we don't always on television see as many examples of that today, this I think is worth recognizing.

MR. LASH: I don't know if this is a question to you or the former legislators.

You mentioned that the proliferation issue came to the forefront with the Indian nuclear test. And I'm interested to what extent these debates in Congress over the Nuclear Waste Policy Act were influenced by the episodes at West Valley and at Hanford and so forth and public perceptions of whether the federal government was capable of managing waste.

HON. MR. SHARP: I don't think there's any question those were part of the issues of whether -- I mean, there always was an issue it was always being too politically driven and not enough scientifically driven,

even though you can see there was a great effort to try to base it on science. Nonetheless, there were political decisions that were made along the way.

And this skepticism is one of the reasons we tried the Nuclear Waste Technical Board was to give an outlet for citizens, states and anybody else to raise scientific questions because the people on that Board are -- well, they're selected. I think they're appointed by the Secretary of Energy. But they are actually nominated by the National Academy of Sciences. But that wasn't sufficient to resolve that issue.

When you use the word proliferation though, usually we're talking about obviously in the international arena. This is actually seen as a solution in part to proliferation to get decisions on this.

MR. LASH: No, what I was saying is that we mentioned that the proliferation perceptions were affected by an outside event.

And I just was surprised that Hanford and West Valley hadn't come up.

HON. MR. SHARP: Well, all these things usually in debates get raised on every issue from running a rail car through to everything else. There's a lot of mythology, and there's a lot of error in that discussion which I hope partly we will in our report try to describe as accurately with historical data as we can, are the consequences of some of these questions or some of them I think should not be in controversy. There are legitimate uncertainties and legitimate questions. But sorting that out could be a useful thing that we do in this process.

MR. PETERSON: I'd agree with that. I'd also point out that our proliferation concerns have evolved substantially over this period of time. The threats that we face today are much different because of evolution and technology and dispersion of technology. And we have not had

adequate flexibility to address these emerging threats under the existing policy. And that's a real serious defect.

MR. HOLT: Yes, that's definitely I agree an undercurrent of the debate.

This is just a New York Times article showing the reaction that the nuclear waste negotiator got. "Hired to negotiate, but shunned by all" was sort of the reaction.

So since the nuclear waste negotiator did not work, this led to some proposals in the 1990s really after the '94 elections. In three successive Congresses, there were efforts to change the law so that nuclear waste could be shipped to Yucca Mountain in advance of the repository. That reached its high-water mark actually after the deadline had passed.

And the Congress did pass a bill to speed up Yucca Mountain licensing and allow early shipments to Yucca Mountain. But that was vetoed by President Clinton. And that

veto was sustained really by only one or two votes in the Senate. So it came very close.

And in recent years, there have been a lot of proposals especially in appropriations bills to create federal storage sites to try to solve the problem. And those have not been enacted.

The Secretary of Energy -- now we're getting very recent history -- did issue the site suitability determination in 2002 finally after many years. And this triggered all these immediate actions that President Bush -- and these are all under the Act -- President Bush recommended the site to Congress. Nevada Governor Guinn issued the state veto or state's approval. And then Congress overwhelmingly passed approval legislation to override the veto allowing the application to go forward. And it was, in fact, after much more delay submitted in June 2008.

And now of course we bring it up

to the present -- March 2010 -- or the Obama Administration has requested to withdraw the application.

HON. MR. SHARP: Pardon me for cutting in, but there is one other issue. And you naturally focused on-site selection. And that's the critical, really hard thing.

But there is the question of financing. And that was a part of these legislative proposals was how to deal with what is in the law. The Nuclear Waste Fund collects a fee on every nuclear kilowatt and goes into a fund. But it's not off budget. And so there's a whole set of issues that I'm sure we're going to get an opportunity to examine. It's what I think is one of the things Commissioner Bailey was referring to about the state utility regulatory commissions have become intense on this issue, not to mention a whole host of other concerns, but what happens to that money that is building up.

MR. HOLT: Yes. That was considered to be one of the problems that DOE was having with their budget constraints. They were able to spend much less than was being collected because it is subject to appropriations.

So as a brief summary of these siting approaches that were looked at that might be of interest -- the administrative process, pre-Nuclear Waste Policy Act, DOE selection of the MRS site administratively, the site ranking process for the first repository, the screening process for the second repository, benefits agreements for host states, negotiations for voluntary sites, and then the actual Congressional designation of a site -- a candidate site -- and this had multiple votes and subsequent votes in support starting with the '87 designation, the 1992 Energy Policy Act, the Congressional votes that were vetoed for Yucca Mountain storage, and then of course the 2002 approval

legislation. But despite all of that, as we know, none of these approaches has yet proved successful.

For future policy, what does that mean? All these approaches, it doesn't necessarily mean it's hopeless. But perhaps promising approaches can be developed or combinations of approaches that were not previously tried or perhaps previous approaches that can be determined why the previous approaches didn't work and be modified so that they might work.

And of course, as has been mentioned several times today, identifying changed circumstances. This has been a long period of time. Technology, knowledge, political environment, other things may have changed that may lead to better results. So hopefully, there is a potential here.

I've been asked to present where are we now as far as the amount of spent fuel. This is data I believe from an Energy

Information Administration survey that is compiled by a contractor to the Nuclear Energy Institute, the ACI Nuclear Energy Solutions. We actually did this one year.

EIA does not compile this data very often. The last time they did it was 2002. And we actually took their raw data which was in a really complicated format and made a real nice chart out of it. But that's from 2002. And they said a new one is coming out this year. But these are charts from the industry from that data.

As you can see, the total right now in metric tons -- 62,683. That's getting pretty close to the Yucca Mountain limit. The number of dry casks that are out there are growing all the time. This is showing the breakdown between the pool storage which is pretty much fixed, and then the independent dry storage which is growing all the time.

DR. CARNESALE: To what does independent refer here?

MR. HOLT: It's not connected to the reactor building, as opposed to --

DR. CARNESALE: Physically connected.

MR. HOLT: Right. As a pool that's actually part of the reactor buildings, literally attached to the reactor inside the building. And this is outside the reactor. So it's mostly dry storage. The Morris, Illinois site I mentioned is really the main wet one. It means we can't say it's all dry storage.

Here it's state-by-state. You can see that Illinois has the most. And it shows the breakdown of wet and independent storage, as I said mostly dry. Pennsylvania has quite a bit. And you can just see there are lot of states that have this waste being stored.

And it was also mentioned that the shutdown sites are a potential problem. And here are the shutdown sites where they're located -- how much is in wet storage.

Illinois wet storage is mostly Zion actually still in wet storage according to the statistics and the Morris site mostly in dry storage. And the issue regarding this, about 2,000 to 2,400 tons per year is discharged. It varies depending on the reactor cycles. And of course, the need for dry storage is increasing as the reactor pools are filled up.

And the problem with the shutdown sites is that there's nothing else there typically except for the pools. And therefore, all the infrastructure and everything else is ascribed solely for the pools. In other words, if not for the pools, they could take out the security and all the other measures that have to be taken to deal with radioactive materials. So it's a very high marginal cost. That total is right now 3,000 metric tons in storage. It's 11 sites in nine states.

MR. PETERSON: Could you comment on the DOE's current legal obligations in

terms of prioritizing which materials it would take first? It doesn't match with what's in shutdown --

MR. HOLT: Yes. Right now, it's done by age. And there is a study -- another study -- that DOE did on these sites and its ability to take the material. And they talk a little bit about that.

I don't think there's a statutory requirement for DOE to do it by age. But I think that's in the contracts. So that might be part of the problem. And of course, the other problem is they don't have any place to put it. So there's two issues there.

Long-term issues -- because of the waste building up under storage, these contracts are enforceable and they are being enforced in the Court of Federal Claims. And DOE is paying judgments for failing to meet the 1988 deadline.

There are sort of two scenarios for the breach of a contract. Right now,

partial breach means that DOE still considers the contracts valid and still plans to take the waste under the contracts, but they just haven't done it on time. And so as a result, DOE is paying the marginal costs that the utilities are incurring for the ones who have reached settlements under these court actions or have actually gotten judgments.

And the estimate is that if no repository or no storage site opens up, that's ultimately going to be about $500 million per year. That's pretty much the industry's storage costs each year indefinitely. And that comes automatically out of the judgment fund. That's not an appropriation. That's just paid automatically.

A full breach has been hinted at potentially which would mean basically that DOE no longer even plans to implement the contract at all -- ever. And the potential has been raised in that case that the federal government would have to return all the

utilities' payments plus interest which is about $30 billion right now. I don't think we've fully legally analyzed that scenario at this point.

The indefinite on-site storage also potentially -- as discussed earlier -- is an impediment to new reactors. NRC is required under its policy to have what they call waste confidence that waste from a new reactor could be adequately dealt with in a timely manner before a license will be issued. And that was due to some court cases in the '70s and '80s.

The Nuclear Waste Policy Act does require waste contracts to be in effect for a new reactor to be licensed. And that was the subject of some recent controversy that DOE has in fact signed some of these contracts for the new reactors even though repository plans have been canceled. And of course, concerns about public opinion.

DOE also may face environmental

cleanup penalties for their defense waste. And then of course, there's long-term storage risks talked about quite a bit today. Long term generally in this case meaning probably more than 100 years seems to be sort of our general consensus, although not really a technical analysis yet. That is being studied that 100 years should be considered fairly secure but indefinite periods. But longer than that have been at least discussed in some of the DOE environmental documents as well. It might be a very long-time scenario.

CHAIR HAMILTON: Mark, do I understand that the federal government has the responsibility for all storage fees and environmental cleanup as well?

MR. HOLT: The commercial waste is paid for under the contracts in which the fee on nuclear power production is collected. The defense waste is really under environmental enforcement actions.

The waste being stored at defense

sites, Congress has made those sites subject to environmental regulation. That is state environmental regulation. So the states and these existing tank wastes and a lot of other wastes are out of compliance usually with RCRA -- Resource Conservation and Recovery Act. And so there are enforcement actions there that could be taken if the states feel that the waste is not being dealt with adequately.

HON. MR. SHARP: Mr. Chairman, I thought you were asking a little different question. I mean, that's part of it.

But there are two different funds that every reactor has to contribute to -- every private reactor. One is the Nuclear Waste Fund which goes specifically and is being utilized now on Yucca Mountain.

The other is their own decommissioning fund. And they have to get a certain level. So that's all coming off of the costs of nuclear reactors today. And there's always an argument over whether those

funds are adequate. And the NRC supervises that. But those are the private funds.

So it's supposed to be the environmental cleanup of the plant itself when it's closed down. It's supposed to be taken care of by the decommissioning fund.

The waste though, I think part of the key issue is another one of the things that we did -- which doesn't look so hot now -- was to say in 1998, this is another trigger on the federal government to push it to get it. It had to take legal title. And now that liability is coming home to roost.

Again, it was designed to try to push this whole process to get complete --

CHAIR HAMILTON: What is the federal government paying now per year for storage costs and environmental cleanup? What's in the budget for that?

MR. HOLT: Well, this final slide sort of illustrates how that works.

What is the federal government

paying for the commercial reactor storage costs? Is that the question? How is the government paying for --

CHAIR HAMILTON: I'm just trying to figure out how much the federal government is paying on storage and environmental cleanup. How much is this costing the taxpayer?

MR. HOLT: Well, for the defense waste, you're right. That is of course DOE's responsibility. And that's in the environmental management budget. And that is I think approximately $6 billion a year. But it's not just for the high-level waste. It's for all of the cleanup and all the waste management at DOE. So it is very expensive.

CHAIR HAMILTON: What's the total cost?

MR. HOLT: Something like $6 billion. I haven't looked at the request.

CHAIR HAMILTON: How much? Six billion?

MR. HOLT: That would be the entire Department of Energy environmental management budget. And that's for cleaning up all of the old waste and managing the defense tank wastes that I talked about. A lot of it is for environmental restoration of previous contamination. So it's obviously very, very expensive -- decommissioning of old Cold War facilities and that type of thing.

This is the cost for the commercial reactors that DOE under the contracts has to pay the commercial reactors' extra storage costs for failing to take away the waste from the reactor sites. And that is not per year as much. That's the $500 million a year I was talking about.

This is a scenario that DOE came up with if waste had begun being taken by 2017. That blue line shows that they would continue paying liabilities until 2046. The 2020 line, which was the most recent Yucca Mountain schedule, shows that they would have

to pay liabilities until 2056. If there is no repository then, those lines go away and at some point, they just pay indefinitely under the current contracts. So that is how that works.

DR. MacFARLANE: Can you clarify the Nuclear Waste Fund issues and where that money is?

MR. HOLT: The Nuclear Waste Fund is like any other dedicated fund -- like the Social Security fund. It's held in usually I think Treasury securities. It's a fund in the Treasury dedicated for this purpose, but it can't be spent without Congressional appropriation. So it's not a revolving fund where the money goes out and DOE can spend it as it sees fit. But theoretically, it's really in effect like an authorization because the money really isn't available unless it's appropriated.

MR. ROWE: How big is it now? $23 billion?

MR. HOLT: It's something like that.

DR. MacFARLANE: But does it exist?

MR. HOLT: Well, it exists as in any other fund.

(LAUGHTER.)

HON. MR. DOMENICI: It exists just like your Social Security trust fund.

MR. HOLT: Yes. If you go to the Treasury Department, they could tell you what securities are held in this fund. So that's how it works. But all the other funds are similar.

The only thing that pays for the program -- because Yucca Mountain is also supposed to take defense waste -- has been a defense appropriation, which actually in many recent years has been greater than the Nuclear Waste Fund appropriation that also pays. So some general revenues are also used to pay for the program, or have been up until now.

MR. ROWE: The Committee might wish to delve into these funding issues a little more deeply because like everything else, there's a layer under the last layer.

In this case, you have all this pending litigation generally to the effect that the U.S. government owes people money for breach of contract, but it's not all settled or final.

In the case of my company, we were able about three years ago to enter into a settlement. But it just might be interesting to have somebody who can trace all of this through to answer Commissioner MacFarlane's question and some of these others in a little more detail than we can do here today.

CHAIR HAMILTON: I think that's a good suggestion. We'll see that we do it.

Mark, we're right at the end. I don't want to shut any Commissioner off, but you've given us a marvelous history here. We're deeply appreciative of it as well as the

charts you've furnished to us.

Are there any further questions?

(No audible response.)

CHAIR HAMILTON: Thank you very much.

MR. HOLT: Yes. Thank you.

CHAIR SCOWCROFT: We'll break now and reconvene at 3:15.

(Whereupon, at 3:00 p.m., off the record until 3:14 p.m.)

MR. FRAZIER: We're going to give the Commissioners just a few minutes to get back in and get settled. Then we're going to start right away.

General Scowcroft?

CHAIR SCOWCROFT: Thank you., Tim.

Having left at the history of this issue, we're now going to take a very brief look at projections for the future. And to do that, we have Matt Crozat from the Department of Energy. Matt is a Program Analyst in the Office of Nuclear Energy.

Since joining the Department of Energy in 2006, Matthew has performed systems analyses to examine current and proposed policies for managing nuclear fuel cycle with regards to economics, nonproliferation and waste management. He currently serves as Co-Chair of the Working Party on Nuclear Economics of the Organization for Economic Cooperation and Development's Nuclear Energy Agency.

Welcome.

MR. CROZAT: Thank you. It's a pleasure.

Okay. My name is Matthew Crozat in the Office of Nuclear Energy. And it's my honor to be here to help talk about the scenarios for nuclear energy growth.

If Mark Holt's presentation gave us a sense of how we got to where we are today, I want to pick up a theme from Secretary Chu's comments earlier which is looking towards the future and where we might

go. And to that end, with these scenarios I want to focus not just on how future nuclear deployment might play out but also what the implications are for used fuel management.

Now I don't often tend to offer forecasts or predictions of how nuclear plants are going to be deployed in the U.S. going forward, but I do want to provide a range of possible scenarios to capture some of the uncertainties that frankly make forecasts so perilous for the forecasters. And in this presentation, I'm going to focus on the 2050 time horizon.

In my ideal sense, I would have started something much sooner at 2030. But one of the things that comes up pretty quickly is that it takes quite a bit of time for even large-scale changes in the nuclear fleet to translate into appreciable changes in the inventories of nuclear fuel.

Of course, one way to deal with these time lags would be to carry projections

well into the future like perhaps to the end of the century. But this is where I get quite a bit nervous about trying to preclude or estimate what new technologies might come forward, both in terms of fuel cycle technologies and reactor types. So what I'm going to try to do is focus on this 2050 time range, and at the same time try to give a sense of how post-2050 deployments might play out and what implications those might have.

Now, I can certainly create detailed, complicated projections, and I've been known to do so on occasion. But I think the purpose is here of trying to quantify what the range of possibilities look like. I think we can do this in a pretty straightforward manner with three relatively simple scenarios.

The first one I want to pick up on is a low-growth scenario. And actually when I say low growth, I actually mean no growth in nuclear electricity in this case. All the growth I'm talking about here is just going to

use fuel inventories.

In this case, I want to think about a situation in which the current reactor fleet until the current licenses expire, as in like where the expiration dates were as of say Sunday morning when I last checked. I don't want to assume any further license renewals, and I don't want to assume any new bills from this point forward -- the minimum case of what I think we can expect going forward.

Now in a medium-build case, I want to think about something a little bit broader. First is to have a scenario in which the current fleet, each of the reactors receive one 20-year license renewal so that they all operate for exactly 60 years. Additionally, new reactors are built to maintain a 20-year, 20 percent marketshare going forward to 2050.

And finally a high-growth case in which the nuclear share expands to 50 percent of the marketshare by the middle of the century.

Now before looking at these cases, I want to highlight a couple of key assumptions that are going to drive the analysis. First of all, I'm going to assume that the overall electricity demand in the U.S. grows about one percent per year through the middle of the century. And that's right in line with what the EIA's latest projection is. Their latest annual energy outlook reference case shows one percent growth through 2035. I simply extrapolated it a little bit further.

Another key assumption I've made so far is that all of the reactors I'm looking at going forward look an awful lot like the ones being considered for the current marketplace -- large, light-water reactors. Now, in doing this, it's mostly for simplification. I don't want to look past the possibilities for smaller reactors. It's a case that we're quite interested in. It's possible to look at these reactors as smaller

reactors if you'd like without changing any of the conclusions.

And the final assumption is that the fuel cycles that we're looking at going forward look again kind of like today's with relatively high burn-offs by historical standards, but no assumptions beyond what's basically the current state of the art.

Okay. With the scene setting complete, let me move forward to actually walking through some of these scenarios.

So first of all, here's the low-growth scenario. In this chart, what I'm plotting, it's billions of kilowatt hours of nuclear energy production. It started out at about 800 billion kilowatt hours which is about where we are today, and slowly declines over the course of the next 40 years. That's about equivalent to about 90 gigawatt years for that unit.

At the same time for these same reactor fleets, I've estimated the used-fuel

generation. And what we see is even in this case where nuclear declines over the course of the half century, the used-fuel inventories grow from about 63,000 metric tons to almost 100,000.

Now let me be clear about this scenario. This is a case in which we are phasing out of nuclear electricity. The first retirement here happens in 2013, and by 2049, the last current fleet is presumed to go off line. This is the low-end case we're trying to talk about here.

Let's look at the medium case. In the medium case, I made two changes to the baseline. The first is I had the remainder of the reactor fleet that had not received license renewals go on for an extra 20 years. That purple band in the upper left-hand side is the electricity production that comes from those assumed units. That's about a 40 percent increase over that base blue that we started with in the lower case. We also see

in the bottom right how much additional used fuel is generated -- about 16,000 metric tons from that.

Now I'm also building new reactors in this story. It's actually about three of these large reactors per year from about 2025 through 2050. By the end of the 2050 range, about all the nuclear electricity is coming from these new advanced light-water reactors.

What also can be seen here too in the bottom right-hand chart is the used fuel. In total, about 150,000 metric tons have been produced by 2050. And the vast majority of that is coming still from the current fleet. In spite of this big expansion of nuclear power -- it's a mild expansion of nuclear power -- the used fuel from the current fleet is actually what's dominating the system so far.

And I'll take this one more step further.

So in the hydro scenario, this is

actually the same place as before. I've just said to smush down the scale here -- the same, especially with the current fleet and license extensions. But now I've got a much more significant build of nuclear power. This is about three trillion kilowatt hours, so about a three-and-a-half fold increase over where we are today to the nuclear output in 2050. That looks something like 260 of these large reactors. It would require building about nine of them per year from about 2020 on out.

Again, I imagine the scales are hard to see. But in the bottom right, we're looking at over 200,000 metric tons of used fuel produced by the end of 2050, with about half of that coming from this new large fleet of advanced light-water reactors.

So now we take these scenarios and tie them together for a second just to help you see what they look like on the same scale.

I think the first thing that comes together from my mind at looking at this is

the disparity in the way the scenarios are depicted between looking at the energy production and the used-fuel generation rates. And of course this is because electricity production here is a rate. It's an annual amount of electricity produced whereas in the bottom right, I'm looking at cumulative effects. What that tells is it takes a long time to see how decisions made about reactor builds in the middle of the time frame here actually translate into large-scale effects on the used-fuel inventories.

That implies that by looking just at the 2050 time horizon for used fuel, I'm only getting a partial picture of what's happening here. So let me try to fill that a little bit.

CHAIR HAMILTON: Brad, which of these three scenarios is most likely?

(LAUGHTER.)

MR. CROZAT: It's difficult to say.

(LAUGHTER.)

MR. CROZAT: I think a lot of it depends not just on the uncertainties we're seeing today on the cost of the reactors, but also a lot to do with what kind of policies we're going to see.

I will tell you that the EIA tries to capture the cost calculations. And what they've seen is if there's no carbon policy through climate policy in effect, there's not a reason to expect an awful lot of nuclear deployment over the next 30, 25 years.

CHAIR HAMILTON: If you've got a group of nuclear experts in the room, would they split all over the place on these scenarios, or would they agree on one?

MR. CROZAT: I suppose we could do a show of hands.

(LAUGHTER.)

MR. CROZAT: I would think you'd probably see a pretty broad range. And I would guess you would probably find more in

the middle as a plausible story. But again, that's a guess. And we could certainly try to expand the range of expertise to ask this kind of question.

And part of the reason I'm trying to show --

CHAIR HAMILTON: Does the Department of Energy take a position with regard to these three scenarios?

MR. CROZAT: I think we're trying to prepare for all of them. Large because -- I'll speak for myself -- I would very much love to see a broad expansion of nuclear power. I think that is a key element of how we'll see these climate concerns mitigated.

But from our perspective, we need to be able to consider all of these possibilities because we can't control how we're going to move forward. These are going to be decisions made by people like John Rowe and commercial industry, and how the Congress tries to encourage those decisions along the

way.

DR. CARNESALE: Just so we're not to answer your questions and you've got a bunch of nuclear experts in the room and ask them the question, the first thing they'd ask you is will there be a price on carbon. That would be the first thing, and what would be the new incentives for nuclear energy over other sources. And if you told them there's going to be no price on carbon and no penalty for burning very cheap coal or other sources, they'd say well, don't talk to me. Talk to somebody else. I can't do it for you.

MR. ROWE: I strongly agree with that.

And I would just point out another thing that I think most folks in my industry would bet on something nearer the central line rather than the red line. And yet if we could attain something near the red line given that the power sector is responsible for about 40 percent of the nation's carbon emissions, that

red line would cut that contribution in half.

MR. PETERSON: I think another important point is while it's a reasonable assumption for the purpose, assuming that there won't be evolution of the technology is unlikely to be correct. In fact, if you go back 25 years, the rate at which reactors produce spent fuel has dropped enormously as the fuel designs have improved. And there's absolutely no reason to expect, particularly with proper incentives, that we couldn't achieve substantial further reductions in the rate of generation of spent fuel per unit of useful energy that you derive.

So particularly on the high end where you're looking at building a substantial number of new reactors, the technology will change substantively during that period of time.

CHAIR HAMILTON: When you folks talk about incentives, what are you talking about? Government subsidies?

MR. PETERSON: Well, actually I'd say for example, currently the Nuclear Waste Fund fee is paid based on the amount of electricity you generate, not the amount of waste you generate. And it's like if you don't charge for carbon, you're not going to see reductions occur. If you don't charge for the amount of waste that you make, you're not going to have the same set of incentives to reduce the amount that you make.

These reductions that have occurred occurred for other reasons just through improved fuel design, besides the fact that there's a benefit from reducing waste. And it's a matter of what you charge -- what you pay for.

CHAIR HAMILTON: How is the charge set? In the market?

DR. MacFARLANE: It's one mil per kilowatt hour.

CHAIR HAMILTON: What?

DR. MacFARLANE: It's one mil per

kilowatt hour that ratepayers pay.

CHAIR HAMILTON: That's the market?

DR. MacFARLANE: That's a fee. If you receive your electricity from a nuclear power plant, or even part of it, you will pay one mil per kilowatt hour in your bill.

CHAIR HAMILTON: Who sets it?

DR. MacFARLANE: You set it. It's in the law. It's in the Nuclear Waste Policy Act.

CHAIR HAMILTON: It's government set?

DR. MacFARLANE: Yes. Now one point of clarification, all this talk about amount of waste and amount of waste being decreased, that is not necessarily the relevant unit of measure when you're talking about a repository. Heat and composition, in particular, long-lived isotopes, those are the significant units of measure. So let's not get wrapped up with volume here.

MR. PETERSON: I agree. The way that you measure the amount of waste is actually a complex question. It's not as complex as figuring out how much carbon you've emitted when you get into the details. But it's not a trivial thing. And it's not just the mass of material.

But by all measures, there have still been I think substantive reductions in the amount of waste -- the rate at which waste is generated in reactors.

MR. ROWE: Chairman Hamilton, to your question, there are several ways to get at the nuclear issue. The one that I personally think has the most intellectual integrity is the cap-and-trade or the carbon tax which prices carbon and greenhouse effects into the marketplace. But there is substantial thought on the Hill these days that such a policy may not come to pass, and instead we may try to deal with greenhouse-type problems by as one member put it to me

subsidizing our favorite technologies. And then we promise to oink as loudly as the others racing for the trough.

MR. CROZAT: Let me just come back to this. I have to say that I think just about every one of these points is already made in the last side.

The point I wanted to make here is that by looking at just 2050 for used-fuel generation rates, I'm missing part of the picture.

If I'm rebuilding nuclear power plants throughout the next 40 years, I expect those to run for the better part of the rest of the century. And therefore, beyond 2050, which is where these used fuel inventory levels are, I would expect to see from those very plants no more production just by running them out through their natural lives, which I'd assume to be 60 years here.

So let me make some final observations. I know I've already gone over.

What I'm trying to point to here to your observation as well is that there is a range of possibilities, and it is very difficult to sit here in 2010 and understand which world we're going to end up in. I think some of us have preferences, but I think trying to actually project where we're going to be is a very difficult task.

Even the low-growth scenario, we're talking something on the order of 100,000 metric tons which I think if nothing else, just moving beyond the 60- to 70,000-ton is a reminder of where we're going. And with any sizeable expansion of nuclear power, we're looking at 250,000 metric tons in my moderate case to 500,000-plus in the high-growth case. And much of that inventory is going to be generated after the middle of the century.

So decisions made in the next two decades are going to be ones that are going to persist for a while. And a useful management system that's going to capture this is going

to need to be persistent as well in how it deals with these changes.

CHAIR HAMILTON: Any further questions for Matt here?

(No audible response.)

CHAIR HAMILTON: Matt, thank you very, very much. We appreciate your contribution. It's helpful to the Commission.

We'll call Frank Marcinowski forward. Is he here?

MR. MARCINOWSKI: Yes, sir.

CHAIR HAMILTON: Okay. Frank has more than 20 years experience with the federal government. He joined DOE in 2004. Serves as Deputy Assistant Secretary for Regulatory and Technical Support for the Department's Environmental Management Program. Serves as the Program's Acting Chief Technical Officer.

The focus of his work is to develop policy and support implementation of waste and materials disposition activities and provide leadership on the entire suite of

regulatory issues. He was Director prior to his current position of the U.S. EPA's Radiation Protection Division. And he has a Bachelor's Degree in radiologic technology from Thomas Jefferson University, and a Master's of Science Degree in radiologic health from the University of Michigan.

And Frank, we're delighted to have you. You're going to cover two topics here -- magnitude of defense high-level waste and other spent nuclear fuel.

Thank you for joining us. You may proceed.

MR. MARCINOWSKI: Thank you. And good afternoon.

And yes, I'm going to cover two topics. And I'm going to talk about -- well, actually the majority of the waste that the Department manages with regard to spent fuel and the high-level waste. And this is going to cover about 95-plus percent of what the Department is responsible for. This is

excluding the Navy waste that you'll be hearing about later today. And there's a small quantity of spent fuel that's being managed out of other programs, primarily the science program at Oak Ridge that amounts to a very small quantity of fuel.

Now, there are some differences that I'll point out as we go along between the spent fuel that we're managing in that we have quite a number of different types of the fuel that we're managing. Some of it is actually commercial fuel that the Department has decided to take on for a variety of reasons. And there's a percentage of it that's also damaged fuel. We'll get into it. We've got the Three Mile Island fuel that we're managing right now. We've got other commercial fuels, and fuels that are damaged are going to be difficult to justify for other purposes other than what the current plans are.

So the outline of my presentation is broken into two categories. I'm going to

first talk about the spent fuel and all the varieties of spent fuel that we're managing; talking about the inventory, what's important too is the state commitments. I know it was touched on briefly a little earlier as well, but we have various state commitments that are directly relevant to the work that we do with this type of material. What the current status is of our sites in the summary, and do the same thing on the high-level waste side as well.

And then I'm going to talk about another small category of waste that was potentially intended to be disposed of at the Yucca Mountain site but currently does not have a disposal path, just so that you're aware that it's another issue that we are dealing with as well.

Right here, this map gives you a pictorial of where the spent fuel is at our various sites across the country, the quantities at each of those particular

locations.

And as I mentioned, there's a variety of different types of fuel that we're currently managing. We've categorized it into 34 different categories and for a variety of reasons. Some of it was from experimental reactors for R&D purposes, production reactors. But there's a programmatic environmental impact statement that actually goes through the specific qualifications that placed each of those waste --

MR. LASH: Can I interrupt you for one moment with a question about this?

MR. MARCINOWSKI: Absolutely. Yes.

MR. LASH: Chairman Hamilton asked earlier about the annual DOE budget for cleanup and was given the figure $6 billion a year, I think. And noticing your title and while the map is up here, could you give us some rough idea where that money is spent among these sites and what it's spent for?

Not a detailed response, but you seem like the most informed person we're going to hear from on that.

MR. MARCINOWSKI: Well, I could actually provide you later the actual annual distribution among the various sites.

As far as for this type of activity though -- the management of the spent fuel and the high-level waste activities -- you're right, the annual budget for the Environmental Management Program is about $5.8 to $6 billion per year.

Of that, approximately a third of that goes toward management of the high-level waste and the spent fuel, probably more so on the high-level waste side in fact, but definitely more so on the high-level waste side because we've got on the order of 230 underground storage tanks that we're managing right now that have liquid waste in them that needs to be somehow treated and put into a form that's suitable for disposal. So that's

the rough order of magnitude of what we're dealing with here. It's approximately on the order of $2 billion a year that goes towards these particular efforts.

If you want a more specific breakdown, we can certainly provide that.

MR. LASH: And how much goes for cleanup?

MR. MARCINOWSKI: Well, some would argue that the high-level waste is part of our cleanup as well. But then toward the other aspects of our cleanup, some of what that funding is actually for is just for what we call men-safe activities. That's turning on the lights, making sure that all the buildings are properly maintained and kept in a safe configuration, the materials are properly managed and then the remainder of that goes towards the actual cleanup of the soils, the groundwater, et cetera.

I'd have to get back to you with the precise breakdown on that, but we can

certainly do that. Sure.

So that's the distribution of what we've got across the country and where it's located right now. We estimated that we're going to have about 3500 of what we call DOE standardized canisters which is what we've assumed would be the form that would be used for disposal of this spent fuel.

Just to touch on the other domestic sites, I think I mentioned Oak Ridge, and I'll talk a little bit later about a program where we retrieve fuel from universities across the country as well. And that's captured in the other domestic sites.

The type of waste that we have. We've got the waste for the defense purposes, from production reactors, R&D activities, government R&D activities. And then on the defense side, it's a smaller quantity of waste but comes from a wider variety of sources. I mentioned the Three Mile Island core debris, commercial power demonstration projects at

those three sites -- Shippingport, Peach Bottom and Fort St. Vrain where we had an agreement that the government would be responsible for the waste from those facilities, the domestic research reactors program I touched on as well. And then there's the farm research reactor program that the Department operates as part of our nonproliferation efforts.

Some of the state commitments that are directly relevant to the spent fuel and the disposition of the spent fuel. The Idaho Settlement Agreement, or more often referred to as Batt agreement after Governor Batt, requires that the spent fuel that's currently at the Idaho National Lab be in dry storage by December of 2023. We're well on our way to fulfilling that commitment. But then the follow-on commitment is that it would be out of Idaho by January of 2035. And so that's a key milestone that's something we're well aware of. And the penalty - there's a number

of other provisions within the Idaho Settlement Agreement -- and should we fail to uphold any of those commitments, then Idaho can require us to suspend any shipments into Idaho for storage of that and also impose on us a fine of $60,000 a day for each day we're in violation.

We also have a commitment to the State of Colorado regarding the Fort St. Vrain fuel. And while we have some of the Fort St. Vrain fuel in the Idaho facility, because of some legal disagreements between the Department and the State of Idaho, we're not able to move all of that fuel to Colorado. And so we have a separate agreement with the State of Colorado that we would remove all of that fuel from that state by the same date in 2035.

MR. PETERSON: Frank, a quick question.

Idaho also has high-level waste remaining from former reprocessing of naval

spent fuel, if I remember. Is that high-level waste also covered under the settlement agreement, or is it free to sit there forever with no penalty?

MR. MARCINOWSKI: No. There is agreement on the high-level waste. And I'll talk a little bit about that when I talk about the high-level waste portion of it. But the high-level waste is meant to be processed and what we call road-ready -- ready to be shipped out of state by that 2035 date with the same penalties.

Getting a little more site-specific right now -- Hanford, right now all the spent fuel that we have in Hanford is currently in dry storage. A large portion of it is in multi-canister overpacks which is what you would see in the right side of the screen there where the gentlemen are lowering that into the floor right there. And at the appropriate time, we're also going to need to package this in a configuration that's

suitable for disposal and shipping to it.

The waste that we have at Hanford accounts for 87 percent of the waste we manage by weight. And the majority of that comes from the end reactor -- the production reactor -- we had at the site. And so besides the multi-canister overpacks, we have other storage configurations on site that you see in the picture there just for the safe storage of the spent fuel until a disposition path is identified.

MR. ROWE: Excuse me. The fact that you've made all of the SNF in a dry form doesn't imply that you've removed all the other different forms of contaminated liquids from the old tanks, does it?

MR. MARCINOWSKI: No, sir. We have not. And the old tanks, I'll talk a little bit more in detail as we go on. I'm just focusing on the spent-fuel aspects at the Hanford site for now.

Out at the Idaho National Lab, as

I mentioned, this site probably has the most diverse inventory of spent fuel of all of the sites. And it has most of the commercial waste that the Department's commercial spent fuel department has accepted. We are in the process of moving all the spent fuel from wet storage into dry storage to meet that 2023 commitment to the State of Idaho, and we expect to have that process completed well before that 2023 date.

There's also some fuel that requires processing as I'm treating it before it is considered to be suitable for disposition. And we're currently in the process of doing that. We expect that to be completed in the next couple of years.

And Idaho is one of the two sites that receives our Foreign Research Reactor fuel that we retrieve from other countries. The other site is Savannah River.

And there's a rationale behind which fuel is sent to Idaho and which is sent

to Savannah River. The aluminum-clad fuel, we actually have capabilities at our Savannah River site to reprocess aluminum-clad fuel should we desire. So the fuel that's retrieved that has an aluminum cladding on it goes to the Savannah River site. That which does not goes to our Idaho facility.

Some of the commercial fuel that we have requires NRC licensing. And so we also have some facilities that are NRC licensed as well.

CHAIR HAMILTON: Frank, do we receive spent nuclear fuel from other countries?

MR. MARCINOWSKI: That's correct, sir.

CHAIR HAMILTON: And are we paid for storing that?

MR. MARCINOWSKI: Well, it depends. This is research reactor fuel that we're retrieving. So it's just a research reactor fuel that's being retrieved.

DR. MESERVE: It is the case that a lot of it is fuel with highly-enriched uranium, isn't that correct?

MR. MARCINOWSKI: That's correct.

DR. MESERVE: Which is why we're retrieving it.

MR. MARCINOWSKI: That's right.

DR. MESERVE: It's a proliferation risk.

MR. MARCINOWSKI: That's right. Exactly right. That's what that program was intended to retrieve -- the high enriched uranium so that the reactors can be switched over to a low enriched uranium fuel.

CHAIR HAMILTON: Who bears the cost of that?

MR. PETERSON: As a matter of nonproliferation basis.

CHAIR HAMILTON: Nonproliferation.

MR. PETERSON: The other thing is I think the total mass --

CHAIR HAMILTON: What is the cost?

MR. MARCINOWSKI: For the countries that are economically capable of paying us for the retrieval and the storage of that, then we do get reimbursed for those activities. For those countries that are less economically able to do that, then we would bear that cost. And the exact figure that we spend on that on an annual basis, I would need to get back to you.

The amount that we retrieve in a year, it's not a great deal. But it is a program that was highly supported by the other foreign countries who didn't have the capability of storing and maintaining this material. So it is a service we provide. But certainly that's another budget cost that we can provide to you as well.

HON. MR. SHARP: There's a big distinction here between this ongoing research program that's been going on for years -- right -- and the retrieval and the larger question of what agreements we made with

Russia in the post-Soviet Union era, right?

MR. MARCINOWSKI: Oh, yes. Yes.

HON. MR. SHARP: I mean there you get at a whole other round and larger quantities and bigger issues.

MR. MARCINOWSKI: This is separate from that. This had been a program that had been in place since I believe '99. I'm talking about the Foreign Research Reactor Retrieval Program. It was originally set up for a ten-year span to end in 2009. Because of the continued nonproliferation concerns, the program was extended to 2019. And so our current plan on operating that program is through 2019.

The Fort St. Vrain was a commercial advanced reactor concept program that the Department entered into a cooperative agreement with at the time with General Atomic. And this was back in '65. And the agreement was that we, the government, would accept the fuel for storage and eventual

disposal. And this occurred throughout the 1980s until about '89 when the facility experienced some operational difficulties. They had to cease operations. And so some of the fuel is in the State of Idaho at our Idaho National Lab. Some of it remains in Colorado at the facility pictured here which is still under NRC license. DOE is the owner of that NRC license. And I mentioned the agreement that by 2035 it's to be out of the State of Colorado.

The Savannah River site -- actually all of our spent fuel at Savannah River is currently in wet storage. As I mentioned, we do have the capability of reprocessing some spent fuel at the Savannah River site in H Canyon which is a chemical separations facility.

DR. MacFARLANE: And have you done that?

MR. MARCINOWSKI: Have we done that in the past?

DR. MacFARLANE: Have you done that since 1994 say?

MR. MARCINOWSKI: I'm sorry?

DR. MacFARLANE: Have you done it since 1994?

MR. MARCINOWSKI: Since 1994? I couldn't tell you when the last date was offhand.

DR. MacFARLANE: Have you done it since 2000?

MR. MARCINOWSKI: I would have to get back to you on the specific dates of when the operations occurred. It is an operating chemical separations facility.

So these disposal alternatives for aluminum-clad fuel as I mentioned are under consideration. As I mentioned, it can reprocess the aluminum-clad fuel. We have not made a decision about whether we're going to do that or not. That would involve exchanges of fuel between Savannah River and the Idaho facility. We've not decided whether or not

we're going to pursue that. But as I mentioned, this is also another site that also accepts the foreign research reactor fuel and some of the domestic research reactor fuel.

Well, we already talked a bit about the foreign and domestic research reactor programs. So far we've collected fuels from 29 countries actually as of this month.

I mentioned the separation between aluminum- and nonaluminum-clad fuel. And the program is going to continue until 2019. As far as the domestic program, there is no specific date for the completion of that program.

And this chart here just summarizes everything we just talked about as far as which sites and what type, whether it's defense or nondefense is being stored at each of those sites. We've got just under 2500 metric tons across all of those facilities. They're going to continue to remain in safe

storage, and that the current facilities where it's being stored can maintain it in that configuration for many decades.

Moving onto the high-level waste, and this shows the geographic dispersement of our high-level waste and where it's currently located. Again, this was a byproduct of our weapons program.

And we have compliance agreements with regard to the high-level waste as well. They're somewhat different than what we have for the spent fuel in that I mentioned in Idaho, it's to be out of a certain state by a certain period of time. We have agreements out in Washington State where it's more about the agreements that we have is the time frame for when we would retrieve the liquid waste from the tanks and when we would process that waste. And likewise at Savannah River, it's when we would retrieve the material from those tanks and when we would close the liquid waste tanks out at those sites.

West Valley. There's no longer operations out at West Valley. There hadn't been for quite a long time. But when the West Valley Demonstration Act was passed, the Department had the responsibility for vitrifying the material that was commercially generated at the site. We've got 275 high-level waste canisters that are currently in storage out at that site. So right now, they're in storage and waiting for a disposition path.

And overall, when all the operations -- the high-level waste operations -- are completed, we're going to have on the order of 20,000 or 21,000 high-level waste canisters. And just to give you an idea of what one of these canisters is, they are currently stainless steel canisters. They're about ten feet tall, two feet in diameter. And they're filled with a boro-silicate glass that is embedded with the high-level waste that's currently in the tanks that's separated

out of the tanks. And so it's a very robust waste form that it's being placed into.

And that's the current plan for how all of this high-level waste would eventually be in that particular form -- most of it. There's some waste at Idaho that I'll get to when we get to the site-specific information that's actually being placed into a slightly different configuration.

HON. MR. DOMENICI: Sir?

MR. MARCINOWSKI: Yes.

HON. MR. DOMENICI: You just described those tanks with the glass in it, and you said they're robust.

MR. MARCINOWSKI: Yes.

HON. MR. DOMENICI: Does that mean that they are ready for permanent disposal someplace?

MR. MARCINOWSKI: Yes. For the waste that's already produced, they're in the configuration that is prepared for disposal.

HON. MR. DOMENICI: So that's

high-level military waste but is not from a reactor?

MR. MARCINOWSKI: It's not from a commercial reactor. Yes.

On the Savannah River site, the canisters we just talked about, we've got just under 3,000 of those canisters right now that are currently in storage at the site. These are those ten-feet tall, stainless steel boro-silicate glass canisters that are currently stored waiting for a disposition path.

We've got two storage buildings right now that are available for this. One is essentially full. We've got a second that we're in the process of placing the waste in storage. And we've got a third one that's planned for the eventual storage of this.

We produce about 200 of these canisters a year. And we've got some facility at the Savannah River site that's planned to come online. It's called the Salt Waste Processing Facility. It's going to accelerate

some of that processing.

But we've got remaining at this particular site about 31 million gallons of liquid waste to be treated through these processes and eventually placed into these. It's going to be separated into it's low-level fraction and the high-level fraction. The high-level fraction will go into the disposal canisters that I mentioned. And eventually all these tanks would have to be closed to the satisfaction of the state regulators. And that's our intent to do that.

DR. MacFARLANE: Can I ask some questions here?

MR. MARCINOWSKI: You bet.

DR. MacFARLANE: So this 31 million gallons that remain, that's just the sludge? Or how are you calculating this? Because in the 1990s or early 2000s, DOE reclassified some of its high-level waste to be waste incidental to reprocessing. It renamed it so it didn't have to deal with it

under the Nuclear Waste Policy Act. How are you talking about that? How are you dealing with that?

MR. MARCINOWSKI: Yes. Again, the 31 million gallons is liquid waste. I didn't say that it was high-level waste. It's liquid waste that's then separated into its low-activity fraction and the high-activity fraction. The high-level waste out of the liquid waste -- that 31 million -- would then go through eventually what's called the Defense Waste Processing Facility which takes the high-level waste and places it into the boro-silicate glass configuration for disposal. The low-activity fraction then goes through a separation process at the Savannah River site for which there was a waste determination. That's how that waste is disposed of.

DR. MacFARLANE: This is the stuff that goes into the ground?

MR. MARCINOWSKI: It goes into

vaults that are at the Savannah River site right now as low-level waste.

DR. MacFARLANE: And what about the heel of the waste that you can't get rid of or it's too difficult to get rid of?

MR. MARCINOWSKI: Sure. Again we remove as much of the waste as we can technologically do.

There's a statute that's called Section 3116 of the Ronald Reagan National Defense Authorization Act of 2005 that provides a process whereby we can ahead and close tanks. Now that process includes removing as much of the waste from the tank including the heel that we can technologically remove. Then we have to go through an exercise to demonstrate that what remains within that tank meets the NRC's classification as low-level waste.

And there's a consultation process that we go through with the NRC whereby they review the information -- the analyses that we

conduct. It's an open public process that it goes through. And we've actually followed this process for the tank farm out at Idaho, and have successfully closed 11 tanks out at the Idaho site using that particular process.

We have not yet gone through that process at Savannah River. We intend to in the next couple of years to pursue that process to proceed with closure of tanks out at the Savannah River site.

Moving on to Idaho, there are three particular waste streams that fall into the high-level waste category. We have calcine waste that's actually in a storage configuration at the site that's called bin sets. They're concrete structures that actually have a storage life that is on the order of 400 or 500 years right now. So it's in a very safe storage configuration at present.

The agreements that I mentioned earlier -- the Settlement Agreement -- is

requiring us to have this waste road-ready as I mentioned by 2035. The decision was made that we would use a process called hot isostatic pressing whereby this -- this is a granulous solid, but through heat and pressure this would actually be made into a ceramic-type material which is some argue more robust than the boro-silicate glass configuration. But then that would be in a disposal-ready package once we complete that process.

Likewise, sodium bearing waste is another waste stream that we have out there. We anticipate that that's going to create another 590 or 600 canisters of that waste. And then there's going to be some waste through the processing of the sodium-bonded fuel that will need to be disposed of as high-level waste as well.

Hanford. Again, we've got a similar situation with the liquid tanks out at the Hanford site. We've got more tanks out there. We've got 177 tanks, 53 million

gallons of liquid waste. There's a project underway called the Waste Treatment Plant out at the facility whose intended purpose is to process all of this particular waste.

We're going to be producing once that plant is operational. This is going to be in the 2020, 2021, 2022 time frame when we're going to be operating and producing. The plan is right now about 400 canisters a year.

And there are commitments that we have with the state as well in the State of Washington in order to clean the tanks out, to remove the waste from the tanks, to close the tanks and to process this waste. It's in a tri-party agreement that we have with the State of Washington and the Environmental Protection Agency. And although there's no particular regulatory commitment with regard to removing it from the State of Washington, the agreements that we have right now are on the removal of the waste from the tanks and

the processing of the waste.

And then we have some cesium and strontium capsules that are high-level waste as well. This is cesium-strontium that we removed from the tanks to remove the heat load from the tanks where the waste is currently being stored. And so we've got these capsules that we have a need to dispose of as well, and they're currently in safe storage at the site as well.

West Valley. I think I mentioned that as well. We've got the 275 canisters currently being stored on that site near Buffalo, New York waiting for a disposition path for that.

So the path forward. Right now for all of this material that I just spoke of is to immobilize/vitrify the tank waste both at Savannah River and Hanford. That's the 177 tanks at Hanford and 51 tanks out at Savannah River.

Idaho National Lab. We talked

about the treatment of the waste out there. And through all of this, we continue to improve our treatment methodologies to reduce the cost and schedules for the treatment of this particular waste. We're talking about right now decades of waste processing at these facilities in order to deal with the nearly 90 million gallons of waste at both of those sites.

And throughout all this, we are going to continue to store those high-level waste canisters on site. We think the current configurations are designed for 100-year storage. And we were hoping that we don't need to utilize them for all that time, and that we can have a storage location identified well beforehand.

I think I touched on this -- the Idaho Settlement Agreement -- and its relation to the high-level waste efforts that we have. And I mentioned, ready-for-transport out of the state -- what I called road-ready.

And just a couple of things to note. And I've talked a few times about the state commitments. We have gotten recent inquiries about concerns about the storage of the waste and whether it's going to be stored on site indefinitely. The various federal facility agreements and settlement agreements I've already touched on.

And throughout however long we need to maintain the waste, there's discussions that we're going to have to have about how we're going to continue to store the waste on site until a suitable disposal facility is identified.

And then again, here's a chart which summarizes the various sites and where the waste is currently being stored, and the projections in terms of how many waste packages we would have at the end of all the processing, which is approximately 22,000 of those high-level waste canisters.

Just briefly about another waste

category that currently does not have a disposition path. The repository at Yucca Mountain was identified as a potential disposal path for this material. But greater than Class C waste is actually a definition of waste that's defined by the Nuclear Regulatory Commission. And this is a low-level waste that's of greater activity than their Class C low-level waste. And this primarily consists of activated metals from decommissioned nuclear plants. Some sealed sources fall into this category as well.

And then there's nondefense transuranic waste that currently does not have a disposition path as well. We currently estimate that there's about 1100 cubic meters of this. But over time, the estimate is about 12,000 cubic meters that needs to be disposed of. It's a smaller quantity -- much smaller quantity than I previously talked about in terms of the high-level waste or the spent fuel. But it's something that DOE has a

statutory responsibility to identify a disposal path.

The Energy Policy Act of 2005 gave that responsibility, or actually the Low-Level Waste Policy Act gave us the responsibility. The Energy Policy Act gave us some more specific directions and required a schedule for us to do this. We've got an environmental impact statement which identifies alternatives for its disposition. That's going to proceed. But I just wanted to raise that to the Commission as a waste form that may require something more than shallow land burial which currently does not have a disposition path.

HON. MR. DOMENICI: Sir, is that same kind of waste that is currently transuranic waste going into WIPP? Is it the same but one's civilian, one's defense?

MR. MARCINOWSKI: That's correct, sir. Yes. At least one of the categories is. Yes.

HON. MR. SHARP: Does WIPP cover

the materials that are regulated under the Low-Level Waste Act?

MR. MARCINOWSKI: I'm sorry. Does who?

HON. MR. SHARP: Could WIPP receive the materials that are covered under the Low-Level Waste Act?

MR. MARCINOWSKI: No.

HON. MR. SHARP: So that's a whole other regime that frankly isn't functioning either.

MR. MARCINOWSKI: They just work under the WIPP Land Withdrawal Act. That's the defense transuranic waste is the only kind of waste that goes into the WIPP facility.

HON. MR. SHARP: I mean, apart from the legal question, I'm asking the technical question as to whether that could receive materials under the Low-Level Waste Policy Act -- the materials that are regulated under the Low-Level Waste Policy Act -- technically?

MR. MARCINOWSKI: Well, materials under the Low-Level Waste Policy Act are generally of lower radioactivity. And so, I'm not aware of any specific analysis that looks at that. But just judging from the category of material --

MR. PETERSON: I think that certainly it was not designed or licensed for that purpose. And it would be a substantive change technically to change the mission of that repository. But certainly it was not designed or licensed to do anything besides what its current mission is.

MR. MARCINOWSKI: That's correct.

HON. MR. SHARP: I don't know whether we're going to deal with it, but a potentially major function is where are we going to put all this stuff because that plan of action is not working either. And if I understand correctly, most states have not done what is expected under the Act.

MR. MARCINOWSKI: Yes. The Waste

Isolation Pilot Plant and its transuranic mission is working very well. And that's a mission that's serving the Department's cleanup efforts extremely well. And it's a complicated regulatory structure for that facility right now. And it's something that is necessary for the program's efforts to continue to make progress on our cleanup.

So as far as the high-level waste and spent fuel, our goal is to stabilize the high-level waste and store it on site, and the plan is to have everything in a safe configuration to store that as such. We don't expect any near-term impacts with regard to completing that. Our storage facilities are designed for 50-plus years depending on what the current need is.

Right now, we're going to continue to improve the methods that we use to process the high-level waste to retrieve it from the tanks to process it into a robust waste form, and we need to be mindful of the compliance

issues that we have with the effected states where this waste is currently being located and the spent fuel is being stored. And we're in constant communications with the states in that regard.

And I think with that, that's the end of my intended remarks. I'd be certainly glad to answer any questions.

CHAIR HAMILTON: Are there any questions for Frank? Vicky?

HON. MS. BAILEY: Just a quick one. The facility -- the WIPP facility -- who owns that? Who makes the decisions as to what goes in there?

MR. MARCINOWSKI: Well, the decision was made statutorily. So there's a piece of legislation that tells us what kind of waste can go in there.

There's a regulatory system with the State of New Mexico and the Environmental Protection Agency that ensures that we comply with their regulations and the letter of the

law.

HON. MS. BAILEY: And so who runs that? Who owns that facility?

MR. MARCINOWSKI: Well, as far as owning it, the Department owns the facility.

HON. MS. BAILEY: The Department of Energy?

MR. MARCINOWSKI: That's correct.

HON. MR. DOMENICI: The Department of Energy is working for the Defense Department in this case. This is defense waste. There's no civilian waste in this facility. It's all defense.

MR. MARCINOWSKI: That's correct.

HON. MS. BAILEY: The Department of Energy could possibly make a decision to do something different there, or no? Help me.

HON. MR. DOMENICI: No, they can't. They would have to change the statute law of the land. Very difficult. It could be done if you had a plan, but there's no plan yet.

MR. MARCINOWSKI: That's correct.

CHAIR HAMILTON: Susan?

MS. EISENHOWER: What percentage of defense transuranic waste goes into WIPP right now as opposed --

MR. MARCINOWSKI: What percentage?

MS. EISENHOWER: Yes.

MR. MARCINOWSKI: Well, anything that qualifies as defense transuranic waste is scheduled to be disposed of at the WIPP facility.

MS. EISENHOWER: That's not my question. What percentage is there now -- just out of curiosity?

MR. MARCINOWSKI: Out of all of it? Approximately one third of the transuranic waste is probably already disposed of at the site.

MR. PETERSON: And when will WIPP cease operations and close up then? Is that like 20 years or so?

MR. MARCINOWSKI: Right now, we're

currently planning on 2030 as the planned end date at present.

CHAIR HAMILTON: Okay.

HON. MR. DOMENICI: Mr. Chairman?

CHAIR HAMILTON: Pete, go ahead.

HON. MR. DOMENICI: I'm sorry to burden you. But I want to ask you something, sir.

I have a Nuclear Energy Fuel Cycle Primer. Have you ever seen this? Can you see it from there?

MR. MARCINOWSKI: Yes.

HON. MR. DOMENICI: Anyway, it's the Department of Energy primer. And I'll show it to the Chairman and I'm going to ask that you provide him with sufficient copies to give to all the members. It's a 30-minute read on understanding the fuel cycle. And it's pretty good.

But it has a statement in it that is particularly informative with reference -- and I'm going to try to distinguish for the

Commission -- two kinds of waste. We're talking about waste we're going to reprocess, and that there's a lot of energy still in it. And most of that comes from reactors where part of the fuel rod was used and most of the energy was left. And we're wondering what to do with that.

And today you've talked to us about another kind of waste. It's high-level, some of it. But it's not from a reactor. It's from Hanford left over from the defense work there. And it's liquified. It's all kinds of different things. But it's high-level. But you're not going to turn it into energy, right?

MR. MARCINOWSKI: Yes.

HON. MR. DOMENICI: Now, wait just a minute. I just want to get it in.

You're not going to turn that into energy -- that Hanford high-level waste? You're going to vitrify it and store it, right?

MR. MARCINOWSKI: The product that it's being manufactured into this glass cylinder, it's meant for thousands and thousands of years of robust storage and disposal.

HON. MR. DOMENICI: That's what I just asked you.

MR. MARCINOWSKI: It's not meant as a package that can eventually be retrieved from.

HON. MR. DOMENICI: That's what I just said. It's vitrified and then stored.

MR. MARCINOWSKI: That's correct.

HON. MR. DOMENICI: Okay. Now let me tell you what this primer says.

After all of this, it says, "If we were to take all of the nuclear waste produced to date in the United States" -- that's not talking about waste from reactors -- okay -- "and stack it side by side, end to end, it would cover an area the size of a football field to a depth of about ten feet. The

amount would increase to an estimated 119,000 metric tons by 2035." That's about a 25 percent increase.

But what I'm saying is the whole thing is a football field that's the depth of ten feet. So everything we're talking about in terms of spent fuel rods, reprocess, don't reprocess, store, don't store, leave it where it is and make that an interim storage -- all of it is a football field full of it. It's ten feet deep.

Now that's a truism, more or less. Well, you can't have a truism more or less. It's a truism.

(LAUGHTER.)

HON. MR. DOMENICI: It's the truth more or less. Truth more or less.

Now having said that, let me ask you this. How much of this high-level waste that we have in barrels and you described as being vitrified, ready for very long storage when we find out how we're going to store it,

how much of it do we have in some way compared to this football field that I talked about? If you don't know, can you find out? I think it would help us to have a quantity that we have in mind. Do you happen to know?

MR. MARCINOWSKI: Well, right now in storage we have about 3,000 of these canisters that I mentioned were ten feet high and two foot in diameter. So I'm sure we can equate that to something such as the football field analogy.

HON. MR. DOMENICI: Okay. I would like that. If nobody else would, you could give it to me. But I think the Chairman would ask that you distribute that to everybody. It's sort of a good talking piece.

And I had just one last one for you. Do you happen to know how much waste and what waste was scheduled to go into Yucca? How much waste and what kind of waste was going to go to Yucca but is going somewhere else now?

MR. MARCINOWSKI: Well, under the legislation, there was to be 7,000 metric tons of that repository space was allocated for defense purposes. So it had a capacity of 70. We got ten percent of the capacity for the Department's materials.

HON. MR. DOMENICI: What was the rest of it going into Yucca? Where would it come from? You get 70, you get ten percent. Where would the rest come from?

MR. MARCINOWSKI: Well, the rest of it's commercial fuel.

HON. MR. DOMENICI: Commercial fuel is supposed to go there.

So it's going to be retrieval fuel rods, is that correct?

MR. MARCINOWSKI: I believe so. But I'm not the expert on the Yucca Mountain.

HON. MR. DOMENICI: Well, you're the expert on high level. I don't mean to put you behind the eight ball. I wouldn't ask you if I didn't think you knew.

MR. MARCINOWSKI: Sure, sure. Yes, it could have been retrievable. Right.

HON. MR. DOMENICI: All right.

CHAIR HAMILTON: Okay. Any further questions for Frank?

MR. PETERSON: I'd just like to add one additional point on the point about all of that material fitting on a football field.

I think it's useful to note that if you'd made the equivalent amount of electricity using coal, you'd have had to burn five billion tons of coal instead of having one football field. It's five billion tons.

CHAIR HAMILTON: Okay. Per, thank you very much.

Frank, thank you very much. You've given us an excellent presentation for an hour, and we thank you.

Our final person speaking about Navy spent nuclear fuel is John McKenzie, Director for Regulatory Affairs, Naval Nuclear

Propulsion Program. He's responsible for matters involving safety and environmental regulation on a national, state, local level that may affect the Naval nuclear propulsion program.

Holds a B.S. in nuclear engineering from Rensselaer Polytechnic Institute, veteran of the naval service.

John, we're delighted to have you here. Thank you for waiting. You're the cleanup hitter here for the day. You're the last man. You have one half hour. And you may proceed.

MR. McKENZIE: Thank you, Mr. Chairman. I'll keep you on time.

It's a pleasure to be here this afternoon. Good afternoon.

Like Mr. Holt before me, I'll encourage you to interrupt me with questions if you have questions as we go along.

Like Mr. Holt before me, I'm going to spend one slide on my program because it is

unique in the federal government. We're a joint organization of the Department of Navy and the Department of Energy. And we have a focused and simple mission. It's to provide the nation with the capability to use nuclear power to propel warships safely and reliably through the water.

Our responsibilities and authorities associated with executing that mission are rather broad. And that's consistent with our history of having taken a concept, developed the capability, and then responsibly managing and providing oversight of that capability through its entire lifetime.

When Admiral Rickover -- then Captain Rickover -- stood up the program in 1948, it really was little more than an idea. Seven years later, the Nautilus went to sea. In that seven years, he created an industrial base and a new technology; developed new materials; developed a quality assurance

system for nuclear products that didn't exist before; developed a training and qualification system for operators; designed, built and operated a prototype reactor in Idaho; and designed, built and delivered the Nautilus.

Since 1955 when the Nautilus went to sea, we've developed over 30 different core designs, we've sent to sea well over 200 nuclear-powered warships. Those designs and our organization have evolved somewhat as the threats have evolved and as the technology has evolved. But the basic way that we approach and execute our work is basically the same as what Admiral Rickover set out for us when he stood up the program.

When he retired after 34 years as the Director, both the President and the Congress took action to sustain the principles, practices and structures that he had put in place. The current Director of the program is Admiral Kirkland Donald. He's the fifth Director in the program's 62-year

history.

This is a diagram of the scope of our activities. I'll just say a few words about those that are pertinent to this afternoon's discussion.

The first is a nuclear-powered fleet: 53 attack submarines, 14 ballistic missile submarines, four guided-missile submarines, 11 aircraft carriers. Those 82 warships represent over 45 percent of the nation's major combatants.

In addition to the reactors on those warships, we operate prototype and training reactors at two sites -- one outside of Charleston, South Carolina and the other outside of Saratoga, New York.

There are six shipyards that construct and maintain the nuclear propulsion plants on the warships. Four of those shipyards handle spent nuclear fuel -- the Portsmouth Naval Shipyard in Kittery, Maine; Norfolk Naval Shipyard in Norfolk, Virginia;

Northrup Grumman Newport News in Newport News, Virginia; and Puget Sound Naval Shipyard in Bremerton, Washington.

All spent fuel from the shipboard and the prototype and training reactors is shipped to the Naval Reactors Facility. The Naval Reactors Facility is on the Idaho National Laboratory in southeastern Idaho.

The design requirements for naval fuel are unique. Day in and day out, sailors live and work within tens of feet of operating reactors. Those reactors have to operate reliably and safely in a wartime environment. That results in fuel designs which are substantially different from the fuel designs that you see in a commercial reactor. Those designs are rugged, exceptionally compact and very effective at retaining fission products within the fuel matrix.

As a measure of the effectiveness of the fuel design, the average radiation exposure for a sailor assigned to a nuclear-

powered warship is less than the average radiation exposure received by a member of the public from background or medical testing.

I mentioned that all of our fuel is shipped to Naval Reactors Facility in Idaho. Those shipments are done by rail. The top photograph is a picture of the shipping container that we use. The wall of that container is 14-inch thick stainless steel. It weighs 350,000 pounds. Though we're not required to do so, we take that container design to the NRC and get an NRC certificate of compliance.

Since the late 1950s, we've shipped over 800 containers to Idaho. Today in a typical year, we'll ship eight containers, all by rail.

When the containers arrive in Idaho, the fuel is taken from the container and unloaded into a water pool in the expended core facility. The picture on the left shows that unloading area within the facility.

All spent fuel is examined to compare actual performance to predicted performance. That technical feedback -- actual to predicted -- allows us to improve our designs and our models. The importance of that feedback is reflected in the improvements we've been able to make in the lifetime of naval fuel.

When the Nautilus went to sea, her fuel lasted two years. For the attack submarines that we build today, the fuel that we put in those submarines lasts the entire life of the ship -- about 33 years.

The inventory of naval spent nuclear fuel is about 25 metric tons. It's stored in the water pool here at the expended core facility and a comparable water pool at the Idaho Nuclear Technology and Engineering Center, also located on the Idaho National Laboratory. That center used to be called the Idaho Chemical Processing Plant.

Today we're in the process of

consolidating all of that spent fuel back at the Naval Reactors Facility and placing it into dry storage. The picture on the right shows you the area in the facility where we load the fuel into dry storage canisters.

That loading is done in such a manner that once the fuel is sealed inside the canister, we can place it in a shipping container and ship it by rail across the country without any further handling or re-packaging of the spent fuel.

The bottom photograph shows our dry storage area, and the concrete overpacks that we place the loaded and sealed dry storage canisters in. Today we have 28 canisters loaded.

Dr. MacFarlane mentioned that there are various ways to measure the quantity of fuel that you have to deal with and how it relates. I've prepared two slides on that which are measures that I can discuss in an open meeting.

The first is metric tons of heavy metal. As was mentioned earlier, 70,000 metric tons is the statutory limit for the repository. President Reagan decided in 1985 that there would not be a separate repository for defense waste, that defense waste and commercial waste would use the same repository. And as Mr. Marcinowski mentioned, that split was 90/10 -- 90 percent for commercial, 10 percent for defense.

Of the 7,000 metric tons set aside for defense waste, the allocation for naval spent nuclear fuel is 65 metric tons. That allocation is sufficient for the spent fuel we expected to have on hand and have generated through 2035.

Because naval fuel uses highly enriched uranium, you can't put as much heavy metal into a single disposal canister as you can with a commercial canister. So if you count canisters, this is what the picture looks like. Again, based on the analyses that

we did to support the repository licensing, we anticipated we would have on the order of 400 canisters of naval fuel out of an expected repository inventory of about 11,000 canisters.

Mr. Marcinowski mentioned the Idaho agreement and consent order. The agreement and consent order resolved litigation between the State of Idaho and the federal government regarding the management of spent fuel and transuranic waste on the Idaho National Laboratory.

In the late '80s and early '90s, Idaho became concerned based on certain events that they were going to become the de facto long-term repository -- permanent repository -- for spent nuclear fuel and transuranic waste. In 1992, they filed suit against the federal government alleging that DOE had violated the National Environmental Policy Act in its plans and programs for management of spent nuclear fuel.

In response to that law suit, DOE prepared an EIS -- again, this is the same EIS that Frank referred to -- which looked comprehensively at how spent fuel would be managed across the DOE complex. The EIS was completed in 1995. And the Settlement Agreement captured the terms and the conditions that the parties felt necessary to fully resolve the matter between them. The federal district court, which had jurisdiction for the law suit, entered that agreement as a consent order and decree, and retains jurisdiction for compliance with the terms of the agreement.

With regard to the Navy and naval spent fuel, the commitments in the agreement on naval spent fuel are identified as commitments of the Navy. And they're summarized in the center of the viewgraph.

Notable there is the same one that Mr. Marcinowski pointed out -- the requirement that all spent fuel be removed from Idaho by

2035. That created some ambiguity for us regarding the future of the Naval Reactors Facility and its mission to continue to conduct research and development for us to continue to improve fuel designs. We went back and resolved that ambiguity with Idaho and negotiated an addendum to the agreement in 2008. That addendum allows us to continue to have a small in-process quantity of naval spent fuel at the Naval Reactors Facility.

In the event that the Navy fails to comply with the commitments set out in its agreement, we're also subject to the $60,000 per day fine that Mr. Marcinowski identified. But perhaps more importantly, we're also subject to the requirements to suspend further shipments of spent fuel into Idaho. A suspension of further shipments into Idaho would interrupt our ability to service nuclear-powered warships with potential impacts to the fleet.

Consequently, your work to define

a potential alternate path for defense waste is particularly important to us, and we're prepared to give you any technical support that you need to further that work. And in addition I'd be pleased to arrange a briefing for you on classified aspects of naval fuel and our management of naval spent fuel if it would be helpful.

That's the end of my prepared remarks.

CHAIR HAMILTON: Thank you very much.

Allison?

DR. MacFARLANE: That was great. Can you go back to slide five?

MR. McKENZIE: I'll try. Everybody just went forward here.

DR. MacFARLANE: Great technology. Okay.

So just help me understand some stuff here. So you said that that transport cask there was by my calculations 156 metric

tons, right?

MR. McKENZIE: The weight of the cask is 350,000 pounds.

DR. MacFARLANE: Which is 156, or let's say 150 metric tons. Okay?

MR. McKENZIE: Okay.

DR. MacFARLANE: And you said your total current inventory of naval spent fuel is 25 metric tons.

MR. McKENZIE: Twenty-five tons. That's correct.

DR. MacFARLANE: So why is that so big?

MR. McKENZIE: To ensure that the cargo is safely protected as it moves across the country. That's the weight of the cask --

DR. MacFARLANE: Okay. I know. I know. Is it mostly the weight of the cask, or is a lot of it the spent fuel?

And then the second question is how much spent fuel is in those dry casks? What's the weight of those?

MR. McKENZIE: It is mostly the weight of the casks. And a typical cask would have about one tenth of a metric ton in it.

DR. MacFARLANE: One tenth of a metric ton of spent fuel?

MR. McKENZIE: Yes.

CHAIR HAMILTON: Other questions?

(No audible response.)

CHAIR HAMILTON: John, thank you very much. We appreciate your contribution to the Commission.

This concludes the work of the Commission for today.

Tomorrow morning, 7:45, breakfast for the Members of the Commission. We'll begin the meeting at 8:30. At 11:00 o'clock, we will begin public comment. We will adjourn at 12:00 noon.

Thank you very much. We are adjourned.

(Whereupon, at 4:41 p.m., the hearing was adjourned.)