BLUE RIBBON COMMISSION ON AMERICA'S
NUCLEAR FUTURE
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MEETING

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MONDAY,
NOVEMBER 15, 2010

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The Commission convened at 8:30 a.m. in Salons B, C and D of the Marriott Metro Center at 775 Twelfth Street, Northwest, Washington, DC, Lee Hamilton and Brent Scowcroft, Co-Chairs, presiding.

MEMBERS PRESENT:

LEE HAMILTON, Chair
BRENT SCOWCROFT, Chair
MARK AYERS

VICKY BAILEY
ALBERT CARNESALE
SUSAN EISENHOWER
JONATHAN LASH
ALLISON MacFARLANE
RICHARD MESERVE
ERNIE MONIZ

PER PETERSON
PHIL SHARP

ALSO PRESENT:

TIM FRAZIER, Designated Federal Official

SHUNSUKE KONDO, Japan Atomic Energy Agency

PIERRE-FRANCK CHEVET, Ministry of Ecology, Energy, Sustainable Development and the Sea

KEN NASH, Canadian Nuclear Waste Management Organization

ROALD SAGDEEV, University of Maryland

MIKE SULLIVAN, former Governor of Wyoming

CECIL ANDRUS, former Governor of Idaho

REP. JOHN GARAMENDI, former Lieutenant Governor of California

RUSSELL JIM, Yakama Nation

RICHARD STEWART, New York University

TOM LaTOURRETTE, RAND Corporation

AUDEEN FENTIMAN, Purdue University

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

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

(8:31 a.m.)

MR. FRAZIER: Okay. We're going to go ahead and get started, if I could get Commissioners to take their seats. 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 to this full Commission meeting. It's all day today, half day tomorrow. And with that, Congressman Hamilton, when you're ready, sir.

CHAIR HAMILTON: Thank you very much, Tim. Good morning to everyone. Thank you all for coming. This morning, the Commission has a three-fold purpose. First, the Commission will learn more about the fuel cycle policy decisions that several leading nuclear energy nations have made, including the factors that influenced those policy decisions and how the policies are being implemented.

Secondly, this afternoon, we'll

have a roundtable discussion with several former state and tribal government leaders who can advise on how to work with state and tribal governments to develop an equitable and enduring solution for nuclear waste management. Third, later this afternoon and tomorrow morning, we will hear from a variety of individuals and organizations who have studied issues before the Commission and who will share their findings and recommendations.

May I take just a moment to reiterate why we are here? Secretary of Energy and the President have asked us to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle and recommend a new plan. That's what we intend to do. We are investigating a wide range of issues. These include reactor and fuel cycle technologies, options for safe transport and storage of nuclear waste, options for waste disposal and institutional arrangements for the management of used fuel

and high-level waste. We'll also make recommendations regarding the handling of the Nuclear Waste Fund.

We are trying, at least, to operate this Commission in an open and inclusive manner. In conducting our work, we have heard and will continue to hear from a broad and diverse range of interested parties. We are very mindful of the erosion of trust in the federal government's ability to meet its waste clean-up obligations. We have appreciated and will continue to appreciate the advice and guidance on restoring trust that we have received from our invited speakers and through public comment, both at our meetings and through our web site.

We remind all who are interested in our work that this is not a siting commission. We will not be recommending specific locations for any component of the U.S. nuclear waste management system. Also, the Commission was not asked to make

recommendations regarding the future use of nuclear power in the United States. We will, of course, consider a wide range of possible scenarios for the future of nuclear power in the United States to ensure that our recommendations can accommodate a full range of possibilities.

We have been charged with submitting a draft report to the Secretary by the end of next July. We intend to meet, if not beat, that deadline.

We will now turn to the business at hand. We very much appreciate the time and effort the speakers have put into their presentations and we look forward to hearing what they have to say. Several of them have come many miles to be with us.

As a reminder, at the end of tomorrow's session, not today's, we will hear from any member of the audience who wishes to speak. A sign-up sheet for the public comment period will be available tomorrow morning

starting at 8 a.m. and closing at 11 a.m. Of course, the amount of time allotted to each speaker will depend on the number of people who wish to speak.

With that, I open the floor to Commissioners for any statement or comment that they wish to make before we hear from our first speaker. Are there any such comments? If not, we will proceed.

This morning, we will hear from four distinguished speakers who will help the Commission understand the policies of other nations for the back end of the nuclear fuel cycle and the factors that have influenced those policy decisions. Several members of the Commission's Disposal Subcommittee recently visited Finland and Sweden to learn more about their approaches to the back end of the fuel cycle and found their visit to be extremely valuable. The information we are receiving from other nations will be of great help to the Commission as we consider what

policies we might recommend be adopted in the United States.

We've asked our speakers to keep their remarks to about 20 minutes so we have ample time for discussion. A caution light will come on with two minutes left. A red light comes on at the end of the presentation of 20 minutes.

Our first speaker is Dr. Shunsuke Kondo, the Chairman of the Japan Atomic Energy Commission. Dr. Kondo has served as chairman of the Commission since January of 2004. He holds a Doctorate of Engineering in nuclear engineering from the University of Tokyo and served as a professor at the University until his retirement in 2004. He also served as Director of the University's Research Institute for Nuclear Science and Technology.

Dr. Kondo, thank you for coming all of the way to help us understand how Japan has chosen to address the many issues before our Commission. We welcome you, sir. We're

delighted to have you here, and you may proceed.

DR. KONDO: Thank you. Good morning, Co-Chairman Hamilton, Co-Chairman Scowcroft, members of the Blue Ribbon Commission on America's Nuclear Future. Thank you for the opportunity to present you an overview of Japanese nuclear energy policy.

CHAIR HAMILTON: Dr. Kondo, you'll have to speak up. I'm not sure that microphone is --

DR. KONDO: Okay, okay.

CHAIR HAMILTON: Okay. You'll have to speak up. Thank you very much.

DR. KONDO: Focusing on the back end of the nuclear fuel cycle. As the particulars of the path Japan has chosen since the establishment of the atomic energy commission, given in the prepared text titled Note on the Back End Policy, Past and Present, I will talk about in this particular presentation just a snapshot of the kind of

policy and activities at the back end of the fuel cycle in Japan with some comment on the related topics.

First, a few words on nuclear energy and nuclear power generation in Japan. Generally, the power companies currently operating, 54 with light water reactors, thus probably about 30 percent of electricity. They contributed to the reduction of the carbon dioxide emission 200 million tons annually and to the increase in energy self-supply ratio from 4 percent to 16 percent under the assumption that nuclear energy is an indigenous source.

Three units have loaded MOX fuel fabricated in Europe and two units are under construction. Three units are under regulatory review for construction, and three units are in the decommissioning phase.

The current policy goals Japan is passing to enjoy the benefit of nuclear energy: A, maintain the sound infrastructure

for safe, secure, safeguarded and sustainable utilization of nuclear energy; B, reprocess used fuel from light water reactors within the domestically available capability, utilize fissile materials thus recovered in light water reactors for the time being and dispose the vitrified high-level waste from reprocessing process into a deep geologic repository; C, promote nuclear energy research and development efforts, including those aiming at commercializing fast neutron reactors and its fuel cycle technology that can attain better fuel utilization and waste minimization before 2050; D, promote international cooperation and trade for contributing to the assurance of the safe, secure, safeguarded and sustainable utilization of nuclear energy in every part of the world and for pursuing mutual benefit and fulfilling common responsibility among partners.

The government recently decided to

expect the increase of the share of nuclear power to about 40 percent by 2020 and about 50 percent of electricity generation by 2030 as one of the most important actions to combat global warming. Therefore, it's necessary for the Japanese nuclear community to, first, improve the average the plant capacity factor; B, promote construction of new plants, replacing aged plants in some cases; and, C, pursue the understanding of the public on the validity of managerial innovation to be introduced from the viewpoint of safety assurance and for increasing the capacity factor, as well as on the importance of nuclear energy for both assuring energy security and combating global warming.

The last point I made because, just show the current recent result of the public opinion survey. This showed that the majority of the Japanese people support the promotion of nuclear energy, but, again, just more than 50 percent of public feel uneasy

toward nuclear.

Now, on the Japanese policy on the back end of the fuel cycle, since the 1960s, in concert with the international effort of nuclear power generation by electric power company in Japan, the Japanese government has been promoting the research under the ATR and the of the fast neutron reactor that utilize plutonium from the reprocessing of spent fuel by conducting experimental fast neutron reactor JOYO prototype advanced reactor FUGEN, prototype FNR MONJU, and the Tokai Reprocessing Plant, recognizing that for pursuing energy security by way of nuclear energy utilization, it is important to aim at establishing closed fuel cycle.

Electric power companies jointly decided in 1970s, sharing such recognition with the government, to invest into the reprocessing business in Europe so as to assure a necessary amount of reprocessing services for the time being and to start the

construction of a commercial reprocessing plant in Aomori, that is Rokkasho Reprocessing Plant, by establishing JNFL.

In the end of 1990s, after they injected the investment into the construction of demonstration advanced reactor, they decided to start the use of MOX fuel in reactors utilizing the plutonium recovered in Europe for the time being and recovered at the Rokkasho Reprocessing Plant also.

Before starting the construction of the Rokkasho Reprocessing Plant, recognizing the importance of assuring international confidence in observing the commitment of nuclear nonproliferation for promoting nuclear fuel cycle activities in Japan based on the recent from the negotiation at the start of the Tokai Reprocessing Plant, Japan started in cooperation with the IAEA, the United States, France, and so on the development of an adequate concept and technologies for the IAEA

safeguards to large bulk-plutonium handling facilities. The current IAEA safeguards activities at the Rokkasho Reprocessing Plant are based on the result of these particular activities.

Furthermore, to increase transparency, Japan has published annually the quantities and the location of separated plutonium it holds since 1997, and since 2005 electric power companies and other organizations have published at the beginning of every fiscal year the objectives of the reprocessing to be executed in the year, namely when and how to use the plutonium recovered, based on the recommendation of my commission.

Along with the decision I mentioned, up to now 5,600 tons of used light water reactor fuel and 1,500 tons of used gas-cooled reactor fuel were reprocessed in Europe by contract, and 1,020 tons of used light water reactor fuel were reprocessed at Tokai

Reprocessing Plant. In the future, among 66,000 tons of spent fuel to be generated before 2046, 32,000 tons will be reprocessed in the Rokkasho Reprocessing Plant, annual capacity is 800 tons, and it should be completed in the near future. In short time, I should say. And the remaining 34,000 tons will be stored at spent fuel storage facilities at reactor or away-from-reactor for the time being and will be reprocessed at the second commercial reprocessing plant in the future. That should be coming in 40 or 50 years.

As the use of MOX fuel, as the fabrication and introduction of MOX fuel, it has been a major R&D activity of 40 advanced reactor R&D. The FUGEN and JOYO and MONJU have been loaded with MOX fuel fabricated at the so-called Plutonium Fuel Fabrication Facility at Tokai, utilizing plutonium transported from Europe and recovered at the Tokai Reprocessing Plant. On the other hand,

the utilities have just started to load MOX fuel in the light water reactors because they decided about ten years before, because of the difficulty in obtaining the understanding of the government.

The JNFL started now the construction of the Rokkasho Reprocessing Plant and for spent MOX fuel that should be stored onto fast reactor, it was immediately after we introduced but, quite recently, this month I should say, it just started a preliminary discussion about the management of spent MOX fuel in the context of the so-called second reprocessing plant, when and how this particular plant should be built.

The Rokkasho Reprocessing Plant of the JNFL, the completion of the commissioning test has been delayed for several years for particular plant due to a series of troubles in establishing operation procedure of the joule-heated ceramic melter in the high-level waste vitrification line. And the JNFL quite

recently announced that it will be completed in two years, based on their analysis of the result of a series of mock-up tests to reproduce the undesirable phenomena in the melter and modeling and simulation activity with a view to establishing the operating procedure.

As for financing of this particular reprocessing business in Japan, along with the deregulation of electric industry, the government established in 2005 a fund for reprocessing and related activities, including the decommissioning of facilities involved, collecting fees from electricity customers based on the generation of spent fuel. The fee is about 0.3 yen per kilowatt hour or 1 yen per kilowatt hour from the nuclear power plant, which is based on the analysis of life-cycle cost of the activity.

Now, on the management of high-level waste vitrified at Rokkasho Reprocessing Plant. In Japan, since 1970s, in parallel

with the operation of Tokai Reprocessing Plant, an expert group had discussed the feasibility of disposing a vitrified HLW in the geologic repository, after storing it for 30 to 50 years at a surface facility to allow cooling, based on a so-called multi-barrier system in stable geology at a depth greater than 300 meters below ground surface.

The group concluded after more than a ten-year study in 1992 that a sufficiently stable deep geological environment to ensure the performance of the multi-barrier system can be found in Japan, even though the country is located in a tectonically active zone and complex geology is expected in most part of the island.

Based on this recommendation, the Commission asked the research organizations to start the research and development activities to establish technical basis for high-level waste disposal project and for its safety regulation. The research organization JAEA is

developing, among others, integrated methods for characterizing the deep geological environment at two typical geological environments in Japan utilizing two underground research laboratories, one in Mizunami city in crystalline rock and the other in Horonobe city in sedimentary rock.

Now, siting is a very difficult program. In 2002, the NUMO, an organization authorized by government to promote the disposal activity, invited mayors of municipalities to apply for site suitability investigation. Although there have been several preliminary moves and one failed application, so far no mayor has successfully applied.

Based on these activities and failure, the Commission has asked government and NUMO to strengthen public information activities on the safety and the importance of the disposal facility at both national and municipal levels. This shows the result of

opinion poll taken last year. This shows that now the majority of Japanese people think it's our responsibility to decide the site for geologic repository for high-level waste. However, a great majority, I should say, of the public disagree to entertain or accept the repositories in their neighborhood.

Therefore, our commission is still encouraging the government and NUMO to continue actions to promote mutual communication with the public patiently, exploring innovative ways for increasing the probability of application and, at the same time, to prepare facilities that demonstrate the concept of the repository and the safety of the disposal, as a picture is worth a thousand words.

Finally, I will briefly talk about fast neutron reactor research and development. We start operation of the prototype fast neutron reactor MONJU in 1994. But in 1995, the sodium fire event occurred at MONJU due to

a second sodium leak. Due to this event, the local government asked us to stop the operation of MONJU, and we are faced with difficulty in promoting the fast reactor.

In 1997, we started the comprehensive review of the program and asked the organization and electric power company and reactor vendors to perform a comprehensive review of fast neutron reactor technology with a view to exploring the promising concept of the system. And receiving a report from these groups, the Commission decided in 2006 to ask the JAEA to step up the activity to promote the research and development of a fast neutron reactor, specifying goals in economy, safety and reliability, waste management, proliferation resistance, and so on from the viewpoint of making it a sustainable energy technology in the future.

In response, the JAEA started FaCT, fast neutron cycle technology, project with incorporation with electric power

companies, nuclear vendors, and so on to explore technologies, reviewing their effectiveness in innovative fast neutron reactors, in which not only plutonium but also actinides, minor actinides, are recycled, so that should satisfy the goals. And they are expected to propose us a feasible design of the system before 2015. And just this month, we started the review of the activity or intermediate result of the activity in a three-month project.

CHAIR HAMILTON: Dr. Kondo, in order to allow time for questions, could you begin to wrap up your remarks?

DR. KONDO: Okay. So, finally, I'd like to say that the Commission believes it important to pursue close cooperation with like-minded countries, including the United States, France in particular, in promoting this particular endeavor, as it is a global interest and the duty of major nuclear energy supplier to make nuclear energy more

sustainable. Thank you for your attention.

CHAIR HAMILTON: Thank you very much, Dr. Kondo. We'll open it up now for questions from Commissioners. Do we have such questions? Per?

MEMBER PETERSON: Kondo-sensei, thank you for coming all this way to speak with us and to present about Japan's nuclear fuel cycle decisions. In thinking about differences between United States and Japan, the one that comes to mind is the difference in the availability of natural resources, especially for energy. So I was hoping that you could talk a little bit more about how the situation with natural resources or lack of natural resources affects the decisions that are made in Japan and what the current assessments in Japan are around the availability of uranium this coming century in terms of stability of price and access, again, given that Japan must import. And then maybe also just to comment a little bit on the

possibility of obtaining uranium from sea water.

DR. KONDO: Thank you. First, natural resources in terms of energy, in the past we have some coal, but it is depleted. As I said, four percent of energy come from domestic. That's from hydro. That's all. And now people are talking about wind, solar, and so on, and we can, by some assumption, sizable amount of energy of course. But as you may know, the Japanese are mostly mountainous, and region is about 20 percent I think, so it's not to so easy to convert whole mountain into solar panels and so on. That's the reason why we choose nuclear as the energy for future back in 1960s.

As for uranium, in our case, we have no uranium resource in our country, so it must be purchased from abroad. And your question is Japanese view of the global uranium availability, we're not appropriate person to talk about it, but we rely on

several estimates estimated by NEA or other guys. We know that there is some significant amount of uranium in the world. But, again, the program is for us to think about everything from the viewpoint of energy security. We know that in the past years we've seen a sudden jump of price of uranium and so on, so we believe that it's prudent for us to assure the on the foreign suppliers. That's current thinking.

CHAIR HAMILTON: Richard?

MEMBER MESERVE: Dr. Kondo, it's nice to see you again. In your presentation, you indicated that you collect a fee of 1 yen per kilowatt hour, and I'm not completely clear on the exchange rate, but I think that's about one cent per kilowatt hour which is about ten times what we collect in the U.S. You indicated it's based on an analysis but that it also includes the cost of reprocessing. Do you know what segment of that fee is for storage and disposal and what

portion of it is allocated for your reprocessing activities?

DR. KONDO: Yes. I think we have some viewgraph on this particular point, but, to be precise, yes, but general. It's the users, customers. And it's going to be converted into the kilowatt hour electricity from nuclear, 1 yen per kilowatt hour. And I think 0.6 yen come from reprocessing, 60 percent or something like that, yes. And the remaining hours is waste disposal and some other activity related to disposal activities.

So this is a breakdown of the cost. Reprocessing and six others are there. Okay. And in terms of, this particular slide is a part of our study at the occasion of the dispute on the needs for start of the Tokai Reprocessing Plant. We have made a very detailed study in the public domain, and we summarize at the bottom. You can see at the bottom that the recycle option is about ten percent or higher than that of disposal cases

in terms of electricity generation.

CHAIR HAMILTON: Al and then Ernie and then Allison.

MEMBER CARNESALE: Thank you, Dr. Kondo. A couple of questions about reprocessing. As you indicated, the decision to reprocess was made in the 1970s and first in Europe and then in Japan. At the time, the 1970s, people expected a much more rapid growth of nuclear energy and much more depleted source of uranium and much higher prices. If you were making the decision today, if you did not already have reprocessing capability, what do you think you would do?

DR. KONDO: Good question. That was, of course, included in this particular exercise, but the scenario one is the use of Rokkasho Processing Plant and continue the recycling business. Scenario two is just operate Rokkasho and after that we dispose of every spent fuel, and scenario three just

abandon Rokkasho Reprocessing Plant and use the direct disposal and so on.

At that time, we decided, based on this and other aspects, that we should continue to use Rokkasho. So your question is then if we have no Rokkasho Reprocessing Plant then what should we, what do you think about for future. It's a good question. It's not so easy to answer. We can answer but just from my personal viewpoint. We know that the future, if we'd like to use the nuclear energy for a long time, that's the key. If we'd like to do so, then we should think about the reprocessing. So at this moment, that's all I can say.

MEMBER CARNESALE: Can I follow up?

CHAIR HAMILTON: Sure, go ahead.

MEMBER CARNESALE: Thank you. A second question also about reprocessing. You indicate that, thus far, you've reprocessed about 8,000 tons of spent fuel, if I'd just

add up the numbers, and you'd expect that by 2046 an additional 32 tons of spent fuel will be reprocessed. Now, when we think about reprocessing around the world, we only think about the Japan and the United States. I'm just wondering, thus far, roughly, what is the total stockpile of plutonium now, what is, roughly, the plutonium unaccounted for now, and when you reprocess 32,000 tons of spent fuel what do you expect to be the unaccounted for mass of plutonium? Is it one percent, is it one-tenth of one percent?

DR. KONDO: Okay. The number is here.

MEMBER CARNESALE: Yes, that's where my numbers came.

DR. KONDO: Yes, yes. And you're talking about the so-called --

MEMBER CARNESALE: Stockpiles of plutonium and the unaccounted for amount of plutonium.

DR. KONDO: Now, as I said, before

starting with the construction of the Rokkasho Reprocessing Plant, we paid due attention to the problem of the safe reliability of the plant, and we, of course, inviting the United State and IAEA and so on, we make a review of the technology available and finally concluded that we should now utilize the approach to not just talk about the math but to review the plant comprehensively from the viewpoint of the diversion. And we introduced several innovative ideas, technologies in the plant.

So I now would like to keep quiet, talk about just only the material unaccounted for. That's my position. Of course, if you would like to calculate it, assuming that one-percent number, you can easily obtain the number.

MEMBER CARNESALE: Yes, that's the point of my question. That's right. And, finally, if I may, again, in the 1970s, you indicated that you felt that people were quite confident that after 30 to 50 years of surface

storage you would be able to safely store it in a geological repository. The 30 to 50 years is rapidly running out. What is your current estimate of when you would expect to be able to store it safely in a repository?

DR. KONDO: Okay. Just to be precise, in starting from the 1970s, they started a discussion and studies of such kind of business, and they concluded in 1992 that, in principle, we can do it in Japan, irrespective of the rather -- geological unstable island that has many complexities. And we decided to go this way in 2000. And we asked, we think about how to obtain the site. My commission decided that to open it is the most democratic way, and so we just explain current policy. And we've spent ten years, 80 years from the start, and now we are talking about this is the, we couldn't wait anymore. So we should discuss new ways to approach to the public. And the opinion poll results show that now the people has a general

understanding of necessity of having a repository but the point is the understanding of the safety or other matters related to these particular procedures.

So we are talking with these guys about what should be the common ground to discuss the matters, and we are now talking about the equity of benefit, the benefit to the nation, and somehow these benefits should be equalized. That means, as a nation, we should do many things to the particular disparities. And then the question comes, hey, you want to buy the site by money, so how to respond to this kind of ethical question in good way. And the solution is just ask them to give us their idea of the future of their society from the viewpoint of equity of benefit.

CHAIR HAMILTON: Okay. Ernie and then Allison.

MEMBER MONIZ: Actually, first, a comment for Commissioner Meserve to bring him

up to date, 1 yen per kilowatt hour is now much more than one cent. Chairman Kondo, this actually follows Al's question. I think Japan has unquestionably been a real leader in terms of transparency, safeguards, integration of this into the Rokkasho design, et cetera. But one thing really disturbs me, and it is this annual publication of quantities and locations of separated plutonium. It just seems to me, in an age of terrorism, this is a policy that deserves reexamination, and I'd like to get your view on that, whether that is happening, that reexamination. And, third, what is the general security posture and is that being upgraded in terms of protection of stockpiles?

DR. KONDO: Thank you. Good question. Our policy is transparency, but, obviously, in the case of Chairman Meserve, the security and the transparency, we're also starting to make balance. But in the sense, in the sense, the information, public information, and what we are doing just to

identify the companies or factories. Obviously, the facility should have something from the viewpoint of the public, so the point is that the quantity adds value from sites. And I don't think we caused a huge difference between no announcement or announcement from the viewpoint of the people.

Of course, this is related to the second question, of course the security is nowadays an important issue, the same as the safety. So we put our huge resources on this particular aspect. As you know, the now international community are in the process of finalizing and we follow the particular international on these particular activities. We have very close operation, and I think this particular -- yesterday or the day after yesterday, President Obama meeting, the necessity or the importance of joint activity on the nuclear security.

CHAIR HAMILTON: Allison?

MEMBER MACFARLANE: Good morning.

Thank you, Mr. Chairman, very much for your remarks. I have a couple of questions related to MOX and plutonium. So tell me if I've got this right. My understanding is that the original plan for reprocessing was to use the plutonium in fast reactors. Is that correct?

DR. KONDO: Fast reactor and advanced reactor, yes.

MEMBER MACFARLANE: Okay. And so at some point in time, a decision was made to use plutonium, as in MOX, instead for light water reactors, and I want to try to understand how that decision was made because that's sort of important in how we're thinking about different fuel cycles in the future. So can you shed any light on that or give us your personal views? And then I have a couple more questions.

DR. KONDO: In 1995, I think the utility companies looking into the design of the demonstrated advanced reactor, they rejected the investment in this particular

project due to the economic reasons. And since they have already invested in reprocessing activities in Europe and also the construction of the Rokkasho Reprocessing Plant, it's quite reasonable for us to hold them to think about the use of this particular plutonium in their light water reactors. Not so difficult but as a simple decision from my viewpoint and from their viewpoint. They have no choice at the particular moment.

MEMBER MACFARLANE: Well, you could decide to just keep the plutonium around and wait until you get your fast reactor program going. I'm interested in the difference there. But, anyway, so in the Japanese program do all 54 reactors plan to use MOX in the future, or is it just going to be a subset of those? And then how long will it take to work through the stockpile of separated plutonium, which I think right now is over 40 metric tons between what's in Japan and what's in France?

DR. KONDO: Okay. The utilities decide to use MOX fuel in just one-third of their reactors.

MEMBER MACFARLANE: One-third. Okay.

DR. KONDO: Yes, yes, 16 to 18 they said. It's quite logical balance of the plutonium, yes. And we, of course, use the plutonium for fast neutron reactor program, of course. At present, most of the plutonium are in Europe. In Japan, we have not enough even to supply fast neutron reactor projects. We are wondering how to make fuel for these activities. If we just rely on the Rokkasho Reprocessing Plant, in 20 or 30 years, we end the supply, the whole plutonium, in the form of spent fuel. So that's the reason why we just started a discussion of this second reprocessing plant, including the how to manage the spent MOX fuel.

CHAIR HAMILTON: Vicky?

MEMBER BAILEY: Thank you. Thank

you, Dr. Kondo, and welcome and good to see you here. I think a great deal of your research and technology has contributed greatly to our understanding of nuclear energy issues here in this country and around the world, and I've had the opportunity to visit some of these areas in which you are talking about today. So maybe I'd like to explore two or three areas and one technical area. You mentioned MONJU, the sodium fire. And I saw the diagram and what have you, but have you pinpointed exactly the cause and can you move forward from there is one of my questions, technically, from the standpoint of safety. And I'd also like to understand the reaction of the community when this happened, how you were able to move forward from there.

DR. KONDO: First, the cause of the leakage was completely understood, yes. Just the root cause is the top management of the engineering design brought the attention to the detailed part of the component.

MEMBER BAILEY: You said it was an engineering design issue?

DR. KONDO: Yes. I should say, as you know, the devils lie in the details. So engineers, design teams should pay due attention to even the very detailed part of the system. Often, in many occasions, you know the cause isn't always the lack of attention to the details. So it's the same as in the case of Monju.

MEMBER BAILEY: I think it goes to the point, though, of you look at recycling, you look at the issue of separation of plutonium and uranium, this goes to some of the concerns we have in this country as it relates to that technology and the feasibility here.

DR. KONDO: And we've learned many things from the lessons learned in the past, especially in the case of safety. And now we are, as probably you know quite well, introduced the so-called defense in depth

philosophy. Okay. We cannot completely any defect in the design, but we review in detail from the viewpoint of public risk. From this viewpoint, as in the case of the Monju incident, was no incidents, no public impact, just psychological impact was there because the people are talking about there's no chance of the sodium leak in this particular plant. From my view, it's not good. But as they are talking in that way, they are talking in that way, this has some psychological impact upon the people around the site. And it's the reason why they took three, four, or five years to accept the start of the Monju. So we are talking about this particular incident taught us many lessons about the management of the facilities that can be regarded by the public.

MEMBER BAILEY: You also talk about, we're not a siting commission, but from the standpoint of looking permanent repositories and geological areas, I notice

you have a, was it the NUMO group and mayors are able to make applications to this group and so far you said no mayor has successfully. Is it because of the areas, the geological, you know, the fact that a lot of the tectonic activity in those areas? What are some of the issues why?

DR. KONDO: We asked the organization to site survey, so mayors is not necessarily to know anything about their geological conditions. But just we asked them to apply for a site survey. We made a three-step approach, starting from the regional survey and site survey and detailed design and the safety. And each step we must ask the opinion of the mayor of the area, and we are now we want to enter the fast stage. Still they are talking about, how to say, the impact on the local industry due to the existence of the particular facility. The psychological matters should be taken care of very carefully with direct communication and making a good

demonstration and inviting these guys to the underground research laboratories 200 meters below the surface. We invite young guys and the people from the municipalities. We invite public to these underground research laboratories and give them some feeling of the safety, hopefully, of the facilities.

CHAIR HAMILTON: Are there further questions?

(No response.)

CHAIR HAMILTON: Dr. Kondo, thank you very much for your excellent presentation. We're most grateful to you.

Our next speaker is Mr. Pierre-Franck Chevet, the Executive Director for Energy and Climate in the French Department for Ecology, Energy, Sustainable Development and the Sea. In this role, he's responsible for green technologies and international climate change negotiations. Mr. Chevet is a state representative of the French government, of GDF Suez Board and a member of the GDF Suez

Strategy and Investment Committee. He is a representative of the French government on the supervisory board of AREVA and is a government commissioner with AREVA NC, Andra, and the French Energy Regulatory Committee. He also is a member of the French Green Industry Strategic Committee.

Mr. Chevet, it's a great pleasure to have you with us this morning, and you may proceed.

MR. CHEVET: Thank you, Mr. Chairman, honorable members of the Commission, ladies and gentlemen. It's a real pleasure for me to be here and to have the opportunity to make a short presentation, I will try to be short, on the fuel cycle's back end. I've got slides. They can be made public, obviously. We also have prepared a small note dedicated to the end of fuel cycle. It's an official note. It can also be made public. We will just review that at the end of my presentation. And you will ask questions. If

I don't have the answer, it's possible I'm quite a generalist, we will note the question and send you the answer by written procedure. It's very clear for me.

Just a few words about the general context of nuclear energy in France, why we have chosen more than 30 years ago to develop nuclear energy. The answer was basically at that time for energy independence and security of supply reason. Now, the reasons are more developed. It's the same, energy independence and security of supply, but it's also a good way to reduce CO2 emissions. It was not the initial reason, but it's now a good reason also. And there's also another reason: the competitiveness of energy. We consider this is a result of our situation that the price of nuclear energy is quite competitive, at least in our country but I think it's general.

And we are also willing to help countries that wish to develop also peaceful uses of nuclear energy, obviously provided the

highest standards of safety, of proliferation, and environmental protection for two main reasons. First, France wants to promote climate change mitigation action plan at the international level, so that's consistent with our policy, nuclear energy policy and climate policy. And also for a more selfish reason, that is to say, if there is an accident elsewhere in the world, we depend from 80 percent of our electricity production from nuclear energy, so we don't want to have an accident elsewhere in the world, so we are willing to help on each area of the nuclear development of nuclear energy.

About the opinion polls, we also have regularly opinion polls organized every six months until the beginning, I think, of the 80s. And on the upper part of this slide, if you can't read it I'm very sorry, we asked the question, do you consider that nuclear has more advantages than drawbacks. You see it's not, do you fully approve. It's a more

mitigated question. And you see the part of this slide show that a rather positive opinion is dominant. It's roughly in between from 45 percent to 50 percent of French citizens that you see that the relative negative opinion is increasing in the time. I don't know if it's a good or bad result. It's a result. I think that the good result in that slide is that there are no opinion part of that slide is we're using in the time. I think that it's one of the result of our strong policy about transparency to explain what is nuclear, what's wrong, what's good, and what happens. And the result is this decrease on the long-term issue when you look at this slide. But you cannot consider that France is clearly in favor of nuclear. We have strong debates, and we still have strong debates about nuclear.

And we tried to develop a policy to take into account the various different timescale. Obviously, we're working now on the extension of the current fleet lifetime.

We've got a big fleet, a nuclear plant fleet. We tried to keep open the nuclear option beyond 2020. We have decided to build two new reactor of Generation 3 reactor in France. And we are preparing actively the future of those reactors, and we've got, we'll speak about that later, a lot of R&D on Gen 4 and especially about fast breeder for after 2020 on other activities. And also thinking about the future, we always try to have an active policy on spent fuel and radioactive waste management.

There is a lot of players in the field of nuclear energy. One detail that I will speak specifically about is how we are organized about the radioactive waste management. We've got a dedicated public agency on that point until now roughly 20 years which operate all the programs, the industrial programs and our R&D programs on that point. It's a very efficient tool for the government.

This is a schematic view of the French nuclear fuel cycle with all the aspects. As you can see, that's part of this fuel cycle. On the main part of the slide is the present situation, and we have tried to figure the Generation-4 system on the right part of the slide to figure what will be in the future, what could be in the future to complete your cycle.

We've got a lot of acts about nuclear energy. We've got the last one about radioactive material. It is quite a recent act. It was in 2006, four years ago. And just to quote what has been in the act, it's dedicated to the sustainable management of radioactive material and waste. Both terms are very important: sustainable management and radioactive material and waste. We try to deal not only with waste, on high-level waste, but we try to deal with all the stuff of the material in radioactive waste.

We have introduced a

classification, a very precise classification of waste, especially on the right part of the slide, dividing them on one side on activity from very low level of activity on the country, on high level activity, and dividing them with the second pyramid, the life of the waste from very short-lived and long-lived waste.

And every three years we try to have a complete inventory of all the waste classified using this classification. Every three years, we publish a complete inventory of where, how many waste we have in each cases of this diagram and where they are precisely and so on. And this report, we've got copies of this report in English, a few copies of this report in English, if you're interested. And every three years, we readjust this inventory and make it public.

Well, just some points of the important point of this act of the waste management. Obviously, transparency and the

requirements, we got a lot of commission, public commission, open commission with all stakeholder which are involved about the inventory of radioactive material I just mentioned. We've got the national commission on that point. We've got the scientific commission on those aspects, everything being basically public.

And we've got this special mechanism, I would like to mention it. We have created the obligation that utilities have to create dedicated assets for decommissioning and for radioactive waste management. They've got to put the money on a given place. They've got to manage this money to invest correctly, just the amount of the money does have to correspond to the cost of the end of the fuel cycle and of the dispensing of the installation. So they've got to place this money somewhere and manage it quite well.

And we've got a special financing

of R&D on research radioactive waste management, which is based on a tax for nuclear facilities. It's on nuclear facilities, not on the cost of electricity compared to the system we just mentioned.

And we also have a dedicated public body, Andra, which is a national centralized public responsible for the operation of present disposal centers but which is also responsible for R&D and also responsible for regular inventory of radioactive waste and so on. And this public body is mainly funded by the utilities, directly funded by the utilities. There is a small amount off public budget in this agency just to cope with off-fund waste. But, basically, it's funded by utility.

Some facts about the French fuel cycle. We've got EDF, Electricity De France, is the world's leading nuclear operator. It's the biggest fleet in the world with operator. We've got, roughly, 60 nuclear power plant in

operation, basically all of the same type. It's BWR. So it's policy choice to have a standardization. We tried to operate in France.

EDF produces more than 1,000 ton of spent fuel every year, that figure is here, and 22 reactors currently have the authorization to use MOX fuel and four other reactors are currently authorized to use reprocessed fuel. We've got those from the main player, which is AREVA, which is not only supplier but which is also an operator in the full fuel cycle and rendering back end services. And just to mention two major installation, La Hague and Melox plant, which have more than 20 years of operation. And the current capacity of the system for recycling is 1,700 tons per year, which has to be compared to the prediction of spent fuel by EDF.

We got various management routes for each kind which are under research,

especially for the high-level and medium-level but long-lived waste. And we are studying final disposal in argillite. It's 200 or 300 kilometers from Paris. We have identified a zone for the possible location of the future waste disposal facility, and we are now in the process to have a very precise investigation on a limited area with geological researches, which is now 15 square kilometers. And we've got a precise time schedule, which is clearly mentioned precisely in the act of 2006 that I have already mentioned.

The license we will have in 2013. It's not written. A big public debate on the main option of this kind of final repository. There will be a license application expected at the end of the next following year, that is to say 2014. We will have to define also at that time conditions of reversibility. The present law is a law of 2006, as I said. It was a result of a personal public debate that we got to introduce the possibility of

reversibility in 100 years for disposal. So at that time, we'll have to define the conditions of reversibility and the final operation which is expected in 2025.

So some comments about recycling or no recycling. While recycling we consider that there is some technical advantages. The first one already mentioned by my colleague is the security of supply. We consider that recycling, we'll get a better use of energy resources which are still in spent fuel. At the presentation to the French system, which is what I have described just before, we recycle. We can set up using our system up to 25 percent of natural uranium consumption with MOX fuel in our NPPs. Alpha dose gain of 25 percent is coming from the use of MOX fuel and is coming from the enrichment of reprocessed uranium.

We do consider also a recycling participate in the security of supply. As part of also as of diversification of

supplies, we apply this kind of principle not only on the uranium. We also apply this kind of principle in gas, on oil also. We don't have gas, we don't have oil, but we try to have a diversification of the sources and the road for all the resources so it's very consistent to have the same type of approach, obviously, with uranium.

And we consider also that recycling is an advantage. We consider that it is with the long-term use of nuclear. It provide a stock of recyclable uranium and also with the fact that we are in the process of studying Gen 4. I will speak about that just after.

And about Gen 4, we are clearly focusing on especially fast neutron reactors as a way to use natural resources to burn plutonium in a more efficient way and, thus, to achieve the base use of natural resource. There is a figure. We can reconvert at least 100 times higher with a fast neutron reactor

than with the present system.

And we've got also on that point a very precise time schedule. We are starting a prototype which is called ASTRID. We're studying that, which could be started in the beginning of the 2020s. And we've got an intermediate rendezvous in 2012, so in two years on that point to decide or not to pursue to build this prototype.

About recycling, although the technical advantages, we consider that this recycling has significant advantage for the disposal of radioactive waste, especially adequate condition for storage and disposal, for the final storing and disposal. It's quite more easy, vitrified waste, they are quite more easy to render and transport and to store. It's quite more flexible.

Globally speaking, we speak about that before, we consider that if reduced volume and loading of the system compared to the open cycle, so it facilitates the

disposal. We considered that there is a positive impact on the disposal cost of using the closed cycle, and it also reduce footprint for storage and disposal facilities. I've got a more detailed slide on that point. And also I may add that we considered that it is a mature technology, not an R&D technology but mature technology with decades of experience, like I think it began its operation in the 60s so more than 40 years ago without any major problem.

If you try to compare the recycling option and open cycle, in terms of footprint calculation with the same amount of spent fuel to cope with, your figure is 5.5 square kilometers for the closed cycle and it's more than two or three times this figure for an open cycle, so there is a problem of size of footprint of various options. And there is also another problem, which is very important, that the waste you're putting the final disposal on, in the first option, on our

first option I'd say, the closed cycle, you inject minor actinides and fission products. But when it's an open cycle, you inject also directly uranium and plutonium. And at the end, in some years, at the end we are fundamentally creating a new mine of plutonium, a possible new mine of plutonium. So for us, it's also a very important consideration, considering the nonproliferation aspects.

We considered that there is a diagram trying to express, the sources of the diagram is OECD calculations. Basically, fuel costs, that's a very common figure, fuel costs in nuclear operation we present to be 20 percent of the total cost. Globally speaking, global fuel costs and the back end cost only, we present only 5 percent of the total cost of electricity generation. And we'll have some comparison about open cycle and the closed cycle, but the order of magnitude about 5 percent of impact on the price of electricity

is roughly the same in the two options. So, okay, we can have a lot of discussion, but what we would like to insist that this figure is quite low. Only 5 percent of impact, globally speaking, of the end of fuel, and there are differences in between the two options of, well, let's say 10 percent. Ten percent of five percent is a very minor impact, so we don't consider that there is a clear conclusion based on economic aspects. Basically, that's largely that nuclear energy is competitive with or without recycling. And we do consider but we understand that recycling reduces the exposure to especially uncertainties, which is very important economically speaking, especially in certainties of the final disposal, which is probably the main issue of the back end fuel cycle.

CHAIR HAMILTON: Sir, can I ask you to wrap up your presentation so we'll have time for questions, if you would, please? MR.

CHEVET: Okay. I will try to do that. Very quick quote about nonproliferation aspect. First, to say that our recycling facilities are very good track record. Also that recycling MOX fuel consumes roughly one-third of the plutonium, which will reduce the stock. Another very important point is that when you do that you degrade the composition of the remaining plutonium and, thus, the potential for future attractiveness for non-peaceful usage. That's very important.

And the last point is that we recycle, our recycling is fundamentally driven by the needs for our NPP to minimize the stock of separated plutonium in France, so driven by the predictions that we are not creating a lot of plutonium reserve. When we create plutonium, it's to have an immediate, very short-term use in our NPPs.

Okay. I'll try to speed my presentation. Just a political comment about political issue: political acceptance. I've

spoken about security of supply and so on and so on. But, basically, we have to demonstrate our capacity to find a final solution for the waste. And that is to say that, in France at least, that the fact that we leave the burdens on future generation, we've never before considered to be acceptable in France, both by the parliament. They want to have, they want us to propose a solution and to have a solution now. We cannot say that, okay, in France at least, we can wait, we'll study on that. They want to have a solution because when we make opinion poll, I've seen for Japanese people that safety was of the major point, and you have the same question in France, the question of the waste. The final treatment of waste is a big question, and the people in France want to have answers, a precise answer. And for us, it will be impossible to say that we will leave the question for the next 10, 20, 50 years. It will be impossible because the question is

asked now.

And we consider that nuclear materials and waste have to be dealt with in sustainable development approach, the same terms that are used by the French, with the idea of recycling. Recycling, meaning minimization and conditioning of the waste, and that we have mentioned elsewhere. I used to work on classical waste also in the past. Recycling is a big question. We try to answer it on environmental policy, classical environmental policy about separation. People please separate your real waste, and we will try after that to recycle. That basic principle we tried to use on classical and environmental matters. So the idea is very known, very well known by French people. And they ask us exactly the same question on nuclear matters.

Well, one principle, it's back in policy, we have to demonstrate now our capacity to find a final solution for the

waste and to avoid leaving the burdens on future generations is the basic principle. Second principle for us is that nuclear materials and waste have to be dealt with in a sustainable development approach. Recycling achieve the general principle we applied in the classical industry. Those are the main points I tried to focus my presentation on.

We also already have some cooperation between U.S. and France in the fuel cycle, with AREVA action especially, cooperation on Gen 4. We have a lot of technical exchange on radioactive waste, but we considered that this cooperation could be pursued because we are discussing a very important matter, especially concerning, obviously, back end of the nuclear fuel cycle. We are interested also in discussing especially about the liabilities of newcomers concerning the spent fuel and waste. It's a very important matter when we are, perhaps, in a time of nuclear renaissance, rebirth -- I

don't know the exact term. And that we would obviously be happy to provide any further information on our policy, and we can also on recycling, on waste management, on economical issues. I mentioned economical issues, which are important. We would be happy to organize, if you please, possibly a workshop in the next month if you want in France or here if you'd like on a more detailed subject I do not have the time to mention here in my presentation.

Okay. I tried to shorten my presentation, but it was too long. Sorry.

CHAIR HAMILTON: Thank you very much, Dr. Chevet, for a very thorough presentation. We'll open it up for questions now. Are there questions from the -- Allison, we'll begin with you.

MEMBER MACFARLANE: Thank you. Thank you very much for your presentation this morning. I have a couple of questions. And I apologize. I think some of them are kind of technical, so maybe they're for later. But,

anyway, let me just go ahead. Do you know if you intend to recycle all of your spent fuel, or will there be some stockpile of spent fuel that you won't recycle?

MR. CHEVET: Basically, I've spoken about the MOX production is driven by the need we have and, basically, we have to reuse it. Basically, with the system, I mentioned that we have 22 reactors using MOX fuel and six are using --

MEMBER MACFARLANE: Recycled uranium.

MR. CHEVET: Yes. And we are near the equilibrium point. I was talking on they can confirm that we're near the point of equilibrium --

MEMBER MACFARLANE: Between production of --

MR. CHEVET: Yes, reuse of MOX. But when we have used MOX fuel, we produce spent MOX fuel, and this is the final production of our system, the spent MOX fuel,

which is not recycled again. So that creates a quantity of non-recycled spent fuel, which is, roughly, 1,000 ton of spent MOX fuel per year. I can confirm the precise figure --

MEMBER MACFARLANE: Yes, that would be --

MR. CHEVET: -- to have a complete --

MEMBER MACFARLANE: Absolutely. And so this brings me to my other questions, so great answer. So what is the plan for the spent MOX fuel? Are you going to reprocess it at some point in time in the future eventually? If so, do you need to build a new reprocessing facility or certainly modify the existing ones?

MR. CHEVET: So spent MOX fuel?

MEMBER MACFARLANE: Yes. And where is the spent MOX fuel now? It's at the reactors?

MR. CHEVET: Basically, it's in La Hague.

MEMBER MACFARLANE: Oh, it's in La Hague?

MR. CHEVET: La Hague. It's a very beautiful country on the --

MEMBER MACFARLANE: Yes, I know. I know, I know, I know.

MR. CHEVET: You know? Okay. So everything is in La Hague.

MEMBER MACFARLANE: And all the spent MOX fuel is there?

MR. CHEVET: Yes.

MEMBER MACFARLANE: And the plan for the spent MOX fuel is?

MR. CHEVET: What is it? Sorry?

MEMBER MACFARLANE: What are you going to do with the spent MOX fuel?

MR. CHEVET: So at that time we store it. It's not a very big quantity, 100. It's a quantity we got to cope with clearly with safety, but it's using mainly pools, are in pools waiting for 100 -- spent MOX fuel barrier is not a big quantity. We've got

discussion. We have at least enough room to go to 2020, and if we want to go further waiting for Gen 4, especially, reactors which could be used at that time, if we got them to reuse spent MOX fuel. We can, obviously, build a new pool in La Hague. We've got space. It's not a technical problem, not as much difficult as the final disposal is for the new pool.

MEMBER MACFARLANE: Right. So you mentioned also that you're reaching equilibrium between the amount of plutonium produced and the amount of MOX consumed, and, at the same time, you have a stockpile of separated plutonium of over 40 metric tons. So how are you going to catch up?

MR. CHEVET: There is plutonium content in classical spent fuel in the MOX fuel, and you didn't mention this and you mention -- there's no stock of plutonium, not at MOX fuel. This stock, roughly, not 40 small, in between 20, but we can have the

precise figure. It's between 20 cubic meter and 30 cubic meter -- no? Tons. Sorry. Tons. Which is what we need to have time to, when we fabricate MOX fuel we need to have just a small reserve, a minimum technical reserve to prepare the new assembly. So that when I was saying that the process was driven by the MOX fuel need, it is that. That in order to build new assembly, MOX assembly, we need to just have a small reserve --

MEMBER MACFARLANE: But it's not small.

MR. CHEVET: -- already in La Hague, but it's not, in France it's like La Hague, which is a very complex, protected installation.

MEMBER MACFARLANE: Okay. One final question, and maybe this is a technical question that you can tell me the number later, but I'm interested in the quantity in metric tons, not volume, of intermediate-level waste that will require a geologic repository

that you have right now and that you have in the processing plant.

MR. CHEVET: I'm sure, we have mentioned that we have a plan, a very precise inventory. So we --

MEMBER MACFARLANE: Sure. You can get that to me later. That's fine.

MR. CHEVET: Okay.

MEMBER MACFARLANE: Okay, thank you.

MR. CHEVET: We give you the summary of this plan.

CHAIR HAMILTON: Okay. We have four Commissioners seeking recognition. I think that's probably about all we'll have time for before the break. Al, Jonathan, Per, and Ernie. Al?

MEMBER CARNESALE: Thank you, Mr. Chevet. I have two questions. One is very brief. On one of your slides, you said the conditions of reversibility for the geological repository are to be defined by law. That's

a very important point whether it's to be reversible or not. When do you anticipate that that decision will be made?

MR. CHEVET: So we have organized on that very important subject a lot of public debate. The last one before the law of 2006, and one of the conclusions coming from the public, but one of the conclusions was that people prefer that we have, at least at the beginning of the operation of the final storage, that we organize all the technical aspects in order to be able in 100 years to be precise to make it reversible if we have another solution. That was the conclusion of the public debate, and we have decided to take into account of this conclusion in the law, the French law.

And we've got a time schedule, there are some elements in my slide, for the final disposal near Paris to be short. When they will have to the license and the file, they will have to define the precise

reversibility condition: what will we do in 100 years? And we will have a discussion in the Parliament about the general principle of this reversibility in 2014, so in four years. In between that, there will be another public debate. After that, Andra will have to take into account of the principles fixed by the Parliament, and we will have to apply that into the license. We will leave to Andra to operate this final waste. And at the end, in 100 years, I won't be there probably, we'll have to, whether we have a new solution in between or something else, no reversibility or reversibility, but I cannot anticipate of this time period.

But, basically, coming from the public debate, it was the idea that we got at that time to conceive a reversible final disposal, which is not completely positive when we speak about safety. When you are doing irreversible things you reduce the probability of having an external enter in the

final disposal. When it's irreversible, it's much more easy to protect the final waste. But reversibility was asked for by the public. We can manage that for 100 years, but for a very more longer period it won't be a good solution. But for so short-term a period, we considered that it was quite a good question.

MEMBER CARNESALE: I'll make my second question brief. You had a number of slides that had why recycling, and it's a brief for recycling.

MR. CHEVET: Yes.

MEMBER CARNESALE: Now, I understand that's what the French do. Of course, the United States is going to have to face the question should we reprocess and recycle and, if so, when? If you're already reprocessing, the argument for recycling is quite different than if you're not reprocessing. But what do you consider, if you're going to consider the advantages and disadvantages, understanding that France

considers the advantages to outweigh the disadvantages, in your experience what do you consider to the principal disadvantages of reprocessing and recycling?

MR. CHEVET: The basic drawback of an open cycle is the fact that you produce a bigger quantity of final waste and that you need to have a bigger final disposal. So the size of the final disposal you are looking for is bigger. And in France at least, I don't know about your situation, we have more spaces in the States than France for the fact that our territory is smaller, the public thinks sometimes it's not so good with this kind of installation. I don't know for you, but for us it was difficult for nuclear waste but to look also for classical waste.

The idea to minimize the final disposal for the high-level waste it's very important, you know, to find at the end the solution because if we arrive in debate saying we've not made any effort to reduce the

quantity of waste, which is the classical requirement to try to reduce the quantity of waste, and we will now put in operation an installation near your house, it's impossible. Politically speaking, for us it would be impossible. I'm not speaking about security of supply, you see. I'm speaking about public accidents just to apply the classical principle.

And for us, you asked a question about what is a situation, would you do again the same choice now you have done in the 70s or in the 80s, I would say I'm not sure. I'm not the administer in charge. I think that probably we would do the same choice, not for the situation of uranium market which is quite good now. We're not sure about the future. I'm not mentioning that I think the best argument, probably the best argument, our most important argument is probably the public accidents just in France of those kind of final waste installation, nuclear or non-

nuclear.

CHAIR HAMILTON: We have time for three more questions. Jonathan, then Per, and then Ernie. Jonathan?

MEMBER LASH: I'm going to ask three, Mr. Chairman. Does that mean I'm taking away -- I'll ask three very short ones. They're all related. I have three questions, Mr. Chevet, about your map of the players in France, which I found extremely useful. The first, you said that Andra, which has the basic responsibilities of public body, and I'm interested in how the decision was made to have a public body rather than a private entity managed by the utilities.

Second, I'm interested in the process for community consent, buy-in, opt-out, how do you manage that process? And, third, which of these entities makes the decisions about siting criteria and operating standards for the facility?

MR. CHEVET: Okay. So, basically,

we decided, we tried to cope with this in France. We tried to achieve a waste aspects in the end of the 70s and beginning of the 80s. And we had at that time a lot of difficulty to find a good solution. And, basically, at that time, with the idea that both utilities can join together. It was a good idea, but we didn't succeed in doing that, especially because that for radioactive waste installations it's a very public service, I would say, as a common public service. So it was not possible to do that, so we created a public body but basically funded by the utility. It was in the very early 90s. I don't know the precise date, but very early 80s. We got this public body, but with a fundamentally with a private funding with a direct mechanism. But the idea that it could be directly private sectors all together having the same ideas about the future and so on, it became a very long-term aspect. That's why we've created such a public body, but we

can have, I think you can have an alteration in between the percentage of public and private. Those are our choices. But I think you need to have part of public and money obviously coming from the private sector, but they've got the responsibility of the final waste. That's the first point.

You mentioned opt-out --

MEMBER LASH: Second is what form of consent by the communities, and the third is who sets the standards and the criteria?

MR. CHEVET: About standards and criteria, Andra is working like an operator, another operator. They propose something, they make geological researches and so on, and they have to produce a safety files. But after that, which is in charge to say okay, it's okay or not, basically. So that's the classical standard applied to a public operation, Andra in the French case.

But the second question I didn't understand you so --

MEMBER LASH: When Andra selects a community for possible siting of a facility, do they have to consent to that selection, the community?

MR. CHEVET: The consent, they are okay with you mean? Yes, and it's always difficult to say everybody is okay with such kind of installation. But we have had, I don't know how to say, a converging process. We at first tried to include positive geological area, very vast area, very large area. But after that, we tried to select, to converge to obtain the base localization. And we are now in the process, a very converging process. We are exploring a very short area, a small area. I mentioned 15 square kilometers. It's a very precise value, very rough to have a strong with the public.

There is an incentive measures which has been put in place. We inject some money to help the local development, the technical development of the community

concerned and so on. We've got, obviously, a local commission for transparency and so on just to facilitate the process of public acceptance, local public acceptance. Not sure if I fully answered your question but . . .

CHAIR HAMILTON: Two final questions. Per and then Ernie. Per?

MEMBER PETERSON: I will compress my questions into two very specific ones. The first very important one relates to the fact that the cost of managing spent fuel reprocessing and the disposal are fully internalized into the cost of electricity, I believe; but I'd like, more specifically, you mentioned R&D costs are paid by a tax on nuclear facilities. Does that include R&D on fast spectrum reactors? And then, more specifically, for the costs of reprocessing and disposal, how are those charged? Is it on electricity, or is it on a tax on facilities, or what's the specific way that it's charged?

MR. CHEVET: It depends. So for

Gen 4, basically it's paid by the state through the CEA, the French Commissariat a l'Energie Atomique, which is in charge to develop these projects which is considered as an R&D project so mainly funded by public fund with the help, I think, of industry as part of, the operators inject a little money. But, basically, it's public funding, but it's R&D.

Specifically about waste management, there is two aspects. Andra is funded mainly by tax on its R&D activities. It's for R&D. It's tax directly paid by the utility. For industrial activities, just to operate existing waste management installation, we've got a lot of already, so it's a contractual operation in between utilities and Andra. We don't interfere with that. They've got to discuss it together.

And I mentioned that at the end the price of electricity got to take into account all the type of costs, including the cost of the final end of the fuel cycle, the

end, the dismantling. So we have created, you have seen in one of my slides, an obligation for each utility to have dedicated assets covering exactly the cost estimate for the end of the cycle, including dismantling. I'm in charge to certify that they are doing their job, that the utilities are doing their job, that they have created dedicated assets and they are managing this fund correctly, safely. And at the end, they say that we've got this cost, financial cost as to be incorporated into the final price of electricity, and it is. I'm not sure it's completely clear.

MEMBER PETERSON: That's actually, it's very helpful. The next question relates to spent fuel, managing spent fuel in countries that are starting new nuclear programs. For example, United Arab Emirates. The United States 123 Agreement that was recently signed pre-authorizes UAE to send U.S. origin spent fuel to France for reprocessing, which is important in terms of

the capability to make sure that we don't have spent fuel building up in places where perhaps it could present long-term security problems. High-level waste would be returned to UAE, but could you discuss how plutonium from the reprocessing of the spent fuel would be managed?

MR. CHEVET: So considering those kind of situations, United Arab Emirates, the French, we do consider that recycling met by serious countries, like Japan or like you if you decide on that, is a positive thing. But, again, when we propose for a newcomer to a recycle issue, we consider that is in charge because it is a responsible, also a responsible country, it has got to deal with the final waste coming from this, which is a result of this recycling. So we don't accept on our territory those kind of final, it's forbidden by law, the French law. We cannot store of a final disposal of foreign waste on our territory. It's a problem also of public

accident, but it's a law, so we are obliged to do that. So at the end, we consider it's a good thing to recycling, but they've got to deal with the final waste.

We are ready to help them, as I mentioned Andra, we are ready to propose an Andra addendum to find an interim storage first because you cannot find directly a final storage. We are not able to do that, so we can help them to -- but the idea is if they are sufficiently responsible for the new NPP they must also be responsible for finding a solution for the final waste, taking into account the fact that I mentioned that when you recycle, the final waste are not plutonium. They are not under high IAEA. It's not the same type, it's not spent fuel, classical spent fuel. It's less, it's much more better for nonproliferation aspects. So that's why our position is, okay, is that the French do say we cannot store final waste coming from outside but to go back. But

concerning plutonium and uranium, we do consider that those are not waste just to be consistent with the fact that we are recycling them. So for plutonium and uranium, those kind of products, the ownership of these products is the ownership -- we do consider that we can and it's better to store it, to sell it, to reuse it in MOX fuel somewhere else. It could be in France, but it could be elsewhere. Everybody is having MOX fuel usage.

MEMBER PETERSON: So you do not return the plutonium? You can use it domestically and --

MR. CHEVET: Domestically or I've said that La Hague is not functioning only for internal purposes. We are doing recycling for other country. We are also fabricating MOX for Japan, for a lot of other countries, or we can reuse it if the owner is okay, and I think it's better we can reuse it in a very safe manner. It's our point of view.

CHAIR HAMILTON: The final question will be by Ernie.

MEMBER MONIZ: Well, given the time, we will not be able to go through a bunch of issues. I must say, I will at least state for the record I believe that virtually every reason given for the waste management advantages of the current reprocessing scheme are dramatically overstated. Volume, mass, you name it, waste form. And these are very serious issues. In fact, following on Per's statement, I see no end to the logical statement just made about what happens to the plutonium because even if you use it domestically then you have used MOX fuel and is that going to go back to the UAE in its form then? The waste management advantages for the country with a small program have not been articulated in any way that is very convincing.

Nevertheless, minor actinides are still going back, et cetera. But that's, I guess, for a

different time to debate. Let me go to a more precise question.

I was actually quite stunned by your graph of the public opinion in France and its trends, and I'm wondering two things. One, do you have a correlation of the positive and negative responses with proximity to nuclear facilities? And, secondly, is that upturn recently, do you know, is it associated with more visible discussions of waste management in the public?

My next and last question would be, first, as an observation, in your slide 15 you talk about the advantages of MOX for, to quote you, which minimizes the stock of separated plutonium. I guess I would argue not reprocessing at all would minimize the stock of separated plutonium, and it just seems to me indicative, as Al suggested, one has locked in a pathway over 30 years ago and the discussions are around variations of that pathway as opposed to going back to a more --

bigger reconsideration, and I'm curious whether that kind of de novo reevaluation is in the cards.

MR. CHEVET: Well, about your two questions about this slide, this diagram, if I understand your question, is there a difference of results if you are near an installation or far, this is a national opinion poll, so these are the average value at the French level. I don't have here but we can find some more local opinion poll which has been made. I think that, generally speaking, we have better results on very local, on very local than 20 kilometers around the installation, nuclear installation. And after that, I believe all of the department, you find classically this kind of result. But we can have a look if we've got more detail. Local results varied around near installation.

You had a second question on that? The question was how can I explain which trend?

MEMBER MONIZ: It was whether the increased public discussion about waste management is known to affect those trends or not. Has that led to more negatives, basically?

MR. CHEVET: It's difficult to, my only comment, I'm not quite sure about that, is that the good news is that no opinion result is decreasing. There is an increase of negative position. I don't know how to explain that. I think that we tried to be transparent. When you try to be transparent, you explain what's wrong, what's bad. So you see at the end, well, you tend, I think, with a more classical result.

We do consider that to have this on nuclear is normal, and the fact that we are now 50/50, well, it's quite normal for me. I mean, I'm not engaging my government on that point.

Second point is that you see, but it's a very political comment, too much

political comment. You see that there is already a reduction in the positive, the comparative advantage of the positive value. In 2002 and 2007, it's presidential campaign. We got a lot of debates also in France, and in those debates there is also nuclear. But if I remember, the two last presidential campaign, the men are questioned was not about waste management, to be clear. But the main, at the political level, the main issue of the political debates were focused on the safety, on the fact we've got to build new NPP. So we've got to wait for the Gen 3. It was more safety than waste management, so I don't think directly link in the median and long-term to that point.

And you mentioned slide 15. When I --

CHAIR HAMILTON: Dr. Chevet, I think our time has expired, and we thank you very, very much for your presentation. We'll take a break. Ten minutes, please. Return

for the final two speakers this morning. Thank you.

(Whereupon, the foregoing matter went off the record at 10:29 a.m. and resumed at 10:40 a.m.)

MR. FRAZIER: Okay. If everyone could take their seats. Commissioners, come on in. Grab a chair, preferably the one behind your name. Congressman?

CHAIR HAMILTON: I ask once again, if the Commissioners would please take their seats we will get underway for the third speaker this morning. Okay. Our third speaker is Mr. Ken Nash, President of Canada's Nuclear Waste Management Organization. He has served in this role since 2006. Mr. Nash is a founding director of the Nuclear Waste Management Organization and was the immediate past chair of the Organization's Board of Directors. Prior to joining the Nuclear Waste Management Organization, he held a number of management positions at Ontario Hydro and

Ontario Power Generation in the areas of finance, engineering, and environmental management.

Mr. Nash, thank you very much for joining us. We look forward to your presentation. I ask you to keep your remarks to the 20 minutes, and then we'll have time for questions. Mr. Nash?

MR. NASH: Thank you and good morning. It is indeed a pleasure to be here. I hope my remarks will be of value and assistance to the Commission. I understand the Commission does have available to it a written submission that we did make earlier, so I'll be drawing most of my remarks from that submission.

The end point of Canada's nuclear fuel cycle requires eventual safe isolation of used fuel in a suitable geologic formation where it will be monitored and it could be retrieved, if necessary. It also requires the facility to be located in a willing host

community that is fully informed. I will explain how we arrived at this policy and reviewed progress on its implementation.

First of all, in Canada, electricity energy choices are the purview of provincial governments. Nuclear energy and the management of nuclear waste are regulated by the federal government. Work on used fuel disposal was initiated in the 1980s after the 1978 Ontario Royal Commission on Electric Power Planning. This commission recommended that nuclear waste capacity be capped pending progress on nuclear waste disposal. This led to the governments of Ontario and Canada establishing the Canadian Nuclear Fuel Waste Management Program where Atomic Energy Canada Limited federal Crown corporation was assigned the responsibility for developing geological disposal.

In 1989, in response to public concern about repository siting activities, the concept of geologic disposal was referred

to a federal environmental assessment panel and a moratorium was placed on siting activities. That federal panel conducted a dedicated long process, very comprehensive, of ACL's disposal concept. In its 1998 report, the panel said that technical safety of geological disposal had been demonstrated at a conceptual level. However, public support had not been demonstrated and there was insufficient social acceptability to proceed.

The panel made a total of 52 recommendations that were largely translated into the 2002 Nuclear Fuel Waste Act, a new framework of responsibility and decision-making. The 2002 Nuclear Fuel Waste Act established clear roles and responsibilities. The Act requires Canada's nuclear energy corporations to establish the NWMO, Nuclear Waste Management Organization. The Act requires NWMO to appoint an advisory council with a diversity of expertise and that that council provide independent comment to the

government on NWMO's work.

The Act established NWMO's mandate. Our first mandate was to undertake a three-year study of options of the long-term management of used fuel. Following selection of the management approach by the federal government, NWMO is to implement that approach. The Act requires NWMO to provide an annual report to the federal government through the Ministry of Natural Resources and the Ministry to table this report in both Houses of Parliament. NWMO is required to submit a report every three years on its progress and a strategic plan for the next five years.

The Act stipulates that the major waste owners provide funding for all aspects of the long-term management of used fuel. Waste owners must establish trust funds and make annual deposits to those funds. The funds may only be accessed by NWMO and may only be used for the purpose of long-term

waste management and may only be used after a construction license has been issued by the Canadian Nuclear Safety Commission.

In accordance with the requirements of the Nuclear Fuel Waste Act, significant progress has been made since 2002. The NWMO was formed with a mission to develop and implement a socially-acceptable, technically-sound, environmentally-responsible, and economically-feasible plan for Canada's used fuel. An advisory council chaired by the Honorable David Crombie, the former federal cabinet minister, was formed. Trust funds have been established by the used fuel owners with balances that now exceed $5 billion. NWMO completed a study of alternative storage and disposal options and submitted a recommendation to the government in 2005. A governmental decision was made in 2007 to accept the NWMO recommendation.

NWMO went on to publish an implementation plan in 2008. More recently,

NWMO initiated a process for selecting the site earlier this year.

During the three-year study of alternatives, significant efforts were made to address the societal aspects of used fuel management. NWMO's study was led in phases, inviting Canadians to help shape the study and assessments at each point. As a starting point, national dialogues were convened to identify those values that Canadians believe should apply to the long-term management of nuclear waste. NWMO led 120 information and discussion sessions that were held in all provinces and territories. Expert workshops and roundtables and web-based activities took place. Aboriginal organizations designed and delivered their own dialogues. The study of options and development of the plan involved 18,000 Canadians, including 2500 Aboriginal people, and contributions from 500 experts.

Not surprisingly, there was a wide diversity of views. However, there was common

ground. Safety and security is a top priority. This generation must take action now to manage the waste that we have created. We must take advantage of best international practice. And because of the long time frames involved, the approach must be adaptable to allow for changes in technology and society's priorities.

NWMO's recommendation, which we call adaptive phase management, emerged as the approach that would best meet the priorities and values of Canadians. This is the plan that was approved by the Government of Canada in 2007. This plan is both a technical method and a management system. The technical method is isolation in a deep geological formation where used fuel can be monitored and retrieved if need be. This method, we believe, is aligned with international practice.

However, equally important is how we get there. And this is specifically tailored to Canadian values and priorities.

It requires flexibility in the pace and the manner of implementation and responsiveness to new developments and traditional Aboriginal knowledge. Openness, transparency, and staged decision-making with the involvement of Canadians at every step of the way. It requires the facility to be located in an informed and willing host community.

The government accepted NWMO's recommendation in June 2007, and NWMO is now responsible for implementing what we consider to be a national infrastructure project that will involve an investment in excess of $16 billion by the owners of used fuel. It will be a high-technology project with skilled employment for hundreds over many decades, and it will operate as a center of international collaboration. It will involve a long-term partnership between the NWMO and the community, and it will foster community well being. Of course, it will be highly regulated with strict scientific and technical criteria

to assure safety.

Since 2008, NWMO has annually published an implementation plan after public consultation. The plan charts direction and milestones against seven key objectives: building long-term relationships with interested Canadians, further developing repository designs in safety cases, collaboratively developing and then implementing a process for site selection, updating the funding formula for trust fund deposits to ensure that those that benefit from nuclear energy pay for its long-term costs, research into alternative technology and technical methods and societal expectations to ensure that our plans are adapted as necessary, continuous improvement in our governance and continuous improvement in our organizational capability.

Building relationships and involving interested Canadians in decision-making is a fundamental part of our plan. We

very much see ourselves as working on behalf on Canadians to implement adaptive phase management and that we can only succeed if we maintain the social license to proceed. We've established several mechanisms to achieve this in a systematic way, including a forum of Aboriginal elders from across Canada and projects with several Aboriginal groups, a forum of municipal association leaders, and frequent dialogues with the leaders of reactive communities.

The diversity of engagement methods. Multi-party dialogues, citizens panels and government roundtables, dialogues led by Aboriginal organizations, public information sessions, and briefings on request are several of the mechanisms that we use. And, of course, ongoing provincial and federal government briefings. We use these mechanisms on a frequent basis to seek input to our implementation plans and, more recently, on our site selection process.

Probably the most challenging task is selecting the site for a used fuel repository. In 2008 and 9, using the mechanisms that I just described, we held two rounds of public dialogues that focused first on the principles and then a draft process for site selection. Throughout those dialogues, Canadians continued to express the values and principles they expect to see guide the siting process: safety first; consistent with international standards; the need for this generation to take action; adherence to the principle of informed and willing host; a commitment to community well being; and the importance of a fair, inclusive, and transparent process involving all those that may be affected.

In May this year, we initiated the site selection process and have been actively building awareness to the process since then.

Capacity building program offers communities an opportunity to learn more about

the project. Several communities in Saskatchewan and Ontario have taken advantage of that program. The full site selection process involves a series of progressively more detailed studies to evaluate candidate sites for both technical safety and social acceptability. For a final site selection, it will, of course, be necessary for NWMO to demonstrate a robust safety case against regulatory requirements and for the community to demonstrate strong support.

So in summary, following the introduction of the legislative framework in 2002, Canada's plan for the long-term management of used fuel has moved forward. Governance is in place to oversee the plan's implementation. Trust funds and mechanisms are in place to ensure that the financial burdens will not be passed to future generations. The plan for used fuel management has been developed that reflects the priorities of many Canadians. The plan is

moving forward in the spirit of collaboration. Interested individuals and organizations shape the design of the site selection process, and communities are beginning to learn more about the project.

Canada, together with its international partners, does have the technology for the safe, long-term isolation of any geologic formation. And as a result of successive reviews, extensive dialogue, and of government decision-making over the past 25 years, NWMO now has a mandate that is consistent with the expectations of Canadians that expect to see action taken. Thank you.

CHAIR HAMILTON: Mr. Nash, thank you very much. We'll turn now to questions from the Commissioners. Mr. Sharp first and Allison.

MEMBER SHARP: Thank you very much, Mr. Nash. It appears to be a very impressive process you folks have gone through and which I know a number of our, especially

one of our subcommittees has focused very heavily on. Let me ask you a couple of questions. I wasn't quite clear on who initiates the interest. In other words, does the federal government or the provincial government sort of say these broad areas appear to be technically appropriate and then people within that area decide whether they want to pursue this, or is this strictly a matter of a tribe, a local community, a county, or a provincial government stepping forward and saying we'd like to discuss this?

MR. NASH: It's definitely the latter.

MEMBER SHARP: I mean, well, that's --

MR. NASH: That's the short answer.

MEMBER SHARP: No, no, no, that's --

MR. NASH: Certainly, the community, whether it's an Aboriginal

community or a non-Aboriginal community, hears about the project, has its own internal discussion, and then decides to step forward to learn more about the project. And a very important component of this is the assurance and the trust on behalf of the community that it can exit at any point in time.

MEMBER SHARP: Right. No, I understand that. They don't get themselves entangled if they step forward with interest is, I'm sure, a major principle here. One of my questions, however, about that is in your country, as well as in ours, we have vast areas in which populations are spread thin, and this ought to be viewed or has been historically viewed, perhaps incorrectly so, as an asset in terms of where we might put this stuff, that we can have less impact certainly on established communities because we have all this territory. But then the question becomes so what's a community? And I don't know if you've defined that. So if

we're in a rural area, is it a -- we use counties. I don't know if you use counties. I know you use provincial governments. Is that sort of a community, or is this just we're waiting to see who steps forward?

MR. NASH: Yes. Certainly, the question of what is a community has been discussed quite extensively and does continue to be discussed, and there is certainly no one neat definition of a community. The process that we have requires this expression to learn more to come from an authorized community, such as a town council. It could, in fact, be a county, and it could be the leadership of a First Nation, a bona fide First Nation. And one of the first things that we would do is to ensure that the expression to learn more comes from a body such as that.

MEMBER SHARP: Then perhaps this answers my next question, which is what constitutes a willing host and whether you define that or not? In other words, is it a

formal act of the local leadership, the provincial government, the tribal council, or whatever the nature of the governing body is? I mean --

MR. NASH: Well, perhaps, I'll provide two points in response to that. First of all, the community, in our definition of community, although it is not a strictly defined definition, but it does include not only the municipality for instance but it could also include any First Nation or Aboriginal group that was in the general area. It could include neighbors. So it is based on the region, so there's a host community but then we also, as we move forward, would consider the region.

MEMBER SHARP: But I'm assuming you're sticking with constitutional and legitimate government authorities as opposed to there has to be an 80-percent agreement within a community. I'm operating on the presumption there is no where in the world

that you're going to get universal consent to anything but especially for a nuclear waste site, so somebody has to make a formal decision. And are you saying that what constitutes a legitimate willing host is when a formal decision comes at some point in the process? I realize you've got a lot of negotiations to get there.

MR. NASH: This question of what constitutes a decision by the community and a strong demonstrate of support, because that's what we're looking for to make such a huge investment over a long period of time, we do believe it would have to be a certain strength in support. Specifically what that strength is is yet to be determined and the extent to which we would look for support in a region is a question that is yet to be addressed. But of course, we need strong support in the host community, and we would need a significant degree of acceptance in the region.

MEMBER SHARP: And I'm assuming

that, excuse me, Mr. Chairman, for carrying on, but one of our difficulties so far to date has been we may have a willing community but we don't have a willing state or vice versa, or we have a willing community but the communities surrounding it are not so willing, and you get this issue of how far do you go. Indeed, I think there's a serious question of we may have a willing state but the neighboring state that has to have it transported through them are not so willing. So I'm just trying to get at whether you, I assume you're assuming layered approval with all the levels of government, or is the provincial government, will they make this determination?

MR. NASH: Yes, regarding provincial governments, that is definitely a very important part of the process. And we've made significant efforts to ensure that provincial governments are fully aware of what we're doing and also have had full opportunity

for the input to the siting process and when and how it's launched. We have not asked for provincial governments who said that they are willing provinces, but we do recognize that if a community does come forward in a particular province that, at some point, the provincial government would have to be involved in the process.

MEMBER SHARP: So you're actually working directly with the communities and hoping over time through just general information at first the provincial government does not step in, as we've had in this country where the state government steps in and says, wait a minute, we're not interested; that tribe may be interested but we're not. I mean, would that stop the process pretty quickly if you had a vote in the provincial parliament --

MR. NASH: We would hope the process would not result in a vote in a provincial parliament. So for instance, if

interested communities do come forward to learn more and there's a resolution passed for instance or the First Nation government, one of the first things we do is to inform the provincial government to make sure that they hear about this as soon as possible. And prior to that, we have had discussions with provincial governments that are aware of our process. And as we go forward, provincial governments are going to be integral to the process.

CHAIR HAMILTON: The Chair has four Commissioners asking questions. Allison, Jonathan, Richard, and Per. Allison?

MEMBER MACFARLANE: Great. Thank you very much. So I'll try to keep this as brief as I can. I noted in the write-up that you gave us somewhere, on page six at the bottom you say these high-level screenings that are now underway are going to inform the communities as to whether there are known technical or geological factors for excluding

the areas from further consideration. So one of my questions is do you or have you already established a short list of exclusionary criteria?

MR. NASH: Yes. There's a listing in our siting document, and that was part of the public consultation that we held over the past --

MEMBER MACFARLANE: Okay. So we could get a hold of those --

MR. NASH: Absolutely.

MEMBER MACFARLANE: -- criteria --

MR. NASH: Yes, that's on our web site.

MEMBER MACFARLANE: That would be really helpful. Okay. So that's one question. Another question is about the trust fund. How is it assessed, or is this up to each utility?

MR. NASH: Initially, in 2002, when the Act was passed, there was a schedule of deposits that were required to be made by

the individual utilities. Shortly after the federal government made the decision on the specifics of the plan in 2007, we were required by legislation to provide an estimated cost of executing that plan and proposals for future deposits by the utilities, and that was done in 2008 and approved by the federal government in 2009.

MEMBER MACFARLANE: And so how were they assessing these funds?

MR. NASH: Well, we estimated the total cost of building a repository, and there's a schedule of payments that are made over a period of time to make sure that by the time we start construction of repository those funds are available to build it.

MEMBER MACFARLANE: Okay.

CHAIR HAMILTON: Jonathan?

MEMBER LASH: Thank you. Mr. Nash, thank you very much. The subcommittee that I'm a member of heard from Elizabeth Dowdeswell, and we were enormously struck by

the kind of process that you went through to ascertain Canadian values and used those to construct the process. I have two very specific questions. The first is do you provide any kind of financial assistance to either communities or civil society groups to participate in the process?

MR. NASH: Yes, indeed. That's been part of our program since its inception. For instance, during the study phase, we did provide quite substantial funds to Aboriginal organizations to do their own dialogues. During the course of when we initiated this site selection process, communities learning more, there's funding for them to hire their independent experts, and one community has taken advantage of that. There's funding for communities to go and visit facilities that already exist and store waste. Communities have taken advantage of that. And there's also a funding, for instance, to go and visit the Canadian Nuclear Safety Commission to get

an independent view on the regulators' perspective on this. So, yes, it's a very important part of the program.

MEMBER LASH: One other question. In your opening statement, you mentioned that one of the objectives is to provide for retrievable disposal. And I thought that I remembered when we heard from Liz Dowdeswell that the initial findings of the NWMO process were that the public was concerned about security and leaning toward permanent disposal. And I'm just wondering about the definition. Is this during the adaptive period, or do you foresee long-term reversibility?

MR. NASH: There's no question that public are concerned about security. But I would say there is a strong demand for continued monitoring and a strong demand for the ability to retrieve. The general public asks questions about the recycling option, and there is a faith out there that there will

someday be a technology that will come along that would provide, perhaps, a better solution than a deep geologic repository. So for a number of reasons, there appears to us to be a strong preference for retrievability and, certainly, when we tested the plan that we drafted that came through strong and clear that it will be important to include the option of retrievability and build that into our planning.

CHAIR HAMILTON: Richard?

MEMBER MESERVE: Thank you. It's a very interesting presentation. You haven't said very much, if anything, about the regulatory environment within this decision is to be made. You indicated that there were some exclusionary standards that came out of the dialogue, but is there a whole regulatory framework that's been put in place by the CNSC, or is that all awaiting and going to be developed in parallel with some communities coming forward?

MR. NASH: Yes, the requirements that I've discussed so far in the program that we've implemented since 2002 is in accordance with the Nuclear Fuel Waste Act, which is specific to use nuclear fuel in Canada. We, like the United States, do have a nuclear regulator that's got very well-developed regulatory processes. The regulatory process in our program would officially start when we have a particular project and a specific site, and we make a regulatory submission to construct a facility on a particular site.

However, let's call it pre-licensing activities of the Canadian Nuclear Safety Commission, they are involved in our program. We have a memorandum of understanding with the Canadian Nuclear Safety Commission. And they have, through the normal course of business, established regulatory standards for deep geologic repositories, and these are consistent with the equivalent IAEA standards so we know what standards we have to

achieve. Another feature of the interface that we have with the Canadian Nuclear Safety Commission, we're in the process of submitting repository designs and safety case at a conceptual level for their review to assess whether the technology we're developing is going to, has the potential to meet their regulatory requirements.

So in summary, the actual regulatory process does not start until we have an informed and willing host community and we're ready to initiate the regulatory process. But the recent interface between ourselves and the Canadian Nuclear Safety Commission -- in fact, I think on the 9th of December we will be making an update presentation to a meeting of the Commission.

MEMBER MESERVE: If I understand you correctly, there is a whole regulatory system that's in place, standards that --

MR. NASH: Yes, absolutely, waiting for the day when we initiate the

regulatory process.

MEMBER MESERVE: You didn't have any litigation over those standards in Canada?

MR. NASH: No. Not so far. It's a different country.

CHAIR HAMILTON: Per?

MEMBER PETERSON: Thank you. We, I think, look upon Canada as providing an important role model, particularly around governance of this process of trying to develop disposal capability. I chair an academic department at a large university that I'll leave nameless at this point where there's no decision that is too minor not to be made by centralized management, so what I find breathtaking about the Canadian approach is that your organization has been given a substantial responsibility and the breathtaking part is the amount of authority that you've also been provided to develop the process and to be in control of the process for trying to execute it. And so I'm very

enamored with the courage that it takes for political leadership to actually delegate authority along with responsibility.

I'd just be curious are there any problems that have emerged that we should be aware of from having delegated this amount of authority to the organization? It seems to me that there's very large positives to having done that.

MR. NASH: I would say the main challenge of this is that the way that this is structured, which is different from the situation you saw in France where Andra is a government agency. When this question first came up in the mid 90s, both industry and government studied this question. And it's clear, to make progress on something like this, trust is a very important ingredient, and so that weighed quite heavily in the government decision to structure things this way. And if one looks internationally where these models are drawn from, and the

government and industry did look internationally in the mid 90s, the ones that are making the best progress and are able to develop the most trust in the system are the ones that are structured like this. For instance, Finland, Sweden, perhaps Switzerland, they're structured like this where it is the utilities that form the organization and it's under government policy, direction, and regulation.

The challenge is the question of trust is constantly challenged and can we be trusted because of our ownership, and that is a continuous challenge. But I can say that from our board of directors, which is appointed by the utilities, those folks are definitely able to separate this question of managing nuclear waste in accordance with the mandate and the mission of the organization is to solely focus on managing waste and not be influenced by other factors in their decision-making. But it is a question. I'd say that's

probably one of the biggest challenges of this, but it's the question of trust. But my own opinion on that, it will take time to see whether and fully prove that this is a trustworthy organization, and I believe that time will prove that.

MEMBER SHARP: Could I ask a follow-up?

MEMBER PETERSON: Thank you.

MEMBER SHARP: Just a quick follow-up on that. Are there organized groups in the civil society who actually have challenged that ownership, that organization, and have said up-front we find this intolerable? I mean, I can imagine that happening here. That's why I'm asking. Right off the bat, you've got a whole set of opponents.

MR. NASH: I mentioned earlier there were 52 recommendations from the environmental assessment panel that were largely incorporated into legislation. One of

the recommendations of the panel was that it be a government-established agency with a governance body appointed from different parts of civil society, and that recommendation was not accepted by the government and did not find its way into the Nuclear Fuel Waste Act. And as far as I understand, there are folks there that would like to see that. We think that's a better formulation.

CHAIR HAMILTON: A question by Al.

MEMBER CARNESALE: It would appear that, having seen our country and perhaps some others going through a process that was quite different, namely identifying which appeared the best places technically and then seeing what might be acceptable politically. Canada has swung the pendulum the other way: what would be most acceptable politically and socially, and can we find a place not only where the people will be willing to accept it but would actually be a very good site technically?

So my question is really two parts. One, is it the case that Canada has so many good sites that it really doesn't matter much and you could do that? And, secondly, how confident are you that this process will converge on one of them?

MR. NASH: You know, first of all, I'd like to state that we're never going to compromise on safety, no matter what degree of social acceptance there is in a particular site. That is not negotiable. Another point that's perhaps helpful is that, as we designed this site selection process, a lot of the participants did ask for the, you know, let's produce where technically it could work and then we don't have to worry about all the others, and that was certainly a question that came forward. However, practically speaking, that's not really practical to do that in Canada. We do need to look at the particular location, and that is why we have something called an early screening where the community

comes forward, they learn about the process, and we look at the available data. And if there's any reason against this criteria why this site doesn't have a chance, then we kind of tell the community right up-front that you shouldn't really go any further with this process.

Back to your last question, what degree of probability do I think exists in a willing host community, the majority of Canadians do believe this is the right process. We do have some interested communities, and we do have the time to move forward with this process of a willing host, and we have flexibility on the timing. And so I think those are the strengths and that, eventually, we will find a willing host. It may take time.

CHAIR HAMILTON: Ernie?

MEMBER MONIZ: Yes, just a follow-up on this question of a willing host. Actually, earlier, Chairman Kondo for Japan

made a very nice understated statement that no mayor has successfully applied yet. And also I think that this first law of nuclear waste, that waste tends to stay where it is, retrievability may have a, you know, limited value in the sense that if there were a problem it would be even more likely to stay where it is.

So in that context, I guess one of the issues, and maybe I missed this, is what is the Canadian law with regard to long-term ownership and liability assignment for spent fuel? If there is a transfer to the government at some point, when and where does that occur? And if there is not, what assurance should any community have that there would be a willing and responsible party in the long term to match their short-term willingness?

MR. NASH: Yes. The ownership of the fuel is clearly with the current waste owners, the people who produced it. And there

is no set date when that transfer will occur or could occur. There are examples in Canada where uranium mining projects have run their natural life, and these have been turned over eventually to the federal government. However, there's no decision been made regarding used fuel management.

Back to your question about what assurance does a community have, they have the assurance that, under the Nuclear Fuel Waste Act, we are required to be in existence by law and, by law, there must be funds from the waste producers who are actually owned by provincial governments to actually pay for this. So those are the level of assurances that --

MEMBER MONIZ: But is there, so there's no principle that it will ultimately --

MR. NASH: That's correct.

MEMBER MONIZ: -- to the government? Okay, thank you.

CHAIR HAMILTON: All right. Any further questions? If not, Mr. Nash, we thank you for your very good presentation, and we turn now to our final speaker of the morning, Dr. Roald Sagdeev, distinguished professor of physics at the University of Maryland; Director of SLCSAT, a telecommunications project utilizing small satellites. He is also director emeritus of the Space Research Institute, the Moscow-based center of the Russian space exploration program which he headed for 15 years. He was one of the youngest scientists ever elected a full academician of the Russian Academy of Sciences. He served as a summit advisor to Mikhail Gorbachev and Eduard Shevardnadze at three summits in the 1980s. It's a pleasure to have him with us today to help us learn more about Russia's nuclear fuel cycle.

Dr. Sagdeev, we are pleased to have you. You may proceed.

DR. SAGDEEV: Thank you, esteemed

Commissioners. First of all, I would like to thank you for inviting me but a disclaimer. I'm not representing official or even unofficial of Russian government or nuclear energy's sector of the country. What I'm going to talk about is my own independent assessment gathered over a long period. Early in my career, I started, actually, at Kurchatov Institute under direct guidance from Igor Kurchatov, even served as advisor to him for a brief moment before he passed.

Later on, I changed my science interest and was involved in space activity. So from time to time, I participate in nuclear gatherings. During the last several years, I hosted at University of Maryland several small workshops related to different potential techniques of transmutation of the nuclear waste. Can I move to the next slide?

Okay. So let me say a few words where Russia is standing now on nuclear energy. It's recovered from Chernobyl

syndrome and current share of electricity generated by nuclear is 16 percent, and they are planning to, at least declaring to increase it until one-quarter of all overall output by 2025. Everything is controlled by state. There is a vertical integrative structure run by RosAtom, the national nuclear agency successor to Ministry of Medium Machine- Building. Recently, it was given state-owned corporation. It accounts for 20 percent of new reactors under construction worldwide and about 17 percent of global nuclear fuel fabrication.

In last year, 2009, the nuclear sector generated a little bit more than 163 billion kilowatt-hour. The majority of it was generated by light water reactors, the Russian VVER, but still a considerable amount, almost more than 40 percent, is coming from graphite-moderated LBM reactors, the same type as in famous Chernobyl reactor. And the plans to retire this series of reactors go beyond to

2025. However, safety standards were increased, according to Russian claims, tremendously, even for graphite-moderated, at the expense of reducing burn-up of the fuel and other measures. And the modern versions of Light Water VVERs are estimated by some Russian experts as already three and a half generations in terms of the safety.

So approved plans would add that much in new capacity of upgraded VVERs by 2030. In addition, the Russians already embarked on designing in publication first several floating nuclear power stations in the category of 100 megawatt. So they're already in production. They will have a lifetime of about 30 years and would need refurbishing once in every about ten years.

So talking about the closed fuel cycle. Russia, in many ways, is following the steps of France and Japan. There's a time lack largely associated with a need to recuperate after Chernobyl accident. They are

talking about the reuse of plutonium, experience they are gaining in extracting plutonium mostly based on their Cold War experience in getting plutonium for military stockpile.

Under pressure from international community, they are moving now to use some of the plutonium in energy of nuclear power stations, and the first use of MOX fuels will come after beyond 2015. That is a lot of experience are gaining from France, and there is some limited cooperation also with Japan on such issues.

So future of comprehensive nuclear fuel cycle is connected in Russia in the view of majority of Russian nuclear science elite associated with the fast neutron reactors. This is considered in Russia as one of their advantages. They have a series of different reactors functioning already for more than 40 years from the beginning of program of fast reactors.

There is a routinely functioning BN-600 in the Urals, which is actually delivering electricity and thermal energy to local communities, and it is considered as one of the most perfectly functioning in those terms, compared even to light water reactors, in terms of the watt factor. At the same time, BN-600 has a special compartment which provides excess of different test materials to run experiments to study specifics of functioning fast neutron reactors related to resistance of different materials on enhanced fluence of fast neutrons, which is critically important for future of fast neutron reactors and their economic justification.

They are planning to construct a larger version, it's already under construction, BN-800, and would be introduced fully according to plan in 2014. And in competition with this sodium-cooled reactors, they are planning to start investment in already existing engineering design of BREST-

300 reactor, which is going to function on liquid lead coolant. Some of the Russian experts can see the lead-cooled BREST generation of reactors eventually to become fifth generation of reactors capable to serve also as burner reactors to incinerate plutonium and minor actinides.

So this is the timescale of development in fast reactors. It's started with this well-known BN-350 on the Caspian. Now this particular land is sovereignty of Republic of Kazakhstan.

There is a BOR-60, the very earliest research reactor, 60-megawatt reactor, functioning in Dimitrovgrad in a major reactor functioning still now. BN-600 already mentioned, BN-800 under construction, and there is a discussion of BN-1200 or 800 as a future conceptual reactor which would be economically competitive visa existing and future reactors.

So this slide describes the major

research center in reactor engineering and science on Volga. And they host BOR-60 reactors.

And I have a number of material describing work on this existing research reactor for many years. It's a workshop in the University of Maryland, and there is a plan, there are preliminary talks about hosting some international foreign experiment on using this neutron fluency in fast neutron and conditions close for operational conditions of future sodium-cooled reactors. One particular use is planned, according to recent negotiations, by new American company, you've probably already heard of it, TerraPower, supported by Bill Gates. The company which is planning to use a different concept of fast neutron reactors called Traveling Wave Reactor. Apparently, the idea of Traveling Wave Reactor which claimed to leave absolutely no dangerous spent fuel materials. The idea was also coming from Kurchatov Institute at the late 50s during

actually my early tenure at Kurchatov Institute.

So that's a brief description what kind of research was going on and could be done on this particular reactor, BOR-60. I'm not going to bother you with the details of all of these things.

Similarly, we had a detailed discussion with Russian experts here at Maryland a couple of years ago on how one can use BN-600 reactor capability to carry research with special insert modeled on routine fuel used for BN-600 reactors. So this is a sketch of the BN-600 reactor.

The initial protocols at that time was ready to sign with Russians on the use of this facility to accelerate our own pace of research related to fast neutron reactors. Now I think it depends largely on future chance for one to see agreement to be ratified by U.S. Congress.

So it describes the interior of

BN-600 reactors. You see the structure of the fuel rods with a few parameters related to internal functioning of BN-600 reactor.

Starting from burn-up percentage rate, about 6 percent, which was typical for BOR-60 and then BN-350 on Caspian. The current reactor, BN-600, already reached 11 percent but still is not enough for future routine fast neutron reactors. One of the limitation of the burn-up is resistance, insufficient resistance of the material enveloping fuel under the flux of energetic neutrons in these reactors. But Russian experts are looking optimistic to the future of this research.

So this is what the Russians are thinking about the future of sodium-cooled fast neutron reactors. Today's capital, of course, is about twice of what you would expect for standard thermal light water reactors. However, there are indications, according to Russian projections, that economy

of scale which would permit to move to higher power fast neutron sodium-cooled reactors would be able to reduce relative capital costs. You see the last figure at the bottom on the right is 0.45. So at the moment, about 1800 or so megawatts, they will catch up with the economics of thermal nuclear reactors.

So I mentioned that some Russians, at least, can see the BREST as a candidate to become a fifth generation reactor. So liquid lead coolant, plus full plutonium reproduction in the core of reactor without the use of the blanket. Transportation of most hazardous long-lived actinides as part of fuel and fission products plans to be done outside of the core in the blanket using the radiation by fast neutrons. And then some other measures are discussed to be introduced in this final generation of BREST reactors.

However, it is not yet the end of the game. There is very touch competition between sodium-cooled and ideas to introduce

BREST reactors. So we will see what will happen in the second half to the next decade.

So this is a brief sketch of the BREST reactor complex. I'm not going to comment. I don't think it's necessary for today.

So in recent discussions in Russia, nuclear energy elite came to conclusion that comprehensive closed cycle based purely on the use of fast neutron reactors would not provide sufficient budget of neutrons for that closed cycle, including transmutation. So as a result of this discussion and the figure of the deficit of the neutrons in this budget is about 5 percent, but different groups in Russia are giving different numbers.

So the final decision was to open R&D to add outside source of neutrons. RosAtom already started to finance system analysis and early engineering designs for hybrid fusion-fission systems.

So future timeline, I already mentioned BREST and the next step after BN-800. It probably might be even BN-1200. There is a firm decision to build multi-function fast research reactor by 2070. It would be in Dimitrovgrad, and Russian government already invited international community to first participate, to co-invest, or to prepare to use this fast neutron multi-function research reactor. So if BREST-300 in the second half of next decade would provide valuable data, then there will be discussion of moving to the next target, operational BREST-1200 reactor.

Russia is somewhat behind France in Japan in introducing the structure for handling radioactive waste and fuel. So what's happening now? There are three laws working independent on radioactive waste. The draft is ready for adoption by state Duma. They claim it might happen by the end of this year. As the radioactive waste, they

categorize about 500 million tons of all the waste including slight radioactive, what is left after mining, enrichment, and so on. So according to this particular draft, they are planning to establish to create national operator to take care of this radioactive waste. It might be even independent of RosAtom. It's a proposal of RosAtom to move it, so perhaps they will do something like French did with Andra, the special agency. And they're planning to have seven geological repository to deposit this type of radioactive waste.

Much more difficult issue will be the next one: law on spent nuclear fuel. And I haven't seen a draft. Nobody is talking about it, but they claim that they will come soon with the first draft for the discussion.

And then the final law, the third one, would be law on retiring of the old nuclear reactors, which would have been portfolio for state Duma in 2011. Perhaps one

in the same national operator would handle all these three issues.

So I had a chance to have a few interviews with leading experts. One of them is deputy speaker of state Duma. He was a chair of energy committee. In the past, he was a nuclear engineer at one of the facilities in Urals. So this is what he said very recently, last week actually, we are on the threshold of the world nuclear renaissance. What should the technological platform for future nuclear energy? My answer: this is closed nuclear cycle on the basis of fast nuclear reactors. Russia provides a unique place in the world. Nobody has experience to run such reactors. We control 40 percent of the world market for enrichment of uranium and 16 percent on construction of atomic reactors. Presently, we have the tenders for 16 blocks abroad. It is clear that in second half of this century the share of nuclear energy will be 12 to 15

percent. Actually, even for such optimist, I would say it's a little brought down. But it will be in the different scale of energy sector, which will be twice bigger.

So there are, of course, critics of Russian approach to nuclear energy, but they do not have much impact on the decision-making.

CHAIR HAMILTON: Dr. Sagdeev, may I suggest you begin to wrap up so we can have time for questions?

DR. SAGDEEV: Yes. Last three slides. So some critics show that even despite a lot of promises, Russia is behind the rest of the world in lot parameter of existing stations, so you see how far it is behind. Perhaps it is not so critical for the country as far as looking for fast reactors as a future.

Another group of critics, not very large clout, but I saw that an interesting suggestion: waste to be sent in Kremlin.

Interesting suggestion for repository. Okay.

Expansion in the international sphere is tremendous. Everyone knows about Bushehr. Russia is doing a lot in China. In particular, there is almost agreement about construction of two fast neutron BN-800s in China. A lot of activity in India. Recent trip to Vietnam by President Medvedev brought contract with Vietnam reactor, and there is discussion almost ready agreement about building at the station in Bulgaria. I will show Putin before signing agreement in Sofia.

Visits of president and prime minister is actually working. All the foreign trips are used to promote Russian nuclear energy services. So all these countries, one of the interesting suggestions Russian even made to some of the countries, Argentina and Italy, they said that they can create it, even invest in construction of nuclear reactor.

And I already mentioned traveling wave by TerraPower of Bill Gates. Thorium

Power, the old name of American company, agreed a rather obscure Russian nuclear energy company, Red Star, to design fuel rods which would be using thorium and plutonium. The original idea was following the idea of so-called Radkovsky reactor, and they wanted to compete with MOX fuel in trying to incinerate bulk of Russian weapons-grade plutonium. But we will see.

Red Star is known abroad, especially to Canadians. Forty years ago, they started nuclear reactors in space. One of them in late 70s was delivered to Arctic areas of Canada.

Okay. So let me show activity of Russian. This is not a joke. This is a little party which Bulgarian prime minister delivered to Putin before the signed agreement on the cost of the Russian investment in Bulgaria. I was trying to figure out similar fresh photograph illustrating activity of Medvedev in promoting Russian nuclear

services.

So you will recognize a face next to -- however, Russians claim that it is not, there is nothing new. Venezuela apparently was operating American-built research reactor from 1960 to 1992. Thank you.

CHAIR HAMILTON: Thank you very much, Dr. Sagdeev. Are there questions for Dr. Sagdeev? Ernie?

MEMBER MONIZ: I have a couple of very narrow kind of questions and a couple of broader ones. The more narrow ones is did I understand on the BREST that your target is a conversion-ratio-1 reactor without blankets? That's the idea?

DR. SAGDEEV: Yes.

MEMBER MONIZ: Okay. On the BN-600, so far has that been uranium-fueled or plutonium-fueled or --

DR. SAGDEEV: It is uranium oxide fuel --

MEMBER MONIZ: Uranium oxide fuel.

DR. SAGDEEV: -- right now, and they are planning to start production of MOX fuel at Mayak facility, but there are some delays.

MEMBER MONIZ: And what's the load factor then? You said it was higher than LWRs? The load factor. You said it was higher than LWRs.

DR. SAGDEEV: Yes. I think they claim that they reached 75 percent for the load factor so an average for nuclear industry, and they say that they BN-600 is better. So I would assume it's probably 80 or a little bit higher.

MEMBER MONIZ: Okay. So the broader question is going back ten or twelve years, some of us were interacting with what was then a very immature regulatory agency. Can you say how has that evolved? Is there developing a strong regulator independent of the certain political pressures?

DR. SAGDEEV: I would say that

discipline, of course, is strengthened now in Russia, and RosAtom is functioning as a vertical integrated structure. But I don't think they are ready yet to have independent agency similar to NRC in Russia. Perhaps, with new legislation, we will see something like that.

CHAIR HAMILTON: Are there further questions? Susan?

MEMBER EISENHOWER: I'd like to know a little bit more about these seven repositories. I mean, this is a rather stunning number. Can you say something about where they are in their development and what kind of geological formations they are planning to use? And also the nature -- well, anyway, why don't you answer those two questions? That would be helpful.

DR. SAGDEEV: My interpretation about this figure seven is most likely is associated with old, now abandoned uranium mines, as would be natural. And it is not

very critical because the level of radioactivity for that type of radioactive waste is not very high.

CHAIR HAMILTON: Per and then Richard.

MEMBER PETERSON: Thank you. Could you discuss briefly the current status of Russian policy on importing spent fuel from other countries?

DR. SAGDEEV: At the beginning of Putin's tenure in early 2000, Russia had a huge campaign to open its spent fuel sites for foreign customers, and there was even special legislation by state Duma. However, what happened nobody, in addition to old customers who were the clients of Russian nuclear sector, came with offers. So gradually the whole campaign kind of degraded, and I would expect that in case of success of one to three Russia would probably relaunch its call for new customers.

A few months ago, I had a brief

conversation with Sergey Kirienko, head of RosAtom. I asked a specific question. It was a moment when lost competition to South Koreans to construct nuclear reactors in any rate. And I remember talking to Koreans at our workshop. They said that if they would have a chance to find a place of what to do with the waste, they will expand much more their nuclear sector. So I thought what are they going to do with the waste which eventually will come from this newly-built future nuclear compound in Middle East. And Kirienko said that they are talking to Koreans about this issue. The latest news I heard a few days ago that Medvedev's picture of nuclear joint venture with Korea when he was a few days ago was not successful.

CHAIR HAMILTON: Final question will be from Richard.

MEMBER MESERVE: Just a quick follow-up to Per's question. My understanding with regard to the Bushehr reactor was that

the understanding with the Iranians is that the spent fuel was going to be returned to Russia, which is good. And I would have thought that would be very attractive for the Russians as they make their agreements with the many other countries, new entrance countries, as well who don't have any capacity to deal with the spent fuel, and to get it out of there would be a great competitive feature for them.

DR. SAGDEEV: This is absolutely right. I think Russians refer to Americans, its idea came from the United States, and now is leasing the fuel, not selling it. So it would be Russian property, even if it would be operating on facilities outside of Russia.

MEMBER MESERVE: I have one question, though, that I wanted to ask. You indicated that in 2015 the Russians intend to introduce MOX fuel, presumably in light water reactors. And I'm puzzled, given that they have the intention to go very quickly to a

large number of fast reactors, why they don't want to save the plutonium to use for the initial cores.

DR. SAGDEEV: I think calculations I heard from Russian experts was that in future science fiction plutonium economy, in order to start up a big number of reactors, each new reactor to activate would need about five tons of plutonium. So Russia said if we have 250 metric tons of plutonium, so it would help us to start 50 new big fast neutron reactor blocks. I don't know if this view has changed right now.

CHAIR HAMILTON: Ernie, did you have a follow up?

MEMBER MONIZ: Just to Dick's first comment. I mean, the fuel leasing was, indeed, introduced in a U.S./Russia negotiating channel some years back without success in the end. But my understanding then and still now that the Russian law is fundamentally the same as the French one that,

in the end, except for the former Soviet Union states, that reprocessed spent fuel would have to return to the country that used the fuel. Is that still correct?

DR. SAGDEEV: The law may be still correct, but the contract with Iran and maybe to some other future clients states that this particular fuel is Russian property and has to be returned to Russia. That's all.

CHAIR HAMILTON: Dr. Sagdeev, we thank you very much. We understand yours was not an official presentation, but it was very informative indeed. We thank you.

MEMBER MONIZ: One more question.

CHAIR HAMILTON: One more question. Ernie, this will be your third round.

MEMBER MONIZ: But this is a very important, I think, distinction because it's also the case that the original deal with Iran required lifetime supply of Russian-origin fuel, and that seems to have possibly changed.

DR. SAGDEEV: I don't think so. I haven't seen any indication that Iranian government would refer with their own fuel to Bushehr.

CHAIR HAMILTON: Dr. Sagdeev, thank you very, very much. Okay. That concludes the morning session. We'll meet at 1:00 for the afternoon working with state and tribal governments to craft an equitable and enduring solution. We stand adjourned until 1:00.

(Whereupon, the foregoing matter went off the record at 12:02 p.m. and resumed at 1:02 p.m.)

CHAIR SCOWCROFT: All right. If we could all begin. I think we had a very productive meeting this morning on our exploration of fuel cycle choices that have been made by other nations. Of course, each country is faced with a different set of circumstances which shape both the options that can be selected and the way in which the

selected options are implemented.

In the U.S., the need to work within our federal system of government is often cited as a particular challenge to finding solutions at the back end of the nuclear fuel cycle. So we will now turn our focus to the question of how to work effectively with state and tribal governments to craft an equitable and enduring solution to our nuclear waste challenges.

With us this afternoon are Russell Jim, manager of the Yakama Nation's Environmental Restoration and Waste Management program. We had the pleasure of hearing from Mr. Jim during our visit to Hanford, and we greatly appreciate having you back with us.

We have the Honorable Mike Sullivan, former U.S. Ambassador to Ireland. Mr. Sullivan served as governor of Wyoming from 1987 to 1995. At the time, the U.S. Office of Nuclear Waste negotiator was attempting to find a volunteer site for a

monitored retrievable storage facility.

The Honorable Cecil Andrus, former U.S. Secretary of the Interior. Mr. Andrus served as governor of Idaho from 1971 to 1977 and again from 1987 to 1995. He has a long history of dealing with the federal government on nuclear waste issues at the Idaho National Laboratory.

And, finally, Congressman John Garamendi. Congressman Garamendi represents California's 10th congressional district, the home of DOE's Lawrence Livermore National Laboratory. Mr. Garamendi served as lieutenant governor of California from 2007 to 2009 and as Deputy Secretary of the Interior from 1995 to 1998.

Gentlemen, it's a pleasure to have all of you with us today. This session we have structured as a roundtable because we want to devote most of our time to a free-wheeling discussion of the major considerations when working with state and

tribal governments.

Before we start the roundtable discussion, we'd be pleased to hear from any opening statements that any of you may wish to make. Are there such opening statements? Governor Sullivan?

MR. SULLIVAN: I don't have a formal opening statement. I just have some remarks to develop during the roundtable. But let me just, by way of background, say that I was last governor in 1995 and that was essentially my last involvement with the issue that you're charged with facing today. I was asked to be on this panel because we undertook the process on monitored retrievable storage in Wyoming, and I vetoed and terminated the process after phase one. One of the interesting things to me is, like Yogi Berra said, this is deja vu all over again. I haven't been at the issue for 18 years. And as near as I can tell, nothing has changed.

But I do, as a result of that

experience, and that's the only portfolio for which I have any credibility appearing before here, have ideas about where the process was wrong, about where we may need to go in the future. And interestingly enough, those ideas which I've developed during the course of preparing for this roundtable, you've heard of all of those ideas as recently as this morning. And those are societal acceptance of the science and solution through collaborative processes, which was missing; independence of the body proposing the answers; voluntary participation and fair incentives to all stakeholders, and the stakeholders are significant and broad regionally, not statewide and certainly not countywide; trust; and stability, not political uncertainty. Those are the areas where I think the emphasis has to be based upon the experience that we had.

I wrote a letter in 1992 that expressed all of the opinions I had at that

time, and not many of them have changed. And some of them even seem to be prescient. Thank you very much for having me.

CHAIR SCOWCROFT: That was a remarkable letter and still is.

MR. SULLIVAN: Actually, it was one of the most enjoyable letters I wrote because as a western governor it's fun to bash the federal government and, two, it was an interesting mix of politics, science, and intellectual reasoning. And that issue still has that very mix.

CHAIR SCOWCROFT: Yes, yes, yes, it does.

MR. SULLIVAN: Well, that's the outside intellect. We don't have any in Wyoming.

CHAIR SCOWCROFT: Mr. Secretary, do you want to make a --

MR. ANDRUS: Thank you, Mr. Chairman, congressman, distinguished members of the Committee. Yes, sir, I'll take about

five or six minutes of opening comment, if I might. I would just share what I've heard here already today that the U.S. failure to devise or adopt a plan to safely handle nuclear waste in America is one of the greatest failures of the last 50 years and a significant failure in that. As a nation, both scientifically and politically, I think we all recognize that we have spent our time, efforts, money to devise advanced technology in the area of making a bigger bomb or a more efficient reactor for electrical energy without any consideration whatsoever for the, well, very little consideration for the back-end policy. It's a lot like building a new house and failing to hook up the bathroom to the plumbing system. Now you can't drain the bathtub and you can't flush the toilet, and that's not a bit different from what we face in this situation.

I don't envy your job. The Committee has got to come up with some

recommendations. Let me just give you a little bit of reason to reinforce what I've heard already here that you can't trust DOE. Their word is no good, and it doesn't have anything to do with political affiliation of any party. It's consistent right down the line.

I was first elected governor in November of 1970. I took the oath of office in January of `71. One of the first things that we had to face was the gigantic dumping of nuclear waste in the state of Idaho. For 20 years, they dug ditches out there with a bulldozer and put mixed waste, transuranic, low-level and some high-level indiscriminately into the ditches and covered it up. I went to then Dixy Lee Ray, who was head of the Atomic Energy Commission, and she said, oh, Governor, you just don't understand. That's just interim storage. We're going to take that out of there. Well, that interim storage went on and on and on. Yes, you know the story.

That's the first edition.

In `77, Jim Schlesinger, well, we created DOE in `77, and Jim Schlesinger became the first secretary. I went to Jim and I said, Jim, does that commitment that the waste, and I still had that letter from Dixy Lee Ray where she said we'll have it out of there by the end of this decade. Anyway, I said does that commitment still stand? Oh, yes, you bet, Cec. That still stands. Oh, lied to again.

Then we had an Admiral Watkins and then we had an Admiral DeMars and the list goes on and on, and DeMars made the public statement. He was head of the propulsion group in America, as I recall, in charge of refueling the battleships and aircraft carriers and what have you. And he publically said, we'll just send that waste out to a remote place in America. Well, the place he selected was just west of Idaho Falls in the state of Idaho on a 50-mile footprint. There

was about 350,000 people. But just beneath it 640 feet, there's the largest fresh water aquifer in North America. And DeMars and I obviously didn't agree on very many things.

And then I would just finally say two things. In 1995, we created an agreement where the only state that has an agreement with the federal government that says you'll take out by a certain date, 2035, and if you don't there will be substantial financial remunerations and fines to go for. Well, the ink wasn't even dry on that document until DOE and Justice said all doesn't mean all, and I said, I beg your pardon. Well, all doesn't mean all. We ended up in the federal district court. The federal district judge ruled in favor of the state. DOE and Justice immediately appealed to the 9th Circuit. It came back again. And once again, the state did win the decision.

I have to say for the first time that I can say on the transuranic waste, they

started doing a pretty good job right now. High-level, we still got a little over 900,000 gallons of high-level waste in single-wall tanks buried underground. Sodium contaminated, that's another issue. That's enough examples, Mr. Chairman, to say you can't trust DOE. They have no credibility. I would submit to you that what this group should recommend is that a separate entity be created by the Congress of the United States with the singular authority to locate and create a high-level nuclear waste.

Trust. I heard trust this morning. I heard a question, first of all, about remote areas. I don't buy that. I believe you asked that question. Because if you ask that again, we're going to unload on you. But it's a situation where I heard Mr. Nash use the word trust several times, and my colleague here used it a moment ago, and that's part of it.

I would say that you've got four

things that you've got to do, Mr. Chairman, and that's to create, first of all, that separate entity. Secondly, you've got to address a responsible fashion of reprocessing the waste we have to reduce the volume and salvage the energy that is there. That doesn't necessarily have to be in the same area as the repository, but that has to be there. Third, we've got to admit as a nation that significant, significant, substantial financial incentive be extended to that location that you choose as a possible site. It comes back to trust. I would say that, cut this short by saying that if you were to make Congressman Hamilton a benevolent dictator for a short period of time and he asked me what to do, I'd say the first thing I believe that you've got to do is to find a spokesperson. Go to U.S. Geological Survey and determine which states have the capability of being a potential site, and then find a proper spokesperson to visit in those states and make

sure that, politically, it would be acceptable. The difference between the transuranic waste facility in Carlsbad, New Mexico and Yucca Mountain is that they didn't have that trust. They didn't have that agreement.

Mr. Chairman, I made several trips to Carlsbad visiting with them about that. That has been a success. One of your members who I see is not present here today, the former senator from New Mexico, can tell you. He was a supporter. The governor was a supporter. Bill Richardson, well, Bill's position was that he was, some of his friends were for it and some of his friends were against it, and he was with his friends. Lee is smiling. He remembers. But that's okay. I take that better than an opposition. He went to doing other things, and Carlsbad is there and it's functioned well. You've got to do the same thing, and you've got to have somebody that's trusting to go to those

various states, whether it's Michigan, Kansas, New Mexico, Wyoming, wherever, and see if it's successful.

I'll stop there. That's longer than six minutes, and I apologize. But I've come a long ways to get that off my chest. But you simply absolutely cannot trust DOE. They're too large with too much responsibility to focus, so it's easy to just, you know, push it off to one side. I yield the rest of my time to the Congressman.

CHAIR SCOWCROFT: That's very helpful. Mr. Congressman?

MR. GARAMENDI: To the distinguished panel here, thank you for the opportunity to be here. I am honored to sit next to these three gentlemen and to share with you some experiences and perhaps some insights into what's going on here.

I was in the California legislature when Three Mile Island happened, and I suspect I had as much to do as anybody

in the West Coast in shutting down the nuclear power industry's growth at that time. We were concerned about the safety of the facilities. In my own district, we had Rancho Seco which was the twin of Three Mile Island. And we also had this little issue of waste: what are we going to do with the nuclear waste material from the reactors? And there was no solution then. You've just heard from the two gentlemen to my right. They also dealt with this somewhat differently and that they were dealing with the laboratories and the nuclear weapons facilities. But, nonetheless, the issue was similar. There was no real solution at that time for the waste issue.

And so for the intervening 30 years now, I've held the position that, you know, we couldn't go forward with nuclear power until we solved those two issues. During that period of time, the safety issue is pretty well resolved. These plants, the new modern light water reactors around the

world operate safely. But the waste issue remains, and to this moment there is not a solution. That's what you're all about, and I'm sure there are millions of Americans and policymakers, perhaps in smaller numbers, that are keenly interested in what you propose.

My second tour of duty on this issue occurred when I was the Deputy Secretary for the Department of Interior. Secretary Babbitt at that time, I'm sure Secretary Andrus didn't do this, handed the hot potato off to me and said, you deal with Ward Valley, which was the preferred dump for low-level radioactive waste for California and two other states, one of which was Idaho.

So we had the U.S. Geological Survey do their work, which they're required by law to do. And we took a look at it, and there were some problems, a migration problem particularly of tritium. And I spent the next two years on that matter. Ultimately, that dump did not take place because of the issues

of securing the waste material.

Something interesting happened after, I guess, I was responsible for stopping that process. About two years later, the principal component of material to be dumped at that location, tritium, turned out to be not a waste product but rather a valuable product. And the industries, all of its various pieces, began to retrieve that particular material and to use it and reuse it.

Since that time, and more recently as I've continued my work on climate change and energy issues, I've come to a different conclusion than I had 30 years ago, and that is that we have to move forward with nuclear energy, that we really have no choice in this world but to do so. However, to do so requires us to deal with the safety issue and the waste issue. Fortunately, the U.S. government, through the 70s and 80s and into the early 90s, worked diligently on a

mechanism to deal with the waste issue, and it was pretty simple. It's not a waste, it's actually a valuable energy source. Most reactors today will use a few percentage points of the energy in uranium, and the rest has been considered to be a waste. But the U.S. government figured out what to do with it and during that period of time developed a mechanism, a reprocessing mechanism, a reuse mechanism, a reactor that actually, over time and through continued recycling, can consume nearly all of the waste and do away with the most dangerous -- excuse me, I used the wrong word -- the most long-lived of those elements.

And as I've looked at that, I'm going a-ha. John, maybe it's time to reconsider, reconsider that if, in fact, there is a viable way of re-using, recycling the heretofore waste and instead of consider it to be a waste consider it to be a valuable energy source, that we can move forward with an essential element, that is essential

mechanism, to deal with the energy issues of America and the climate change issues of this world. And so the Generation 4 reactor systems, processing, IFR, other things, they actually happened and they actually work and they actually prove that it did work and to work without proliferation issues.

And so I bring to you today the years of experience, concerned initially about safety and waste products and the disposal of them and then over the years learning that there was a solution and that if we pursue that solution we can move forward with an extraordinarily important part of our future. So I'm happy to be here and answer whatever questions and engage you in a dialogue. And thank you so very much for the opportunity. Thank you.

CHAIR SCOWCROFT: Thank you very much. Mr. Jim, would you like to make a few - -

MR. JIM: Yes, I would. Thank you

very much, Mr. Chairman, members of the Commission. I appreciate this opportunity to be on this panel. As a recovering councilman, I should fit right in. I hope the methods that I bring today will help address the problems that we all have in regard to America's nuclear future.

The main issues are many for the Yakama Nation whom land is situated right there at the most contaminated site in the country, the land of which the Yakama Nation at one time had exclusive use to that land, water, and all the resources. And the underlying problem here, as I see, to go forward would be the participants out there, whether it be the Department of Energy, the Interior, or EPA, as this term of trust responsibility. That is misunderstood at times, and I think the newer generations that are coming in to represent the federal agencies do not fully understand that term.

The highest courts in this land

have interpreted, for instance, that any major decisions, borderline decisions, must be made in favor of the Indian nations because when those treaties were made we didn't understand the English language, and that seems to be misunderstood today. And I hope it isn't just being pushed off into the side, the wayside.

We have a considerable problem relative to the trust responsibility, plus the trust issue. How can you trust a federal agency that does a study, for instance, with a fish commission and determines out of that study that if I eat the salmon and the fish, other fish, out of the Hanford Reach I will have 1 chance in 50 of getting the fatal cancer. That's a long way from ten to the minus four.

So based on that, the federal agency that did the study, we approached them and said, what are you going to do now. and they said, we're sorry. We don't have any money to do anything. And to this day, I

don't understand the comment when they said, you should be more concerned about the contaminated strawberries coming out of Nicaragua. The strawberries out of Nicaragua are not natural food to the Yakama. And while we're on that subject, the natural foods that are there in that Hanford area, some only grow to a certain elevation.

My point is they're part of my DNA historically. My consumption of that food that we have been utilizing for millennia I believe is preventive medicine, and without that understanding and the evidences within the fact that we have some of the highest rates of diabetes because of Burger King, Kentucky Fried, and et cetera, that's another problem, but we do have a very high rate of cancer. And the health and welfare is paramount in our treaty, and it is part of this trust responsibility that the federal agencies have as a fiduciary obligation, and it is being misunderstood further and further

as time goes on.

And so we oftentimes find ourselves on the periphery of some of the major issues that are being addressed. And as the president from Ronald Reagan this way said, we must deal with these tribes on a government-to-government basis of sovereign nations, that has not fully being understood. And although a federal official in the Department of Energy last year pounded on the podium and said, we will comply with treaty rights, that message needs to get through the field office.

So that is the basis of my introductory remarks, and I'll gladly take any questions. Thank you.

CHAIR SCOWCROFT: Thank you very much. I think we've established a good basis for discussions. I would now open the floor to questions from the Commissioners. If you want to direct your question to a particular member of the panel, fine. If not, just in

general. Jonathan?

MEMBER LASH: I'm particularly interested, Governor Sullivan and Governor Andrus, in how you would construct the process so communities and states can be effective participants, and is it practical to ask states to approve a process, give them a veto, and think that we can come out the other end with a site, assuming that communities are given the right to opt out?

MR. ANDRUS: I'll take the first shot at that, Mr. Lash, and say that, no, I don't think that you want to hand the state or an independent nation veto power. But if you've got any political smarts at all, you simply will not go into the state after your initial contact to find out do we have a spokesperson, the governor or somebody who has the bully pulpit to be able to talk to people. But you have to be prepared to find out whether you have the acceptance, like we had in New Mexico on Carlsbad. If they had gone

the other way, it would have been very difficult to achieve. We would not have. So you have to establish that we have, but you've got to give that spokesperson something to sell. It's simple politics, ladies and gentlemen. You all understand that. You've got to give them something to say, yes, we've got to do our share of this but, by the same token, the process is going to create this many jobs on a permanent basis and we're going to give you a substantial remuneration that is equal to your cost of higher education or some incentive. Now, it doesn't have to be that, but it has to be an incentive that that person can say that this is what we will receive.

But if there is strong political opposition, then don't waste your time. Go to your other potential sites because look at Yucca Mountain and just compare Yucca Mountain and Carlsbad, the two situations. That will tell you the story. Michael?

MR. SULLIVAN: It must be your

federal background, Cec. I'm shocked to hear you say you shouldn't give a veto power to the state. I can't imagine siting a facility without state participation and acceptance, and I believe it is possible to get that. But I think we may have missed two or three steps in the process. Nuclear power, at least now, seems to me to be a subject that can be discussed in political circles. It wasn't some years back. But the experience that we had with the MRS clarifies for me the raw emotion of this issue because of the lack of education and because of the lack of a national consensus.

I mentioned last night in discussing with some of the staff one of my great disappointments from the MRS study was that about five months after issuing my letter terminating the process I said to my staff, we have those boxes of letters on this issue. Would you retrieve them? because I think they would be good historically and for any future

process because they weren't check-the-box letters or sign off on this petition. They were handwritten letters from every demographic in our society, both pro and con. I got word two days later that my staff, in its rush of efficiency, threw them out about two weeks before that.

But the nature of the response was so dramatic, and it was both sides. We had people in Wyoming, we were suffering economically, and there was a large part of our society that felt this was the answer to our future economic circumstances. So it was a divided state. I concluded we didn't have the energy to face this issue, no pun intended, given the circumstances that we were faced of the uncertainty, the lack of a national consensus, the lack of a clear understanding of what the science was.

I think this is like a pyramid, and the foundation has to be a national understanding of the critical need and the

safety and the voluntary process. And I fear we're in a situation, and I hope that you would share the fear, that we can't have instant gratification. We can't go out and find somebody who wants it and then let them wrestle with the problem without the educational background that's needed to explain so that you can at least get some kind of support and reasonable discussion of the issues. And I think that has to take place on a national basis before you start looking for sites. It wasn't there with Yucca Mountain. It wasn't there with the MRS process. And until it's conducted, I think then you get raw emotion responding instead of thoughtful, considered process.

MR. GARAMENDI: Let me add just briefly to that. My experience at Ward Valley is exactly the opposite. The state of California did want to use Ward Valley as a dump site for low-level radioactive waste, some of which happened to be extremely

dangerous and quite migratory. It turned out that the federal government actually stopped it for reasons of safety and for inappropriate mechanisms of dumping or technique of disposing of the material, you know, like steel barrels dumped in a trench and covered over and walk away.

So I think we need to look at this in a different way here. I think we need to consider the material: what is it; can it be transformed in one way or another to reduce the nature of it, and that can be done; and also the educational point that was made by Governor Sullivan is absolutely correct. It was a big, big issue in California. It turned out that the lack of education was actually with the state government, and the public, at least those that were advocates against the dump, had far better knowledge than the state did on the matter.

Anyway, it's very complex. But education, knowledge, and then, to the extent

possible, transform the material so as to reduce the dangerousness of it, the length of life of it, and to reuse what is potentially reusable, and there's a lot of potential in that.

CHAIR SCOWCROFT: All right. Phil?

MEMBER SHARP: Yes. Governor Andrus, I wanted to ask you several questions about trust and try to desperately reestablish my own. I will never again refer to remoteness. I come from Indiana, and that seemed like it was, it seemed like a reasonable proposition in the past but not for the future. And also let me quickly say my grandfather homesteaded in Coeur d'Alene, Idaho, so I'm a great admirer of the frontier. I just wanted to open it up a little bit here.

But let me say, you know, the issue of trust, obviously, there's no magic to it. It's a very hard to regain once it's lost kind of proposition, so I'm sort of toying

with obviously there are a number of steps you both have already referred to that need to be taken in consultation and things of that sort. What I want to get it is is there any value and can we place any value in legitimate agreements between local, state, and federal government that goes stage by stage and, therefore, nobody is committed to anything but that stage?

Ronald Reagan always said about dealing with the Soviet Union, trust but verify. John Dingell, who was one of my mentors in the House of Representatives, always said his pappy said, trust but cut the cards. And what I'm wondering is if the technique of, in a sense, having an agreement between the federal and the state government, you have an agreement that you believe is enforceable in the courts. Governor Sullivan's letter suggest the supremacy clause and the general behavior of the U.S. Congress suggests you can't keep these agreements. But

I'm just suggesting is there a way which you can have an agreement about phase one that doesn't lock the community or the state into phase two if you have multiple phases? I don't know what those are. I'm just asking do you see this as a technique that has value in staging and steps forward in building trust?

MR. ANDRUS: If I may use again the example of Congressman Hamilton being a benevolent dictator, whomever headed up this agency that we are going to create in the Congress of the United States, that that person is yet to be politically astute enough to know, yes, you're going to go to a certain level. Let's say that it's this subterranean salt of Kansas is the attractive place. Okay, that's an example. Then that new agency has to go to the governor of Kansas, whomever he or she might be, and say this is a situation we'd like to at least discuss with you, and it becomes a first stage. And if they throw the bum out, then it comes back to it may not be

an institutionalized veto power but it turns out that you're not going to fight that battle. But that's phase one.

But my colleague here is absolutely correct that you have got to do the educational aspect at that state level. But when you're created brand new, you're a new agency, that's a perfect opportunity for education at the national level, and that's where some of your first bucks should go. Now, we haven't asked yet about the financial incentives that I alluded to earlier in my comments, but somebody is going to get to that in a little bit. But, yes, I think that it's a level situation, but it's pretty hard to draw those lines. You've got to have small cadre at the top of people with the experience and the knowledge of our two co-chairman of this blue ribbon committee, for example, to say, woops, Kansas is no longer a potential but Michigan is or something and go again.

Yes, you've got to go a step at a

time. You don't turn loose the dogs until you're pretty sure that you're ready to go to stage three.

MEMBER SHARP: Well, one of my concerns is that obviously it's unlikely in anybody's tour of duty at that agency or in that governor's position that all of these issues get resolved. In other words, we have no experience that would suggest, not from WIPP, certainly not from Yucca Mountain, that in the two to four-year period we would end up getting a final decision. So we're into multi-generations of leaders at the state and local level, so they changed at the local level, as well as the federal level, kind of propositions.

So what I'm trying to think about is I certainly take your advice as well heeded how these people must behave who are there, but we're going to have a turnover. You know, the general and the congressmen are going to move on to other functions and a

different administration is going to come in. So I'm thinking can we have a series of staged agreements that kind of bind to that level and then, of course, they don't bind beyond a certain set of functions you perform. And then you've got another treaty, which I know Russell Jim is not likely to find this reassuring that we would sign a treaty with anybody since our history on that score is very poor.

But I just didn't know, I'm trying to think of what can take us behind the generational problem. And certainly getting a new agency that starts out fresh, that starts with superior talent, and is committed to these things, but it has to function that way over a 10-year or 15-year period. I think it does.

MR. SULLIVAN: The only comment I would make is you keep talking about an agency, and I think that's a part of the problem. I think we need an independent body,

whether it's quasi-governmental or not. Canada's presentation this morning illustrated that, and I think appropriately because the political uncertainty, the change of administration, political will, and everything else, is what causes the generational issues. And as long as they're there, the issues that I faced, how do we trust -- I'm sitting here thinking about wolves in the West, and if you get back into siting them solely in the West wolves are going to be a big issue because that's what the federal government does to you. And that is the problem, and I think the trust needs to come from an independent long-term corporation, if not quasi-judicial or quasi-governmental function, that has long-lasting, accountable, contractually obligated to fulfill the needs.

MEMBER SHARP: And who would they be accountable to?

MR. SULLIVAN: Well, that's beyond my expertise, but I am convinced that, in the

infinite wisdom of Congress, they can figure out how to do this because it seems to me -- and you need the utility participation. They've got to embrace, it seems to me, some of this issue as well that this is a national issue that needs resolution, and it takes innovative ideas to make it last as long as the waste material is likely to last.

MEMBER SHARP: Governor, I was with you up until you got to the infinite wisdom of Congress. I spent 20 years there, and I was for 20 years a member of that chamber, and there are a lot of extraordinary individuals there. But the collective wisdom sometimes is not as much as the individual wisdom.

MR. SULLIVAN: I reserve any comment.

CHAIR SCOWCROFT: Well, I would like to add just a point. There are two sides to this, and let's suppose you, as the governor in Idaho, say, fine, go ahead. An

election is held, a new governor comes in and says, no, I don't like it. What do you do in that circumstance? Because what you're doing is committing here to a long-range plan, and how do you do that in an elective system with the local level, the state level or what have you?

MR. ANDRUS: That's why I mentioned earlier about no veto power, that you're setting yourself up for that example that you just pointed out. But I would say to you that you have to have an understanding within the Congress and an agreement within the Congress of the importance of this. What the Congressman said a moment ago about the future of nuclear energy being created, whether it's 20 percent of our output now, and it is a very important resource and it's going to be in the future, but I would just submit to you that you've got to have an understanding within the Congress. And I'm not prepared to write it out, but I'm the

eternal optimist. I think you could work it out with that provision of trust.

You're right. Long-term, you've got to work your way around that. It's very necessary. But that's the danger of veto power is what you just spoke of.

MR. JIM: Thank you. Mr. Sharp, it's the Treaty of 1855 that is supposed to be inviolable as long as the suns will shine and the grass shall grow and the rivers flow. I had the opportunity and the honor to work with Morris Udall to help create this Nuclear Waste Policy Act in which the tribes do have veto power. And so the point being that we strive to become part of the solution. And if the Treaty of 1855 would be adhered to, it covers everything from health to environment, et cetera, it would be protective of all future generations, not just the Yakama. And I know that's a very difficult issue, as I've witnessed for the past 30 years. But I think that, in the creation of any body to address

this issue in the future, you will find consistency from the Yakama that this land needs to be clean in order to be utilized for future generations.

And our term is that we must preserve and protect the land and resources for those children yet unborn.

And I think that if we could create this better understanding of what the treaty rights mean and the coordination between the state and the federal agencies, we would all get along much, much better looking for a solution to what the future holds for the nuclear future. And I know there are many opportunities.

Perhaps, as I asked when I managed the first nuclear program that was looking for a repository, it took me four and a half years to convince that Hanford was not technically a place to put the high-level waste. But having said that, the next step is how do we resolve all of these issues and maintain a

good working relationship with the states and federal government and et cetera? And as I stated a bit ago, if there is going to be an organization, you're going to have to figure out how the tribes may be involved in that.

And so when all of this is going to be addressed in the next few years and coupled with the development of all these new nuclear power plants, I asked in the first program I managed I'll give you back all the money you have provided to me if you will give me a design for a nuclear power plant; I think the Yakama Nation will need one one day. And I hope that research and development can establish a safer way of operating these plants. There may be not as much dangerous waste. But first we have to resolve the legacy that has befriended us up to now. Thank you.

MEMBER MONIZ: Thank you, Mr. Chairman. I have two questions. The first is for the governors and congressmen. Governor

Andrus, you specifically brought up the issue of the new organization, and I would agree. In fact, an MIT report this year endorsed, as well, the idea of a quasi-government organization. However, it came with a condition that such an organization's creation would be unlikely to, frankly, have much difference unless it were given authorities that do not currently exist with anyone, like the ability to manage the Waste Fund which Congress has not authorized anyone to do. The authority to negotiate with facility owners about when waste is moved was stuck in an old contract mode and can't move from decommissioned reactors, et cetera. There's a whole list of authorities that would have to be given, so the question then is what between governors, Congress can one see to not simply have the feel-good step of creating a new organization but of creating one with the authorities required: a governors' association, working with industry, Congress,

administration? That's the first question: how can we actually move to an organization with the authorities required to make an impact?

Second question for Congressman Garamendi. You presented this vision of the solution in the future fuel cycle that, roughly speaking, utilizes and burns up all of the transuranics, the minor actinides, and dot dot dot. Let's not worry about factors of two, but, certainly, our estimate is that, to reach that kind of a possible solution, we're talking about the order of a billion dollars a year for the order of 20 years of RD&D. And the question is where's the money? Should this be another mil per kilowatt hour on nuclear power? That's 800 million a year, for example. How do we ask to get an RD&D program of the scale to do this?

MR. GARAMENDI: We've started at the other side of this table. I'll take a shot at it. The new organization. Let me put

these two questions together. I don't see a solution with the new organization or an existing organization until you change the nature of the game. If the nature of the game is how do we dispose of the waste that we presently have without changing that waste isn't going to work. There's just going to be opposition because you're looking at a time frame of several tens of thousands or more years with very dangerous materials. Where are you going to put them? Well, not in my backyard, thank you. But we'll try Idaho or maybe Wyoming, but not my backyard.

So you've got to change the game, and I think there is a game change that is available for much of this. Not all of it but for much of it. I think that we need to be very creative, we've talked about the research and development, with regard to those waste materials that are not easily transformed or maybe cannot be transformed because of the nature and where they came from and so forth.

However, for many of the other waste materials, I think we need to change the game. They're not waste, they're a resource, a resource that can be used to provide energy. And in doing that, reusing, recycling over time, and it may be a lengthy period of time, a hundred years, maybe more, to recycle and recycle, you wind up with a waste at the end of the process that may be very short-lived and by comparison very short-lived and more easily handled.

I think that's what we need to focus on here. And if we do that, you've changed the nature of this problem in that your waste is now an asset. It's a valuable product, a resource to be used.

Now, what's it take to do that? In my opening statement, I said the U.S. government spent 20 years looking at this issue and came up with a solution, actually did it. They developed a reactor, they developed a process of recycling, reusing,

pyroprocessing, and a reactor to IFR, sodium-based reactor, and it worked. It worked for more than a decade, almost two decades, until decided that there was a proliferation problem. It turns out you take a look at the proliferation problem and you go, hmm, maybe it wasn't carefully analyzed and that, depending upon how you do things, how you recycle, you may not have a significant or even a serious proliferation problem.

So by doing that, how much money is it going to take? It's estimated that to build a pyroprocessing facility, demonstration facility, that is take it beyond what was done 15 years ago and build a new one, you're talking something less than a billion dollars, 700, okay? A lot of money, but in terms of what we're talking about here not much. And to build a reactor to a demonstration, IFR reactor, a couple billion dollars. How long would it take? Less than a decade if we put our minds to it, perhaps even less than that

if we really put our mind to it.

You then have changed the game. The nuclear material, the used nuclear material at your various power plants suddenly becomes not a waste product but a resource to be used at some time in the future. So now we're talking about an interim storage, perhaps for, I don't know, a hundred years. Maybe some of it will be used next year, others will be used ten years or 50 or 100 years from now. So you've taken that and you've built that into a valuable asset.

The material that is plaguing Idaho and a few other sites around the nation where we had nuclear weapons research going on, that's somewhat different. It needs to be handled differently. Some of that can be recycled and reused. Others cannot for a variety of reasons. So I'm not speaking to that specifically.

What we're talking about for a, I don't know, let's say on the outside $3

billion or $4 billion investment over the next five years to prove that we could do this. I'm new to Congress, okay? And I don't have infinite wisdom, may not even have collective wisdom. But I ask questions, and I asked the question in the Armed Services Committee, how much money are we spending protecting the flow of oil out of the Persian Gulf. Get back to you, sir. I asked the RAND Corporation. I figured they would actually get back to me. Not that the Pentagon wouldn't, but they didn't yet. Fifteen to seventeen, eighteen percent of the total defense budget, which is over $700 billion. Do the math. Over a $120 or $130 billion a year for that energy source. So we take a small piece of that or a small piece of the wars or whatever you want and move to something that could be a game-changer so that your waste is a resource, not a waste to be disposed of in somebody's backyard forever but rather to be put aside in a safe temporary -- temporary meaning long-term, not

talking ten years. It will probably be somewhat longer than that. You change the game, and it's not expensive in terms of what we spend our money on here in this nation.

MR. ANDRUS: I have just one footnote I would add. In my opening statement, I said there were four things that my benevolent dictator should do, and the second thing was reprocessing for the very reasons. The Congressman articulated it very, very well, so I don't think there's any need to carry it on any further. But is that cost extreme when you look at the situation of the way we're spending now and what we'll get as an end result? Absolutely not.

MR. SULLIVAN: If I might just make one addition. I don't have the science that John has, but it still seems to me you have the same problem. You've got to put whatever you got somewhere. And as a game-changer, and this goes back to Chairman Scowcroft's question earlier, how do you do it

when you've got two political lives going on at the same time? I think you need to change the game with the education and collaborative processes first on a serious long-term basis and then couple that with incentives, attractive incentives to the governmental agency that's willing to come in and make a bid for this so that you end up with something that's attractive to more than one governmental agency and not a threat because you've convinced them of the safety and the national need and a general consensus. And then you let the process, if you don't want it we've got somebody else who will take it, and you end up with not having a political issue but an economic issue.

The MRS process had, it seemed to me, some very good aspects to it. It just needed a five-year foundation to put it in a place where it would work.

MEMBER MONIZ: Could we have a reaction to the question of how to get an

organization with sufficient authorities?

MR. GARAMENDI: Well, I don't think you'll get there, I don't know how you could get there in the current circumstance because nobody is going to trust anybody to solve this problem because it may somehow impact them. You think Congress is going to give you guys the authority without some oversight and some opportunity to pull you back and rein you in or something? It isn't going to happen in my view, not that I've been around Congress long enough but I've been around government for 35 years, almost as long as the gentleman to my left or my right here and my left.

So I think the organization is going to have to work within the reality of the ultimate authority is going to lie with Congress and the President over time. And so you need to set a mechanism that leads you in the direction where you have a solution, recognizing that the benevolent dictator may

exist in other countries but not around here.

MEMBER BAILEY: Thank you. Thank you all for this panel. Let me pursue this line of comments, and since I have the opportunity to have a sit-in congressman here before me let's pursue this idea of a separate entity. And my questions go along pretty much some of the same as Commissioner Moniz. Who should be involved in this separate entity? Do I need to amend the Nuclear Waste Power Act? And how do I get the money to this new entity? How do I get the funds that are already there and have been stored in the Nuclear Waste Fund? What would be my mechanism? What kind of process would I need to set up?

Recognizing that, obviously, as you have articulated quite well, this is going to be difficult, but I've got to get beyond that. You know, I appreciate the history and the history of the negative experiences help to inform how I can go forward, but I've got

to go beyond that. And really my questions go, if I can fill in those blocks, if I can fill in those pieces of the puzzle and put four corners on this, I also need to know who's the best person, who has the credibility, the gravitas to articulate the need and, if you agree with this, that we do have a nuclear future, who can articulate that position? In our travels to Sweden and Finland, there was one afternoon where we were quite impressed with a community that articulated quite well the fact that they recognized that they have a responsibility to do something with this spent fuel. You can call it a dump, you can call it a waste, you can call it what you want, but there's a certain responsibility that lies with each and every one of us. And no matter how diverse and fragmented and dysfunctional DOE or Congress or whomever may be, there still lies this responsibility, and we've got to move forward.

So I need answers. I need something to help me make this decision and help me write this report. So I'd like to hear your comments on what are the components of this decision-making process here, and how do I get the money? Money is a big issue of it. How do I get that? Congress is not going to be an entity that's going to say, oh, okay, we're going to allow this new entity now to have all this money, and take it out of our treasury and put it over here and that kind of thing. So I pose that to all the panelists.

MR. GARAMENDI: I liked your last sentence best, and it was, all the panel. How to deal with it? I've said this. I don't want to become boring, but in the current circumstance I don't see a good solution and I don't see any entity that's going to be trusted over time to solve this problem. The educational piece that has been discussed by Governor Sullivan is really important. We really need to understand. Certainly,

Congress and others who are engaged in this need to understand what it is we're actually dealing with here. I've divided in my own mind, and this may be incorrect, but you've got, a word you use, spent nuclear fuel. Mostly we're talking here from power plants. I would use a different term. I'd use used nuclear fuel. You've got the waste material from the various laboratories which is somewhat different. Some of it's the same and some of it is quite different. So I think we need to have a good understanding of what exactly we're dealing with.

With regard to the spent or used nuclear fuel, there is a solution available. You've heard from France. They've got a partial solution where they recycle using an aqueous process of recycling. It has certain troubles associated with it, very complex, very expensive, and has the potential with a little tweaking of the chemistry to wind up making some really bad stuff like plutonium.

There are other mechanisms to recycle, but I think what the game change here is to think of this material as being a resource.

Now, how can we use that resource in a way that gives us something of value? And it is. I mean, you're looking at, I don't know, using three or four percent maximum of the energy in that material. And we figured it out. America figured out what to do here. We spent, I don't know, billions of dollars over 20 years, and we figured it out. And then we dumped it. As near as I could tell from my studies we dumped it because we were fearful of proliferation. Well, guys, hey, there is proliferation. And there's a whole bunch of terrorists out there that don't need to proliferate, they just need to steal.

So we need a game change here, and the game change is what is this stuff? Is it an asset, a resource, or is it a waste? America proved that this is a resource, not a waste. If we go down that path, then we can

find a solution to the question you raised, which is an entity that has the ability over time to move us from a waste to a resource, and that's your Generation 4 reactors. You can debate for some time. I've reached my own conclusion about which mechanism to use in recycling.

We have money that's been set aside for, I don't know, three decades by the nuclear power industry. It's sitting someplace, God knows where, probably close to where the Social Security trust fund is. But let's assume it's somewhere. A pile of money. I don't know how many billions of dollars. In that context, could you use that money to change the game? Is the industry willing to use that, allow that money to be used to change the game? That is to prove in a demonstration program that we can not have a waste but we can have a resource. Three, four billion dollars over five, maybe ten years maximum. We change the game.

Now, certain waste, and this is a particular problem from our friend at the Yakama tribe and Yakama Nation and certain other laboratories around the nation, you've got a somewhat different problem. And I'm dividing the issue here. And I think that if we think about changing the game and we think about this in a different way and then develop the mechanisms to do that, which is basically building a demonstration facility, and an entity in that modality is the easier entity to build than one that deals with something that has to last for 200,000 years and is very dangerous. Thank you. CHAIR SCOWCROFT: Susan?

MEMBER EISENHOWER: Maybe this is the perfect segue. I was going to initially make an observation and ask a question, but maybe the congressman has just gone a long way to making one of the points I wanted to probe. First of all, in hearing about these violations of trust over the years, it strikes

me that many of the most egregious acts of this occurred during the Cold War and this is part of our legacy that we were in the middle of a national emergency, that we probably took a lot of shortcuts and let the American people down across this country. But we are now in a new era. I think it's fair to say we're maybe even in the post-Cold War period, and I think it's now just beginning to dawn on this country that we're in a new environment, a new global environment.

And so I was going to ask the panel about how to talk about this issue in the new set of circumstances, and I think the congressman has gone a very long way in answering my question.

I'd like to point out that I was born in Fort Knox, and that was the gold repository for this country. And I actually would like to associate myself with your comments because I think that taking spent fuel to call it used fuel is a step, but it

should be called partially used fuel, not used fuel because used fuel sounds like it, too, is spent. I mean, we're all on the same page on that one. I think if we had called this repository a national nuclear strategic reserve it would feel a lot more like Fort Knox than it would Yucca Mountain.

And so given this new nuclear political environment we're in which is one that's full of potential and hope because the Cold War is behind us, it's also a period of deep uncertainty and kind of collective angst in this country. So let me just re-frame this question for the whole panel. What cautions and opportunities would you see for us in framing these issues today in the current political environment in which we are living?

CHAIR SCOWCROFT: Governor Sullivan, you already did it in your opening statement.

MR. SULLIVAN: But not with regard to the current political climate of which I am

basically unfamiliar or on the wrong side of the fence. But I think it's a very good question. Going back to the limited experience I have, the angst, the anger, the fear that I saw generated because of a lack of information and a lack of a common solution, agreed-upon solution. And I think the current political situation makes that just that much more problematic and, thereby, makes the educational -- and I'm repeating myself and I apologize for that -- the educational component, the collaborative process component -- just like technology has advanced over the years, so has our ability to have collaborative process and understand how we inform people so that they view it as a responsibility as well as a part of our strategic energy answer. I think there is good opportunity to inform and educate and, based upon what John says here today, I think part of that information and education has to be we need a separate entity. So it may be

informing Congress, as well. But I would be concerned about the current uncertainty and angst.

MR. ANDRUS: I think I would agree that you have to concerned about the political element that we face today in the Congress, but that's not your job as a blue ribbon committee. You've got to come up with, irregardless of what you think might be happening out there, you've got to come up with something that you think would work. And I think that you've got to do what the congressman has suggested here, but you come back to Ms. Bailey's question about how do you get the money and that's the very ingredient that you have to have to make the agency work or to do the reprocessing that we're endorsing here today. And I believe that the first step from that agency or that entity is created that there is an appropriation, or an authorization if you can, if that two and a half billion dollars of money is still out

there some place -- Congressman, I doubt that. I think it's been sucked up --

MR. GARAMENDI: It's in a trust fund. Not to worry.

MR. ANDRUS: Oh, it's a trust fund. I'm sorry. I didn't know that. I don't want to go there. Anyway, that amount of money could be utilized. If not, an appropriation to start it up taken from some other source such as the congressman outlined here, the cost of protecting the hydrocarbon fuels that we ship into this country or some means. And then as you get working over that period of time, that money from the industry that is allegedly going into that trust fund should be directed right directly into your agency. It can be funded from the number of people that pay their utility bills, but you've got to start and the Congress has to either authorize or appropriate, whichever is the proper means.

CHAIR SCOWCROFT: Allison?

MEMBER MACFARLANE: Thanks. Okay. I guess I want to go back to this issue -- sorry? Did you want to make a comment? I'm sorry.

MR. JIM: To follow up on that issue, it took us years to try and get the education curriculums to teach about treaties in public school systems. Only within the last three years that has passed in the state of Washington, but signed by the governor with the proviso that only schools are on or near reservations would be allowed to teach about treaties. And the education process that's been mentioned is very important. I call it the logic of the uninformed, especially about treaty rights. And to prevent down the road, in the future, this consistency of litigious people. I would hope one day that the education curriculum on a nationwide basis be allowed to teach about treaties. It would provide a venue for your grandchildren or my grandchildren to grow up and understand each

other and not be so litigious or confrontational because of the issue of being uninformed about treaty rights. Thank you.

MR. GARAMENDI: You asked about the political. I've been in Congress now 375 days, so I have a great reservoir of historical knowledge. But obviously there's a significant political change afoot. For this issue, it seems to me that it's not an irretrievable but rather an opportunistic time. Generally speaking, there are far more folks on the republican side that are interested in nuclear power than on the democratic side. I use far more, not necessarily stronger advocates or better advocates but more numerous, at least judging from the nuclear caucus, if you will.

So I think that there are some opportunities here, but the opportunity will not bear fruit as long as we are considering, and I'm going to talk here about nuclear energy waste or partially-spent fuel, as long

as it's considered to be a waste, it isn't going to get resolved. So this is the game change I'm talking about.

As to money, obviously, the deficit hawks are about to gain control. Not that they haven't for the last seven or eight months, but, nonetheless, there is money that's supposed to be spent on this issue. How you access that money, whether the industry is willing to involve itself in a way, it seems to me that it's possible to do something here, and I see an opportunity. That's where the nuclear power industry, let's just say the energy, well, I won't say that, the nuclear power industry has an interest in building additional nuclear power plants. It's part of our national energy policy now. It has been for five or six years. But it can't overcome this issue of what are you going to do with the waste?

But if we transform this from a waste to a partially-used fuel, that it's in

a retrievable storage place that's sufficient for retrieval, and you couple that with Generation 4 reactors and a recycling system that deals with your proliferation problem, we've done a move to a completely different plateau from which to discuss this issue. And I think it's viable politically. What does it take? It takes the nuclear power industry. I'm referring to the manufacturers. It takes the research that we have spent billions of dollars on in previous years, decades actually. And to use that research, the nuclear power industry, the electrical energy industry, and the general public coming to an understanding that there is a path that we can follow.

Would Congress do this? I think the answer is yes. I know that in the Science and Technology Committee, some of us that are on this path, we were able to insert a piece of legislation that's now passed the House and may get to the President in the lame duck

session, or if not then it will be recycled next year, in which the Generation 4 path is laid out and funded, at least authorized funding. Now, the dollars are not there, but this is where the industry can come in and say maybe we're not going to have to store this stuff in our nearby swimming pool -- well, I guess that's not a swimming pool. Let's just say pool of water forever, but we can store it temporarily. We can recycle it in a mechanism.

So I think what has to be done here is to understand those recycling mechanisms very, very well, and there are basically two: the pyroprocessing and the aqueous processing, and the reactors that would then be able to use that recycled material. If we understand that, then I think there's a pretty clear path for us to move on. And I believe the political will would be there. And if the industry is on board, that is the nuclear power industry is on board,

then there's a funding source. Now, that would require a mechanism, and I'll just work with this for a second, a mechanism made up of the industry representatives, pick and choose. I'd have a few advocates. Russell Jim would be a great person to put on it speaking for future generations, as he has so eloquently done.

I don't know about DOE. A lot of emotion from my colleagues here about DOE, but it's pretty hard to ignore DOE in this process. But I would recommend a separate mechanism apart from -- and, ultimately, it's got to be responsible to the President and to Congress. I mean, you just don't do that. You cannot do otherwise in America. So you can put in installation, you know, various installations report back and leave us alone and a funding source that is not cut off, as often happens and has happened repeatedly in renewable energy.

CHAIR HAMILTON: May I interrupt

here? All of us are really wrestling with this question of organization, and you all stress or most of you do your dislike of the DOE and the necessity of setting up an independent quasi-government group, as you've indicated. And I've been sitting here asking myself what's the analogy? We have an independent group. We call it the Federal Reserve. It doesn't call upon the Congress for money, at least for the most part. It generates its own. But it's generally independent of the Executive and of the Congress.

Now, it has its own sources of money. It generates its own money, and that may be a big difference there. If you have an organization dependent upon the Congress and the President, you can bet they're going to exercise oversight and probably should. But can you set up an organization that is independent, like the Federal Reserve? Then you'd have genuine independence. Now, I'm

told you've got $23 billion in the Treasury generated by fees, I guess, from the nuclear power industry that might give us a measure of independence here.

So when you talk about an independent quasi-government organization, I presume you're talking about a board of directors. Who appoints the board? In the Federal Reserve case, the President appoints the Board, even though it's independent of the President to some degree. So does the analogy of the Federal Reserve make sense to you, or do you have a lesser idea of independence? The only way you're going to have genuine independence is to not be dependent upon the Congress and the President for money. As long as you're dependent upon them for money, you don't have independence. I'm wrestling with that.

MR. GARAMENDI: I'd like to defer to my learned colleagues on both sides here. The analogy that you used is an interesting

one in that even as independent as the Federal Reserve is, they're often called before Congress for an explanation of what they're doing and, in some cases, beaten up and maybe they modify their activities and maybe they don't. But, you know, you still have oversight, and if Congress and the President really get upset, as Mr. Paul is presently upset, we're going to audit them. Fine, okay.

CHAIR HAMILTON: No, but you've got a lot more clout if you've got money.

MR. GARAMENDI: The money issue I addressed a moment ago, and I didn't realize it was $23 billion, but if there is I'm even more excited about the potential. And we've seen the money issue over and over, Congressman Hamilton. We've seen it over and over again. You talk about the renewable energy issues in the United States. They're usually good for two or three congresses, and then the money ceases and the whole industry dies. You can take a look at what I've been

talking about here, the Generation 4 IFR pyroprocessing. Twenty-years of research. It worked, and then it died because the Clinton Administration decided that it was somehow proliferating. It actually wasn't but, nonetheless, that was a decision that was made.

So, yes, you need something that has longevity, a long period of time, because we're talking about something that goes on for a long while here. A high-level of independence. I do think you need to involve on the board, if you would. Key players. You can't do this without the electric energy industry. They're going to have to be involved. They have most of the waste, although it's stored in their facility now. I don't know who owns it. That's a question that can go on for a while; but, nonetheless, it's there.

CHAIR HAMILTON: You can get a measure of independence by long-term

appointments. You give a ten-year appointment to the FBI director, for example. Now, that's a very different organization than what we're thinking about here, but you do get a measure of independence if the President appointed a member of this organization we're talking about for an extended term far beyond his own term. Well, the FBI director is subject to Senate confirmation. I don't think you'll ever be able to not have that. You're going to have probably the President making the appointment, probably Senate confirmation. They are going to be called before the Congress, as they should be it seems to me, to answer questions.

But I'm really struggling personally and I think most of us are on what kind of an organization we can put together here that would be most effective in dealing with this very difficult problem.

MR. ANDRUS: I think you're awfully close -- excuse me just briefly. I

think you're awfully close when you say terms of office. We were talking up here behind the mics a moment ago that terms of office with staggered terms type of situation we use in corporate boards of directors all the time, that would give you some continuity, of course. But I think that's about the only way you can go.

MR. SULLIVAN: And I would simply say that when we speak of independence, I don't think any of us are naive enough to think that you're going to have total independence. You get independence by having your own money. That seems to me to be one of the major issues when dealing with the federal government is they've got control of the first strings, so you can't do anything with it. Oversight brings transparency, and transparency in this issue is of ultimate importance it seems to me. So I think your suggestion has some staying power.

CHAIR SCOWCROFT: We are now badly

over time. I'm going to adopt, we're going to call out the questions. Allison, Per, and Al, and then the panel can answer all three of them.

MEMBER MACFARLANE: I just want to remind Governor Sullivan that in his letter he stated that he did not trust the federal government or the nuclear industry to assure the interests of the state, and so I think that's something, I wonder if you still feel that way? And then in terms of the states or tribes that are affected or that would host such a facility, I'm interested in how much control the state or tribe should have over the process.

MEMBER PETERSON: My question is also related to trust. Thinking about it from the technical and operational dimensions of what should one prioritize for early actions, and we've spent some time debating this. I'd be curious about thoughts about some things that might be prioritized that can be done at

smaller scale, yet demonstrate the capacity to do what's needed subsequently at larger scale, looking at the example of where we started with true waste, now we're starting to do remotely handled. So a couple of options would include, for example, prioritizing centralized storage to spent fuel from decommissioned reactor sites. Another might be prioritizing early disposal activities to be for defense high-level waste where there's no controversy about the potential that it might have future economic value. That's a couple of examples of things that could be done technically at smaller scale to demonstrate capacities that, in the longer term, could be implemented at larger scale.

CHAIR SCOWCROFT: Al?

MEMBER CARNESALE: Congressman, mine is a little more of a very brief speech that ends with a what do you think of that because it relates to -- so the history here is credibility problems, to cheap to meter,

waste isn't a problem. Too cheap to meter gone. And climate change really since it includes a social cost, this is really competitive, not economically otherwise but worth subsidizing because of that. Waste still a problem. Yucca Mountain wasn't the solution. It was a small step in the solution but indicated that we had a plan, we knew where we were going. Now it's clear we don't. We don't have a plan, and we don't know where we're going. We need a plan.

How's about recycling and reprocessing, really rethinking used nuclear fuel? That was the plan. That was the plan 40 years ago. Anybody that studied nuclear engineering, it was wasteful to do anything other than that. It turned out not economical. Industry wasn't interested. They were only interested if the government would pay. Also, it presented proliferation problems, but those come second.

The notion that the plan is going

to be sodium-cooled reactors, try citing those. Sodium-cooled reactors with reprocessing plants and, trust me, that's going to make it cheaper and it's going to reduce the proliferation problem.

I think we're dead if we don't have something that takes into account that we need geological repositories, and we've got a lot of spent fuel that is not going to wind up in some other kind of reactor. Nobody has a scenario that makes use of all that fuel. And the recycling that's taking place now is once-through, right? MOX -- doesn't really help. So I think we've got to be very careful not to sound like, trust me, it will be too cheap to meter and the waste won't be a problem.

So what do you think of that?

CHAIR SCOWCROFT: That's a good way to make up for our being over time.

MR. GARAMENDI: I'm going to be very, very quick about this. I never for a moment indicated there doesn't need to be a

permanent repository. Certainly, some of these materials are absolutely going to have to be in a permanent repository of some sort somewhere. I'm not suggesting Yucca Mountain or any other place. You'll make your suggestions on that.

But what I am saying is the fuel that's currently being used in our nuclear energy industry is an extraordinary asset that should not be locked up in a permanent repository but rather in a retrievable situation where we can then use that fuel once again in an advanced reactor system. That makes sense to me.

It also gets us past what I think is an extraordinarily important issue here, and that is what are we going to do about the energy for America? What are we going to do? Are we going to continue on the path of where we are today, coal and oil; or are we going to transform and do what has been discussed for more than 40 years? It's time for us to get

on with it.

One thing, and you mentioned the cost issue here, you mentioned the economics, the economics of the nuclear energy is pretty well understood and is usually or almost always calculated when we want to take the next step. What does it cost us to dispose of the waste? What does it cost us to build a reactor? What does it cost us to build a Generation 4 reprocessing system? Those costs are always understood. Earlier, I said very categorically that the cost of oil is not understood. $120 billion a year to protect the flow of oil out of the Persian Gulf is not calculated, nor is the cost to the environment of carbon in the atmosphere. Those costs are not calculated. If they were, we'd be on nuclear, we'd be on solar and wind in half a nanosecond.

MEMBER CARNESALE: I agree. That's what I was saying about climate change is change the calculation because of the

social cost.

CHAIR SCOWCROFT: Other comments from the panel?

MR. SULLIVAN: I would just respond to your question as I haven't changed my mind any. I think plan and education and a separate entity would resolve my concern. I don't hate DOE. I just have a general distrust for the ebbs and flows of political decision-making.

MR. JIM: Mr. Chairman, I, too, would like to echo that, as we've said, funding is a very important issue, and the tribes particularly are dependent upon the federal government for their participation with the funding. But we always have to take care to be careful about putting those line items or wherever it may come from because as of `95 the new Congress came in and under the logic of the uninformed, what's all this money for Indian tribes? They took it out. We had to fight months to get it back in there.

So OMB also needs to be educated about what the trust responsibility means because they are a very important segment when it comes to funding. And if they don't understand trust responsibility, even though they're not a federal agency, they make a very important decision. Thank you.

MR. ANDRUS: I will just say in conclusion that we appreciate the opportunity to share with you our thoughts. None of us have an absolute perfect blueprint for the future, but I would submit to this blue ribbon committee that if we continue to go forward without a plan and actuality of what we can accomplish then we're being irresponsible. We simply have no right to continue to produce it if we don't have plan to properly manage it. And that puts an awful burden on you, Mr. Chairman, and your colleagues, but that's absolutely what we have to do.

Thank you very much for having us today, sir.

CHAIR SCOWCROFT: Thank you very much. I want to thank all of the panelists for helping us get to the heart of the issues that we're all grappling with. We greatly appreciate your contribution and being with us. Thank you very much.

We'll now take a ten-minute break.

(Whereupon, the foregoing matter went off the record at 2:42 p.m. and resumed at 2:55 p.m.)

CHAIR SCOWCROFT: I'd like to begin now our final session of the day. It will consist of presentations and a panel discussion with three experts who have studied various aspects of the issues before this Commission. We've asked the three presenters to keep their remarks to about 15 minutes a piece.

We will hear first from Dr. Richard Stewart, University Professor and John Edward Sexton Professor of Law at New York University School of Law. Dr. Stewart is in

the process of publishing a book on U.S. nuclear waste policy, and we have asked him to deliver a summary of his findings. Dr. Stewart, please proceed.

DR. STEWART: Thank you very much, Mr. Chair. I am a law professor at New York University where I teach environmental and regulatory administrative law, and I've worked with the Consortium for Risk-Based Evaluation with Stakeholder Participation, CRESP. You've heard from Charles Power of that organization. And as Chair mentioned, my wife, Jane Stewart, who is an environmental lawyer, and I recently sent to the publisher the first comprehensive history and account of U.S. nuclear waste law, regulation, and policy, and that will be out in the spring.

And I should just mention, as an autobiographical addendum, I was the Assistant Attorney General for Environment and Natural Resources in the George H. W. Bush Administration where I worked with Admiral

Watkins and the Energy Department facilities. And I actually argued the case before the 9th Circuit where Nevada unsuccessfully challenged the constitutionality of the Nuclear Waste Policy Act amendments of 1987.

Our book, I think, has some key lessons that I'll try to distill at this point. First thing to be said is I think we need to move on for a beginning a process to site a new repository. Given the uncertainties over the future of Yucca, there is a possibility the WIPP's mission could be enlarged to include other waste. But given those uncertainties and the fact that we may need several repositories, especially if we have a pilot approach to the first one to see if there are start-up issues. So we ought to begin now, and we ought to begin with at least one consolidated storage facility for spent nuclear fuel to deal at least with fuel from the decommissioned reactors. There's broad consensus on that and I think some additional

fuel to show that we can succeed at this enterprise.

Both of these involve siting challenges. And if we look over the history, we can see a variety of techniques or strategies that we've followed in this country to site nuclear waste storage or disposal facilities. One is what we're going to call the top-down technocratic approach. That was the 1982 Nuclear Waste Policy Act. The top-down political approach. That was the `87 amendments. And the low-level radioactive waste legislation. Congress had a situation of interstate compacts to site new facilities. We've had some experience with private siting in the early days with low-level waste and, more recently, with the private fuel storage facility in Utah. And then what I'm going to call government host state and local host negotiation, which is the WIPP. And all of these, except the last, have failed. And the WIPP, it's very difficult to generalize

because we only have one case study and all the studies are limited in extent. But the lesson thus far suggests that a system of negotiation with local and state host assent to these facilities is critical to the success of the process.

Now, the Nuclear Waste Policy Act imposed these top-down approaches because it assumed that we had to bury the waste as soon as possible. There was a rush. We couldn't afford securing local assent. The current generation had to deal with this accumulated problem that had been neglected. That was 25 years ago or more at this point, and the whole strategy that emerged out of the initiatives of the late 70s and early 80s is pretty much collapsed at this point. And the Commission, you, have an opportunity to rebuild, to start with a new approach which is an opportunity, and I hope you'll seize it in the fullest degree with a sort of top-to-bottom re-examination and a fresh start.

The ethical premise of the Nuclear Waste Policy Act, building on the interagency review group from the Carter Administration, was that the current generation had to deal with the waste as soon as possible. I think that's overly simplistic. It couldn't burden future generations. I think that's an over-simplistic ethical premise, and I think we now realize that, as Tom Isaacs has said, that we need a more sophisticated approach that leaves options open to future generations without unduly burdening them in the process. And I think that means, one, that it's going to take time for a repository to open, especially if we site a new one as I think we need to; and we're going to need to acknowledge need for interim storage, at least to some limited degree, maybe to a greater degree.

Under the Nuclear Waste Policy Act, interim storage and a repository were seen as enemies, so Congress put strict limits on sort of any interim storage. And now I

think we have to see them as compliments. Starting with an interim storage facility can show, at least one, maybe several if geographic equity is an important consideration, to get into the siting process, to deal with local and state host constituencies; and successful siting of an interim storage facility can be the next step for successful siting and opening of a repository. So they should work together, not across purposes as I think the Waste Policy Act presumes.

Starting with an interim storage facility, that could be located at a DOE site. It wouldn't have to be necessarily constructed by DOE, depending on your new institutional arrangements. All of these are linked to some extent. It could be leased land on DOE sites. There's a precedent, you know. There's a private reactor at the Hanford site. I think the possibility of private facilities is something that the government ought to allow

for and encourage if it's suitably regulated.

The future siting efforts have to, I think, learn from the failure of the strategies other than securing host assent and, specifically the failure of Yucca and the success of WIPP. Forcing a site on the state doesn't work. Collaboration that gives state and local hosts a real say can work. That means host assent, probably regulatory authority as New Mexico has over the facility. The override of state regulatory authority in the Waste Policy Act is totally at odds with the Federal Facility Compliance Act that says federal facilities should be subject to state environmental regulation.

It has to proceed step by step, not sort of one fait accompli. There has to be full disclosure. The state and the local community have to have independent technical capacity that's funded by the federal government. There have to be significant long-run economic benefits, not just for the

locality but the state, and a variety of regulatory and other assurances. That seems to be the lesson so far in the way forward.

Now, our book goes into greater detail on the low-level waste situation, which is, in many ways of course, less pressing but still serious. The Low-Level Radioactive Waste Policy Act I think has failed. We have a serious problem of B and C waste. We have an orphan problem of greater than Class C waste. And those need to be addressed front and center, and I would respectfully suggest the Commission do so.

The institutional and financial issues were being aired in the last panel. My own view is that we need at least two new institutions other than DOE. One is the siting process. I think the legacy of distrust of DOE is significant on the siting issue. And I guess my own view is something like an independent commission that is multi-member, three to five members, that has a

base, a sort of political base of different sorts with different constituencies can work well with states and locality and the Congress and the Administration to develop new storage and repository facilities that are needed and then, on the other hand, the operational management of the actual handling, treatment, storage, disposal of waste is a long-term operational responsibility. I think it's rather different than the work of the Federal Reserve but one that I think should be outside of a regular department with all the political push and pull, and it should have an assured funding source. That was discussed in the last panel.

Just what that might be, I think there are a variety of options, but we need to move more to a business model, probably a government corporation very probably with the private industry involvement in some way and representation in the governance structure of which is done in Europe. And the financial

element has to involve some resolution of the government's liabilities under the Nuclear Waste Policy Act for not taking spent nuclear fuel beginning in 1998.

I mean, it's sort of a scandal I think that this problem has been festered and been left to the lawyers and the utility industry and in DOE and in the Justice Department. I think it's obscured a lot of openness. The DOE lawyers I think have clamped down on getting information I found in researching my book. It's not a healthy process.

So we need to somehow liquidate and transform the government's obligations. It's obviously got to be an important funding source given its backlog of obligations, along with funding from the industry and, depending on the model, of funding from the government for the defense part of the waste. And that all has to be rearranged.

Finally, I want to urge the

Commission to also put on the table for the national agenda our existing system of waste classification and regulation, which is grown up patchwork without, you know, higgledy-piggledy over time, over 40 years, with no consistent approach to the classification of waste. Some waste are classified by their origin, some are classified by their characteristics, some are classified by whether they're civilian or defense. And this has led to excessive regulatory burdens in some cases, like certain reprocessing waste streams, and inadequate regulation for others, like sealed sources that are currently classified as low-level waste or greater than Class C. And I think we need to make a fresh start. That doesn't mean, you know, a revolution all at once. There has to be maybe some orderly transition. But I think that's a key part of dealing with our waste.

Finally, let me just say on the debate on reprocessing or the discussion that

just occurred, I think my own view is we ought to make some investment in R&D, but it wouldn't be prudent to bet our future on reprocessing at this point. But I think the idea of both consolidated storage, at least one start with it, and a repository are consistent with those are going to take time, they're going to be phased, they're going to take decades, not as the Waste Policy Act pretended, you know, 16 years from start to finish. And in that time I think decisions can be made on the results of R&D and an ongoing evaluation of the role that reprocessing might play. So I think that scenario outline is compatible with a range of decisions on the reprocessing issue.

Thank you very much.

CHAIR SCOWCROFT: Thank you very much, Dr. Stewart. Our next presenter is Dr. Tom LaTourrette of the RAND Corporation. Dr. LaTourrette and his colleagues at RAND recently published a study entitled Managing

Spent Nuclear Fuel, which he will summarize for us today. Thanks for being with us, Dr. LaTourrette.

DR. LATOURRETTE: Thank you. On behalf of myself and my colleagues, thank you to the Commission for inviting us to speak here today. I've got some slides. Okay. I don't have a clicker, so can I have it? Thank you.

So the objective of the work I'm going to present is to look at how different technical approaches to managing spent fuel can be combined to create different overall strategies and then to try to develop a way to help think about how to distinguish those different strategies. In the end, we don't make specific recommendations. The idea is to identify a range of feasible options for dealing with spent fuel and then how we might think about choosing among them.

Just very briefly about RAND and this study. RAND, for those of you who are

not familiar, is a non-profit independent institution that helps improve policy and decision-making through research and analysis. And this study is part of an -- we have an energy program. This is part of our ongoing energy work, and it was a modest internally-funded effort, so there's no external client with this work.

So this just gives us a brief outline. We tried to use both technical and social considerations to distinguish, well, to design and then distinguish spent fuel management strategies. So we first looked at what are the opportunities and limitations as sort of a qualitative evaluation of different technical approaches to managing spent fuel. Then we also looked briefly at how the current institution framework has performed. I won't be able to take time to talk about that, although I could raise some points in discussion. Suffice it to say, we didn't find anything inconsistent with what's been

discussed already.

And then, finally, to what extent are different spent fuel management strategies consistent with different societal priorities? That's the sort of measure we use to try and distinguish them.

So I'm just going to very briefly step through the technologies. You're all aware of these. We have on-site storage in pools or in dry casks. We've got centralized interim storage which is technically, more or less, exactly the same thing as dry cask storage on-site but you, of course, have to transport the fuel there. The third is permanent disposal in a deep geological repository, which is, of course, required in any strategy. No matter what recipe you come up with, this is part of it for sure. And then the fourth is I guess what we call semi-generic advanced fuel cycle. There are, of course, a lot of different advanced fuel cycle schemes. This is just a schematic eye crib

from the web. It's not meant to be specific to what we're envisioning. We don't really consider most details, other than the waste is essentially only fission products and that it allows multiple recycles. From a waste management perspective, those are the important components.

And we evaluated these technologies according to a bunch of criteria: safety, security, technical obstacles, the impact of the waste characteristics, cost, and public acceptance. And some of the most important findings I'll just list here.

So from everything we've been able to gather, dry cask storage, it works. It's feasible, safe, secure, and low cost. There are concerns having to do with repackaging: when would you have to do it, how often would you have to do it. And it's certainly, of the things we could do today, it's the most acceptable because we're doing it now, but it's certainly not perfectly acceptable,

particularly at decommissioned sites. There is some urgency to remove spent fuel from decommissioned sites where it's preventing redevelopment of the site.

The second point: technical obstacles to geological repository. They appear surmountable. This is, of course, a bit tricky because we still haven't completely settled the question of how good is good enough, what should we expect a repository to do, and what should we design it for. And, of course, the performance depends a lot on the details of the geology and the engineering barriers involve. But I think there's a broad consensus that we can build geological repositories that meet technical regulatory safety requirements. The greater challenge is gaining public acceptance and trust.

Then the third is advanced fuel cycle. I'll only spend a minute on this. These have the potential to greatly reduce repository capacity needs and uranium

consumption. And by repository capacity needs, it, of course, can decrease the volume of waste but, more important in terms of repository capacity is the heat load of the waste. And there are versions, schemes you can come up with where if you wait a sufficient cooling period of a hundred or two-hundred years, you can actually greatly reduce the repository capacity needs by decreasing the heat load. This doesn't account for the fact that there's going to be ancillary long-lived intermediate level waste that will also need permanent disposal, although perhaps not in the same type of environment as the spent fuel itself or the high-level waste.

Of course, the transition is going to take several decades I think it's fair to say. And another important point is, while it could greatly reduce the repository capacity requirements, it may not offer much benefit in terms of reducing the environmental risk. And the reason is the environmental risk stems

from the dose, not the radiation level. So it can reduce the radiation level by getting rid of a lot of the long-lived actinides, but the dose to the biosphere is a function of the amount of stuff there, so the radioactivity as well as the performance of the repository and the mobility of the elements. And the fission product elements are far more mobile in general than the actinides. So even getting rid of the actinides, you're still keeping the dose level quite high by having those fission products in the repository, so it may not reduce the dose level very much at all. So you may still need to have this thing as safe as you can for hundreds of thousands of years.

And detail this result, it's important since we don't have advanced fuel cycles yet, it depends on a few things. It depends on how the fuel cycle is designed. You could remove the offending fission products from the waste chain separately. It also depends a lot on the geology. This

includes bias towards Yucca Mountain, which is a very oxidizing environment. You can go to a reducing environment. In fact, fission products are a lot less mobile, and you could actually start to reduce the dose level. But, again, that raises the question of how important the geology is.

Okay. So those are just some of the, I don't want to take too much time on that. I know you've heard a lot about these before.

So what we did then is we took those four technical pieces and combined them in different ways to create what turned out to be also four different strategies, overall strategies for managing spent nuclear fuel. And I'm presenting these in terms of a notional timeline, but it's obviously highly uncertain and the timeline really only acts as a framework just to present the different elements of each strategy.

So the first is what we call

expeditiously proceed with Yucca Mountain. We recognize that particular siting of a repository is not the purview of this commission but, nonetheless, we included this particular site because so much work has already been done and we felt it was important to include it to be complete. So that includes maintaining on-site storage and then, at some point, we don't know exactly when, maybe ten years, maybe more, we license a repository and begin to place spent fuel. And the important point is we continue to maintain on-site storage for decades afterwards just to clear this backlog of spent fuel.

The next, what we call the strategy, is a two-part strategy where we develop centralized interim storage in conjunction with restarting the site selection process for a new permanent geologic repository. In this case, again, we're maintaining on-site storage. In some number of years, we're able to site license and open

a centralized interim storage facility and begin to transfer spent fuel, and that buys us more time to take a measured staged approach to select a new permanent geologic repository and then begin to place spent fuel there.

The third strategy is what we simply call aggressively pursue advanced fuel cycles. In this case, we're maintaining on-site or probably eventually develop centralized interim storage, maintaining surface storage anyway, for several years, maybe several decades while we work out the bugs and the research and demonstrate and then eventually commercialize advanced reprocessing for advanced fuel cycles. Off to the right would be a permanent geological repository as well, but it's so far in the future it's not explicitly considered in this strategy.

And then the fourth is what we call wait and see, maintaining extended on-site storage which is self explanatory.

So given these different

strategies, which we feel span -- there are certainly an infinite number of variations of these and combinations of them, but we feel they span pretty much a range of things that are seriously being discussed. So the next step was to think about how to distinguish among them. Given that they're all, more or less, technically feasible, we could do it, how do we decide what to do? And so what we did is we examined some of the key social priorities or values that often come up in discussions of nuclear energy and dealing with nuclear waste, and for each we asked which strategy is most consistent with this priority? And this exercise is intended to help with the question, you know, how do we distinguish among them, given that they're all doable and they all, I think, have constituencies.

So the first one that we often hear about is we need to solve the spent fuel disposal problem quickly. We just heard about

that. We've heard about it on and off for years. And this stems, I guess there's really two reasons. Generational equity. That is, we have a responsibility, those of us who have benefitted from spent nuclear fuel can't leave the disposal problem to the future. But there's another slant on this that you might say it's irresponsible to proceed with nuclear power until we've demonstrated the feasibility of the entire fuel cycle.

In any case, for whatever reason, if this is our priority, then you want to proceed with Yucca Mountain. That's the fastest way. If you really want to close this out, that's the fastest way to do it.

The next priority that I want to discuss in discussions of nuclear energy is, of course, paving the way for nuclear power growth. We all know nuclear power has not grown nearly at the rate we expected 40 years ago or even 20 years ago. And I don't want to oversimplify this. There's a lot of reasons

for that. It's complicated. Spent fuel and the inability to dispose of spent fuel is one element to that. And, certainly, utilities have been reluctant to invest in the nuclear power, partly for the reason that they can't get rid of the spent fuel.

There's another reason that's more pragmatic. It's, in many cases, illegal to expand nuclear power until we come up with satisfactory solutions to spent fuel disposal. California, Oregon, Wisconsin, several states have different versions of this sort of law that makes it illegal. So if that's our top priority, then either of those two solutions, expeditiously proceeding with Yucca Mountain or the centralized interim storage in conjunction with a new geologic disposal site. Both would get the spent fuel off the utility sites, demonstrate good faith that the federal government can take possession and begin to dispose of the fuel or make arrangements for disposal of the fuel. So that, conceivably,

would contribute to pave the way to nuclear power growth.

A third one. If we've heard anything today it's that there's been an erosion of trust and credibility in the process of pursuing Yucca Mountain. And so if the priority really is to regain that credibility and trust and increase confidence in the decision-making process and the decision consensus, then you don't want to necessarily rush ahead with Yucca Mountain. You want to slow down, start over. But at the same time, you want to do something. So in that case, the centralized interim storage is really the way to go. It solves the immediate problem of the federal government making good on the contracts, taking possession of the spent fuel, and, at the same time, doesn't rush us into anything where you don't have a lot of trust and confidence in the decision.

You can come at this from a very different perspective. Equally valid is that

we're very confident that nuclear energy is going to increase dramatically and become the dominant source of electricity in the country and perhaps the world. In that case, you may really want to start worrying about repository capacity and perhaps uranium resources, although that has less to do with spent fuel management. And of course, if that's the case, really the only way to really reduce the repository capacity requirements is to aggressively pursue advanced fuel cycles.

And then, finally, what we call, you know, the priority would be to wait and see. And I'm not sure all the reasons this would come up, but one is simply that if there's a sense that current options are just too uncertain to warrant doing anything now. There is a voice that argues for this and, of course, if that's your priority you want to maintain extended on-site storage.

So that's really the gist of the presentation. I can summarize now in a couple

of slides what we found. So aggressively pursuing advanced fuel cycles is attractive if constrains on repository capacity or uranium resources are really your top priority. This entails great investment and great uncertainty.

Maintaining extended on-site storage is attractive really only if all other options are unacceptable. And I think, in addition to not helping pave the way for nuclear power, it could, in fact, be quite detrimental by deliberately stating our plans to do nothing. I think that could make licensing quite difficult.

And then that leaves Yucca Mountain or this two-phase centralized storage with a reopening the site selection process for a new permanent geologic repository. That would facilitate the growth of nuclear power. It would not leave the spent fuel disposal problem for future generations. And really either of them would satisfy those priorities,

and the real decision of which to choose depends on how important it is to increase our confidence in the decision-making process. Thank you.

CHAIR SCOWCROFT: Thank you very much, Dr. LaTourrette, for your presentation. The third and final presenter is Dr. Audeen Fentiman, Associate Dean of Engineering and Professor of nuclear engineering at Purdue University. Dr. Fentiman chaired a recent study by the American Nuclear Society of options for managing the back end of the fuel cycle. Dr. Fentiman, we appreciate your being with us today.

DR. FENTIMAN: Mr. Chairman and Commissioners, thank you very much for the opportunity to present the results of our study. In the spring of 2010, the then President of the American Nuclear Society, Dr. Tom Sanders, formed a special committee to explore options for managing used nuclear fuel and asked me to serve as its chair. The

committee's charge was to prepare a report for members of the general public who want to understand the basics of used nuclear fuel and also for policy managers who must choose a path forward.

The report will describe currently feasible used fuel management options and explore the advantages and disadvantages of each, including consideration of environmental, economic, and social factors, as well as proliferation risks. It was not the committee's charge, nor its intent, to identify the correct storage treatment or disposal method. Rather, the committee focused on presenting the options and discussing the factors relevant to selecting the methods for storage, treatment, or disposal.

Now, clearly, the methods selected will depend, in part, on the number and types of nuclear power plants operating in the United States for the remainder of this

century. Committee members did not attempt to predict the mix of the nuclear power plants but, rather, we defined two bounding scenarios.

Now, the lower bound is a no-growth scenario in which all existing nuclear power plants operate for 60 years and then shut down with no nuclear power plants being built. The upper bound is a growth scenario in which half of the growth in U.S. electricity met demand between 2010 and 2100 is supplied by nuclear power.

We will complete our report in January of 2011. However, we have identified our major conclusions, and I'd like to present those today.

The first and foremost, the U.S. fuel cycle policy must be guided by stable and long-term program direction. Whether America's nuclear future is the orderly closure of the current nuclear plants or expansion of the nation's nuclear capacity

with advanced technologies, a long-term stable nuclear energy policy with clear objectives and milestones is critical. Utilities, used fuel program managers, contractors, and, most importantly, the communities considering hosting any used fuel management facility must have confidence that they can make long-term plans.

The ANS and many others support the concept of an independent entity to manage the back end of the fuel cycle. There are some who suggest that perhaps Congress and DOE can find a way to do it themselves. Either way, something needs to change.

Second, the committee concluded that a geological repository will be needed under any conceivable scenario. It will be required for reprocessing wastes if the U.S. decides to recycle used fuel and for the used fuel itself if we don't. In addition, it will be needed for the defense waste. The committee agreed that Yucca Mountain, salt

formations, and deep boreholes are all feasible options for geologic disposal that pose no technological showstoppers, just different engineering challenges.

Third, the committee concluded, rather obviously, that interim storage will be required. We are already storing used fuel at the reactor sites in pools and dry storage casks, and the NRC has recently ruled that it will be safe there for 60 years after the reactor's license expires. The committee felt that if a deep geologic repository is licensed or used fuel reprocessing commences in the next, perhaps, couple of decades, there may be no need for a separate centralized storage facility. But if not, the centralized interim storage will almost certainly be needed, but, again, it should present no technological challenges.

Reprocessing may make economic sense at some stage. The decision needs to be made with a long-term perspective that

considers the prospects of fast reactor deployment and the possibility of taking back used fuel from other nations.

We looked at the two reprocessing options. Option one is limited reprocessing and recycling of used fuel into light water reactors with reprocessing waste permanently disposed of in an underground geologic repository. And option two is full recycling of used nuclear fuel using fast reactors, again with fission products and other waste permanently disposed of underground. The committee felt that, while MOX fuel was of limited use in light water reactors, it's much more valuable in fast reactors where it can be recycled multiple times. Option one should, therefore, be considered as an interim step towards option two, full recycling in fast reactors.

It may be worthwhile to develop reprocessing capabilities to develop reprocessing capability and begin building an

inventory of MOX fuel while the U.S. reactor fleet consists primarily of light water reactors if it is clear that fact reactors will be coming online in the near future. The United States could also decide to pursue option one if providing used fuel reprocessing services to other countries appears to be a way to avoid nuclear proliferation.

Aqueous reprocessing has been used worldwide for decades, and advanced aqueous reprocessing technologies are under development, primarily motivated by the recovery of other minor actinides to reduce the toxicity of the remaining waste and to enhance proliferation resistance. Pyroprocessing is another reprocessing technique that is being investigated for metal fuels and may have some applications for oxide fuel.

If and when fast reactors are in place, there will be a strong incentive for full actinide recycling. Used fuel from fast

reactors has as much or more fuel value than the fresh fuel put into the reactor, but it must be reprocessed.

Since option two requires the use of fast reactors, evaluation of this option must include consideration of capital costs associated with the development of fast reactors. A cradle-to-grave cost/benefit analysis will have to take into account the total impacts of uranium enrichment, fuel fabrication, fuel recycling, reactor construction and operation and waste disposal.

Again, I must point out that for both limited and full recycle options, high-level waste will be produced from reprocessing and will require a permanent disposal facility. Numerous studies have been conducted on the impacts of reprocessing on repository performance. In general, as the radiotoxicity of waste are reduced in reprocessing, the potential releases from the repository and impacts on humans and the

environment will be reduced.

As I was preparing this testimony, one of my colleagues asked me, but what is the big news in this report. My answer was, the big news is that there is no news. For 50 years plans for developing nuclear power have included interim storage facilities, deep geologic repositories, and sometimes reprocessing and recycling facilities. This isn't rocket science. The main obstacles to a rational fuel cycle policy are political, financial, social, not necessarily technological. We, therefore, urge the Commission to focus on the management mechanisms needed to create a stable, durable fuel cycle policy, and I'm highly confident that the men and women in the American nuclear community can take care of the rest. Thank you very much.

CHAIR SCOWCROFT: Thank you, Dr. Fentiman. Questions? Richard?

MEMBER MESERVE: I'd like to thank

all of the panelists for their thoughtful presentations. I have a few questions, however, I'd like to direct at Professor Stewart. You made the case, as had the previous panel, I think most of us appreciate the need for state and local collaboration and asset in establishing a repository. And I think that it would not be surprising that it's necessary but perhaps not sufficient, and I think we can look at the example that you didn't have time to discuss but our experience with low-level waste, about its insufficiency. That's a statute that allows or requires the states to find a means to handle the low-level waste, allow them to make agreements among themselves for how to do it. And over the course of 30 years, I think we have established exactly zero low-level waste sites under a situation where the states have control.

And I wonder whether you could just spend a minute about why that situation

where the states were, in fact, given the responsibility and they still couldn't proceed. It seems a little bit inconsistent with the assertion that assent will help to solve the problem. It may be necessary, but it may not be sufficient. And then I have another question when you finish that.

DR. STEWART: All right. Thank you. There has to be strong federal leadership. That was the recommendation of the interagency review group on low-level waste that the federal government really had to take a major lead in promoting the siting, and I think they envisaged, you know, federal financial support for hosts, which certainly came out of the negotiation with New Mexico. The facility itself may provide enough local benefits for a community, but in our federal system, unlike in Finland or Sweden, the states are a key part of our governance system, and you have to provide sufficient incentives for them, which I think include not

just money but maybe research institutions, infrastructure, and so forth.

The problem with the Low-Level Waste Radioactive Policy Act was it left it to these compacts. The compact commissions were supposed to do the siting when there was no agreement. They were very weak. They're part-time employees put together. They had no financial resources, and the thing collapsed. We do actually have, though, a new facility. It's up and running or will be soon in Texas, but that's not in the compact framework. Texas sort of has a gerrymandered compact with Vermont. They want it, and they're hoping to get a lot of market benefit out of it.

But we can't just leave it to states and localities. The federal government has got to take a lead.

MEMBER MESERVE: My second question is directed at an item you also didn't have a chance to cover. As you know, under the Nuclear Waste Policy Act, there's a

fractured regulatory system where the standards are established by EPA and the licensing is done by the Nuclear Regulatory Commission. And I wonder if you have any views about the regulatory side of the issue as we go forward, whether the notion of divided regulatory responsibility is appropriate as something we should continue or whether it should be a single regulatory. You may have thought more deeply about what the various issues are about the regulatory side of the question.

DR. STEWART: You know, I'm of two minds on that question. I put my professor hat on and I say it doesn't make sense to have, you know, two regulators, the NRC and EPA both regulating. I can say, wow, we don't maybe trust the NRC, we need another regulatory. That way lies, you know, an infinite number of regulators since who's going to watch over the next one?

On the other hand, I guess my more

pragmatic side says this is now sort of an accepted part of the process. It seems to work not terrifically but reasonably well. So I think the notion of trust that's been spoken of here suggests that, despite my, say, academic misgivings or more than academic, that probably we ought to go forward with the system we have. I don't think it's so broken that we should give it up.

CHAIR SCOWCROFT: Per?

MEMBER PETERSON: I have a question for the panel members that arises out of some of the information that comes from the RAND study. Dr. LaTourrette, you had pointed out that the impacts of advanced fuel cycles can sometimes be a bit counterintuitive. That is, the improvement for long-term performance of a repository is a more complex type of question than simplistically reducing the inventory of radioactive material. You noted, for example, that reducing the amount of transuranics may have a fairly modest effect.

However, a benefit of reprocessing may be the capability to immobilize fission products in a form which is more intrinsically stable in a repository environment. Likewise, we do have this question about repository capacity and whether it would be sufficient. And this is really, I would say, a pretty complex optimization problem to try to figure out what types of technologies should be developed and commercialized and deployed.

There's basically two ways, I guess, of trying to achieve these goals. One is to have the government, I guess, pick the correct technologies. The other would be to try to put in place some type of market incentives such as moving from charging a Waste Fund fee that's based on electricity generation maybe to something that would be more directly related to the cost and difficulty of waste disposal.

So I'd be interested in thoughts about whether a more market-based approach to

try to drive the behavior of waste generators versus a command-and-control approach, which might be more effective and desirable.

DR. LATOURRETTE: Well, I wish my economist colleague was here. I'm not certain, but I think that the answer to the last part of your question, if we're worried about paying for a repository we ought to charge by the cubic, you know, volume, not by electricity, not by the kilowatt. That would create an incentive if there was a market for reducing the volume of waste or the mass or the volume of the repository. But I think before you get to those kind of arguments, there's an important question of just deciding why do you want to do advanced fuel cycles. There needs to be a policy check here, and I think there are a little bit of a mismatch. I don't think it's particularly new, but I think we start hearing more and more often that we want to design an advanced fuel cycle around the spent fuel optimization. I'm not

sure it ever started that way, but I think that question has always been in there. But it's certainly not the only question. It's a complicated thing because it interacts the entire front, middle, and back of the fuel cycle.

So I think the first thing you need to do is decide why are we doing an advanced fuel cycle, what do we want to get out of it, and then you can decide on an incentive structure. I'm not at all opposed to market-driven. That makes sense but not until you kind of decide what you want it to do.

CHAIR SCOWCROFT: Allison?

MEMBER MACFARLANE: Great. My question is for Professor Stewart. I was very interested in your suggestion that we needed two new institutions, not one. And it's an issue that I brought up and I don't have an opinion on, a strong one anyway. I have opinions on everything. Poor Jonathan. But

I'm curious about this and I want you to explore it a little more because I don't think there are any other countries with the relatively advanced siting programs that have two institutions. They all seem to just have one, and I wonder why you suggest two. Is there something unique to the United States where two is necessary?

DR. STEWART: Well, what's different about the United States? Well, in part is our federal system. France, Sweden, Finland --

MEMBER MACFARLANE: Canada?

DR. STEWART: Canada is still, you know, remains to be seen. We're at a very early stage of their planning, and they do have what we call stakeholder representation in their NWMO entity. And, you know, I think, given the sort of complicated politics in this country, that the sort of what you need to manage the waste is a long-term business type strategy with adequate assured financing,

long-term capital planning. That's one sort of an enterprise. And a process of discussion with many different hosts working through exchange of information, that's a different sort.

And I think in the DOE thing, besides all the overlay of the budget and political process, those have been at war. We've got to find a way to bury this waste and we're going to move forward with it and, you know, that has undermined the sensitivity, I think, to the concerns of hosts and localities. And, actually, the WIPP story was the story over 30 years. It sort of was serendipitous. There was no plan. DOE would have just as soon, yes, all right, we're going to dig it and bury it, but the state fought back with litigation, through its congressional delegation and all sorts of ways and really forced the government to sort of come to the bargaining table. My own instinct is that a more broad-based organization like

an independent commission would be well suited for our particular circumstances.

MEMBER MACFARLANE: And who decides who the commission members are?

DR. STEWART: These would be appointed by the President and --

MEMBER MACFARLANE: So then it's --

DR. STEWART: -- confirmed by the Senate, like any other independent commission.

CHAIR SCOWCROFT: Phil?

MEMBER SHARP: Yes, I want to go back to sort of the issue trying to get at this issue of the history of what caused failure. There are obviously multiple things, and we're speaking as if we can get the institution and the strategy right we'll get a result, and I'm a little more deeply suspicious that we've learned a lot. But that doesn't guarantee anything. It's the leadership at the time and the individuals involved and the political nature that's going

on that has a great deal of influence here.

And so I just want to suggest that we be careful that we don't fight the last war. Generals were always accused of making the mistake of fighting the last war and only to discover the new war is different kind of proposition. So I guess I believe these lessons are important.

One that I would like for the staff, I think could be really important in our report, to do is to identify all of the techniques over the last 25 years that we have developed and utilized in the state of Washington, South Carolina, Idaho, Nevada, and New Mexico to allow for participation. And they're different. Some of them are imposed by courts, some were imposed by federal-state agreements, some were imposed by federal law. But they involve how different groups can function, how they get funded on either technical information development or even participation. Even things like paying in

lieu of taxes, how much is Nevada winning or losing at the local levels as this decision changes. If we could, I think this would be valuable. So how many earmarks went into the 20-year WIPP thing that actually paid off. And we never had a grand deal, as I understand it, in WIPP, but we had multiple ways because of the skill of the representation in Washington of making that work.

And I think it would be useful because some of those techniques we've actually learned a lot, and they're very well in helping DOE. I'm not defending that we keep DOE in charge. So we shouldn't lose that kind of proposition.

One of the advantages I see that hasn't been articulated of a presidentially-appointed commission to do siting in this particular case is it would be genuinely high level. One of the things that is that the governors and others are talking about is who are we dealing with? If we're dealing with

three and four tiers down in the Department of Energy and a secretary who's got 20 minutes to spend on this because he's spending all the time before 40 committees of Congress testifying on everything under the sun, it means you can't develop the kind of consistent focus and relationship. And so it seems to me that's one value that we ought to be focused on is giving them a clear and singular focus, but they've got to be high level enough that when you're dealing with them you know you're dealing with somebody who can make a decision.

I didn't mean to make a speech, but I got inspired. So let me ask you if you make the statement in your preface I read, which, by the way, I think the manuscript, all I've read so far is the preface but you've shared them with us, is really powerful in bringing stuff together. The other report is very helpful, too, and so I'm looking forward to reading the rest of it because it gets it in one place that lesser beings have a chance

to understand.

But what I didn't know is whether you went back and examined with, you make the case, as is often made, about Yucca Mountain as a failure that the implacable, you didn't use the word implacable but opposition is like it's going to go on as long as nuclear waste goes on. But I guess I want to challenge that just a little bit, and I don't know if anybody has gone in the sampled opinion and whatnot. But is there a reason for us to expect that that opposition will sustain itself over the next decade? The reason I say that is we have people testifying here at various times from the local and county communities and saying, hey, we've come to accommodate this. Now that we understand the game, now that we understand the economics and things like this, we can live with this. That hasn't been the position of state government or the Majority Leader of the Senate, but my point being that maybe we're just on the cusp and this political

situation may be changing at a time that they decided. This is not the function of this Commission, and I'm not trying to take a position, but I'm just curious whether you actually updated the politics there or not.

DR. STEWART: On lessons from the past and being careful, as I mentioned we have a very small sample. But I guess my belief is that this notion of host jurisdictions, local and state, meaningful engagement, and assent is a necessary but not sufficient condition. And Congress in the Waste Policy Act did put some provisions for independent technical review of funding the state, some sort of engagement by the state. But looming was the sense it's all a fait accompli.

Now, where the politics are in Nevada, where they might be going, I have no special insight. I think things could conceivably change if it's a more open game. At least I think there might be some chance. There are certain localities that see a

benefit here. But what we see from public surveys is that the localities, particularly if there's already some sort of nuclear facility, a reactor or DOE site, tend to see the risks as much lower than the general population and, of course, they're familiar with it and they also get some economic benefit. You move 50 miles away and further and suddenly the risks are higher than the average public perceives it, and that translates in the WIPP case that reaction in Albuquerque and Santa Fe and certainly in Las Vegas. So whether that will ever be overcome, I don't know.

CHAIR SCOWCROFT: Jonathan?

MEMBER LASH: Thank you. Commissioner Meserve, as a former Vermont environmental regulator who discovered, to my horror, that I was also responsible for managing low-level radioactive waste from Vermont Yankee, I have to say I thought it was exceptionally clever of a little state whose

value proposition is clean and green to cut a deal with Texas. We could all learn.

I do want to follow up on Commissioner Meserve's question about regulation. Professor Stewart, you answered, well, being pragmatic, the current system probably makes sense and seems to work. But I want to ask about two other aspects of regulation. First, siting criteria. Should Congress establish the criteria, or should there also be an agency that is responsible for setting site screening criteria? And should there be site screening considerations, or should there be some absolute hurdles? That's one.

Second, you, I think, endorsed the idea of the application of conventional environmental regulations as in the case of WIPP, and at that Vermont Yankee plant we had to issue a waste order permit every five years. It wasn't actually even that big of a deal, but it helped establish the

relationship. Tell us a little bit more about how that would work, how you can have states applying RCRA and the Clean Air Act and the Clean Water Act at the same time as EPA and NRC are regulating and licensing facilities.

DR. STEWART: Well, I'm sorry, your first question? I was so attentive to your second I forgot --

MEMBER LASH: The first one was about siting criteria.

DR. STEWART: Oh, siting criteria. Yes. Well, I think that Congress, obviously, it's going to have to meet the environmental technical requirements. I mean, that's obviously fundamental. And beyond that, I think some general criteria about, you know, transportation, population, et cetera, but at a very general level, and I think it has to be left to whatever entity is going to manage that process.

And on the second one, well, we have as part of our, we do have the experience

of WIPP that really gave the state the confidence that it had effective control about what was going in there and was going to be assured it could raise its concerns with not only DOE but they could take them to EPA, which had to certify the facility. And the Defense Department works under this regime, so why should there be something special here? And state requirements can be more rigorous than the federal requirements. That's a familiar part of our federal system. It may give the state an effective veto, but that may be the price of getting the confidence over the long-term safety and appropriateness of this facility.

Now, maybe that's a total block and you have to come back to force majeure, but I don't think that's worked so far. So I'm prepared to go with the limited experience we have at WIPP.

MEMBER LASH: Which statute turned out to be the most important? Was it --

DR. STEWART: The RCRA statute because a lot of the waste, the TRU that was going into WIPP was mixed waste and, therefore, within the RCRA authority of the state.

MEMBER PETERSON: Actually, my question is very closely related to the one that Jonathan just posed because the question of the regulatory authority that the state has for activities that are required for operation of facilities is clearly an important one. I'd be curious, you mentioned that these regulatory, the regulatory authority the state has, actually, in some sense, constitutes an effective veto capability. That is, those regulations can be used to essentially immobilize a project, if needed.

This raises two questions. The first is is there any wisdom to having federal statute preempt state regulatory authority or is that counterproductive? And then the second would be since state regulation

actually does constitute something that looks like a veto, might it be a sufficient veto? That is, a local community that can get all of the necessary, you know, can arrange and get all the necessary permits, as with any other facility, is that essentially a sufficient mechanism for the state to exercise some control over the process to assure that it meets the needs of the state? Does that make sense?

DR. STEWART: Well, on the first one, I would point out, you know, that the Atomic Energy Act has been interpreted, at least consistently by the courts, not explicit, to preempt state regulation of radiological hazards. So the Federal Facility Compliance Act is really going to go to air, water, hazardous waste --

MEMBER PETERSON: Right. But all of these facilities require additional state permit.

DR. STEWART: Yes, exactly.

MEMBER PETERSON: Everything from the emergency diesel generators down to --

DR. STEWART: Water permits --

MEMBER PETERSON: -- water --

DR. STEWART: Yes, absolutely. But I wasn't clear on your second question.

MEMBER PETERSON: The second question I guess is, since the state does have control over permits, and I guess legislatures can actually pass legislation saying that issuing this permit would not be in the interest of the state.

DR. STEWART: Well, it would have to be non-discriminatory. It can't discriminate against . . .

MEMBER PETERSON: Okay. Would that be a sufficient effective veto, or does one need something that's more explicit?

DR. STEWART: Well, it would depend on the situation. I mean, maybe it would just take the mixed waste. I mean, some waste forms might not be classified as, some

radioactive waste forms might not be vitrified high-level waste. That would be a technical issue. So, yes, you might need and maybe you would want to say, if you're going to go down this road a little further, say the state has to assent to the facility.

CHAIR SCOWCROFT: Any questions? Yes?

MEMBER CARNESALE: On the RAND study, as I look at the conclusion in here that, you know, it depends on society's objectives is what it is, and when I look at the ones you identify, solve the spent fuel disposal problem quickly, that's one of the objectives. All right. They've got multiple, but that's one. People are really eager to do that. Pave the way for nuclear power growth, that's another one. A lot of people want to do that, especially now in light of climate change. So the first one has you expeditiously proceed with Yucca Mountain, but politics, for the moment, say that's an

interesting proposition however, dot dot dot.

Pave the way for nuclear power growth leads you to both decentralize interim storage but also extend on-site storage. Nobody is talking about taking all of the fuel from the reactor sites and moving it to centralized storage, right?

So with that objective, you need on-site storage at reactor sites and you probably need some centralized storage if for no other reason other than the plants that are going to be deactivated or are deactivated. Increase competence in repository performance and decision consensus. Well, certainly after Yucca Mountain people are going to insist upon that. Decreasing the demand for repository capacity, probably Yucca Mountain wasn't there was too much stuff. It was we don't want any.

So the only one, as I read these, everything of the three strategies you recommend, there's a strong push for each of them except for advanced fuel cycle. There's

nobody -- I mean, I wouldn't say nobody. The industry cares. Analysts care about the demand for repository capacity, but our problem in the near term is that the capacity is zero.

So I know you guys didn't make a recommendation, but what were reactions to what you did have to say in the end to these --

DR. LATOURRETTE: Well, we haven't talked about this much. I mean, the report is just out, so I'm getting them now. I think you're right. Of all the difficulties about spent nuclear management, maybe the one thing that has never come up is the amount of spent fuel. Nobody has ever said if we'd only had a tenth of the amount, gosh, all of our problems would be solved. A lot of countries have only a tenth or less than what we have, and that has not proved to make their life any easier.

So in that respect, from a purely

waste management perspective, maybe there's not a convincing case. But, you know, advanced fuel cycles are complicated. They differ from these other approaches because they affect much more than waste management.

MEMBER CARNESALE: No, I was only talking about your study. I agree. There are other that has to do with conservation of resources, a whole bunch of other arguments for advanced fuel cycles. But it sounds like from what you did that's the one where there is no pressure other than --

DR. LATOURRETTE: Well, I don't know. I mean, there are a lot of, I think there are a lot of people who are convinced that nuclear power is going to grow dramatically that we really do have to worry about siting. Maybe not volume in the sort of space on the Earth sense, but capacity in the sense that we can't go through this siting process every six weeks.

MEMBER CARNESALE: No, just have

the least pressure. I don't mean the least, it's not the same as the least important.

MEMBER PETERSON: Could I do just a quick follow-on to that? Actually, in contrast to what Al said, are there any cases where we've developed a waste disposal facility where we haven't placed societal capacity limits? Yucca Mountain has a 70,000 cap. WIPP has a cap. In the end, are there any cases where communities and states have been willing to sign on to an infinite amount of stuff that might be disposed in a facility?

MEMBER MACFARLANE: Per, the Yucca Mountain capacity limit was to force a second repository.

MEMBER PETERSON: It was societal demanded. I'm just wondering if there's any --

MEMBER CARNESALE: Per, that's the opposite of what I'm saying. I'm saying if you suddenly said you only have to take 10,000. Oh, well, send it here, right?

That's my point, not that it's infinite.

DR. LATOURRETTE: I don't know the answer to your question, whether there's any repository with no limit. Maybe Richard? I doubt it.

DR. STEWART: No. And even I'm not sure about some of the low-level waste facilities, but the Nuclear Regulatory Commission is considering this down-blending issue where B and C waste would be mixed with A waste, and that would be shipped to the facility in Utah. And Utah is now unhappy because they want to keep the capacity for the future, and they don't want it to be used up and they don't want to be, there's a limit to how much of the dumping ground.

CHAIR SCOWCROFT: Dr. Fentiman, you've escaped relatively unscathed. Is there any last comments you'd like to make?

DR. FENTIMAN: I think the key point that we want to make is that there needs to be a stable long-term policy and a group

managing that policy. No one is going to make decisions about how much or where things are going to go until they're sure that there's a long-term policy that they can count on.

CHAIR SCOWCROFT: Thank you very much, all of you, for a very valuable contribution to our understanding. We appreciate you being with us very much. That concludes our meeting today. We will convene again tomorrow morning at 8:30. Thank you very much.

(Whereupon, the foregoing matter was concluded at 4:07 p.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Blue Ribbon Commission on America's Nuclear Future

Before: n/a

Date: 11-15-10

Place: Washington, DC

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R. Gross

Court Reporter