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NUCLEAR REGULATORY COMMISSION

Title: **BRIEFING BY DOE ON PLUTONIUM**
DISPOSITION - PUBLIC MEETING

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1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

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4 BRIEFING BY DOE ON PLUTONIUM DISPOSITION

5 ***

6 PUBLIC MEETING

7 ***

8
9 Nuclear Regulatory Commission
10 Commission Hearing Room
11 11555 Rockville Pike
12 Rockville, Maryland
13

14 Monday, January 27, 1997
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16 The Commission met in open session, pursuant to
17 notice, at 2:30 p.m., the Honorable SHIRLEY A. JACKSON,
18 Chairman of the Commission, presiding.
19

20 COMMISSIONERS PRESENT:

21 SHIRLEY A. JACKSON, Chairman of the Commission
22 KENNETH C. ROGERS, Member of the Commission
23 GRETA J. DICUS, Member of the Commission
24 NILS J. DIAZ, Member of the Commission
25 EDGAR McGAFFIGAN, JR., Member of the Commission

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1 STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:
2 JOHN C. HOYLE, Secretary
3 KAREN D. CYR, General Counsel
4 HOWARD CANTER, Acting Director, Department of
5 Fissile Materials Disposition, DOE
6 DAVE NULTON, DOE

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P R O C E E D I N G S

[2:30 p.m.]

CHAIRMAN JACKSON: Good afternoon, ladies and gentlemen. The Commission would like to welcome Mr. Canter and Mr. Nulton of the U.S. Department of Energy. Mr. Canter, I understand, is Director of the DOE's Office of Fissile Material Disposition.

Good afternoon, gentlemen.

MR. CANTER: Good afternoon.

CHAIRMAN JACKSON: This afternoon, the Commission will be briefed on, first, DOE's plans to implement a program to provide for safe and secure storage of weapons usable fissile materials, that is plutonium and highly enriched uranium. And, secondly, on DOE's strategy for the disposition of surplus weapons-usable plutonium.

This briefing is timely in that the Department of Energy just last month issued its final programmatic environmental impact statement on the storage and disposition of weapons-usable fissile materials. The Secretary of Energy announced her record of decision of this matter less than two weeks ago on January 14, 1997.

The Commission is extremely interested in the plans and strategies being considered by the Department of Energy on this topic because the program could effect facilities that the NRC has licensing and regulatory

1 authority over, such as commercial nuclear power reactors,
2 the high-level radioactive waste geologic repository and
3 possibly other facilities.

4 The Commission looks forward to hearing about your
5 plans, the Department's plans and strategies and,
6 particularly, how in your view those plans and strategies
7 might effect NRC's licensing responsibilities.

8 Unless the commissioners have any comments,
9 please, Mr. Canter, proceed.

10 And I understand Mr. Grumbly was called away.

11 MR. CANTER: Yes, he was. I want to apologize for
12 that last-minute perturbation.

13 I would like to cover a number of things. This is
14 a paper copy but we can also arrange for this to be, I
15 believe, on your screen.

16 CHAIRMAN JACKSON: Yes, that always happens.

17 MR. CANTER: All right.

18 I won't spend any time on this. Basically what I
19 want to cover is a little bit of background, what was in our
20 record of decision, how we are approaching the
21 implementation, some future interactions with the NRC that
22 we see and where we think there are some questions about
23 regulatory responsibility.

24 Next viewgraph.

25 The basic problem is what to do with the fissile

1 material that is surplus to the national security needs. As
2 you know, the President declared about 174 metric tons of
3 highly enriched uranium to be surplus and approximately 50
4 metric tons of plutonium. Actually what was declared by the
5 President was 38.2 metric tons of plutonium but that was
6 strictly weapons grade and we have another 14 or so of non-
7 weapons grade also that we have declared surplus.

8 The decisions to be made. These involve the
9 locations for storage of plutonium and highly enriched
10 uranium and the technologies for the plutonium disposition.
11 And these were the basic decisions that were in the record
12 of decision that was approved on the 14th of January.

13 Next viewgraph.

14 This map briefly shows the storage decision. I
15 didn't intend to spend a lot of time on this but, basically,
16 through a process of consolidation and disposition of this
17 material, we're going to reduce from seven sites to three
18 where material will be stored. Those three sites that will
19 remain in the long term will be Oak Ridge, that's the Y-12
20 plant for highly enriched uranium, the Pantex plant for some
21 strategic reserve plutonium and Los Alamos National
22 Laboratory for some of the strategic reserve of plutonium
23 and for some material used in the research and development
24 programs.

25 On plutonium disposition, which is a dynamic

1 program, not static like storage, the record of decision
2 involved an approach that involved two tracks. One is
3 immobilization for minimum of eight metric tons of surplus
4 plutonium that is basically undesirable for use in mixed
5 oxide fuel. And the other is to fabricate the rest into or
6 part of it into mixed oxide fuel for reactor burning.

7 The amount that would go into either MOX fuel or
8 into immobilization is depending on a lot of things. One is
9 the technical work which we still have under way, the costs,
10 there are many institutional issues and last, and I want to
11 emphasize this one, is the international situation.

12 Because what we do is strongly dependent and
13 closely linked to whatever arrangement we work out in
14 bilateral agreement with Russia on what they're going to do
15 because this is not a unilateral decision. Some of it, we
16 may proceed unilaterally with. Some of the material. But
17 the bulk of it would await getting an agreement with the
18 Russians.

19 COMMISSIONER McGAFFIGAN: Could I ask a question
20 at that point?

21 CHAIRMAN JACKSON: Sure.

22 COMMISSIONER McGAFFIGAN: I was almost tempted to
23 make that point a couple slides earlier. The problem to
24 solve is how to dispose of our plutonium and the Russian
25 plutonium in some sort of way in parallel; is that correct?

1 MR. CANTER: Yes.

2 What we have done with the Russians is we have
3 conducted a joint study and, in that report, the Russians
4 agreed in the summary portion of it that the objective of
5 the two programs would be to reduce the amount of plutonium
6 to equal levels, to equal levels.

7 COMMISSIONER McGAFFIGAN: Do we know the starting
8 point of the Russians?

9 MR. CANTER: No. No.

10 COMMISSIONER McGAFFIGAN: How do you --

11 MR. CANTER: Well, that's part of the negotiation
12 that will go on. But it's not equal rates. In fact, we
13 believe that the Russians have a great deal more surplus
14 than we have but they have never declared what's surplus.

15 COMMISSIONER McGAFFIGAN: I've seen press reports
16 in the 125, 150 ton range but that's totally speculative?
17 It could be higher or lower?

18 MR. CANTER: Yes.

19 But if we want to get to equal levels, then it may
20 require one party to run a little faster than the other.

21 We think that the strongest negotiating position
22 that we are going to have is to proceed now with
23 preparations for implementing both tracks of this dual track
24 strategy. We are not going to study it for another two
25 years and do a down-select. We are going to proceed down

1 both tracks.

2 CHAIRMAN JACKSON: Along the lines of the kinds of
3 negotiations, international, that you mentioned basically
4 with the Russians, have you attached a schedule or
5 milestones to this actual dual track strategy at this point?

6 MR. CANTER: To this?

7 CHAIRMAN JACKSON: Yes.

8 MR. CANTER: Yes, we have an overall schedule for
9 it and I didn't bring it here today.

10 CHAIRMAN JACKSON: Could you just sort of describe
11 it in words?

12 MR. CANTER: Well, yes. For the immobilization
13 alternative, the biggest uncertainties are technical and we
14 have an R&D program.

15 For example, we don't know what impurities can be
16 dissolved in either a glass or a ceramic medium. The
17 experience in the United States, in fact in the world so far
18 is not with immobilization of plutonium but with high-level
19 waste. And the experiments we have done to date are with
20 pure plutonium or plutonium oxide and there are many, many
21 impurities that some of the forms have.

22 So we have to do a testing program and we've got
23 that started. It will be this year and next year
24 essentially to determine what impurity levels will be
25 tolerated.

1 Then there are other experiments that have to be
2 done on the final form. We have to down-select the -- if we
3 use the can-in-canister approach which I will describe in a
4 little while, what's in the cans, whether it is a ceramic or
5 a glass, and then of course we will have to go through a
6 design process to get whatever additional facilities we
7 would need up and running. So it will be the early part of
8 the next decade, sometime around 2003 before we would be
9 ready to start immobilization on a pilot scale. Until then,
10 it will be experimental scale, small scale.

11 On the MOX fuel alternative, the first thing we
12 have to do is go through a procurement process. There are
13 many utilities, there are many people who claim they know
14 how to fabricate fuel. So we will go through a competitive
15 procurement and we will probably start that in the end of
16 March and solicit contractors and proposals for development
17 of the MOX fuel plant and for utilities to propose using the
18 MOX fuel in their reactors.

19 That process of down-selecting that and going
20 through final proposals and all that you go through in the
21 government procurement process is scheduled for about 15
22 months. There are those who say it will take a lot longer,
23 there are those who say you could do it in less. But I
24 think that's a reasonable number.

25 CHAIRMAN JACKSON: What about the FFTF facility at

1 Hanford and how does that play in?

2 MR. CANTER: The FFTF is retained as a possible
3 facility for the production of tritium.

4 CHAIRMAN JACKSON: I see.

5 MR. CANTER: This has nothing to do --

6 CHAIRMAN JACKSON: Nothing to do with that?

7 MR. CANTER: That's correct.

8 COMMISSIONER McGAFFIGAN: Doesn't it burn
9 plutonium to produce the tritium?

10 MR. CANTER: It can make the tritium using uranium
11 fuel.

12 COMMISSIONER McGAFFIGAN: But isn't it optimum --
13 as I understand the Jason Study, optimally you want
14 plutonium fuel in quite high concentrations.

15 MR. CANTER: There is a problem if we have
16 declared the plutonium surplus to national security needs.
17 The president -- to then use it for making bomb material.
18 And I think that will create a great deal of difficulty in
19 any negotiations with another nation.

20 CHAIRMAN JACKSON: So this is an integrated
21 strategy here.

22 MR. CANTER: I am here to talk about plutonium.

23 [Laughter.]

24 MR. CANTER: I like to tell people that getting
25 rid of the plutonium is beating swords into ploughshares.

1 If you then produce tritium with it, you may be beating the
2 ploughshares back into spears and I don't want to get
3 involved with that at this juncture.

4 CHAIRMAN JACKSON: Okay.

5 MR. CANTER: To replace contracts, utilities will
6 have to apply for a license modification. We would have the
7 vendor who is developing the MOX fuel plant apply for a
8 license and I will get into this in a little bit.

9 It appears that the schedule for all that would be
10 that we would have people under contract in fiscal year --
11 sometime around the latter part of fiscal year 1998.
12 Probably the license applications would be fiscal year 1999
13 and it would then whatever time the licensing takes, the
14 critical path is actually getting the MOX fuel plant,
15 assuming that licensing takes about three years, which may
16 be an incorrect assumption, and then construction would be
17 about three years and then startup about a year, we would be
18 ready in about nine years from now to start consuming MOX
19 fuel in commercial reactors.

20 COMMISSIONER McGAFFIGAN: Could I go back to the
21 question about the Russians?

22 We're not going to do this unilaterally, you said.
23 As I understand it, the number of reactors that might be
24 coming in for license applications could range up to 12 to
25 15, if we only do one -- you know, 30 percent of the core is

1 MOX, if you go 100 percent it might be as few as three to
2 five.

3 In the Russian case, you're talking about if there
4 were 150 tons, almost all of their civilian reactors,
5 wouldn't you -- using MOX fuel, again, depending on whether
6 it's 30 percent or 100 percent MOX in their cores, I'm just
7 trying to -- and if our actions are dependent on Russian
8 actions, isn't there a huge amount of uncertainty as to when
9 indeed this might or might not occur?

10 MR. CANTER: yes, there is. In fact, in looking
11 at --

12 COMMISSIONER McGAFFIGAN: If anything I've just
13 said is wrong, please correct me.

14 MR. CANTER: No. No, it is. The Russians have --
15 what we have seriously looked at is the use of the VVR-1000
16 reactors. They have seven and I am not counting the ones
17 that are allegedly under construction that are promised to
18 be complete this year or next year. But there are seven in
19 existence.

20 In meetings with the Russians, they finally agreed
21 that there happens to be 11 in the Ukraine. So a year ago
22 they refused to talk about the 11 in the Ukraine. But since
23 they control the fuel supply for them and take back the
24 spent fuel, they have suddenly decided they want to stay in
25 that business, I presume, and they are now very much

1 interested in the 11 and they have had a dialogue with the
2 Ukrainians about this. So now you're talking about 18.

3 Now it starts to become reasonable that in some
4 reasonable number of decades we could do something about the
5 Russian plutonium. When you dealt with just the seven
6 reactors, you weren't going to get there.

7 What the Russians would really like is for us to
8 pay to build new reactors.

9 CHAIRMAN JACKSON: Of course.

10 MR. CANTER: Which nobody wants to do.

11 CHAIRMAN JACKSON: How many U.S. reactors are we
12 talking about, potentially, and over what period of time?

13 MR. CANTER: Since all 50 tons wouldn't go the
14 reactor route anyway, let's say that two-thirds of it goes
15 that route, it would be the better quality material, we're
16 probably talking about somewhere between four and eight.

17 COMMISSIONER McGAFFIGAN: What is the percentage
18 core?

19 MR. CANTER: We would start with about 30 percent
20 core because of the fact that there's no point jumping into
21 a new development program when you've got a lot of
22 experience in Europe.

23 COMMISSIONER McGAFFIGAN: With 30 percent only.

24 MR. CANTER: With the 30 percent. And that will
25 allow us time in parallel to do further testing and lead

1 test assemblies and whatever else has to be done so that if
2 we need to speed up, we could increase the loading and go to
3 full MOX cores or at least increase that percentage in
4 parallel.

5 But you might as well start with something that we
6 know how to do and where there is a substantial database of
7 information on performance.

8 COMMISSIONER McGAFFIGAN: Would the Russians also
9 start with 30 percent?

10 MR. CANTER: Yes.

11 The studies that we have done with them indicate
12 that even to do that, they would have to add control rods to
13 their reactors.

14 COMMISSIONER McGAFFIGAN: So if the Russians are
15 doing 30 percent, they have maximum of 18 reactors to
16 utilize, what sort of phasing problems does that involve?

17 MR. CANTER: They could do in that with 30 percent
18 about four to five tons a year of plutonium.

19 COMMISSIONER McGAFFIGAN: So if they had 150 tons,
20 that is 30 to 40 years?

21 MR. CANTER: It's a long time.

22 COMMISSIONER McGAFFIGAN: And would you want to
23 finish our program at the same point they finished their
24 program in 30 to 40 years?

25 MR. CANTER: I think this is all going to be part

1 of the negotiations.

2 The thing that is going to drive what gets done
3 over there is who is going to pay for it. Realistically.

4 CHAIRMAN JACKSON: Okay.

5 MR. CANTER: We mentioned the dual track strategy.
6 If you will move to the next --

7 COMMISSIONER DICUS: Let me ask you a question
8 before you get off of slide six. You anticipate in either
9 case both waste streams going to the same geologic
10 repository?

11 MR. CANTER: Yes. In fact, I want to address that
12 a little bit.

13 Since either the immobilized form or the spent
14 fuel from use in reactors would go to the geologic
15 repository, we have had as part of this program an analysis
16 done of the acceptability of these forms in the repository.
17 Since the repository does not yet exist and a firm standard
18 on what will be acceptable does not yet exist, the analysis
19 is concentrated on several things, one of which is to what
20 extent would these forms fit within the bounds of what
21 you're expecting to go there now, like the defense high-
22 level waste and the spent fuel from commercial reactors, LEU
23 spent fuel. And how far out of the envelope of that
24 material would it be.

25 In fact, we have made some adjustments. Looking

1 at underground criticality, we have had to reduce the amount
2 of plutonium in the immobilized form because of concern for
3 that. There is further analysis being done now of what we
4 call the degraded form phase, what happens in the repository
5 many, many years downstream and if this form degrades.

6 Because you've got a fairly -- in the immobilized
7 form, let's say we ended up with 5 percent. That's 5
8 percent fissile material and it doesn't do us much good to
9 wait until the Pu 239 decays because it decays to uranium
10 235, which doesn't help me much.

11 So we've got to make sure that there isn't a
12 criticality problem. So we have taken that on board and we
13 have in fact had the repository people themselves do this
14 analysis and any time you are interested in that material,
15 we can make it available to you.

16 CHAIRMAN JACKSON: And so they are folding that
17 into their work in terms of the suitability of --

18 MR. CANTER: Of the repository.

19 CHAIRMAN JACKSON: -- of the repository at this
20 stage?

21 MR. CANTER: Yes.

22 COMMISSIONER DICUS: How dependent is your choice
23 of either one of these tracks or the time table for the use
24 of either one of these tracks dependent upon resolving the
25 issues and getting a repository available?

1 MR. CANTER: I don't believe the time table is
2 dependent on it at all. If we go with some MOX fuel into
3 existing reactors, we are substituting for LEU spent fuel,
4 so we are not creating more spent fuel. If the utilities
5 have a problem on where to send it, they have the problem
6 today. So we are not aggravating that problem.

7 With regards to the immobilization, and I will
8 come to that in a minute to describe the process we tend to
9 use, we don't create a lot more canisters of high-level
10 waste; we again substitute. There is some slight increase
11 in the number of the canisters but not the total quantity of
12 waste. So I don't think it is going to be that big an
13 impact.

14 We are presently vitrifying high-level waste at
15 Savannah River as we speak and, if there is no repository in
16 20 years, then Savannah River will have to keep those
17 canisters of high-level waste glass for some longer period
18 of time. And it won't make any difference whether there is
19 some plutonium cans in there or not. It may make a
20 difference in some institutional requirements like security
21 and safeguards but not in -- you know, if they have a place
22 to store it, it will be satisfactory.

23 I've got a sheet in here with just the definition
24 of the spent fuel standard because this is something that I
25 wanted to talk about just briefly. The National Academy of

1 Sciences in their report first I guess coined the phrase
2 "spent fuel standard" in early 1994. It is grossly
3 misunderstood. Most people think it is strictly a radiation
4 barrier. It is not. It is a combination of things such as
5 size, weight, chemical dilution of the plutonium, the
6 radiation barrier and, in some cases, isotopic dilution.

7 In the view of the Russians, their position is it
8 should have isotopic dilution -- or degradation, not
9 dilution. We don't think that's needed and if it were
10 needed as a mandatory requirement, then we couldn't go
11 immobilization at all because, in immobilization, you do not
12 change the isotopic mix of the plutonium.

13 So it's really sort of a region or a general
14 subjective measure of whether you've achieved this standard.

15 I want to talk about the plutonium conversion and
16 extraction. The first thing is that the form need for
17 plutonium disposition, whether it is immobilization or to go
18 into fuel for reactors is an oxide. Most plutonium
19 inventory, that's the bulk of the tonnage, is in the pits,
20 the plutonium component of the weapons. And that's metal so
21 it has to be processed.

22 We have developed a dry chemical process which we
23 are presently building into a prototype at Los Alamos for
24 testing. The construction of this prototype will be done
25 the end of this year and it's full-size equipment and it is

1 an integrated system.

2 This process will extract the plutonium from the
3 component by a hydride-dehydride process and then can
4 convert it to an oxide through several steps after that.
5 Since it's not an aqueous process, you don't have a waste
6 stream. There is a little bit of waste in terms of
7 deconning the can that you put the plutonium oxide in, but
8 that's not a big problem. That is why we are interested in
9 this.

10 Plutonium, one of the disadvantages of plutonium
11 in using it for anything is it does hydride very rapidly and
12 what we are doing is taking advantage of that.

13 COMMISSIONER McGAFFIGAN: Is this the point to
14 ask, the New York Times article this morning about the
15 gallium complications?

16 MR. CANTER: Well, you're free to ask that
17 whenever you want.

18 [Laughter.]

19 COMMISSIONER McGAFFIGAN: I mean, is Los Alamos'
20 process -- they are citing a Los Alamos paper in the
21 article. Is this the process where the gallium will
22 complicate things?

23 MR. CANTER: No.

24 COMMISSIONER McGAFFIGAN: Is it further
25 downstream?

1 MR. CANTER: It's downstream. But let me explain
2 the gallium.

3 See, one of the unique features that we have at
4 our laboratories is that they have a certain degree of
5 academic freedom and they write a lot of papers, so we
6 applaud them for that.

7 But Gallium was added to some of the plutonium to
8 improve its machinability. Gallium is liquid at a very low
9 temperature and it makes the plutonium much more workable.
10 It is in the neighborhood of about -- approximately about a
11 percent.

12 By some strange coincidence, the Russians have
13 gallium in there too. I don't know who was first and I
14 won't comment on that.

15 So when you use this hydride-dehydride process,
16 whatever impurities are in the plutonium come with it. So
17 it does not purify the metal.

18 So if the gallium has to be removed, we would have
19 to add some steps to do that and either remove it with a
20 thermal process or chemically.

21 We have made some fuel with weapons plutonium and
22 we found out that in the fuel fabrication process, including
23 the centering that you do to fuel pellets, the gallium gets
24 reduced from about one percent down to about 20 parts per
25 million. Now that could create another problem because it

1 has to go somewhere. So where does it go in the centering
2 furnace and how do you condense it out without having it
3 redeposit on the fuel. And we are concerned, not that it's
4 a big problem, but we want to make sure it isn't a problem,
5 that even that 20 parts per million of gallium that's in the
6 fuel would not cause an interaction like an inter-metallic
7 compound with the cladding. It won't affect anything from a
8 neutronic point of view but it might be a corrosion problem.

9 So, as a result, we have undertaken a test program
10 and the first part is out-of-pile tests with the proper
11 temperatures to see what happens with gallium in contact
12 with zirc fours or two or whatever the different cladding
13 materials are. And the second part will be in-pile tests so
14 that you get the proper migration of the gallium under the
15 actions that will occur.

16 If we cannot substantiate that the gallium does
17 not create a problem, we will remove it. In the meantime,
18 in parallel, we have some development work on some thermal
19 processes to remove the gallium. So that's just a matter of
20 adding some steps, some additional glove boxes and spending
21 a little more money. We don't want to create a licensing
22 risk, though, and a safety risk.

23 Again, we could start off with plutonium that has
24 no gallium because a significant portion of even the pits
25 have plutonium that didn't have gallium added to it. So you

1 can start with that and it gives you a lot more time to work
2 out the methods of removing it and do more testing.

3 What we found in our work is that a substantial
4 portion of the effort is to prepare these materials for use
5 either as fuel or to go in the immobilized form and this we
6 didn't realize until we really took on the technical work of
7 the last two years and I think it was underestimated by the
8 National Academy of Science. In some cases, it's as much as
9 a third or 40 percent of the costs will be the preparation
10 of the materials.

11 COMMISSIONER MCGAFFIGAN: Is there a significant
12 cost advantage potentially to the immobilization as opposed
13 to the MOX, because you have to do less of this
14 purification?

15 MR. CANTER: We don't know yet. We haven't tried
16 to immobilize any plutonium with impurities yet. And we're
17 just starting that now. So we just won't know.

18 The next viewgraph is sort of a cartoon of what we
19 call the ARIES process, which is this hydride-dehydride
20 process for removing the plutonium from the component and it
21 goes directly into a welded can which goes inside another
22 welded can. What's not shown here is it just has the words
23 "assay." We have a separate module that does an automated
24 nondestructive assay of the material in the can and whether
25 it's metal or an oxide and we think we can get it accurately

1 enough that that can be the start of international IAEA
2 safeguards.

3 We will not have a one-to-one correspondence
4 between pits and cans of material. Because that will reveal
5 how much plutonium is in a pit, which is still a classified
6 piece of information. So there will be about four-and-a-
7 half kilograms in each can. And we have shown the IAEA this
8 assay system and they agree that that could be a good
9 starting point because what we intend to do is place the
10 disposition of the surplus plutonium from the time it's out
11 of a classified form under IAEA safeguards, whether it's
12 immobilization or the reactor route.

13 This requires the IAEA, by the way, to step a
14 little bit out of their normal box where they are used to
15 drawing samples and analyzing them themselves. You've got
16 two very heavy welded cans here and I think the last thing
17 we want is a bunch of people cutting them open and exposing
18 plutonium oxide to the environment. So they have looked at
19 it, they think they can handle this, they think this is a
20 good way to go.

21 The next two charts, I won't go through in any
22 detail but just to show you that we've got this stuff in a
23 lot of locations and it's in a lot of forms. And these are
24 only the highest level classifications of the forms because
25 oxide isn't necessarily pure oxide. You know, metal isn't

1 necessarily pure metal. We've got some alloyed with
2 aluminum, we've got some alloyed with uranium. So it's all
3 over the place.

4 These are the 38 tons of weapons grade, the 14.3
5 tons of non-weapons grade. By the way, most of that is what
6 we call fuel grade and runs about 12 percent plutonium 240.
7 It isn't -- we've only got about a ton-and-a-half of real
8 reactor grade, which is up like 20, 25 percent Pu 240. But
9 you will also notice that almost 7 tons is in irradiated
10 fuel and unless that fuel is processed for other reasons,
11 we're not going to take the plutonium out of spent fuel for
12 the sole purpose of processing it so we can put it back into
13 spent fuel. So we will just leave that.

14 So what that adds up to is we've really got about
15 45 tons of material. We analyzed 50 tons because it allows
16 for some additional dismantlement which we think will occur
17 and that will be relatively clean stuff in metal.

18 The next cartoon is a process for preparation for
19 reactors. Depending on what the material is, it would
20 require different processes. I am not trying to go through
21 the whole flow sheet as we talk here but the idea would be
22 to produce a spec plutonium oxide.

23 Unlike LEU fuel, there is no ASTM spec for the
24 plutonium and there is a series of specifications that are
25 used in Europe. Each vendor claims his specification is

1 proprietary so we have developed a generic, by the way, that
2 we've gotten the vendors to take a look at. They say they
3 think that's acceptable.

4 But the interesting thing is, you know, the
5 experience came from plutonium that was recycled in their
6 reprocessing plants. So you sort of know what kind of
7 impurities you get and what you don't get. We may have a
8 different array of impurities than they are used to and, if
9 that's the case, then it just means we will have to do more
10 testing to make sure that we got the right spec on that.

11 I also have a cartoon for the processing for
12 immobilization. In this case, it says impure oxides because
13 we are hoping that the immobilization process will allow us
14 to be -- allow the system to be more robust and tolerate
15 more in the way of impurities.

16 I would like to talk a little bit about
17 immobilization. The next viewgraph, please, number 13.

18 What we are talking about is what we call the can-
19 in-canister. At Savannah River and planned for the Hanford
20 site, they immobilize high-level waste and it gets poured
21 into rather large canisters. They are about four meters
22 tall and about two feet in diameter and they are pretty big
23 and it's a homogenized system.

24 We found out that you can't -- that would require
25 construction of a new facility to use -- to do that with

1 plutonium because the melter, for example, at Savannah River
2 was never designed for criticality control, the systems are
3 too large, it would require gutting that facility and
4 putting new smaller equipment in and we don't want to do
5 that.

6 So we were looking for other ways out. Although
7 in our environmental analysis, we analyzed building a whole
8 new facility to get the worst case and one of the things we
9 came up with is this can-in-canister. And what we would do
10 is immobilize the plutonium in either glass or a ceramic and
11 it would not be mixed with high-level waste so you don't
12 need heavy shielded facilities, strictly glove box, and it
13 would be poured into small cans. They're about two liters.

14 We would then suspend these small cans, and some
15 number of them, and we have run a test with eight cans and
16 we've run a test with 20, in a framework that goes inside a
17 canister. Then that would be moved into the -- if it's at
18 Savannah River, the Defense High-level Waste Processing
19 Facility and the fission product glass would be poured into
20 the canister and it would surround these cans.

21 So it is not homogenous anymore and that raised
22 some other questions and we had a vulnerability assessment
23 done by an independent team of technical experts including
24 explosives experts and chemical processing people and a
25 concern came up that with the right explosive arrangement,

1 the shock wave would traverse the high-level waste glass,
2 reflect off the cans and it would separate the cans from the
3 glass and when this thing split open and then the
4 perpetrator could go in and pick up some cans and run out
5 with them.

6 So we are redesigning the can so it's not solid
7 anymore and it would be more friable and it's an easy thing
8 to do and we'll probably do some cold tests of that, just to
9 make sure you can't shatter it and separate it.

10 COMMISSIONER McGAFFIGAN: Could I ask, at the
11 Hanford site, is it the intention that that facility also
12 potentially be -- you mentioned it would be useful for this
13 purpose. Or would it only be at Savannah River? Would you
14 envision it both places if you needed to use the
15 immobilization option in both?

16 MR. CANTER: We have two candidate sites for
17 immobilization. One is Savannah River because they have an
18 immobilization facility and the other is Hanford because
19 they have definitive plans for getting one.

20 COMMISSIONER McGAFFIGAN: Right.

21 MR. CANTER: All the other sites don't have plans
22 at the present time.

23 If they build -- the present plans for the
24 privatized venture at Hanford is supposed to result in what
25 they call a pilot plant in about the year 2003 or 2004.

1 That pilot plant could handle something on the order of 100-
2 and-some-odd canisters a year. It's a pretty good size
3 pilot plant. And if they really are doing that much, that's
4 a possibility there, too.

5 COMMISSIONER MCGAFFIGAN: If they ever go on to
6 the next step at Hanford beyond the pilot plant --

7 MR. CANTER: Well, we could live with the pilot
8 plant; it's big enough.

9 COMMISSIONER MCGAFFIGAN: The pilot plant alone
10 would take care of your --

11 MR. CANTER: Yes. Yes.

12 If you would go back to the photograph a minute,
13 number 14. It's a little hard in the reproduced copy. In
14 the nice color one I've got, it shows a picture that was
15 sectioned.

16 We ran a cold test of this can-in-canister concept
17 to make sure that the glass could pour around the cans and
18 then we sectioned it to make sure there weren't any voids or
19 anything like that and it came out pretty well. This was
20 done before the Defense Waste Processing Facility went hot.

21 The next chart is a cartoon of a diagram that
22 shows the possible arrangement. And I think that's self-
23 explanatory.

24 The next viewgraph -- I want to talk about
25 reactors a little bit.

1 Oh, one other thing on the immobilization, if for
2 example we put 20 of these cans in one of these canisters,
3 it will displace about 20 percent of the high-level waste
4 glass that would have gone into that canister. So if
5 they're going to get rid of that high-level waste that's in
6 the tanks, it means for the ones that we're involved with,
7 and it may be 100 canisters a year, we would actually have
8 to pour the glass into 120 canisters.

9 So although they would have to handle 20
10 additional canisters, it is the same amount of high-level
11 waste glass, the feed. And that's one of the bigger
12 impacts.

13 The other thing would be that we would have to
14 have safeguards in security applied to these cans and to the
15 canisters at least until such time as the high-level waste
16 glass is poured around it. After that, whether we can give
17 any credit for the radiation barrier is not yet decided.

18 With reactors, of course, everybody is familiar
19 with what mixed oxide fuel is. You replaced the low
20 enriched uranium with a mixture of in the neighborhood of
21 something like 4 to 7 percent plutonium oxide and the
22 remainder being uranium oxide. In general, we would
23 probably want to use depleted uranium. We have a few
24 hundred thousand tons of that and we will be happy to use a
25 little bit of it up on this.

1 It requires a MOX fuel fabrication facility of
2 which there is none in the United States at the present
3 time.

4 We have an option that we retained of using the
5 Canadian reactors in the event there is a trilateral
6 agreement between Russia, Canada and the United States to do
7 so.

8 CHAIRMAN JACKSON: I believe that DOE has
9 indicated that the MOX fuel for the CANDU, if that were to
10 occur, reactors would be fabricated in the DOE facility.

11 MR. CANTER: Yes.

12 CHAIRMAN JACKSON: Do you imagine having the same
13 facility fabricate both kinds of MOX fuel or are you really
14 talking separate facilities?

15 MR. CANTER: I don't think we would start a U.S.
16 light water reactor program and a CANDU program at the same
17 time.

18 Believe it or not, we are not going to have enough
19 plutonium to do all these things that everybody wants to do
20 so it would just -- it would cost an enormous amount of
21 money and it's just not worth it.

22 PRESIDING JUDGE: So it's a question of picking
23 which track you would take with respect to which kind of
24 reactor and then building the fabrication facility?

25 MR. CANTER: Well, our choice is U.S. light water

1 reactors. The advantage that the CANDU reactors brings is
2 that the Canadians actually proposed a two-sided program
3 where MOX fuel fabricated in the United States would go to
4 Canada and MOX fuel fabricated in Russia would go to Canada
5 and Canada, being a neutral nation and not a nuclear weapons
6 state, although they were at one time, would be the neutral
7 party that would take care of the material and would consume
8 the fuel in their reactors and would keep the spent fuel,
9 all under safeguards.

10 Now that is depending -- whether we would play in
11 that arena is dependent upon whether the Russians would. So
12 we are just preserving it as an option in the event the
13 Russians will sign up to that.

14 COMMISSIONER MCGAFFIGAN: Could I ask a question
15 about the CANDU? I mean, in my reading of the various
16 documents that you all have put out, the CANDU option looks
17 like it has cost problems, nonproliferation problems, I
18 mean, just lots of problems compared to -- transportation
19 problems, obviously -- compared to the light water reactor
20 or immobilization.

21 Is it because we once made a positive sounding
22 signal to the Canadians when they made this proposal that we
23 are keeping it alive even though we don't believe in it or
24 what is the -- why keep the CANDU option alive given all the
25 disabilities that are enumerated in these various studies?

1 MR. CANTER: It has problems but it has one
2 possibility that the U.S. light water reactors -- in my
3 wildest dreams, I can't imagine the Russians ever sending
4 their plutonium to be consumed in U.S. reactors. That's the
5 one thing going for the CANDU option if they can bring the
6 Russian side to it.

7 The Canadian government is investing a little bit
8 of money in a study that is presently under way in Russia to
9 look at the infrastructure and other things in Russia to
10 handle that side of the triangle. But lacking the Russian
11 side, there is probably no way that the United States would
12 send its plutonium to Canada because we take on, like you
13 said, a great many other problems that aren't necessary when
14 we've got adequate resources to do it in the United States.

15 It's interesting because, you know, besides the
16 disarmament issue, one of the reasons some of the Canadians
17 are interested in it is it reduces their quantity of spent
18 fuel. See, they operate on natural uranium and really what
19 you do when you have MOX fuel is you get an enriched fuel
20 and you can about double the burn-up on the fuel, which cuts
21 the spent fuel in half. So we have told us they should
22 really pay us to let them do this.

23 COMMISSIONER McGAFFIGAN: Could I ask, just on
24 that point, what is the Canadian high-level waste and spent
25 fuel solution in the long run? Do they have one?

1 MR. CANTER: It's a little different in Canada
2 than here. And I'm not an expert on this, but in Canada the
3 spent fuel belongs to the utility forever. And it doesn't,
4 through some law or something, get turned over to the
5 federal government. So that means of the 20, of the 22
6 reactors, Ontario Hydro owns the spent fuel.

7 I also realize that in Canada, Ontario Hydro is
8 part of the -- somewhat part of the government of Ontario,
9 so it's hard to distinguish between the government and the
10 private sector but they have been studying repositories but
11 right now, just like we do, they store it at the reactor
12 sites.

13 COMMISSIONER MCGAFFIGAN: Do they have any
14 candidate repository?

15 MR. CANTER: I don't know.

16 CHAIRMAN JACKSON: Not at this stage of the game.

17 MR. CANTER: There are some conditions on the use
18 of mixed oxide fuel and there has been a lot of controversy
19 over this and one of the things I would like to point out is
20 what the President's policy on the civil use of plutonium
21 really says.

22 The policy was issued September 27, 1993, the
23 current policy. There have been prior ones to this.

24 It says the United States does not encourage the
25 civil use of plutonium and therefore does not itself engage

1 in reprocessing. And the second phrase of that sentence is
2 extremely important.

3 So as a result, our commitment is there shall be
4 no reprocessing of this spent fuel. We also feel, so that
5 we don't try to encourage somebody to promote the civil use
6 of plutonium, that the MOX fuel facility that fabricates the
7 MOX fuel will be government-owned and on a government site.
8 And the MOX fuel use will be limited to surplus plutonium
9 disposition. There will be international inspection and
10 verification and it will be shut down when this mission is
11 complete.

12 In fact, we feel that even in placing a contract
13 with a contractor, that we may put words in the contract
14 that limit so that when that contractor applies for a
15 license, that that contractor must request that the license
16 must be limited to carrying out this mission so that we
17 don't have a situation where either a utility gets a license
18 for use of MOX fuel, they finish with our plutonium and they
19 go by MOX fuel in Europe. We don't want that. And we don't
20 want that opportunity.

21 We know of nobody who wants to do that, by the
22 way.

23 COMMISSIONER McGAFFIGAN: Would you expect us to
24 have that as a license condition, binding license condition?

25 MR. CANTER: I would expect that the parties

1 applying for the license, the applicant, will specify that
2 as a condition and we would hope that you would approve that
3 as a condition.

4 CHAIRMAN JACKSON: Or conversely have it as a
5 condition.

6 MR. CANTER: Yes.

7 The siting of the disposition facilities, I
8 mentioned before, for immobilization, we're just looking at
9 Hanford and Savannah River. For the mixed oxide fuel
10 fabrication, we are looking at four sites, Hanford, Idaho,
11 that's at the INAL site, Pantex and Savannah River and for
12 either approach, the pit disassembly and conversion will
13 either be at Hanford, Idaho, Pantex or Savannah River.

14 We are doing a supplemental or tiered-off EIS so
15 that we can select the sites for this and we are about to
16 start that. It probably will get started in the next month
17 and probably in March we will announce the notice of intent
18 on that. It is a straightforward EIS just to pick the
19 sites.

20 With regards to coverage under NEPA, of course, if
21 you look at our programmatic EIS, we handled the reactors
22 generically. That will be a competitive procurement and
23 when the reactor owner or licensee applies for a license
24 modification from the NRC, they will have to update their
25 environmental report and whatever has to be done. I think

1 the generic look that we had provides a substantial amount
2 of information on the environmental effects of using MOX
3 fuel versus LEU fuel and, as I recall, the delta caused by
4 the MOX fuel is extremely small.

5 COMMISSIONER MCGAFFIGAN: Could I ask, on the
6 timing, when you put out your request for proposals, you are
7 going to look for plants that do not require a license
8 renewal in order to be relevant in the time period that
9 you're talking about?

10 MR. CANTER: Yes.

11 COMMISSIONER MCGAFFIGAN: What other conditions
12 may you put in your RFP for the sorts of reactors that you
13 would be willing to contemplate?

14 MR. CANTER: Well, I should have brought a chart
15 that I usually lug around with me but it shows all 109
16 reactors and when they fall off the table at their end of
17 license.

18 Even if we eliminate any that would reach end of
19 license during the potential campaign, there are probably
20 still 40 or 50 that we wouldn't have to get into any license
21 extension. So I believe that might be one of the
22 requirements we would examine.

23 COMMISSIONER MCGAFFIGAN: I just want to -- if the
24 Russian case were to be 150 tons and 40 years, there almost
25 is no reactor that will be -- and you got into some of those

1 reactors being shut down for periods of time for safety
2 reasons or whatever, there is -- don't you -- I think I can
3 contemplate a set of circumstances where there -- you are
4 into license renewal almost necessarily depending on how
5 much Russian reactor -- how much Russian excess plutonium
6 there really is.

7 MR. CANTER: Well, we always have a fallback and
8 now you are describing our strategy. We are going to be
9 immobilizing high-level waste at Hanford for probably 30 or
10 40 years. Less at Savannah River.

11 So, if we run out of reactors, clearly we can go
12 the other route.

13 CHAIRMAN JACKSON: So perhaps another way would be
14 to say it is that you would be looking at reactors that, in
15 your best estimate, would not require license renewal during
16 the life of the campaign?

17 MR. CANTER: That's correct.

18 CHAIRMAN JACKSON: But, should that occur and/or
19 should you decide for other reasons that the reactors that
20 might come to the end of their licenses, their current
21 licenses, might be desirable, that at any rate your fallback
22 position of the immobilization allows you to deal with it.

23 MR. CANTER: Yes.

24 CHAIRMAN JACKSON: And you would switch over to
25 that track?

1 MR. CANTER: Yes.

2 I think the decision on whether a reactor license
3 gets renewed and its life extended is a commercial decision
4 for the reactor owner and has to do with electric power
5 production and other things and it should not be dependent
6 upon this. We are not in this effort trying to solve the
7 nation's energy problems.

8 CHAIRMAN JACKSON: And you aren't necessarily --
9 you aren't looking to have a built-in pressure or
10 implication of extending the license of any given reactor?

11 MR. CANTER: Not at all.

12 The next viewgraph is just a few ideas on some
13 facilities and functions that might potentially involve NRC
14 action. The reactors are very clear. You are the licensor.
15 The reactor operator is the licensee and if they are going
16 to change the fuel to MOX fuel, they would need some kind of
17 license modification.

18 The MOX fuel facility where it would be
19 fabricated, we would like that to be NRC licensed.

20 CHAIRMAN JACKSON: Does that require legal change,
21 the law, a change in the law?

22 MR. CANTER: There is one issue that has to do
23 with that and that's this DOE ownership. If, for example,
24 we contract with a contractor, a fuel fabricator, whoever
25 that may be, to design, license, construct and start up and

1 run this facility, it would not be our conventional M&O
2 contract type arrangement. We might -- we would pay for all
3 that to be done, that's the up-front investment cost. And
4 we would own it and we might lease it to the contractor who
5 then fabricates fuel for the contracted utilities under
6 contract from those utilities so the guarantees of fuel
7 performance, of delivery, of quality and of all the other
8 issues that are involved are the same as they are today
9 between the utility and their fuel fabricators.

10 So rather than have the fuel be government-
11 furnished, what we would furnish is to the fuel fabricator
12 plutonium oxide and uranium oxide if they want it or uranium
13 in some form that they could convert.

14 If you had a facility like that, where it is
15 operated by a private entity who is the licensee but the
16 United States Government is the owner of it, would we have
17 to be a co-licensee? That's the question. In the case of
18 the gaseous diffusion plants, they're not really licensed;
19 they're certified. So I couldn't use that as an example.
20 So I don't know what the answer to that is.

21 If DOE would have to be the co-licensee, then I
22 think it would take some legislation to give you the
23 authority to license something that belongs to DOE.

24 Transportation. We have proposed to some of your
25 staff and have taken the position that we would transport

1 the plutonium to the disposition site, whether it's the MOX
2 fuel fabrication plant or the immobilization by safe, secure
3 trailer, the SSTs that we own. We have 52 of these. We are
4 building more to replace some of the older ones. That is a
5 very good infrastructure, its very well recognized and it
6 provides a lot of security and safety and has many, many
7 features that I can't talk about in an open meeting.

8 One of the questions is, if the MOX fuel
9 fabrication plant were NRC licensed and the reactor is NRC
10 licensed, do you have a link in the middle that is the
11 transport of the MOX fuel that is not NRC licensed because
12 it's under DOE? Or should the NRC also license, at least
13 for this purpose, the safe, secure trailer system?

14 We feel that it provides a lot of advantages to
15 use that system rather than to try to create an
16 infrastructure for doing this in the private sector.

17 COMMISSIONER MCGAFFIGAN: Could I -- the trailers
18 that I am a little familiar with were designed for a
19 different purpose. They can take long fuel assemblies
20 and --

21 MR. CANTER: Yes.

22 COMMISSIONER MCGAFFIGAN: -- they can, you know,
23 you can pull them out when you get to the reactor and load
24 them in the spent fuel pond and all that?

25 MR. CANTER: Yes. There happens to be a container

1 for MOX fuel and for some unknown reason in the dim distant
2 past, there's one. And when this container was designed, it
3 was designed to go on a flat bed truck. So it provides, the
4 container provides, all the ballistic protection and all the
5 other things. It is enormous and, in fact, you could only
6 put one of these containers with two fuel assemblies in a
7 trailer. So we would need thousands of sorties.

8 We are designing a container that takes advantage
9 of the protection provided by the trailer so it becomes
10 quite similar to the kind of container that you put LEU fuel
11 in and it will be tested and certified and whatever has to
12 be done. But the SSTs are large enough for this.

13 CHAIRMAN JACKSON: Okay.

14 MR. CANTER: It's too bad Tom isn't here. He was
15 the chairman of our Task Force on External Regulation. I
16 was a member of it. And so I'm familiar with some of the
17 things that the Department has recommended but, you know, it
18 is possible if the recommendations that are in the report
19 from that task force and were approved by the Secretary, if
20 they are codified in law by the Congress, some program to
21 give the NRC increased authority over DOE facilities that
22 the NRC would take on the regulatory authority of these
23 other facilities like the pit disassembly and conversion,
24 the immobilization facilities, just about the time that we
25 would be getting started.

1 So if the Congress is going to act, and that
2 report had a two-year time frame in the schedule for the
3 Congress to act and then ten years to reach full
4 implementation. If they are acting, if they will act
5 favorably on this, it would be better to bring the NRC in
6 early rather than to try to back into it as a retrofit.
7 Since some of this will be new facilities or new additions
8 to existing facilities, it would be appropriate to bring the
9 NRC in to the review process in the design phase.

10 I am just pointing this out. I don't know what
11 the answer is. It's a subject that I think none of us have
12 the answers to.

13 CHAIRMAN JACKSON: What about the storage of the
14 fissile material?

15 MR. CANTER: Well, the same might be true with the
16 storage. The storage is very simply this. Right now, the
17 decision consists of moving as reasonably quickly as we can
18 the material out of the Rocky Flats site. There are pits at
19 Rocky Flats. The pits will start this year to be shipped to
20 the Pantex site where we have many thousands of pits now and
21 they have ample storage capability. There will be some
22 upgrading of facilities there over a period of time.

23 The non-pit material will be shipped but it won't
24 be shipped until several conditions are met but it would go
25 to the Savannah River site. Savannah River is building and

1 they have started design work on what they call the Actinide
2 Packaging and Storage Facility. It is a new storage
3 facility. it is more than just a vault because you have to
4 have the ability to repackage and do other things with the
5 material.

6 What we are going to do is to expand that design.
7 It is modular. Add some modules, several thousand
8 additional positions, so it could take the non-pit materials
9 that are from Rocky Flats.

10 The material that is presently at Idaho and at
11 Hanford will await our decision on location of the
12 disposition options and it will then be -- rather than have
13 to ship it twice, ship it to the location where the
14 disposition would be done.

15 But the new facility at Savannah River, if the NRC
16 is given authority over these kinds of facilities, would be
17 the first new storage facility to be created and that's
18 scheduled to be on line about 2002.

19 CHAIRMAN JACKSON: Let me ask you this question,
20 going back for a second to the MOX fuel facility because you
21 kind of laid out a potential structure that is a little more
22 simple to think about from the commercial perspective.

23 You indicate an NRC license is desired and you
24 talked about how that might occur, depending upon who owns
25 and what, et cetera. Why, in your mind, is it desirable to

1 have an NRC license? Is it because of this interface with
2 the commercial sector? But what advantage do you --

3 MR. CANTER: It's several things. One is we think
4 that there is value to the NRC license and we think many in
5 the public feel there is value to the NRC license. That's
6 one point.

7 The second thing is we are going to contract for
8 it to be run in a manner that is similar to the way fuel
9 fabricators run today. And they are all licensed and there
10 is a contractual relationship between their product quality
11 and so forth and the requirements of the reactor users. So
12 it keeps it in the same arena where we are reasonably
13 comfortable and where I believe the utilities are
14 comfortable and rather than try to create a whole new arena,
15 a new regime, untested, that it just seems to us that this
16 is -- this would be the proper way to do it.

17 Now, you know, if there are reasons not to, then
18 it is another thing we could take a look at.

19 I have a sheet here on page 20 that is just a few
20 other issues on where the NRC might be engaged. As you are
21 aware, for a small test up at the NRU reactor at Chalk
22 River, Los Alamos had applied for an export permit to ship
23 this small quantity of fuel and we decided that the prudent
24 thing would be to wait until our record of decision and so
25 that was withdrawn until preparation of an environmental

1 assessment of the shipment to make sure that there is no
2 environmental consequences that are unacceptable.

3 That is presently in draft form. We are in the
4 process of going to review that shortly and then that will
5 be sent to the affected states and Indian tribes. and then
6 if that's -- whatever comments we receive, it would be
7 modified. And, if it warrants it, we would have a finding
8 of no significant impact.

9 If we have such a finding, they would then apply
10 for the export permit. But not until such time as we
11 satisfy the environmental consequences.

12 So that could happen, that application, in two to
13 three months. I mentioned before the initiation of the
14 reactor license modification. Maybe two to three years from
15 now. And the application of the MOX fuel plant, two to
16 three years.

17 There is another issue that has its own problems
18 and that is the possible use of a European fabrication
19 capability to make leak test assemblies. A lot of this is
20 going to depend and will require significant consultation
21 with your staff. We don't know to what extent LTAs will be
22 required and nobody wants to say one way or the other and I
23 can understand that.

24 If we have to wait until the MOX fuel plant is
25 complete and producing -- can produce fuel and then first

1 make LTAs that could be tested in a reactor, we are
2 extending this schedule. So one way to cut three, maybe
3 four years off the schedule is to ship sufficient amount of
4 plutonium oxide under many, many controls and safeguards and
5 security to the appropriate manufacturer in Europe, have the
6 LTAs fabricated there and ship them back.

7 Of course, that raises -- solves one problem and
8 creates three or four more. So we are looking for ways --
9 right now, the only capability to make MOX fuel is a
10 relatively small capability at Los Alamos. That is all we
11 have in the United States.

12 COMMISSIONER McGAFFIGAN: Could I ask, the record
13 of decision on this point says, the careful placement of the
14 word "not," "This record of decision does not decide to do
15 this." It doesn't say "we have decided not to do this."

16 MR. CANTER: That's correct.

17 COMMISSIONER McGAFFIGAN: So what would be the
18 mechanism for that decision? There would be a further
19 record of decision required based on the same environmental
20 record already created?

21 MR. CANTER: Yes.

22 COMMISSIONER McGAFFIGAN: And that would not
23 require any further process, public process?

24 MR. CANTER: Well, there would probably be some
25 public announcement of revised record of decision or a

1 subsequent one and you allow usually a small comment period
2 on that, 30 days or something.

3 But, you know, we understand the problems.

4 COMMISSIONER McGAFFIGAN: They are discussed in
5 some detail here.

6 MR. CANTER: So we are looking for a way out of
7 that, but I don't know what the answer is yet. But we just
8 want to let you know that is something we are looking at.

9 I have just got a couple of suggestions here. We
10 need to establish a working group, obviously, between the
11 department and the Commission to clarify the regulatory
12 responsibilities because, in some respects, we are doing
13 some things that are a little bit out of the normal.

14 The reactors, I don't think, are a big problem.
15 The MOX fuel plant is under the aegis of 10 CFR 70 and I
16 know, in talking to your people, they even have a draft
17 standard review plan but I don't know whether you need
18 rulemaking or what's going to be so only you and your staff
19 can determine that.

20 The question of the definition of high-level
21 waste, it was an interesting -- Commissioner McGaffigan's
22 comment. If these canisters contain plutonium, does the
23 statutory definition of high-level waste still cover it?
24 And I am neither an attorney nor an expert on this subject
25 so I think there are a number of things.

1 The transportation I mentioned. The evolving
2 external regulation and oversight of the Department of
3 Energy, however that comes out. And I mentioned the
4 rulemaking for security of fresh fuel reactor sites.

5 This is the kind of little thing that comes up.
6 For example, and it's solvable but every one of these
7 details has to be worked out.

8 I believe the licenses that the utilities and
9 others have do not permit them to use deadly force to
10 protect material but only to protect human beings and the
11 health and safety of the public. I don't -- that's my
12 understanding. Because a lot of their authority to use
13 firearms comes from local law enforcement and so forth, the
14 states.

15 Under DOE rules, the people providing security for
16 nuclear materials can use the deadly force to protect the
17 material. So if we have fresh fuel arriving at a reactor
18 site and it is going to be stored there at least a few days
19 before it goes into the reactor, to what extent can deadly
20 force be used because the difference between MOX fuel and
21 LEU fuel basically is simply that if somebody acquires the
22 MOX fuel, they can chemically separate the plutonium from
23 the uranium matrix. While with LEU fuel, they cannot do it
24 without an enrichment capability, the fissile material.

25 COMMISSIONER McGAFFIGAN: Can I also ask that

1 this -- I had some discussions with former Commissioner
2 Gilinsky about this. You, up to this point, including with
3 the use of the weapons transports, have maintained a stored
4 weapons standard for the fuel.

5 Would the nature or size of the guard force also
6 change for that period of time before the fuel is loaded?
7 You mentioned deadly force.

8 MR. CANTER: At the reactor.

9 COMMISSIONER MCGAFFIGAN: At the reactor. Because
10 the stored weapons standard is something -- I mean, I'm not
11 sure what that means. Maybe you're not sure what it means
12 either but the stored weapons standard strikes me as what
13 you have at defense facilities today and what you will have
14 had up to that point it is delivered at the reactor.

15 So do you have a paramilitary force armed to the
16 teeth ready to take on, you know, some threat?

17 MR. CANTER: This is one of the questions. First
18 of all, much to the surprise of a lot of people, the stored
19 weapons standard does not mean a military escort.

20 CHAIRMAN JACKSON: Right.

21 MR. CANTER: It's an armed escort.

22 COMMISSIONER MCGAFFIGAN: It's a heavily armed
23 escort.

24 MR. CANTER: Well, I can't talk about how heavy or
25 light, not in this forum. But this is an issue.

1 We have allowed for one of the costs in our cost
2 estimate of what it would take to do things at a utility
3 that there would probably be increased security. The
4 utility may require some modification to the location where
5 they store fresh fuel. Some of them, since they are
6 different depending on which reactor you look at, it would
7 depend on which are the ones that win the contract, and if
8 there is added costs we would have to cover that added cost.

9 COMMISSIONER McGAFFIGAN: So that is not a
10 contracting selection criterion. It is something that will
11 be an added cost you just pay when you know it?

12 MR. CANTER: Yes. It -- we wouldn't make that a
13 discriminator in selecting who are the best utilities to
14 carry out whether we have to spend a few dollars here and
15 there for additional guard force.

16 But this is an interesting point and you get into
17 details, Commissioner, that, you know, if the SST arrives at
18 the gate and there is DOE guards and they're armed, can they
19 take it all the way in to the loading dock? And it is all
20 these little details that get very interesting. And if you
21 think it's interesting on that, just try crossing the border
22 to Canada.

23 COMMISSIONER McGAFFIGAN: Right. That was one of
24 the points on Canada.

25 CHAIRMAN JACKSON: Are there questions?

1 Commissioner Rogers?

2 COMMISSIONER ROGERS: No, I don't have any
3 specific questions.

4 CHAIRMAN JACKSON: Commissioner Dicus?

5 COMMISSIONER DICUS: One more question.
6 Presumably, considering the MOX fuel option and the ultimate
7 use of it in a power reactor, some anticipation that the
8 waste stream, the commercial waste stream, low-level waste
9 stream might change, for example the potential that there
10 would be true waste, commercial true waste.

11 Any thought about where that might be disposed?

12 MR. CANTER: Well, you know, our plans are to
13 dispose of true waste at WIPP. That's assuming there is a
14 WIPP.

15 COMMISSIONER DICUS: So it would probably be able
16 then to go to WIPP?

17 MR. CANTER: Yes.

18 COMMISSIONER DICUS: Okay.

19 MR. CANTER: And if there were any -- you know, in
20 the event you have a leak or something like that, and you
21 had a problem with that, that may be one of the conditions
22 we would have to accept in contracting. But you could have
23 plutonium in low-level waste now with LEU fuel. Why would
24 it be different.

25 CHAIRMAN JACKSON: Commissioner Dicus?

1 COMMISSIONER DICUS: I am surprised, I don't have
2 any questions.

3 [Laughter.]

4 CHAIRMAN JACKSON: Commissioner McGaffigan, any
5 further questions?

6 COMMISSIONER MCGAFFIGAN: I just ask one maybe
7 large question. If I am a utility trying to figure out how
8 to bid when you put this out for bid, there is a huge amount
9 of instability. I think we have only touched the tip of the
10 iceberg here today.

11 One of the things I understand will be conditioned
12 is that the utility will have to have an LEU supply
13 available rather than the MOX supply, if we get out of phase
14 with the Russians.

15 A lot of the instability comes from figuring out
16 how to stay in phase with Russians. How does a utility bid?
17 They don't know their security requirements, they don't know
18 when they are going to be asked to put MOX fuel in, they
19 don't know when they will be told, no, don't put MOX fuel
20 in, put LEU fuel in. They are facing a deregulated
21 environment where they are trying to compete.

22 What am I bidding for if I am a utility?

23 MR. CANTER: Well, I can't instruct a utility how
24 to bid because it is going to be a competitive process. But
25 I think a lot of these uncertainties can be eliminated with

1 the proper legislation and, in fact, what I'd like to see is
2 that the thing that drives this engine is an international
3 treaty between us and the Russians. Even legislation is
4 readily changed by the Congress, the Congress giveth; it can
5 taketh away. But the Congress is very reluctant to modify
6 year to year something required by a treaty once they've
7 ratified that treaty.

8 So that would be the best of all worlds and would
9 provide tremendous stability. Nobody said they had to
10 maintain an LEU supply. We don't know that. That may be
11 what some claim. There is a way if things speed up or slow
12 down, and this is another reason for the dual track, that we
13 can handle increases in throughput and decreases in
14 throughput without impacting the utilities and that is use
15 the immobilization alternative for that, which is totally
16 within our control.

17 In other words, we do what utilities always should
18 have done, base load nuclear power plants, don't try to use
19 them for peaking plants and use something else for a peaking
20 plant. That is one of the advantages of the dual track.

21 COMMISSIONER McGAFFIGAN: The other fundamental
22 question, again it goes to the Russians, and maybe a lot of
23 this would be solved by a treaty but it takes us a long time
24 to negotiate treaties and sometimes even longer to get them
25 ratified by two-thirds of the Senate. But if you -- as I

1 understand, a main motivation, from reading all these
2 documents, for choosing the MOX option as opposed to
3 immobilization alone is to try to influence Russian policy
4 and to get them to behave somewhat similarly to us with
5 regard to first consuming their weapons plutonium, not
6 reprocess, et cetera.

7 What conditions are we looking at getting out of
8 the Russians as a result of us really, you know, raising
9 questions about our civil plutonium policy, which we have
10 had for two decades?

11 MR. CANTER: There has been a start of dialogue,
12 which actually had started a couple of years ago in a couple
13 of summits. But it started heating up in April of this past
14 year in the Moscow Nuclear Safety Summit, which addressed
15 this question of plutonium disposition in very broad terms
16 but then called for an experts' meeting in the fall and the
17 experts' meeting occurred in Paris, the end of October. I
18 was a member of that delegation. Eric Newsome from the
19 State Department was the head of the delegation.

20 At that meeting, the United States provided
21 several conditions, nonproliferation conditions on its
22 support of a MOX option in Russia. One was that the spent
23 fuel would not be recycled. In fact, the words were "at
24 least until all the separated plutonium is consumed." The
25 other was that any MOX fabrication capability created would

1 be used only for this mission and that is getting rid of
2 their military plutonium.

3 The Russians tried to resist this very strongly.

4 COMMISSIONER McGAFFIGAN: With the help of the
5 Europeans, as I understand it.

6 MR. CANTER: Well, the French supported them. But
7 others were on our side so it came out sort of a compromise
8 that this is a statement written into the record by the
9 United States and we have made it very clear to the other
10 nations that we are standing by this position.

11 One of the things that we feel very strongly about
12 is that the Russians will -- at best probably will
13 immobilize a small portion of their plutonium and then it
14 would only be the material that is of lesser value, but that
15 they feel very strongly that they have spent their national
16 treasure creating it and they want to get some economic
17 value back.

18 If we are going to play a role in dictating how
19 that's done, then we are going to have to be in that arena
20 and that's another reason for the dual track strategy.

21 COMMISSIONER McGAFFIGAN: The heart of my question
22 was, given that meeting and given the degree to which we
23 were isolated on some of these points, what if we don't get
24 any of those conditions and yet we end up with MOX in our
25 plants in this country? So we end up -- I can see a

1 negotiation where we end up with the worst of all possible
2 worlds, where we are on a MOX track at least for part of our
3 program, the Russians are on a major MOX track with no
4 constraints and the Europeans, who have opposed our policy
5 on plutonium and reprocessing and MOX fuel for civilian
6 purposes are cheering from the sidelines and claiming that
7 we have -- am I creating a negotiating possibility that is
8 unlikely?

9 MR. CANTER: I think what you are missing is the
10 fact that we are not going to have any MOX fuel in our
11 reactors for eight or nine years.

12 COMMISSIONER MCGAFFIGAN: Right.

13 MR. CANTER: If we can't get a deal negotiated
14 with the Russians in eight or nine years, then I don't think
15 we are going to do anything with our plutonium but store it.
16 And I am very serious about that.

17 COMMISSIONER MCGAFFIGAN: Right.

18 MR. CANTER: Because we will never be able to sell
19 up on the Hill spending a lot of money to do something with
20 ours unilaterally.

21 CHAIRMAN JACKSON: On that note, I want to thank
22 you very much, Mr. Cantor and Mr. Nulton. This has been a
23 very informative briefing on a subject that clearly has both
24 national and international significance inasmuch as it
25 involves the balance of views, what some would view as a

1 change in U.S. civil plutonium policy an balancing that
2 against clear nonproliferation goals.

3 The Commission recognizes the Administration's
4 view of the importance of this program to this country as
5 well as to other nations around the world and the need to
6 successfully address the broad goals and objectives of the
7 program. And, as such, you know, the issues are complex and
8 the Commission itself is beginning to think about how it
9 should respond and prepare for the potential for change. So
10 that if, in fact, this program proceeds that it succeeds in
11 the sense of progressing the right way.

12 So the Commission would request, and this is
13 consistent with your own suggestion, that you keep an open
14 line of communication with the NRC staff on these activities
15 and this is necessary because of the technical issues, some
16 of which you have raised, funding issues as well as any
17 legal ones that maybe need to be addressed, including
18 enabling legislation.

19 And if a joint working group or task force is to
20 be established, it would need to be addressed, we believe,
21 in a memorandum of understanding which folds in aspects of
22 initiatives already under way with DOE with respect to the
23 high-level waste geologic repository, the Hanford tank waste
24 activities as well as any activities we are beginning with
25 DOE regarding external regulation of DOE nuclear facilities.

1 So, again, I think that is the track that would
2 make sense. So, again, the Commission would like to thank
3 you for taking the time to come and brief us on what we both
4 obviously agree is a very important subject.

5 MR. CANTER: Thank you.

6 CHAIRMAN JACKSON: We are adjourned.

7 [Whereupon, at 4:07 p.m., the briefing was
8 adjourned.]

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CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING BY DOE ON PLUTONIUM
DISPOSITION - PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Monday, January 27, 1997

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Christopher Cutchall

Reporter: Christopher Cutchall

***Briefing to the Nuclear Regulatory Commission
on the Storage & Disposition of
Fissile Materials Record of Decision***



DRAFT

DRAFT

Thomas Grumbly
Under Secretary, Department of Energy

Howard Canter
*Acting Director, Office of Fissile Materials
Disposition*

January 27, 1997



Agenda

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- **Background**
- **Record of Decision (ROD)**
- **Implementation approaches**
- **Future interaction with NRC**
- **Clarification of regulatory responsibilities**



Problem to Solve

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- What to do with fissile materials surplus to national security requirements?
 - Approximately 174 metric tons of highly enriched uranium (HEU)
 - Approximately 50 metric tons of plutonium

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Decisions Made

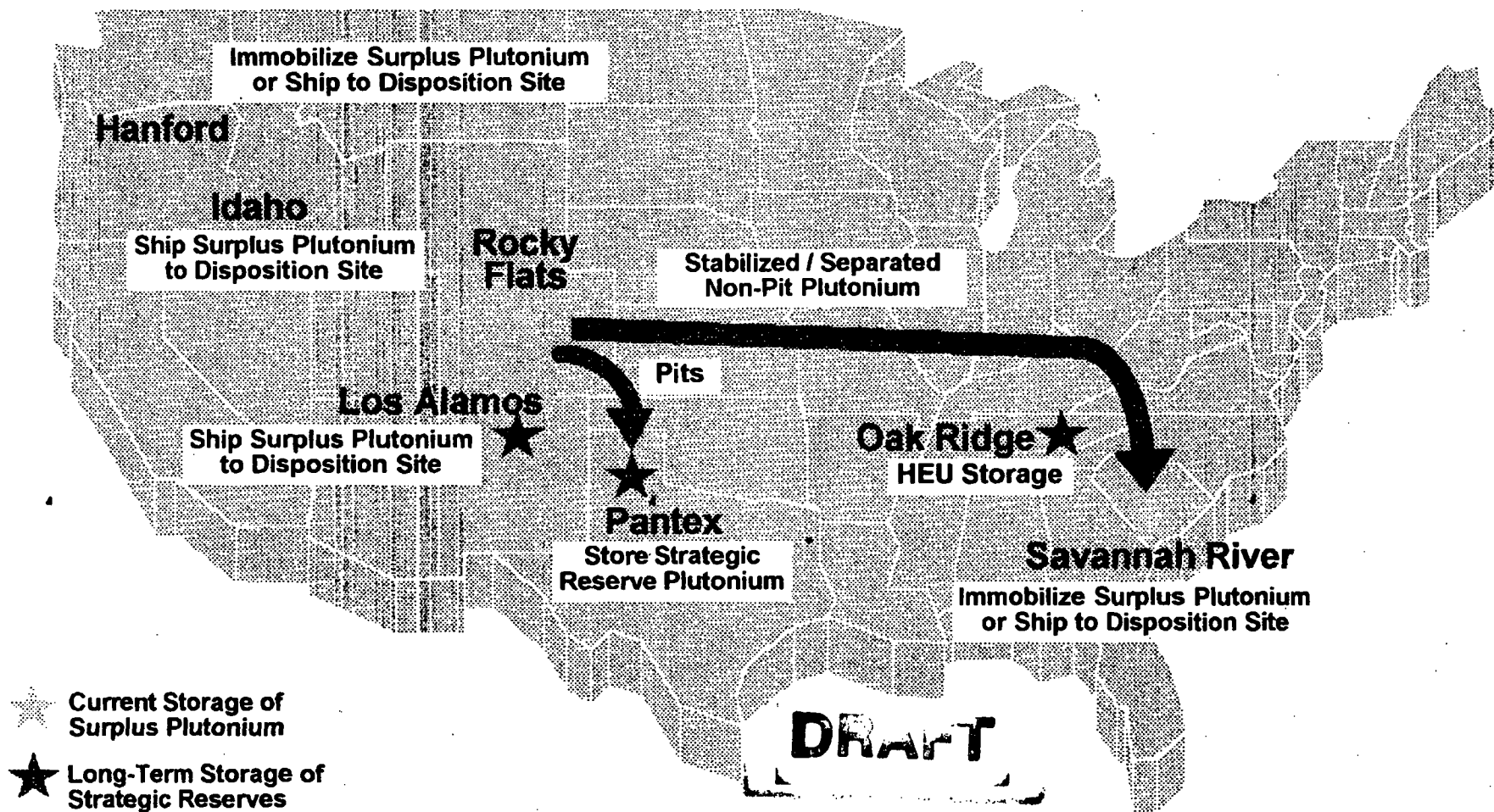


- **Locations for storage of plutonium and highly enriched uranium**
- **Technologies for plutonium disposition**

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DRAFT Storage of Plutonium & Highly Enriched Uranium





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Plutonium Disposition

- **Approaches**

- Immobilization *(will be used for a minimum of 8 metric tons of the surplus plutonium that are undesirable for use in MOX)*
- MOX/Reactor Burning *(approach would be undertaken consistent with U.S. nonproliferation policy objectives)*

- **The timing and extent to which either or both approaches are ultimately deployed will depend on follow-on work**

- Technical
- Cost
- Institutional
- International

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Dual Track Strategy

Dismantle Nuclear Weapons

Store Nuclear Material & Components

Convert Nuclear Material Components & Prepare Materials

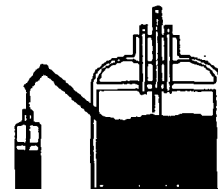
**Mixed Oxide Fuel
for Burning in
Existing Reactors**

**Immobilization in
Glass or Ceramic**

**Spent Nuclear
Fuel**

**Vitrified High Level
Waste Canister**

Geologic Repository



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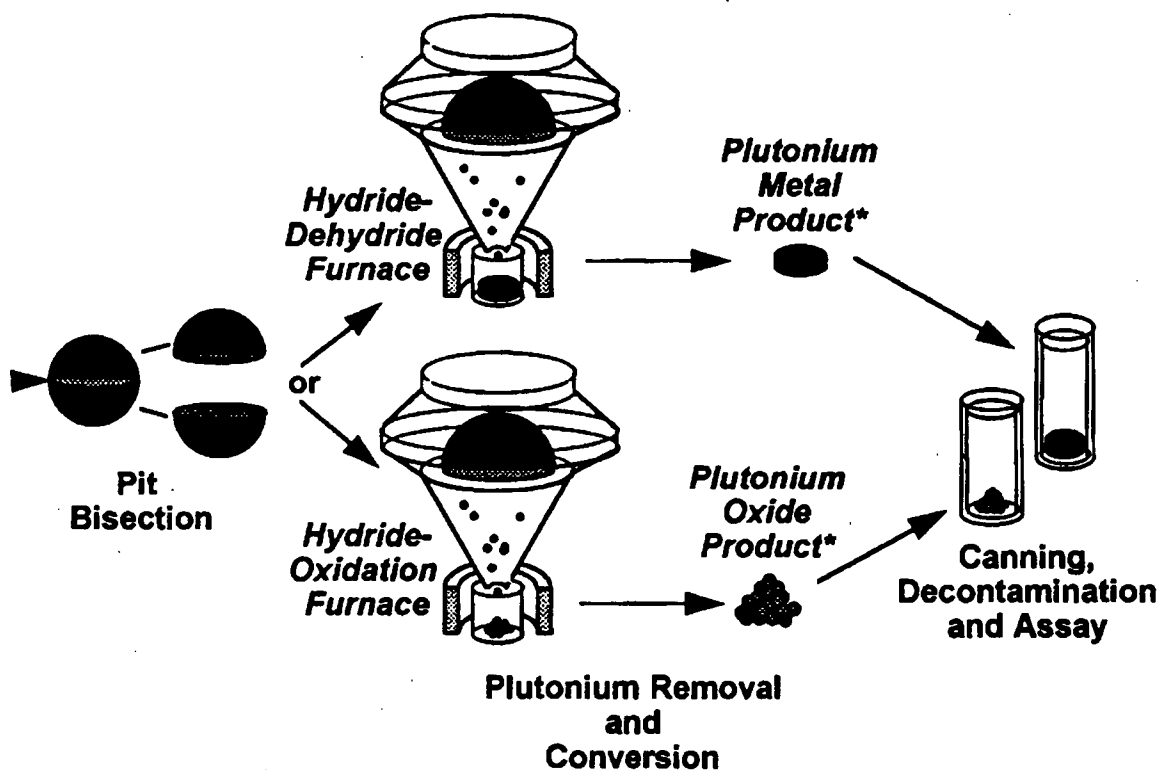
Plutonium Conversion and Extraction

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- **Form needed for plutonium disposition: oxide**
- **Most plutonium inventory in “pits”**
 - Dry chemical process being developed to extract plutonium as plutonium oxide
- **Significant plutonium quantities in other forms**
 - Extraction of plutonium depends on existing form and disposition alternative
 - Significant purification of plutonium oxide for fuel

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ARIES - Pit Processing

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* The plutonium metal will be recast in a furnace and the plutonium oxide mixed to mask classified information.

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Excess Weapons Grade Plutonium (MT)

September 30, 1994

LOCATION	METAL	OXIDE	REACTOR FUEL	IRRADIATED FUEL	OTHER FORMS	TOTAL
Pantex/ Dismantlements	21.3	—	—	—	—	21.3
Rocky Flats	5.7	1.6	—	—	4.6	11.9
Hanford Site	<0.1	1.0	—	0.2	0.5	1.7
Los Alamos	0.5	<0.1	<0.1	—	1.0	1.5
Savannah River	0.4	0.5	—	0.2	0.2	1.3
INEL	<0.1	—	0.2	0.2	<0.1	0.4
Other Sites	<0.1	—	—	<0.1	<0.1	0.1
TOTAL	27.8	3.1	0.2	0.6	6.4	38.2

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Excess Non-Weapons Grade Plutonium (MT)

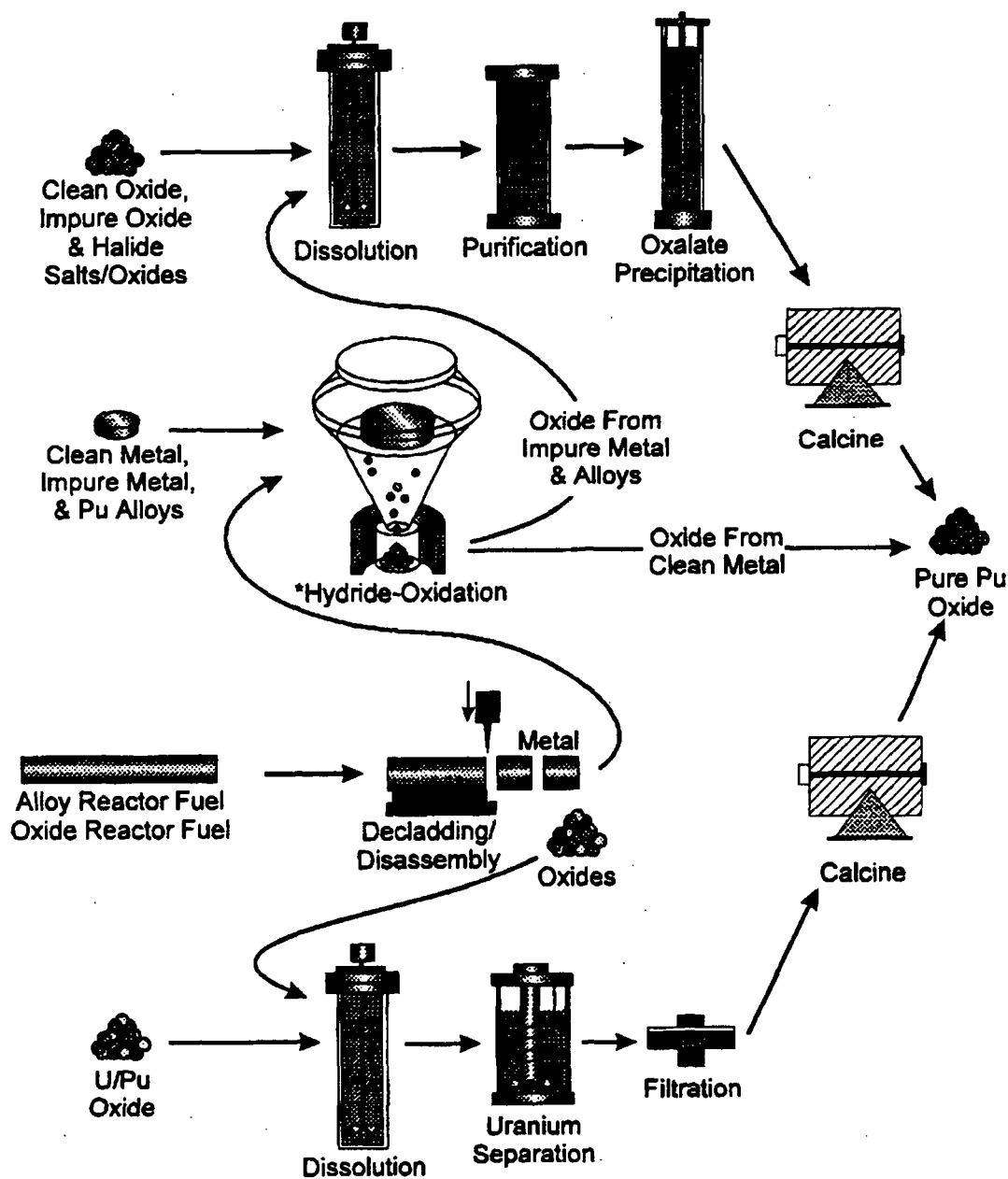
September 30, 1994

LOCATION	METAL	OXIDE	REACTOR FUEL	IRRADIATED FUEL	OTHER FORMS	TOTAL
Hanford Site	0.8	1.1	0.8	6.4	0.2	9.3
Los Alamos	0.1	—	<0.1	—	0.3	0.4
Savannah River	0.1	0.2	<0.1	0.1	0.2	0.6
INEL	—	—	—	0.3	<0.1	0.3
ANL-West	<0.1	—	3.6	<0.1	—	3.6
Other Sites	<0.1	<0.1	<0.1	0.1	<0.1	0.1
TOTAL	1.0	1.3	4.4	6.9	0.7	14.3

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Reactor Nonpit Processing

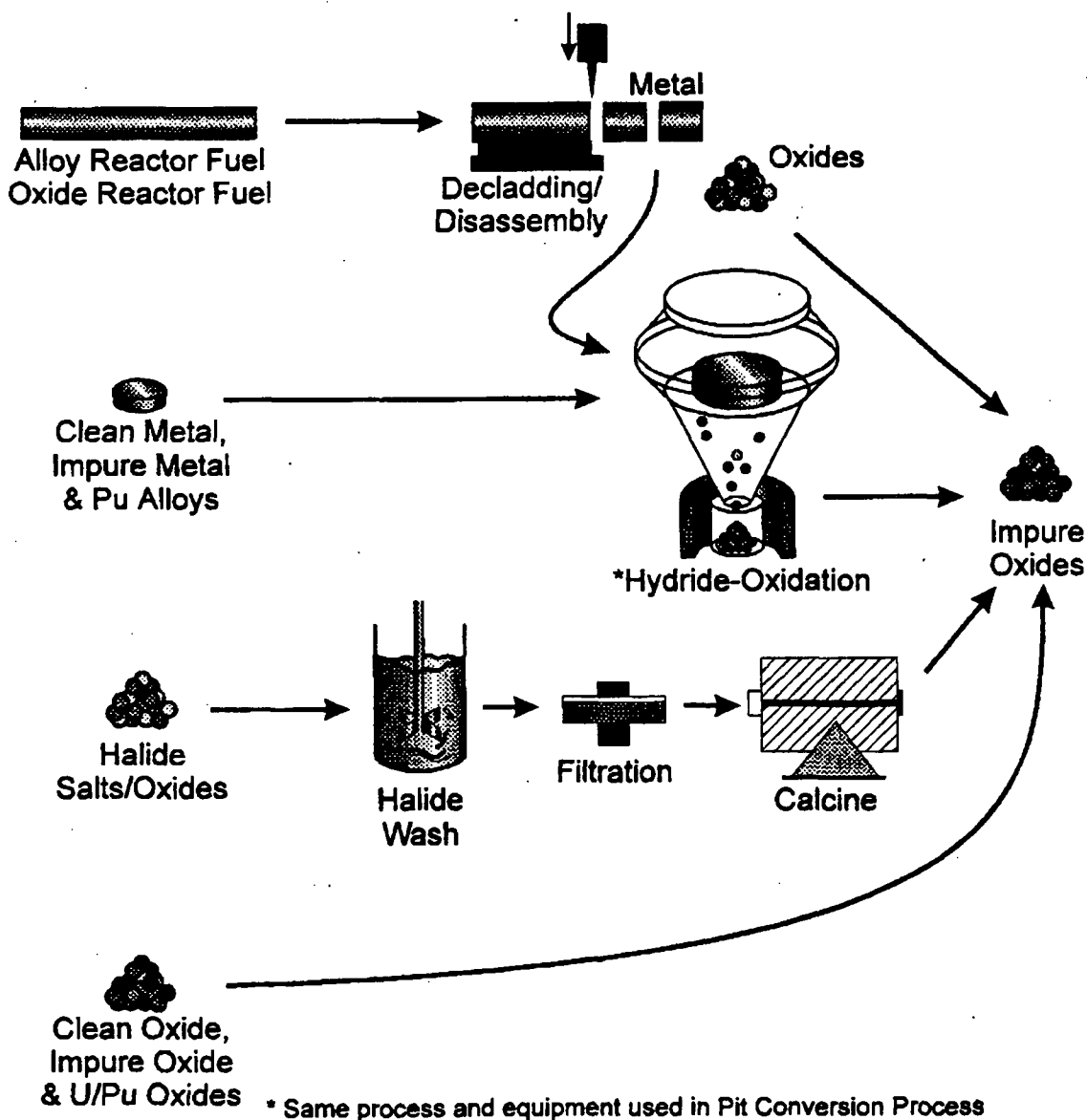


* Same process and equipment used in Pit Conversion Process

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Immobilization Nonpit Processing

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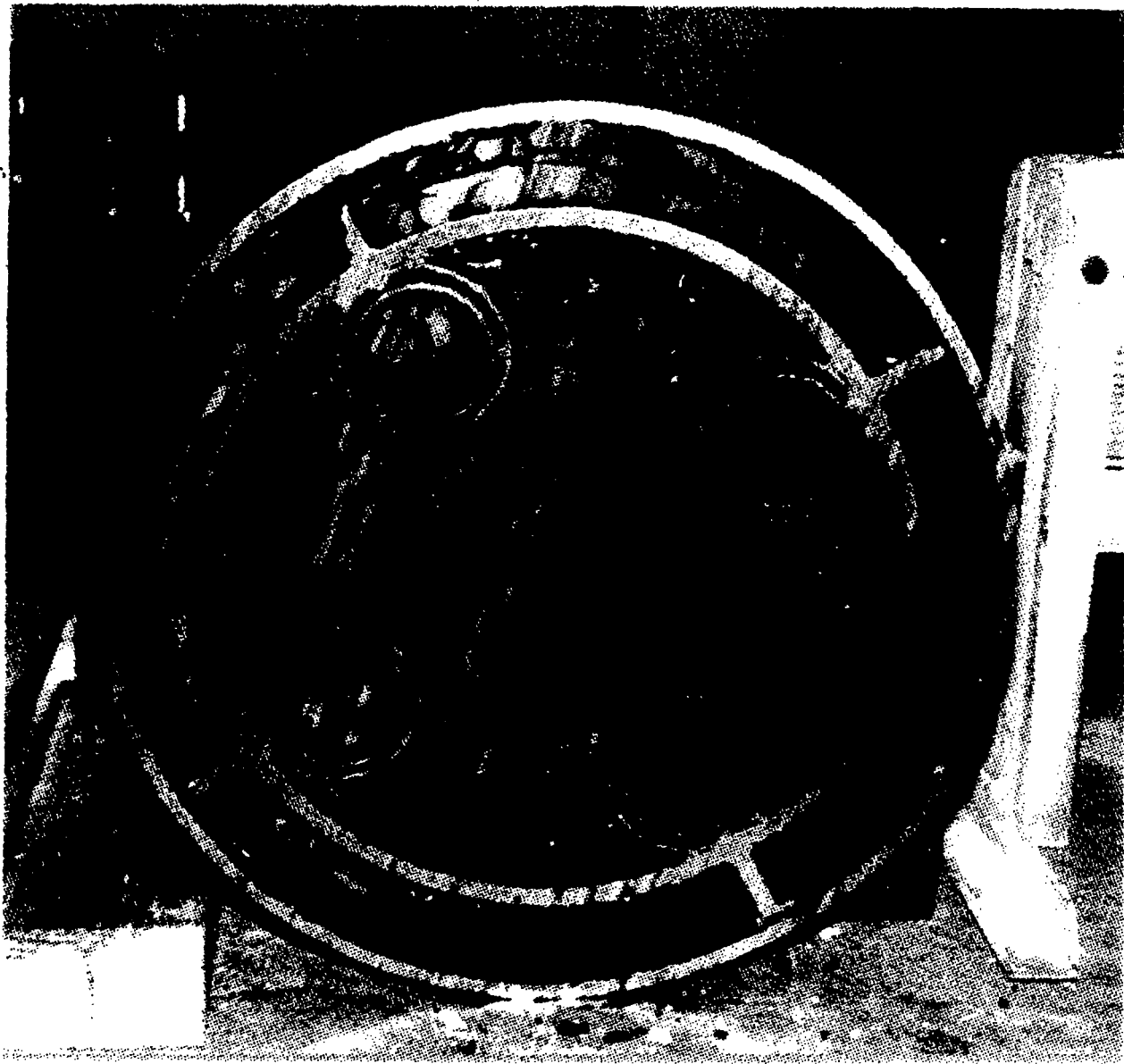
Immobilization

["can-in-canister"]

.....

- **Plutonium dissolved into ceramic or glass matrix within small cans**
- **Cans emplaced in Savannah River Site's Defense High Level Waste (HLW) canisters**
- **Canisters then filled with HLW glass**

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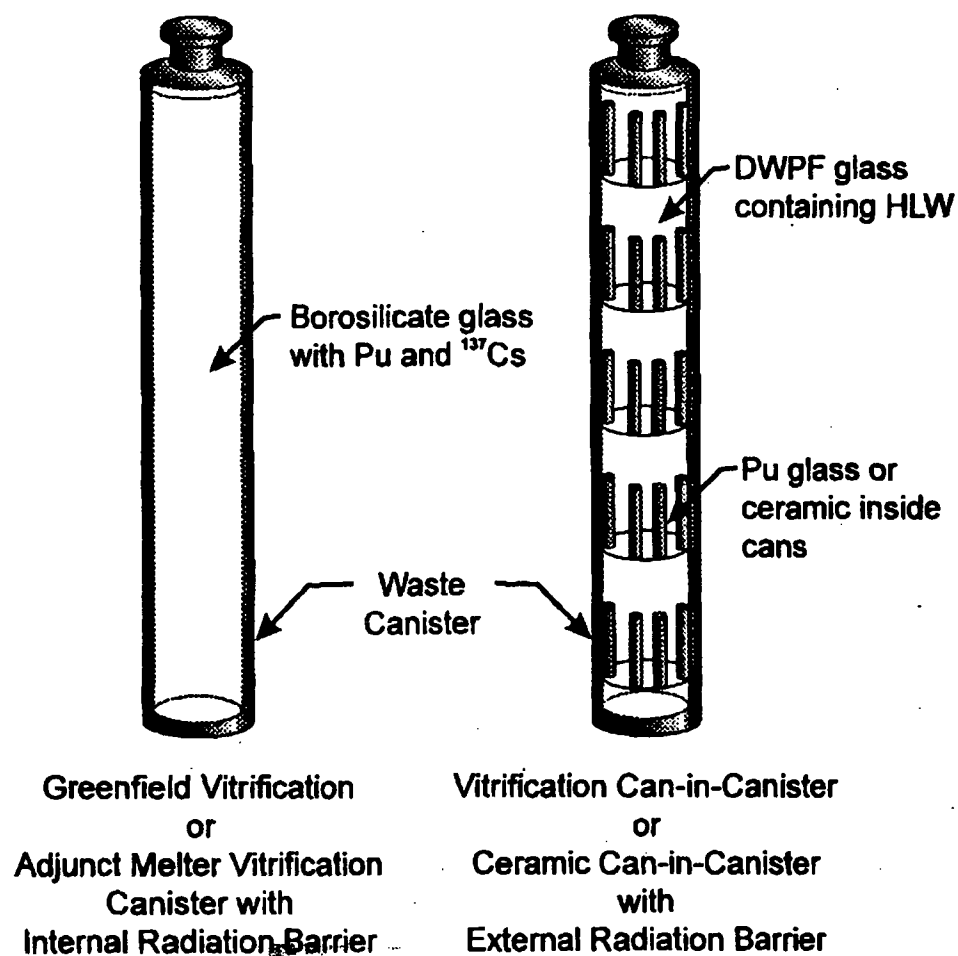
DRAFT**"Cold" Can-in-Canister Demonstration**

Sectioned DWPF canister revealing small cans of surrogate plutonium glass surrounded by simulated HLW glass

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Canister Comparison



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DRAFT **Reactors**

- **Mixed oxide (MOX) fuel replaces low enriched uranium fuel in commercial light water reactors**
- **Requires MOX fuel fabrication facility**
- **May burn MOX fuel in CANDU reactors in the event of an appropriate agreement among: Russia, Canada, and United States**

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Conditions for Mixed Oxide (MOX) Fuel Alternative

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- **No reprocessing -- *“Once-through” fuel cycle***
- **Government-owned facility & site**
- **MOX fuel use limited to surplus plutonium disposition**
- **International inspection/verification**
- **Finite nonproliferation mission -- shutdown upon completion**

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Siting of Disposition Facilities

- **Decisions will be based on site and facility specific environmental review to be completed by early 1998:**

Disposition Facilities

Immobilization (*including plutonium conversion capability*)

Mixed Oxide Fuel Fabrication

For either approach:

Pit Disassembly/Conversion

Candidate Sites

Hanford, Savannah River*

Hanford, Idaho, Pantex, Savannah River

Hanford, Idaho, Pantex, Savannah River

* *Preferred Alternative will be to use "can-in-canister" approach at Savannah River's Defense Waste Processing Facility*

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Facilities and Functions Potentially Involving NRC Actions

- **Reactors: Clear NRC authority already**
- **MOX fuel facility**
 - NRC license desired
 - DOE ownership issue to resolve?
- **Transportation:**
 - By safe, secure trailers
 - Future regulatory/oversight unclear

- **Pit disassembly**
- **Plutonium conversion**
- **Immobilization**



Evolving Framework

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NRC Engagements

- Possible export permit for CANDU reactor test fuel (~2 months)
- Initiation of reactor license modifications (2-3 years)
- Initiation of application for MOX fuel plant license (~ 2-3 years)
- Possible use of European fuel suppliers for short term (3-5 years)

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Clarification of Statutory Requirements

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- **Need to establish a joint working group for clarifying regulatory responsibilities**
- **Examples of uncertainties are:**
 - **Definition of high level waste**
 - **Transportation of plutonium or MOX fuel using safe, secure trailers**
 - **Evolving external regulation and oversight approaches**
 - **Rulemaking for security of fresh fuel at reactor sites**

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Conclusions and Summary

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- **DOE intends to move forward quickly to implement decisions**
- **NRC will be involved in many ways**
- **Recommend a team to clarify regulatory responsibilities**

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