

[Briefing Charts]

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1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

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4 OFFICE OF THE SECRETARY

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6 BRIEFING BY DOE ON
7 PLUTONIUM DISPOSITION PROGRAM AND
8 MOX FUEL FABRICATION FACILITY LICENSING

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10 PUBLIC MEETING

11
12 Nuclear Regulatory Commission
13 One White Flint North Bldg 1, Room 1F-16
14 11555 Rockville Pike
15 Rockville, Maryland

16
17 Monday, November 27, 2000

18 The Committee met in open session, pursuant to
19 notice, at 9:35 a.m., the Honorable RICHARD A. MESERVE,
20 Chairman of the Commission, presiding.

21 COMMISSIONERS PRESENT:

22 RICHARD A. MESERVE, Chairman of the Commission
23 NILS J. DIAZ, Member of the Commission
24 EDWARD McGAFFIGAN, JR., Member of the Commission
25 JEFFREY S. MERRIFIELD, Member of the Commission

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1 STAFF AND PRESENTERS:

2 FRANK MIRAGLIA, Deputy EDO
3 KAREN D. CYR, General Counsel
4 ANNETTE L. VIETTI-COOK, Assistant Secretary
5 LAURA HOLGATE, Director, DOE Office of Fissile
6 Materials Deposition (OFMD); Acting Director,
7 Office of Defense Nuclear Nonproliferation
8 ED SISKIN, DOE Deputy Director, OFMD
9 DAVID NULTON, DOE Director, Reactors Group, OFMD
10 JAMIE JOHNSON, DOE/OFMD
11 PATRICK RHOADS, DOE/OFMD
12 JON THOMPSON, DOE/OFMD
13 ED BRABAZON, DCS
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1 P R O C E E D I N G S

2 [9:05 a.m.]

3 CHAIRMAN MESERVE: We are here this morning to
4 hear from the United States Department of Energy and the
5 National Nuclear Security Administration on the disposition
6 of plutonium and enriched uranium. These materials of
7 course are materials that are subject to DOE's purview as
8 part of its weapons-related activities and as such are not
9 subject to NRC jurisdiction.

10 As part of the process for disposition, however,
11 there is going to be some involvement of NRC and NRC license
12 facilities, so our briefing this morning is to provide an
13 opportunity for DOE to explain the various activities that
14 it envisions in this area over the coming years.

15 I am going to turn the meeting over to Laura
16 Holgate, who is the Director of Office of Fissile Materials
17 Disposition, and why don't you introduce your colleagues.

18 MS. HOLGATE: Very good. Thank you, Mr. Chairman.
19 I appreciate the chance to come and give an update on our
20 program here.

21 In terms of who you see on this side of the table,
22 you have my Deputy, Ed Siskin and Dave Nulton, who is the
23 Director of our Reactors Group and two members of Dave's
24 staff focusing on our Mox Activities, Pat Rhoads and Jamie
25 Johnson --

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1 CHAIRMAN MESERVE: Good morning.

2 MS. HOLGATE: We are very glad to be here.

3 CHAIRMAN MESERVE: Good. Thank you very much.

4 Why don't we proceed? I know that you have some
5 slides that you have presented and our customary practice is
6 to walk through the slides and then the Commissioners will
7 ask questions after the completion of the presentation.

8 MS. HOLGATE: Very good.

9 As I said, I very much appreciate the chance to
10 have -- to bring this group up to date on our activities.
11 This is my first briefing before this august group, but you
12 have been involved in a long history of positive
13 interactions at the Staff level and also in other briefings
14 by my predecessors on this program and so I think there's a
15 long history of good work together on this effort.

16 One of the key goals that we have in our

17 interactions with the NRC is to support your authority, both
18 the legal and the moral authority, to regulate these
19 activities safely, at the same time meeting our national
20 security priorities and schedules and I think those are two
21 goals that we can pursue simultaneously in very good
22 connection.

23 I would like to just say a couple words about some
24 of your Staff who have been very good colleagues in working
25 with us over the last few years, particularly Drew Persinko,

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1 Janis Dambly, Melanie Galloway and Mike Weber are certainly
2 well known to us and have been very productive cohorts in
3 this.

4 Just a brief outline of our presentation for this
5 morning.

6 We will talk a little bit about program
7 objectives, touch very briefly on our off-specification
8 highly enriched uranium activities but focus primarily on
9 plutonium, first looking at our bilateral agreement with
10 Russia, giving you a summary of that, and then turning to
11 U.S. plans to implement its commitments under that bilateral
12 agreement. Next slide, please.

13 Our program objectives have been fairly stable
14 over the last few years and have three basic goals -- first,
15 to dispose of 174 metric tons of surplus U.S. highly
16 enriched uranium coming out of our weapons programs;
17 secondly, to dispose of 50 metric tons of surplus U.S.
18 plutonium -- this is both weapons grade and non-weapons
19 grade -- but that all comes out of the weapons programs; and
20 finally, working with Russia to dispose of their surplus
21 plutonium.

22 It is really that last piece that keeps our eyes
23 all focused on the fact that this is a national security and
24 a nonproliferation mission here.

25 Our goal is not that we are so worried about the

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1 safety and security of U.S. materials but to use our
2 activities in connection with the U.S. materials to
3 instigate activities in Russia that will result in a safer
4 and more secure environment for their fissile materials in
5 Russia. Next slide, please.

6 The NRC is involved in these activities in a
7 number of ways.

8 First of all, on the highly enriched uranium, most
9 of our highly enriched uranium activities are fairly
10 transparent, that's blended down to low enriched uranium
11 uses, fuel and NRC-regulated reactors all over the country.

12 There is small amount of off-specification
13 material however that will be used at TVA, where there will

14 need to be a license modification. We will talk a little
15 bit about that in a minute.

16 On the plutonium side, there are several elements
17 of the MOX set of activities on fuel fabrication,
18 qualification, utilization, packaging and transportation
19 where the NRC has very strong roles. Next slide, please.

20 On the international front, the NRC has
21 interactions -- both a very strong role with the IAEA and
22 one of the things we have been particularly grateful for is
23 their participation in a regulatory working group we have
24 established with Russia under the 1998 Scientific and
25 Technical Cooperation Agreement, and many of our main

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1 interlocutors there are with the Gotsadanadzor whose future
2 we are all watching very carefully at this point. That will
3 be an important issue to watch, but that has been one of our
4 ways to interact with them. Your team's participation in
5 that has been very helpful.

6 Turning to the off-spec projects, off-spec HEU, as
7 you know, there has been several years of cooperation or
8 conversations anyway with the Tennessee Valley
9 Administration to utilize this material as fuel in their
10 reactors. We are just about to conclude an interagency
11 agreement that will cover 34 metric tons of off-spec HEU.
12 This is the majority of off-spec. We may add some
13 additional tons to this as it is characterized in more
14 detail in the future but this gives us the baseline of what
15 we are going to do and this will result in some of the
16 material being processed at Savannah River prior to being
17 transferred to TVA vendors for fuel fabrication and the
18 majority of the material however will be transferred
19 directly to TVA vendors.

20 You will be hearing directly from TVA on the
21 licensing issues associated with inserting this fuel in
22 their reactors.

23 COMMISSIONER MERRIFIELD: Mr. Chairman, if I may,
24 could you just define what you mean by "off-specification"
25 just for the benefit of our audience and for me?

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1 MS. HOLGATE: Sure. It has mostly to do with
2 isotopics and let me turn to Dave --

3 MR. NULTON: Yes. The primary isotopic
4 contaminant in there is U-236, not a lot but enough that it
5 puts it over the specification for commercial reactor fuel,
6 so in our agreement with TVA they have said they can through
7 blending and so forth they can blend that down to a
8 manageable level.

9 They have to up the enrichment a bit to use it in

10 their reactors but it is still below 5 percent and they feel
11 that they can use it.

12 COMMISSIONER MERRIFIELD: And I am sorry to do
13 this, but just so it is clear again for our audience,
14 there's nothing inherently dangerous about the fact that it
15 is off-spec?

16 MS. HOLGATE: No.

17 COMMISSIONER MERRIFIELD: That it is off-spec for
18 the purposes of --

19 MS. HOLGATE: It is off-spec for the purposes of
20 normal fuel fabrication, but it is not off-spec for the
21 purposes of normal fuel fabrication, but it is not off-spec
22 from the basics of safe reactors.

23 COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.

24 MS. HOLGATE: As I mentioned, there will also need
25 to be some new containers that will require NRC

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1 certification.

2 Turning now to the main topic before us of
3 disposing of plutonium coming out of weapons programs and
4 dealing with the non-proliferation risk associated with
5 that, over the last 18 months -- actually, it is closer to
6 two years now -- the U.S. and Russia have been engaged in
7 very intensive negotiations, kicked off by Summit statements
8 in the fall of '98 that pledged both countries to develop as
9 quickly as possible a bilateral agreement specifying exactly
10 how each country will separately and together eliminate
11 their excess weapons plutonium.

12 In June's Moscow Summit we were very pleased to be
13 able to announce that that negotiation had been concluded
14 and that it was signed after a few bureaucratic internal
15 maneuverings within Russia, it was ultimately signed and
16 went into effect on September 1st, 2000.

17 I will just point out that it is being ratified in
18 Russia by the Duma. It will not be ratified by the U.S.
19 Senate, as it is an Executive agreement and not a treaty,
20 but it is going through a ratification process in Russia
21 because of some of the tax protection language that will be
22 insisted upon, but we have a very clear explanation that it
23 is to be provisionally applied pending that ratification and
24 therefore it is in full effect as of this time, even though
25 it is not yet ratified in Russia. We don't expect there to

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1 be any problems with that ratification process. Next slide,
2 please.

3 The key provisions of this agreement focus on 34
4 tons of weapons grade plutonium from weapons programs.
5 There are two techniques embedded in the agreement for
6 disposition, irradiation as MOX fuel in reactors and

7 immobilization with high level radioactive waste. There is
8 provision in the agreement for the two sides to agree to
9 additional techniques if those are developed and agreed
10 upon, but for the moment these are the two approaches that
11 are approved.

12 The U.S. will be pursuing what we call our hybrid
13 strategy, which I will talk to in more detail in a moment,
14 where 25.6 metric tons out of our 34 will be irradiated as
15 MOX and I looked at this -- I apologize. The chart should
16 say "immobilization" -- MOX is obviously irradiation.
17 Immobilization is 8.4 metric tons.

18 I should say a word or two about the 34 tons
19 because the Summit statements and various public statements
20 have been made that talk about 50 tons of material.

21 The U.S. does in fact have 50 tons of excess
22 material when you combine weapons grade and non-weapons
23 grade, when you combine very dilute materials with the
24 plutonium that is already -- that is still in weapons.

25 The Russians were very clear when we began the

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1 negotiations with them that they would match us quality for
2 quality with our material and if we insisted upon putting
3 all of our non-weapons grade and very dilute low-quality
4 materials under the agreement that they would do the same
5 with theirs and it would essentially become an environmental
6 agreement rather than a nonproliferation agreement, so we
7 agreed to focus on the amount of material that we both had
8 that was actual weapons grade material and that the U.S. had
9 34 tons of that, and so that is where the 34 tons came from.

10 We consider this a first step towards the pledges
11 of 50 tons and it gives us a chance to get the
12 infrastructure in place to get the monitoring and
13 inspections provisions in place to begin to eliminate this
14 material and then to add more material later. Next slide,
15 please.

16 The U.S. and Russian programs are established in
17 this agreement to proceed in rough parallel. There is a
18 series of milestones in leading through the design and
19 construction phase and approval phase of these facilities
20 that commits both sides to begin operating their industrial
21 scale facilities by the end of 2007.

22 The goal is a disposition rate of two metric tons
23 of plutonium per year and there is a pledge in the agreement
24 that the sides must work together to develop a plan to be
25 able to double that disposition rate, at least double that

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1 disposition rate within a year of signing. Now obviously
2 that is -- the plan needs to be developed within a year of

3 signing, not the actual disposition doubling.

4 We are in very intensive negotiations right now
5 with other countries and doing a fair amount of R&D; to
6 identify mechanisms by which that disposition rate can be
7 doubled in Russia. The U.S. program is sized to be able to
8 handle roughly four metric tons annually of weapons material
9 plus an additional amount of non-weapons grade material.

10 Bilateral monitoring and inspection procedures are
11 obviously a key element of such an agreement. We need to be
12 sure that the Russians are in fact disposing of the material
13 that is of the quality that is intended by the agreement,
14 that they are keeping to the milestones that they have
15 pledged to and that they are using the facilities only for
16 disposition missions or for other missions that don't
17 conflict with the spirit or the progress of disposition.

18 The agreement that was signed in September
19 includes a set of principles on which those monitoring and
20 inspection agreements will be determined but because the
21 facilities are still early enough in their design, we were
22 not able to get into the kind of detail surrounding how many
23 inspectors would show up on which day and stay for how long
24 and take what kind of measurements and so on. That is set
25 for a separate follow-on negotiation that is to be concluded

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1 within a couple of years, and in fact there is a commitment
2 in the agreement that the U.S. will not provide any funds to
3 help Russia begin construction if we have not concluded that
4 follow-on bilateral monitoring and inspections agreement.

5 The other thing I should point out about
6 monitoring and inspections is that the agreement definitely
7 plans for an IAEA role and there is agreement between U.S.
8 and Russia that it will not be full up safeguards but
9 probably something short of that but exactly what forum is
10 used to negotiate that agreement and what the level of
11 safeguards will be is yet to be agreed between U.S. and
12 Russia and then agreed with IAEA, so there is a commitment
13 to begin negotiations with the IAEA jointly soon after.
14 Next slide, please.

15 One of the important aspects of this agreement is
16 to make sure that at the same time that we are eliminating
17 or transforming this material into a form unattractive for
18 weapons use that it is not simultaneously being separated
19 back into forms that are attractive. This was a tough point
20 with the Russians. Obviously they believe in the closed
21 fuel cycle and they perceive plutonium to be an asset and a
22 value not a burden to be managed, and what we were able to
23 do is to obtain their agreement that there would be no
24 separation of any of the plutonium, any of the 34 tons of
25 plutonium that is covered by this agreement during the time

1 that that 34 tons is being eliminated and any subsequent
2 reprocessing, which would only be on the Russian side
3 obviously of irradiated MOX fuel that stems from this
4 agreement would be subject to mutually agreed monitoring
5 measures, which we have told the Russians will be full up by
6 IAEA safeguards, that they should have no mistake about
7 that.

8 COMMISSIONER DIAZ: Excuse me, Ms. Holgate.
9 Disposed means until they all have been placed through a
10 reactor?

11 MS. HOLGATE: Correct and achieved the spent fuel
12 standard.

13 COMMISSIONER DIAZ: Dispositioned?

14 MS. HOLGATE: Dispositioned, yes.

15 I tend to use those words interchangeably. I
16 don't intend any difference in meaning between the two.

17 The commitment is further that immobilized
18 plutonium may never be separated.

19 This was another sticking point with the Russians
20 because they have long believed and continued to assert that
21 immobilization is not an effective disposition technique
22 because it does not have any isotopic transformation of the
23 plutonium. It remains weapons grade and that one could --
24 if one needed to -- re-obtain that material, gather it back
25 from the immobilized form. We have made powerful arguments

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1 to the contrary and in fact have told them there is, for the
2 form the U.S. will be using for immobilization there is no
3 known separation technique and that it would be very
4 challenging and we have certainly no intent to do this.

5 We were ultimately able to get them to agree to
6 immobilization as an approved technology but only for that
7 material that is not the highest quality -- in other words,
8 material that is in oxide form as opposed to currently being
9 in pit form, but we will not separate that, obviously.

10 One of the things that the Russians made clear,
11 again coming back to the differences envisioned between the
12 U.S. and the Russians on the value of plutonium and its role
13 in the fuel cycle, is that they would only proceed down this
14 path if they received support from the U.S. and the rest of
15 the Western communities and therefore the agreement includes
16 U.S. assistance to provide near-term financial assistance on
17 the order of \$200 million, as described in the agreement.
18 The President made a pledge in January of '99 of a total of
19 \$400 million and we are working very closely with European
20 colleagues to identify additional sources of multilateral
21 assistance leading towards an agreement at the next G8

22 Summit in Genoa of exactly what those pledges will be.

23 We have been gratified that in addition to the \$30
24 million plus that Japan had pledged in 1999, recently
25 England, the UK, pledged an additional \$100 million and

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1 France indicated it will be providing -- ready to consider
2 providing up to \$60 million and so we are slowly getting
3 there. Hopefully we will be able to describe our Genoa G8
4 meeting as a success in approaching about a billion dollars
5 of necessary capital costs to support the Russia program
6 based on current estimates.

7 COMMISSIONER DIAZ: That is \$200 million per year?

8 MS. HOLGATE: No, sir, \$200 million total, with an
9 additional \$200 million from a collection of annual
10 appropriations from 2000, fiscal year 2000, through 2004, so
11 we are about half-way through that second \$200 million.

12 The other key point, as we look to the future on
13 this agreement, is that we codified in writing that any
14 additional plutonium added to this agreement need not be on
15 a reciprocal basis. The Russians certainly have not yet
16 accepted this point in reality. They were willing to have
17 it be reflected in the agreement as a statement but they
18 continue to say that they will only come down at the same
19 amount that we're coming down. Given that they started with
20 about 50 percent more than we did, this will obviously lead
21 to unequal levels, if we proceed with equal reductions, so
22 one of our major challenges over the next 15 years as we
23 work through the 34 tons is to identify ways to get them to
24 eliminate more without the U.S. having to go below levels
25 that it may consider what we require for our strategic

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1 needs.

2 Given the number of changes we have seen over the
3 last 10 years, I am certainly humble enough to suspect that
4 we will have significant changes over the next 15, perhaps
5 even enough to change the Russians' minds about closed fuel
6 cycles and so on, so we may -- that may be more likely in
7 the future than it is today.

8 So with that summary of the bilateral agreement,
9 that sets the stage for the heart of our discussion today of
10 how is the U.S. going to meet its commitments as embodied in
11 this agreement.

12 We will be pursuing, as I indicated earlier, a
13 hybrid strategy that has two elements, immobilization, where
14 we immobilize the plutonium oxide with ceramic material
15 surrounded by vitrified high level radioactive waste and the
16 second technique will be through manufacture of MOX and
17 irradiation in reactors as in existing domestic commercial
18 reactors.

19 The key of both of these technologies is to meet
20 the spent fuel standard, to make the surplus plutonium as
21 inaccessible and unattractive for retrieval in weapons use
22 as the residual plutonium and spent fuel from commercial
23 reactors that it currently resides in in fuel pools
24 throughout the country and in fact throughout the world, so
25 I don't want to mislead anyone into thinking that we are

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1 pursuing an absolute level of disposition. This is a
2 comparative standard by definition and yet it will achieve
3 the nonproliferation and national security goals that we are
4 pursuing. Next slide, please.

5 The pursuit of this strategy will require three
6 new facilities in the U.S. -- one facility known as the pit
7 disassembly and conversion facility, which is designed to
8 take the plutonium pit or trigger of the nuclear weapon and
9 convert it into an oxide powder using the advanced recovery
10 and integrated extraction system known as the ARIES system.
11 This is a dry system in contrast to previous oxidation
12 techniques involving wet chemistry which resulted in large
13 amounts of aqueous waste. This results in a very small
14 amount of waste and is a very interesting, innovative
15 technology developed at Los Alamos and Livermore National
16 Labs.

17 The second facility is a MOX fuel fabrication
18 facility to take that plutonium oxide manufactured into
19 mixed oxide fuel and fresh fuel assemblies.

20 Finally, there will be a plutonium immobilization
21 facility which will focus on the non-pit plutonium, mix it
22 with ceramic material to manufacture pucks, array those
23 pucks in a canister and surround it with molten high level
24 waste coming out of the Defense waste processing facility at
25 Savannah River -- so we are using this -- in the

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1 mobilization case we are trying to make maximum use of
2 existing facilities in the DOE complex. Next slide, please.

3 Focusing on the mixed oxide fuel aspect of this
4 hybrid strategy as being of primary interest to this
5 audience, a couple of words on the contract, prime contract,
6 that we are using to support this.

7 It has four elements -- fuel qualification,
8 fabrication, packaging, and irradiation, and the NRC
9 obviously is involved in each stage in terms of identifying
10 the adequacy of the work that is being done and in providing
11 licenses and approvals along the way. Next slide, please.

12 Our main contractor is Duke, Cogema, Stone &
13 Webster -- referred to as DCS. This contract was signed in
14 March of '99 and it involves a consortium of Duke

15 engineering and services, Cogema and Stone & Webster. You
16 may be aware that Stone & Webster has been in some corporate
17 excitement over the last few months. It is still not
18 settled but one of the key elements of settling the
19 relationship of the new owner to this contract is that they
20 be prepared to take the same commitments as Stone & Webster
21 had been in this consortium.

22 We are working very closely with the bankruptcy
23 court on that.

24 There are a handful of subcontractors underneath
25 this overall contract that are listed, as you can see.

20

1 Turning to the fuel fabrication facility, this as
2 you can see is a large and very complex facility but one of
3 our key elements in choosing this group of contractors is
4 that it is based on using proven technology based on the
5 MELOX facility in France, the Cogema facility.

6 Three interconnected areas within the hardened
7 space and current French technology is one of the key pieces
8 of work that we have underway in the design phase, where we
9 are now, is modifying that existing technology to meet NRC
10 licensing requirements and other activities that we refer to
11 as Americanization of the design -- things as basic as stair
12 height to meet OSHA regs have had to be changed from the
13 French plant.

14 All the plutonium processing in this facility will
15 be in glove-boxes. Next slide, please.

16 One of the first activities in an effort of this
17 nature is the creation of lead assemblies. These are
18 required by the reactor operator for confirmation of MOX
19 fuel design and, as you may be aware, that the initial or
20 original plan for manufacturing these lead assemblies has
21 been terminated. That was to do so at the Los Alamos
22 National Laboratory. They were not able to meet our
23 schedule requirements and so we terminated that approach in
24 May and proceeded with an analysis of two alternatives to
25 that.

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1 One would be fabrication in Europe using
2 prototypic processes and equipment and then movement of that
3 material to the U.S., of those fabricated rods to the U.S.

4 The second approach is fabrication in the MOX fuel
5 fabrication facility as the initial product of that
6 facility.

7 Our two main goals in this study is
8 prototypicality and schedule.

9 We expect to make a decision this winter.

10 On the irradiation services, the four plants
11 involved are four Duke Energy operated PWRs, two McGuire and

12 two Catawba. This will help us -- these four plants rather
13 will meet the two metric tons per year goal on their own and
14 then the immobilization will give us some additional
15 disposition of about half a ton of weapons grade material a
16 year that will give us some wiggle room in meeting our
17 requirements under the bilateral agreement.

18 The 25 tons that is scheduled to go through the
19 irradiation process will meet the spent fuel standard by
20 2019 and this is based on two cycles of irradiation for each
21 element and the spent fuel will be stored onsite pending
22 geologic disposal, very similar to the LEU fuel portions of
23 the reactor loads.

24 The spent fuel will have to be monitored by the
25 Russians and probably the IAEA once it reaches the spent

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1 fuel standard, so it will probably have to be
2 managed potentially separately but at least in a way that
3 makes it clear which are the MOX elements and which are the
4 LEU elements. Next slide, please.

5 Just a reminder to all of us that the NRC role
6 here stems from law -- the FY '99 Defense Authorization Act.
7 This is -- the law was required because this is such a
8 unique situation. We are talking about a regulated facility
9 that is on a classified site but with a commercial operator.
10 It is kind of an island within a whole sea of DOE operations
11 and undoubtedly we will find some surprises as we go down
12 this route, some things we have not predicted about the
13 interrelationships of this kind of a situation but there are
14 clearly benefits associated with co-location of this
15 facility with the other disposition facilities and other DOE
16 facilities, so this is in some ways a new enterprise for
17 both DOE and the NRC. Next slide, please.

18 Now what you will be seeing from us -- actually
19 that is not an accurate statement -- you will be seeing from
20 the licensees.

21 First focusing on the fuel fabrication facility, I
22 want to indicate my appreciation for the NRC's willingness
23 to be flexible in terms of receiving our environmental
24 report prior to the full construction authorization report.
25 That will help us keep to our schedule and I hope it will be

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1 helpful for your side as well.

2 The next item will be the construction
3 authorization report. At the moment we had hoped to be able
4 to do that this fall but obviously we have not been able to
5 meet that schedule. We are looking at early next year but
6 we are not going to give you a specific date until we are
7 confident that that can be met.

8 What I will tell you is that it will be a robust
9 submittal and hopefully identify as many of the obvious
10 questions that would come about from the regulatory
11 perspective as we can and try to provide answers to those in
12 the initial submittal.

13 Finally, on this facility comes the application
14 for the license and we expect this date to hold of
15 mid-calendar year '02. We don't expect a delay in the CAR
16 to perpetuate that. The next slide shows how these dates
17 all fit together between the design Licensing/NEPA
18 activities and construction of the facilities.

19 The dates that are reflected here will keep us on
20 track with our bilateral commitments that are embodied in
21 our agreement with Russia and these are obviously based on a
22 certain set of assumptions, we hope accurate assumptions,
23 about NRC licensing dates and durations of activities.

24 Some of the other submittals that you will be
25 seeing from the licensee will be for fuel qualification and

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1 irradiation as well as for fuel packaging and transportation
2 and we are on schedule for the deliveries of the documents
3 that will be provided in connection with these activities.
4 Next slide, please.

5 This is not the first time that MOX has been
6 considered in the context of U.S. reactors but certainly a
7 new enterprise in terms of the scale and the motivation for
8 a MOX activity and as such there's certain to be questions
9 and issues and uncertainties that arise.

10 The good news is that at this point we have not
11 been able to identify any show-stoppers either technically
12 or otherwise in proceeding with this technique of
13 disposition and we have no issues or concerns vis-a-vis the
14 licensing process at the moment.

15 Our goal over the next few weeks or months, years
16 working with you and working with the licensee will be to
17 maximize the communications to maintain this fairly stable
18 situation.

19 At the same time, this is the first facility to be
20 licensed under the new 10 CFR 70 rule, as we understand it,
21 and the first time that the two-step process embodied in
22 that rule will be applied to this particular type of
23 facility.

24 Another novel aspect of this is the performance
25 requirements for the worker exposure and we will be -- this

25

1 is obviously in support of the license application and our
2 role here is a little bit unique as well because of the
3 outside of the PIDAS for this facility will be a DOE
4 reservation, as opposed to an open kind of geography, so

5 that is a little bit different for everyone involved.

6 One of the things that needs to be clarified also
7 is the process for determining the fuel qualification needs.
8 DCS has provided your Staff with the approach that they
9 intend to take and this is one area where I say that if
10 there is any concerns from the NRC side about that approach
11 the sooner we know that the better, because we will need to
12 be making decisions about this particular aspect in the
13 spring. Next slide, please.

14 Just a couple of words on interfaces between DOE
15 and NRC. We have been talking about really most of the
16 activities up to this point in the briefing have been
17 between the licensee and the NRC with DOE as obviously an
18 interested party, but there are some direct connections as
19 well.

20 One is the Memorandum of Understanding on
21 security, especially information security. The ball is in
22 our court on this and we will be providing the next
23 iteration of this back to the NRC side as soon as we
24 complete our internal discussions on this issue.

25 As you can understand, security issues are pretty

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1 sensitive within the Department right now and we want to be
2 sure we get it right.

3 The broader and more ongoing issue will be the
4 need for a continuing dialogue in support of our national
5 security missions and the commitments that we have made in
6 our bilateral agreement with Russia.

7 With that, I will close and open myself and my
8 team here to any questions your Staff may have.

9 CHAIRMAN MESERVE: Thank you very much for a very
10 helpful and informative briefing.

11 I have just two matters I wanted to ask about. On
12 Slide 17 you indicated that in discussing the MELOX facility
13 and the French technology that it would have to be modified
14 to meet NRC licensing requirements.

15 MS. HOLGATE: Yes.

16 CHAIRMAN MESERVE: And you mentioned a trivial
17 example of that is some OSHA requirements. I presume that
18 there are some others that are more substantive.

19 MS. HOLGATE: Absolutely.

20 CHAIRMAN MESERVE: And if you could indicate what
21 sorts of changes we anticipate are going to have to be made
22 to Cogema process in order to be able to have it licensable
23 in the U.S.

24 MS. HOLGATE: Dave, do you want to -- pardon me.
25 I would like to turn to Ed Brabazon from DCS, who is with us

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1 this morning and ask him to address that question.

2 CHAIRMAN MESERVE: There is a microphone there at
3 the podium.

4 MR. BRABAZON: Basically the design of the MOX
5 facility is very similar to the MELOX facility. The process
6 is essentially the same. The capacity is different, so
7 there are a different number of units in the MOX facility
8 compared to MELOX.

9 The differences are things like United States
10 codes and standards. One main difference obviously is the
11 50 cycles used in Europe versus 60 cycles in the U.S. but
12 beyond that we will comply with the various IEEE codes and
13 standards, those that are required by the various NRC
14 Regulatory Guides.

15 We would comply with other mechanical ASME or ASDM
16 codes and standards so it is really in the details of the
17 components where the process is different, but fundamentally
18 there are no significant difference in the design.

19 CHAIRMAN MESERVE: Thank you very much.

20 The other question I had was a follow-up on
21 something that isn't part of our regulatory purview but to
22 ask a question of how the Russians are planning to use the
23 MOX.

24 MS. HOLGATE: The Russians are looking to use
25 their mixed oxide fuel in either the VBR -- well, in a

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1 combination of VBR-1000s and their BN-600. The first is of
2 course a lightwater reactor. The second is a fast reactor.

3 There is a question of whether they will be using
4 four VBR-1000s loaded at roughly 40 percent MOX cores versus
5 seven loaded more towards a third and maybe all seven at 40
6 percent. That is one of the aspects of the expansion plan
7 of how do you double that two metric tons. You may start at
8 one-third core and then slightly increase each of those
9 reactors.

10 The fast reactor will have its initial load at
11 one-third core and depending on the performance during that
12 initial hybrid core consider moving to 100 percent MOX core.

13 Again, some combination of that expansion could
14 lead to making a significant dent in that doubling
15 requirement for the expansion capacity.

16 CHAIRMAN MESERVE: Okay. Let me turn to my
17 colleagues.

18 Commissioner Diaz?

19 COMMISSIONER DIAZ: Thank you, Mr. Chairman.

20 The first question, just for my own information,
21 this separation between the 25.6 and 8.4, is that something
22 that is fixed in time or do you see as time progresses that
23 maybe some of this additional plutonium could be classified

24 as being able to be used for MOX -- or is there a final
25 determination that's being made?

29

1 MS. HOLGATE: The numbers that are in the briefing
2 are embodied at this level of precision in the bilateral
3 agreement.

4 COMMISSIONER DIAZ: Okay.

5 MS. HOLGATE: That doesn't mean it can't be
6 changed, but it means it would have to obtain Russian
7 agreement to any decision to change.

8 This is based, the split is based on both a
9 technical understanding of which plutonium is most suitable
10 for MOX and on a wish by the Russians that we maximize the
11 amount of material that we use in MOX because of the
12 concerns I mentioned that they have about the immobilization
13 technology.

14 COMMISSIONER DIAZ: Right. That is really the
15 reason for the question.

16 Also, I have a bias, being a reactor engineer.

17 I would like to put the plutonium that was
18 produced in the reactor back in the reactor and burn it.

19 MS. HOLGATE: Yes.

20 COMMISSIONER DIAZ: So I was wondering whether it
21 is 8.4 and if that has been identified it's 95 percent
22 certainty that that is what it is going to be or 10 years
23 from now we might revisit the issue.

24 MS. HOLGATE: I would say both those things are
25 accurate. It is 95 percent certain today that this is the

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1 split but 10 years from now there is a mechanism to change
2 that if that is agreed with the Russians.

3 COMMISSIONER DIAZ: Okay, thank you.

4 In the issue of immobilization, is this, the
5 present option has considered, and you were pretty certain
6 that you considered the alternative that has been selected
7 as being as good -- I want to quote -- as irradiating them
8 in a reactor. Has that determination been made to again an
9 85 percent confidence level or --

10 MS. HOLGATE: Yes, it has been.

11 In both cases we are trying to make it big heavy
12 and radioactive and I think we have very high confidence
13 that the immobilization technology will have that result.

14 COMMISSIONER DIAZ: Okay. On Slide 14 you talk
15 about the facilities and you talk about three different
16 facilities with different degrees of security, different
17 degrees of involvement.

18 These are going to be in three different, separate
19 places or some of these facilities like the MOX fabrication

20 and the PIDAS assembly, they are going to be in the same
21 building?

22 I am concerned about the interaction that we are
23 going to have in the three different places and how can that
24 be separated.

25 MS. HOLGATE: That is a concern we have, not just

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1 in the context of the regulatory structure but a whole
2 number of operating and security and monitoring and
3 inspections concerns.

4 At the moment -- not at the moment -- we have
5 determined that these will be three different facilities.
6 They will all be located in F Area at the Savannah River
7 site and we are still studying the various specific plots of
8 land where they will be located.

9 Some of them may be contiguous. They may end up
10 being unctiguous on the site, depending on the geology
11 obviously. That is a key consideration. We are doing
12 geotechnical work right now to identify -- there's about six
13 or seven different plots of land that are candidate
14 locations for these three facilities.

15 COMMISSIONER DIAZ: They will be physically and
16 regulatorily separated?

17 MS. HOLGATE: Yes, sir.

18 COMMISSIONER DIAZ: Thank you, Mr. Chairman.

19 CHAIRMAN MESERVE: Commissioner McGaffigan.

20 COMMISSIONER MCGAFFIGAN: If I just look at the
21 trade press and some of the discussions about the Russians,
22 I get a little confused as to their ability to keep
23 schedules ever.

24 You said in one of your comments that the Russians
25 obviously think of plutonium as an asset and may never want

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1 to go beyond what we have here.

2 Just as a fundamental issue, why did we not --
3 when Mr. Kantor used to come here we would see in the trade
4 press numbers like 150 tons of excess plutonium on the
5 Russian side, and why did we not insist on proportional
6 reductions rather than one-for-one reductions, because
7 obviously if those trade press reports were right, they are
8 going to be left with vastly more weapons grade plutonium
9 after this than we are, plus they are still producing it at
10 the production reactors that have never been shut down.

11 MS. HOLGATE: True on all fronts. Absolutely.
12 The estimates of the total Russian amount of material range
13 all over the map but no one thinks it is as low as our
14 total, which is roughly 100 metric tons, as we identified in
15 our Fifty Years of Plutonium document a few years ago.

16 This was a matter of real discussion and

17 soul-searching and interagency wangling in the run up to the
18 agreement in terms of what was our posture going to be.

19 One of the challenges is without knowing the total
20 it is hard to know what the right proportion would be.

21 COMMISSIONER MCGAFFIGAN: People aren't worried
22 about break-out potentials I guess any longer in the arms
23 control space?

24 MS. HOLGATE: Well, Russians are, rhetorically.

25 COMMISSIONER MCGAFFIGAN: That's why I find that

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1 the Russian attitude about immobilization, you know, akin to
2 the pot calling the kettle black.

3 They are going to be left with vastly more weapons
4 grade plutonium and they are worrying about somebody in
5 America busting into Yucca Mountain if it is licensed or
6 busting into Savannah River, taking the stuff out of casks,
7 you know, coming up with sophisticated techniques to try to
8 get the last little bit?

9 You would produce it, as Mr. Kantor said at the
10 previous hearing, you would go and start producing it over
11 again rather than go through that story, but --

12 MS. HOLGATE: We have certainly shared that
13 perspective with the Russians.

14 COMMISSIONER MCGAFFIGAN: You can share it -- on
15 this Commissioner's behalf I just find the Russian argument
16 nuts, but --

17 MS. HOLGATE: I would have to agree with you,
18 right.

19 COMMISSIONER MCGAFFIGAN: This is not to hurt the
20 Duma ratification process because they are getting a pretty
21 good deal out of this thing is what I am saying.

22 I noticed that you didn't mention the Canada stuff
23 any longer, and I know that has never been part of our
24 program really as a central element.

25 We get in because at one point it was going to

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1 require an export license and all that. Mr. Kantor at one
2 point in one of our discussions called the whole exercise
3 the eternal attraction of the moth to the flame, but it is
4 not economically or financially viable, the "can do"
5 approach, right, so why does political capital continued to
6 get burned over that issue?

7 MS. HOLGATE: Well, I didn't mention it because
8 this briefing focuses on the U.S. program and certainly once
9 we identified the consortium that included adequate reactor
10 capacity for the U.S. material the "can do" option became
11 not part of the U.S. program.

12 It is still on the table as far as the Russian

13 program goes, however, and your comment about
14 un-economicness of it applies to any MOX activity, frankly.
15 We do not consider this to be an economic activity. It
16 won't be an economic activity in Russia.

17 COMMISSIONER MCGAFFIGAN: It is even less
18 economic.

19 MS. HOLGATE: That may well be, but this is an
20 arms control, nonproliferation mission that we are looking
21 at.

22 The challenge for the expansion plan in Russia is
23 severe. There is a very short list of expensive,
24 technically-challenging and politically difficult options.
25 We can expand current capacity in Russia, as I mentioned to

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1 the Chairman, in terms of maybe going to 40 percent in the
2 LWRs, maybe going to 100 percent in the fast reactor.

3 You can irradiate it in Europe. You can irradiate
4 it in Canada. You can irradiate it in Japan. You can build
5 new reactors in Russia. The Russians have their vision.
6 They would love another fast reactor. We are pursuing the
7 gas reactor technology as another possibility. There's some
8 half-built LWRs that might be able to contribute to the
9 activity.

10 None of these are cheap, easy, or technically
11 obvious and so we are keeping all of them on the table for
12 the moment, and believe me, we are continuing to talk with
13 the Canadians about whether or not they are going to be
14 prepared to add reactor capacity to the Russian mission.

15 COMMISSIONER MCGAFFIGAN: Is the Russian MOX
16 program going to be dependent on the export of this German
17 facility to Russia?

18 MS. HOLGATE: In terms of schedule, it will be.
19 In terms of ultimate accomplishment, that equipment can --

20 COMMISSIONER MCGAFFIGAN: Right, but the schedule
21 we are currently working on in our process, your process,
22 presumes the German facility will at some point be exported.
23 How soon?

24 MS. HOLGATE: It does not need to be exported
25 until the 2002-2003 timeframe, which is a benefit in the

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1 sense that there is plenty of time to identify the
2 mechanisms by which it will be provided to Russia, which is
3 an upside, but the downside is that you have to sort of
4 immobilize it if -- you have to put it into a form that it
5 can be maintained and either stored in a safe way so it can
6 be reconstituted in Russia.

7 There is a difference of opinion about exactly how
8 much of that Hannau equipment is applicable to the most
9 efficient MOX design in Russia. The U.S. view is that it

10 is, in terms of number of equipment, it is not very great,
11 but it is the type of equipment that has a very long
12 lead-time -- furnaces, mills, the presses and so on.

13 If these have to be designed, manufactured from
14 scratch, it will take significantly longer than moving that
15 equipment into a Russian facility.

16 COMMISSIONER MCGAFFIGAN: I have been focusing on
17 schedule issues on the Russian side. On our side you in
18 passing -- one of the slides discussing it said your
19 assumptions about our licensing process. I guess one of the
20 assumptions I am making given the public interest and
21 debates that have been held is that there will be hearings.

22 There will be a hearing on construction
23 authorization. There will be a hearing on the license.
24 There will be a hearing on individual license amendments to
25 use MOX fuel in reactors.

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1 This question really should probably go not to you
2 but to our General Counsel, and this may be the last meeting
3 we have with you because we become the Supreme Court once
4 all those hearing start, but it will be an ex parte I guess
5 public meeting would be okay, but we would have to be
6 worrying about ex parte communications.

7 Of these hearings, are these all prior hearings
8 that they have to be completed before -- say, the
9 construction authorization, does the construction
10 authorization hearing have to be complete before --

11 MS. CYR: The construction authorization, yes.

12 COMMISSIONER MCGAFFIGAN: The license to operate,
13 does that have to be completed before?

14 MS. CYR: I am pretty sure the license
15 authorization has to be, as well, both of them.

16 COMMISSIONER MCGAFFIGAN: And then irradiation in
17 reactor facilities --

18 MS. CYR: The amendment -- it is not clear --
19 right.

20 COMMISSIONER MCGAFFIGAN: Okay. This is not to
21 help the Russians, but it is probably the single largest
22 schedule uncertainty I think you face on our side are the
23 two hearings on the MOX facility and then potential
24 hearings, although they may not be prior hearings.

25 MS. HOLGATE: That has certainly been my view,

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1 which is why I have been, in spite of the comparative
2 uncertainty on the Russia schedule, I have been pushing our
3 team to stay on the schedule to get to that licensing point.

4 If we have to pause to keep our rough parallelism
5 with the Russian facility, we want to pause with an existing

6 license design with all of the regulatory pieces in place so
7 that as soon as we -- as soon as the Russians catch up we
8 can move expeditiously to that --

9 COMMISSIONER MCGAFFIGAN: Okay.

10 MS. HOLGATE: -- and so I am -- hopefully we have
11 captured, we certainly made those assumptions about public
12 hearings and that we have captured timing for that
13 effectively.

14 If it turns out we haven't, I agree --

15 COMMISSIONER MCGAFFIGAN: I don't think we have
16 successfully conducted a hearing in 12 months in the history
17 of the Agency so you may be being overly optimistic about
18 the construction authorization start.

19 MS. HOLGATE: I have a reputation for that, I'm
20 afraid.

21 COMMISSIONER MCGAFFIGAN: You know, you should
22 talk to Judge Bollwerk and challenge him, and we just issued
23 an order at the start of the Turkey Point hearing. That was
24 one of the things that we did I think earlier today.

25 We may well need an order at the start of this

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1 hearing to the Board laying out our expectations on schedule
2 as we did in the Turkey Point order and as we have done in
3 previous orders to give you a fighting chance to come
4 somewhere close to the schedule that you would like.

5 Thank you, Mr. Chairman.

6 CHAIRMAN MESERVE: Commissioner Merrifield.

7 COMMISSIONER MERRIFIELD: To follow up that, I
8 would imagine the Commission if there were to be a hearing
9 would impose the same level of expectation of discipline
10 with our board as we have in other areas recently.

11 I want to go back to the question that
12 Commissioner Diaz had, because it is still -- just so it is
13 clear to me, on the issue of the various facilities -- this
14 is on Slide 14 --

15 MS. HOLGATE: Yes.

16 COMMISSIONER MERRIFIELD: -- and I am also going
17 to be cross-referencing Slide 17 as well.

18 You have got three different facilities here. The
19 pit disassembly and conversion facility is a facility which
20 I presume is one that the NRC would not have regulatory
21 oversight over?

22 MS. HOLGATE: Correct.

23 COMMISSIONER MERRIFIELD: Okay -- so we pick up
24 with the only one for which we do have regulatory oversight
25 under the Act is the fuel fabrication facility.

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1 MS. HOLGATE: That's correct.

2 COMMISSIONER MERRIFIELD: And that is what is

3 referenced on page 17?

4 MS. HOLGATE: Yes, sir.

5 COMMISSIONER MERRIFIELD: So the 32,000 square
6 foot facility with conventional structures and so forth at
7 hardened space, three affected areas. That reference is
8 only to the MOX fuel fabrication facility and does not
9 include any areas associated with pit disassembly and
10 conversion?

11 MS. HOLGATE: That is correct.

12 COMMISSIONER MERRIFIELD: Okay. Thank you.

13 Going to Slide 19, you have talked about how we
14 are going to be able to meet the two megaton yearly goal
15 with four identified Duke plants, two McGuire plants and two
16 Catawba plants.

17 You also spoke that you have plans to be able to
18 go to four metric tons.

19 How would that affect these four units and do you
20 have any early expectations of how you would be able to go
21 about doubling that capacity?

22 MS. HOLGATE: Well, as far as capacity goes, we
23 will have capacity to deal with four metric tons of weapons
24 grade material within the fuel fabrication facility and the
25 immobilization facility combined, so the fuel fab facility

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1 is being designed to just over three metric tons per year.

2 The reactors -- these four reactors, as I
3 mentioned, get us to two metric tons per year if additional
4 reactor capacity is identify to allow the Russians to expand
5 their disposition rates we'll be looking potentially for
6 additional reactors to expand the U.S. disposition rates to
7 match that.

8 We have -- I'm sorry?

9 COMMISSIONER MERRIFIELD: So were that to occur,
10 let's just play the assumption game, were that to occur,
11 would you expect that you would need to identify four
12 additional units in order to meet that doubling capacity or
13 is it some other number?

14 MS. HOLGATE: I think it is probably less than
15 that, because we will be dealing with some of the material
16 through the immobilization pathway, so it is probably just
17 another two, maybe three, reactors.

18 COMMISSIONER MERRIFIELD: Okay. Would the amount
19 of MOX used at these currently identified facilities be
20 changed at all under that doubling? Would they increase the
21 volume of MOX fuel, or is that a steady state capacity?

22 MS. HOLGATE: Actually it is likely to decrease it
23 because we have only 24.9 or 24.-whatever tons of MOX to do,
24 and so if we are doing it quicker, then we will be doing

25 less of it in these reactors, total.

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1 We would be doing, you know, about the same annual
2 rate but --

3 COMMISSIONER MERRIFIELD: Just so my question is
4 clear, what I meant was at the annual rate --

5 MS. HOLGATE: Yes --

6 COMMISSIONER MERRIFIELD: -- would the amount be
7 likely to increase at these units, not the total rate over
8 the lifetime, but --

9 MS. HOLGATE: Understood. We do not expect --

10 COMMISSIONER MERRIFIELD: The amount of fuel
11 loaded into the reactor, would that increase were there to
12 be any increase in the rate?

13 MS. HOLGATE: No. We would not expect to increase
14 these reactor capacities in any way.

15 We would seek additional reactor capacity from new
16 reactors, yes.

17 COMMISSIONER MERRIFIELD: Okay. On Slide 19 you
18 also reference, maybe it was a little later, you reference
19 that you need to have some different security requirements
20 in terms of monitoring the fuel.

21 Do you or does Duke at this point have any
22 expectation of what types of changes in our processes would
23 be required in order to track that fuel in a way different
24 than what we do now?

25 MS. HOLGATE: At the moment we are not -- we

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1 haven't worked out the details of those arrangements, either
2 bilaterally with the Russians or ultimately trilaterally
3 with the IAEA, so we don't have the details of that yet.

4 We expect it can probably be managed just through
5 serial number monitoring of the fuel assemblies themselves.
6 There's some specific requirements in the bilateral
7 agreement about marking, making sure that we have
8 traceability among the MOX elements.

9 COMMISSIONER MERRIFIELD: Would you expect that
10 that fuel would have to be isolated in a portion of the
11 spent fuel?

12 MS. HOLGATE: That is certainly one way to do it.
13 It is not clear that that will be required if there are
14 unique markings for the assemblies but we have not worked
15 out the details of that yet.

16 COMMISSIONER MERRIFIELD: Okay, but for any other
17 purpose you would expect that that fuel either in its
18 pre-irradiation act or after it has been irradiated and is
19 sent to the spent fuel pool it would be treated like any
20 other --

21 MS. HOLGATE: That is our expectation.

22 COMMISSIONER MERRIFIELD: -- any other fuel?

23 Okay.

24 The last question --

25 CHAIRMAN MESERVE: Wait a minute. Before

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1 irradiation, you don't have to treat it differently, I
2 assume.

3 MS. HOLGATE: Well, the security issues will
4 obviously be significantly different.

5 COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.
6 That is a good point.

7 Finally, on Slide 6, and I want to go back to the
8 HEU blend-down, and again this wasn't the primary focus of
9 today's meeting, but I did have some initial questions on
10 that.

11 If you could just briefly again describe what you
12 mean by off-specification and what in any way you expect
13 that this fuel will have to be treated differently than the
14 traditional LEU fuel that is used in our reactors at this
15 point?

16 MS. HOLGATE: We don't expect that it will be
17 treated in any -- significantly in any different fashion
18 from the LEU fuel.

19 COMMISSIONER MERRIFIELD: You did mention
20 something about some higher enrichment. Is that the --

21 MS. HOLGATE: In terms of manufacturing, yes.
22 Dave, why don't you --

23 MR. NULTON: Yes. The isotopics are slightly
24 different for this off-spec material. They are higher than
25 what would be allowable for the commercial fuel spec,

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1 primarily Uranium-236 I think in some instances maybe
2 there's some Uranium-234 that is slightly above the spec --
3 236 is an absorber, therefore you would have to up the
4 enrichment of the fuel to overcome the absorption of
5 neutrons by that material, so it is -- but it still stays
6 below the 5 percent limit so we don't expect it to be
7 handled any differently than other fuel.

8 COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.

9 CHAIRMAN MESERVE: Good. I would like to thank
10 you very much.

11 We very much appreciate your briefing today and
12 particularly appreciate your comments about the NRC Staff.
13 It was very welcome to hear that.

14 We look forward to continued interaction with you
15 as this project goes forward. It's been very helpful.

16 MS. HOLGATE: Thank you very much, sir.

17 CHAIRMAN MESERVE: We are adjourned.

18 [Whereupon, at 10:07 a.m., the hearing was
19 adjourned.]