

PANEL: U.S. AND RUSSIAN MILITARY PLUTONIUM DISPOSITION PROGRAMS

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David Albright: Please take your seats. We should reconvene the conference.

The next panel will address military plutonium disposition programs in the United States and Russia. There are three speakers on this panel. The first speaker is Ms. Laura Holgate, who is now the Vice President for Russia/NIS programs at the Nuclear Threat Initiative. The second speaker is Mr. Vladimir Rybachenkov, who is a Counselor at the Russian Ministry of Foreign Affairs. The third speaker is Mr. Eric Proust, the Executive Deputy Director for International Affairs at CEA in France.

Laura Holgate: It is nice to be back at ISIS, and to see so many familiar faces at this conference.

I would like to begin by setting a few context points. Let me just remind us all of a couple of things.

The first is the historical context. September 11 was a graphic demonstration that the dangers—that many in this room have been warning about—are not abstract dangers. These dangers are very real and based on real-world concerns. Our task is to take advantage of the increased attention to these issues in order to sketch an affirmative, forward-looking agenda that treats the issue of plutonium disposition with the attention and resources appropriate to a true national security mission.

The second context point that I would make concerns the substance of the analysis. Plutonium disposition is part of a seamless fabric of efforts to prevent a “nuclear September 11.” It is one element of an overarching strategy for nuclear materials security and management. This strategy includes: high levels of security and accountability for materials where they currently exist, and for materials in transport; the reduction of overall locations where separated plutonium is stored; the safe and secure disposition of plutonium—and international monitoring of some nature throughout this process.

Some of the questions raised today seem to be looking at pieces and parts of this strategy, and asking: “Shouldn’t you make this a higher priority?” The fact is that we have to do it all. Safe and secure storage, transportation, disposition—internationally monitored—is the overarching strategy that has to be looked at. To talk about each component as competing goals misses the larger point, and will result in the failures that we have collectively been striving to prevent.

I’ve been asked to speak about the U.S. plutonium disposition program. In contrast to previous years, I want to remind everyone that I no longer have no authority over that program. I am speaking as an informed and interested party. My talk is based upon what I have been able to piece together, but obviously includes some stake of emotion and intellect.

As I understand it, the administration’s nonproliferation review remains in the decision-making stage. We anticipate that the outcome will be reflected in some presidential decision documents and in the fiscal year 2003 budget, both of which are in preparation. The decision-making documents very well may be made public within the next two or three weeks. That seems to be the time frame that this review process is on.

As I understand it, the characterization given earlier that there was an NSC review that kicked off a DOE presentation of options—which are now being considered by the full interagency process—is more or less my understanding of who is doing what, and with what authority.

The outcome of the NSC review process is not yet known because it is not yet concluded. My comments, therefore, are educated guesses. Logic would seem to indicate that the administration faces essentially three possible paths forward:

- The first possibility is the status quo of 2000. I think the chances of that happening are about zero;
- The second possibility is to move forward with disposition of weapons plutonium with some modification of the previous program that aims at reducing costs and/or accelerating the schedule;
- The third possibility would be to cancel the program altogether.

I would remind everyone that none of these options are either cheap or easy. There may be some cost savings that can be wrung out of the program as it existed in 2000, but long-term storage has its own costs, as well. However, the most important outcome of this review is the decision itself, whatever the content. The limbo that this program has been in for the past year has done nothing but harm the program. What everyone needs is a definitive path forward, even if that path includes a decision to terminate all disposition plans and focus instead on long-term storage.

What might a modified disposition program look like? When looking to save money, the first place you have to start—with the baseline being the program of 2000—is to eliminate one or more of the three facilities that are currently planned—the pit disassembly and conversion facility, the MOX fuel manufacturing facility, and the immobilization facility. Doing so would be a quick way to save money.

If you were to go that route, there are three options:

- A MOX-only option. In this case, you would need some kind of pit conversion capability, plus a MOX plant. In addition, the MOX plant would have to have some kind of upgraded polishing capability if it were to dispose of material that was previously slated for immobilization, because that material would require additional cleanup;
- Another option would be immobilization-only. If you are going to immobilize pits or pit material, then you still need some kind of pit conversion facility. You also need a facility to produce the pucks to be immobilized, assuming that you proceed with the can-in-canister approach. Of course, you need the radioactive glass. But the source of the glass has been defined as being outside the scope of the plutonium disposition program, because it would be coming from other sources, especially the Defense Waste Processing Facility at Savannah River;
- The third approach has to do with new reactor technologies—thorium based reactors, the gas-cooled reactor, and other novel fuel cycles that are being considered, looked at, or otherwise advocated for the mission.

I do not know where the administration is going to come out on these approaches. If administration officials were to ask for my advice, I would say that the main thing that they need to do is evaluate these approaches based not only on the budget, but also on the time that it will take to achieve the spent-fuel standard, as well as the likelihood of continuing current Russian commitments to participate in a parallel way.

Taking these considerations into account, I would recommend a MOX-only strategy:

- Immobilization-only would take longer, because of the delays in obtaining a radiation barrier. I also would guess that Russia will neither immobilize its own material, nor match the elimination of any pit material that the United States would immobilize. Therefore, this option ceases to have much meaning from a national security perspective, in that it would not inspire any parallel action by the Russians;
- New reactor technologies, while very attractive to some Russians, are not sufficiently developed either technically or from a regulatory standpoint to provide realistic, near-term options. Therefore, any cost or schedule savings will be extremely difficult to quantify. My concerns here are similar, in particular, to the concerns that Senator Domenici has raised about leaving an existing plan and moving to a fuzzy plan.

In contrast, a MOX-only approach will definitely retain Russian support for the mission—that is where they started, and that is what they preferred—and a talented negotiator may be able to translate that support into some kind of leverage. The MOX plant design appears to be on track on the U.S. side, and the regulatory process is underway. The technology is known. Costs and schedules are both quantifiable and stable.¹

I have no idea what criteria the administration will use to evaluate these options, or what the outcome would be. But that is my view.

Whatever the administration concludes, if it chooses to continue with some kind of plutonium disposition effort in the context of a national security mission, then the administration needs to take several steps. In this regard, there is no room for halfway measures.

The first step is to communicate, reinforce, and sustain senior-level commitment at the White House, at the DOE, and at the State Department. Success in plutonium disposition will mean keeping this issue high on the list of things that the administration discusses regularly at senior levels with Russia, with potential donor states, and with members of Congress.

The second thing that the administration needs to do is be prepared to increase U.S. funding for the Russian program. Even with the senior-level arm-twisting that needs to be applied to extract the additional contributions that, reportedly, were in the works before the United States signaled its doubts about this program, Europe and Japan are not likely to provide the lion's share of funding support for the Russian program. The United States needs to be prepared to increase its level of contributions in order to make this program work.

Third point: The administration needs to adequately and stably fund the U.S. disposition program. The U.S. program was continued this year with roughly a flat budget compared to last year. I suggest that you cannot build one, two, or three major nuclear facilities on a flat budget. When I was in the program, we planned on needing about \$350 million in fiscal year 2003, and about \$600 million in fiscal year 2004. I cannot conceive—even with programmatic modifications—that these needs will shrink considerably. Budgets below these levels would not be consistent with success. The level of the proposed fiscal year 2003 budget would be one way to judge the senior level commitment by the administration.

¹The Energy Department confirmed a MOX-only approach in January 2002. See DOE News, "Secretary Abraham Announces Administration Plan to Proceed with Plutonium Disposition & Reduce Proliferation Concerns," January 23, 2002. <<http://www.energy.gov/HQPress/releases02/janpr/pr02007.htm>>

Finally, some resolution to the domestic battle with South Carolina needs to be arrived at. All I know about this fight is what I read in the papers, and the press reports are pretty eye-opening. I am glad that I am not on the receiving end of the dueling press releases.

The Governor has threatened to use his own National Guard resources to stop DOE's plutonium convoys from Rocky Flats, and presumably from anywhere else, unless DOE provides a plan to eventually get the plutonium out of the state. Resolving what to do with this plutonium is the major solution to this problem. But there are lots of frayed nerves, hurt feelings, and lots of little things that have very little to do with logic that affect this resolution. How that path forward is arrived at, presented, and portrayed needs to take into account how it will affect the relationship with South Carolina.

That is my four-part strategy for what the United States needs to do. But I am not going to let Russia off the hook. Russia also needs to do its share if plutonium disposition is to be successful—that is, if there is to be a consummation of the disposition of both the U.S. and Russian excess stocks.

First of all, Russia needs to demonstrate its preparedness to move along quickly and efficiently once the U.S. decision is made. This means adequate staffing and strong centralized leadership from Minatom in order to move from an institute-driven, R&D effort to an industrial-scale, national program. This will not be cheap or easy, but it is the one single thing that can most directly signal Russia's intent to put actions behind its so far unimpeachable words of commitment.

The second thing that Russia needs to do is find a credible answer to what happens after the 34 tonnes is disposed of. This answer needs to sound appealing to U.S. hardliners. One of the major challenges to the continuing U.S. commitment to this program is the vague answer received to questions about what to do after the 34 tonnes is disposed of, given that the disparity of stocks of separated military plutonium will be even more pronounced in favor of Russia. Those who care about this issue need to collectively arrive at an answer about how those disparities will be addressed.

Finally, Russia needs to take an active role in the partnership with the United States to enhance fundraising—both cash and in-kind contributions—from other countries. I would characterize Russia's position to be too often the passive partner in this effort. For example, the potential for the Hanau equipment to be taken off the table is one manifestation of this relative passivity. We can go into more details on that if you like, and Mr. Rybachenkov is welcome to correct me if I am wrong.

To conclude: I think we need to remember where the National Academy of Sciences started us off on this almost a decade ago. Excess military plutonium represents a "clear and present danger." Almost a decade later, it is not at all clear that we are treating it this way.

Thank you.

Vladimir Rybachenkov: Good afternoon ladies and gentlemen. It is an honor and a pleasure for me to speak before such an audience. We have to thank our organizers who have selected the correct moment to discuss the topic that we are now discussing.

Let me start by giving some general remarks about the strategy of plutonium management in Russia, including military and civil plutonium. First, plutonium is considered as a national asset that should be fully used in the national energy mix. In the context of the closed fuel cycle adopted in Russia, this means that

priority is given to disposition options related to the use of separated civil or excess weapons-grade plutonium in the nuclear fuel of nuclear power plants, and not to those associated with its immobilization and disposal. The final strategic goal consists of the full use of the plutonium's energy potential by methods assuring its conversion into forms unusable for nuclear weapons. Taking into account proliferation risks, utmost importance is paid to the application of the highest national and international standards to physical protection, accountancy and control in relation to plutonium storage, transportation, and management.

As you know, it has been declared that, since 1989, Russia has not produced any military plutonium. Russia has 13 military plutonium production reactors, ten of which are shut down. The remaining three, located in the Tomsk and Krasnoyarsk regions, are functioning because of the necessity of supplying electricity and heat to the regions. In accordance to the provisions of a Russian-American agreement signed in 1997, all ten shutdown Russian reactors will remain shut down. The remaining three reactors were to stop producing plutonium by the end of 2000 after undergoing core modifications. Here I would like to underline that, in fact, these reactors produce weapons-grade plutonium, but there is no military order for this plutonium. These reactors just operate because of the necessity of producing electricity and heat.

Since the signature of the agreement, substantial research and development work has been carried out. In the beginning of the year 2000, it became clear that the proposed core conversion approach could not be implemented for safety reasons. The three reactors are too old; their lifespans end by 2010. Bearing this in mind, the Russian and American sides developed amendments that offer another option: The creation of replacement energy sources based on fossil fuels at Tomsk-7 and Krasnoyarsk-26, which will mean the cessation of non-reactor-grade production at Tomsk-7 by the end of 2005 and at Krasnoyarsk-26 by the end of 2006.

Hopefully, these amendments will soon come into force. The Russian government has already approved these amendments, and they were sent to the United States for approval as well. I think that this process is very much affected by the ongoing nonproliferation review that is being undertaken by the administration, and that we have heard so much about already today.

Now, let me turn to the topic of managing excess military plutonium. As you know, the President of the Russian Federation stated at the Moscow Nuclear Safety Summit in April 1996 that about 50 tonnes of weapons-grade plutonium removed from the Russian nuclear warheads, in accordance with the START Treaties, will be withdrawn from the military sphere and stored at the Fissile Materials Storage Facility at Mayak near Chelyabinsk, which is being constructed with the U.S. assistance.

By the way, I think that the President's statement gives us a unique possibility to calculate the amount of military plutonium in Russia. The Russian President said that 50 tonnes would be released, which represents 40 percent of the overall quantity of plutonium produced in Russia and the Soviet Union since 1945. This gives us the figure of 125 tonnes. I give this figure based on my own calculations. Official Russian estimates are classified.

Russia expressed its readiness to place the facility at Mayak under IAEA verification in order to promote international confidence that excess military plutonium remains irreversibly removed from nuclear weapon programs. In September 1996, the Trilateral Initiative between Russia, the IAEA, and the United States was launched to investigate technical, legal, and financial issues associated with this proposal. Since then, substantial progress has been made in developing and testing special verification equipment with "information barriers" for use with classified forms of plutonium, as well as in developing technical criteria for inspection procedures.

Russia's attitude towards the Trilateral Initiative is very simple: We want to have reciprocity. If we place a certain quantity of military plutonium removed from nuclear weapons under verification, I think that we have the right to wait until the United States is ready to do the same, and not restrict itself to placing under verification some other material removed from military programs.

The first wing of the Mayak Storage Facility is planned to go into operation by the end of 2002 or 2003. Necessary technical provisions for international monitoring are being incorporated into the design of the storage facility. Twenty-five tonnes of metallic plutonium from the Mayak Storage Facility are supposed to be disposed of in accordance with the September 2000 Russian-American agreement concerning the management and disposition of plutonium designated as no longer required for defense purposes. An additional nine tonnes in the form of oxide is also to be disposed of. This oxide is being stored near the three operating production reactors at Tomsk and Krasnoyarsk.

I think that this meeting gives a proper occasion to review the situation around the agreement and to draw a balance of factors having influence on its implementation.

A considerable amount of work has been accomplished by the G-8 Plutonium Disposition Planning Group (PDPG), which was set up in November 2000 in accordance with the Okinawa summit recommendations. I will not spend much time on this, because you all know the results of this working group. Suffice it to say that the group's final report presents a detailed project plan for disposing of 34 tonnes of Russian excess weapons-grade plutonium, updated cost estimates, key elements of an international financing plan, and elements of a multilateral framework to coordinate the cooperation.

Substantial results in support of the Russian program were obtained within the framework of Russian-French-German and Russian-American agreements on scientific and technical cooperation concerning civil uses of excess military plutonium. Substantial work was also accomplished within the framework of Russian-Japanese cooperation concerning BN-600 fast reactor technologies.

The milestones of these efforts are as follows:

- The choice of Russian sites for CHEMOX and DEMOX plants, as well as the choice of the necessary technological processes were made. CHEMOX is the plant for converting metal to powder, and DEMOX is the MOX fuel production plant;
- Cost assessment of the five projects (CHEMOX, DEMOX, MOX demonstration, VVER-1000 and BN-600 modifications) was accomplished;
- Engineering studies for CHEMOX and DEMOX plants were carried out;
- Three MOX lead test assemblies were fabricated and loaded into the BN-600 core;
- As far as the fabrication and loading of three lead test assemblies into a VVER-1000 core, it will take some additional time—about two or three years.

Important efforts were undertaken by the Russian side to speed up the process of entry into force of the agreement. In May 2001, the Russian government submitted the agreement for the ratification to the State Duma. Furthermore, instructions were given to the ministries concerned to take necessary measures to accelerate the ratification of the Vienna Convention on Civil Liability for Nuclear Damage in order to facilitate the resolution of the controversial liability issue in the agreement.

Having listed the endeavors that may be considered as elements in favor of the practical implementation of the agreement, I have to draw your attention to other factors, which seriously complicate the situation, and cause deep concern not only of the Russian side but of the international community, as well. I would frankly tell you that while listening to Mr. Lyons' presentation, I was really very pleased to note how many coincidences of thought I found in the Senator's presentation, and in my own.

One such factor is that, as of today, the G-7 statements of intent to contribute to the Russian plutonium disposition program total about \$600 million, which represents only two-thirds of the international capital investments needed for the creation of the corresponding industrial infrastructure in Russia.

The most uncertain situation is with Germany's contribution. Germany, as we understand, due to its recently adopted nuclear energy policy, would be ready to render assistance to Russia only for the immobilization of plutonium and not for its use in MOX fuel for nuclear power plants. Such a position seems to have little rationale behind it since, in accordance with the provisions of the Russian-American agreement, the Russian program does not include the immobilization component at all.

Unfortunately, recent news from Siemens about the prospects of delivering to Russia major equipment from the MOX fabrication plant at Hanau are not more encouraging. At the end of November 2001, the Siemens spokesman confirmed the reports that the company intends to press ahead with the Hanau plant decommissioning due to the failure of the G-8 Summit in Genoa to provide political or financial backing for long-standing plans to export the equipment to Russia. This is even more regretful, since according to international experts it would be extremely difficult to keep on schedule plans for beginning disposition of the Russian plutonium without the Hanau equipment.

Regarding this topic, I am not pessimistic. I would refer you to a document prepared by the Nuclear Disarmament Forum by Mr. Bengt Tweiten. I absolutely agree with him when he writes that the biggest mistake of the German government is that, deliberately or otherwise, it does not distinguish between a Hanau plant that contributes to a plutonium economy in Germany, and a Hanau plant that contributes to weapons plutonium disposition in Russia. He puts forward an idea, which I think is worth considering, that one potentially acceptable path is for the German government, under the right circumstances, to let TVEL—the Russian nuclear fuel-producing enterprise—purchase the Hanau components and swap the \$82 million expense—which includes not only equipment but also technology transfer—for German economic assistance to Russia, or factor this figure in negotiations over the repayment of old Soviet debts. This would be a classical "win-win" situation for both nations.

But the main reason of concern, which may have a decisive impact on all other "players of the game," is the uncertainty about U.S. plans to contribute to the Russian plutonium disposition program, given the on-going review in the United States of Russian-American programs of cooperation in the field of nuclear nonproliferation.

Presently, Russian experts—and I guess they are not the only ones—have difficulties in making a meaningful assessment of this vital issue due to scarce information from official U.S. sources and contradictory comments published in American and European press.

According to the information from some American officials, the U.S. decision on U.S.-Russian plutonium disposition cooperation may not be announced until February or March 2002. In the meantime, U.S. government experts are supposed to continue considering technologies for military plutonium disposition that are more cost-effective and proliferation resistant than the MOX approach.

Recently we have received news about one of the proposed options—I think that it was also mentioned in the presentation by Mr. Lyons—which could be eventually financed by the U.S. government: A thorium-plutonium nuclear fuel, which could be allegedly fabricated at existing Russian facilities with minor modifications, and burned in existing VVER-1000 power reactors, without introducing any modifications in their design.

A preliminary evaluation of this option by Russian experts shows that it is not a promising one, due to the lack of an industrial scale experience in the thorium nuclear cycle in Russia. Its eventual implementation would require ample and costly R&D, not to mention serious modifications in Russian nuclear fuel plants and power reactors. All this would eventually require bigger expenses in comparison with the MOX approach, and would certainly delay implementation of excess military plutonium disposition programs in both countries for an uncertain time.

One has to recognize that such turbulences around the agreement do not make the Russian side more enthusiastic about prospects for its practical implementation. Moreover, possible changes in the U.S. approach may give additional arguments to the Russian opponents of the agreement's ratification by the State Duma, as well as undermine the readiness of other international partners to move the plutonium disposition project ahead if the United States drops the ball.

Having said this, I would like to point out that despite the complicated situation around the agreement, strong support is voiced in Russia in favor of its earliest implementation under the assumption that all the provisions of the agreement—including the choice of plutonium disposition methods, as well as the assurance of international assistance—are complied with.

Such a position is determined primarily by Russia's commitment to the irreversibility of nuclear disarmament—that is, to the process of converting excess weapons-grade plutonium into forms unusable for nuclear weapons. The Russian-American agreement is to play a pioneering role in this regard. Here, in particular, I am thinking about the so-called upload potential of the U.S. arsenal, which is a big concern of the Russian military.

As far as the choice of the MOX option is concerned, we proceed from the assumption that at the actual stage this technology is the only one that was industrially tested and should be adopted as such, despite some of its drawbacks. It is worth mentioning that such a conclusion was supported by a Paris international experts meeting in October 1996 and by the U.S. scientific community as expressed in the National Academy of Sciences report published the same year.

We presume that there is no harm in exploring other potential plutonium disposition technologies, but such experimentation should not delay implementing the agreement that was signed by two countries more than a year ago.

One has also to bear in mind that, under the agreement, less than 30 percent of the overall weapons-grade plutonium stock of both countries is planned to be disposed of in the course of 15 years. Advanced nuclear fuel cycles and next generation technologies that are cleaner, more efficient, less waste-intensive, and more proliferation-resistant may be developed by the year 2020 as it was proposed by President Putin in his address to the Millennium Summit last September, and by the President Bush this May in his announcement of the U.S. administration's national energy policy. Obviously, these very technologies could then replace the existing ones for the disposition of the remaining excess military plutonium stocks.

Recently, we have heard with satisfaction that the views from the U.S. Senate are very much concurrent with those exposed above.

This autumn, Senator Pete Domenici, seconded by Senators Lugar, Biden, Murkowski and Landrieu, proposed an amendment to the Defense Authorization bill, which demands that no changes be made in the current plans for the Russian or U.S. plutonium disposition programs until a report is provided to the Congress outlining a comprehensive strategy for all related activities. Furthermore, the report is required to specify the costs of any modified approach, the interactions with Russia and other international partners that were conducted in developing any new plan, along with details of the extent of concurrency by these governments in the new plan and the willingness of other nations to cost-share some of the expenses.

As Pete Lyons described, a couple of weeks ago 20 U.S. Senators sent a letter to the U.S. President calling for an adequate financing of the Russian-American agreement on plutonium disposition which, they think, meets U.S. national security interests, especially in the light of the September 11 tragedy.

On this occasion, the Ministry of Foreign Affairs of the Russian Federation issued a statement for the press, outlining the utmost importance of the agreement as one of the key elements of bilateral measures that are aimed at reducing nuclear dangers. The statement goes on to say that, thus, the earliest implementation of the agreement fully meets the interests of both countries.

In this context, Moscow expressed its hope that the implementation of the Russian-American programs and arrangements in the nonproliferation sphere—taking into the account the realities of the present day—will continue to be the subject of thorough consideration in the United States, and will not become a hostage of political circumstances.

Well, to sum up the subject of disposing of military plutonium, I do not want to leave you with a feeling of deep concern and pessimism. Rather, I have a feeling of moderate optimism. Before I departed from Moscow to attend this conference, one of the Russian newspapers published a statement by the American ambassador to Russia, who expressed ideas that are very dear and close to me. He said that the United States and Russia shares not only a common enemy—which we had the experience of during the Second World War—but we also share common values, like democracy and freedom. I think that the atmosphere in the relations between Russia and the United States changed substantially since September 11. This gives me additional hope that the plutonium disposition problem will be resolved to the benefit of both countries.

Next, I would like to briefly turn to a discussion of the management of civil plutonium. Having adopted the Guidelines for the Management of Plutonium that were established in 1997, Russia fully complies with the guidelines' provisions related to nonproliferation and international safeguards, physical protection, and so forth.

In the field of enhancing nuclear materials physical protection, accountancy and control, impressive results were obtained since 1994 in the framework of Russian-American cooperation. Security of dozens of tonnes of fissile materials, including plutonium, was substantially upgraded at about 25 Russian facilities, such as the federal nuclear centers at Arzamas and Chelyabinsk, the Obninsk nuclear center, and others.

At present the Russian and American sides are developing a long-term implementation plan for enhancing security of fissile materials at ten additional sites, including the Bochvar Institute, Mayak, Krasnoyarsk-26, and Tomsk-7. We are pleased to hear several times from official American representatives that the United States considers this program to be of utmost importance to U.S. national security interests and, despite cutbacks for other programs, this program received substantial funding for the next year.

In the framework of the plutonium management guidelines, Russia publishes annual statements of its holdings of civil plutonium and of its estimates of the plutonium contained in its holdings of spent civil reactor fuel. For the year 2001, the amount of unirradiated separated plutonium at Russian storage sites was about 33 tonnes and the amount of plutonium in the spent civil reactor fuel was about 70 tonnes.

It would be worth mentioning that presently the spent nuclear fuel from only six of the first generation, VVER-440, reactors is being reprocessed at RT-1 plant at the Mayak site near Chelyabinsk. The spent fuel from the other 24 Russian operating nuclear civil reactors is not reprocessed. The spent fuel from eight VVER-1000 units is sent for storage to the Krasnoyarsk-26 wet storage facility. The spent fuel from 11 RBMK units and BN-600 fast reactor is stored at the reactor sites.

These figures clearly show that at the present time less than 20 percent of the Russian spent fuel is being reprocessed. But even this small amount causes concern of the Russian policy-making and industrial bodies for two reasons:

- In accordance with the strategy of nuclear energy in Russia for the first half of the 21st century, approved by the Russian government in May 2000, the reprocessing of the main volume of spent fuel should be postponed until the beginning of the serial construction of fast reactors of the new generation, which are to become the main source of nuclear energy for the future. Immediate separation and stockpiling of plutonium and uranium as a basis for the MOX fuel for the future fast reactors' fuel is not deemed reasonable, since the increased period of spent fuel storage makes reprocessing easier;
- Another factor: Russia has to comply with the provision of the plutonium management guidelines, which stipulate the need to take into account, while formulating a national strategy for the management of plutonium, the importance of balancing supply and demand, including demand for reasonable working stocks for nuclear operations, as soon as practicable.

But the sheer reality is such that the RT-1 plant cannot be shut down until modern storage facilities for VVER-440 reactor fuel are constructed at the reactor sites, the Mayak site, or elsewhere, which may demand substantial time and resources. One may hope that if Russia's plans to import a foreign-origin spent nuclear fuel are implemented, this process may be substantially accelerated.

Thank you for your attention.

Eric Proust: Well, I am sorry to impose a second presentation upon you.

As my good friend Vladimir Rybachenkov just explained, France and Germany—now joined by Belgium and Italy—have been engaged with the Russian Federation, since the early 1990s, in a cooperation on the management of Russian excess weapons plutonium.

Let me stress that as early as 1992, France considered the management of Russian excess weapons plutonium to be a critical nonproliferation issue, and was addressing this issue. And burning weapon plutonium in reactors as MOX fuel was already identified as the best management option from all standpoints:

- In terms of nonproliferation, this option effectively destroys part of the weapons-grade plutonium, and degrades the isotopic vector of the undestroyed part down to levels making it unpractical for military purposes;

- In terms of economy, this option enables the partial recovery of disposition costs. Fifty tonnes of weapons-grade plutonium can indeed produce 350 billion kilowatt-hours (kWh) of electricity, or save 10,000 tonnes of natural uranium and 5 million Separation Work Units;
- In terms of environment costs, the spent MOX fuel is being substituted for spent uranium fuel, and so this option does not add new wastes;
- In terms of speed of implementation, as Laura Holgate mentioned, this is the only solution that can be demonstrated in the short term as it can rely on industrially mature processes and technologies with a flawless record of safe and reliable operation. Let me remind you, over 1,300 tonnes of MOX fuel have already been fabricated in European MOX fabrication plants, representing a cumulative amount of processed plutonium exceeding 75 tonnes of plutonium metal. This experience covers a large variety of fuel types for pressurized-water reactors, boiling-water reactors, and fast-breeder reactors. And over 30 European power reactors are operating with MOX-loaded cores, with the first MOX loading dating back to more than 25 years for some of them.

Coming back to the trilateral French-German-Russian cooperation, its objective is to develop practical industrial solutions that take full advantage of industrially mature processes and technologies—in particular the European MOX experience—and of the available Russian power reactor infrastructure. This is to enable an expeditious disposition of Russian excess weapons plutonium at the lowest costs.

To achieve this objective, integrated Russian-French-German project teams were established. They involved CEA, COGEMA, FRAMATOME and EDF on the French side, Siemens and GRS on the German side, and many Russian research organizations (VNIINM, RIAR, IPPE, Radium Institute, Kurchatov Institute, and others), engineering institutes (GSPI, GYDOPRESS, VNIPIET, and others), and sites (Mayak, Krasnoyarsk) under the coordination of Minatom.

What did these various project teams achieve? I think that my friend Vladimir Rybachenkov already gave you an idea of their accomplishments, but I would like to elaborate.

First, they established that using three percent MOX fuel in VVER-1000 reactors was feasible after making minor modifications to the reactors. These modifications are similar to those made in France from 1985–1990, when EDF began using MOX fuel in its 900 megawatt-electric PWRs. Thus, they confirmed the capacity of the Russian fleet of seven VVER-1000s to irradiate about 1.9 tonnes of weapon plutonium per year.

Second, they established the feasibility of implementing in the BN-600 fast reactor—without significant modifications—a hybrid core containing 23 percent of MOX fuel assemblies and capable of irradiating an additional 280 kilograms of weapon plutonium per year.

Third, they defined and produced, on the basis of relevant safety studies, the technical specifications of the reactor modifications necessary for the Russian regulatory body to authorize reactor operation with such MOX fuel loading schemes.

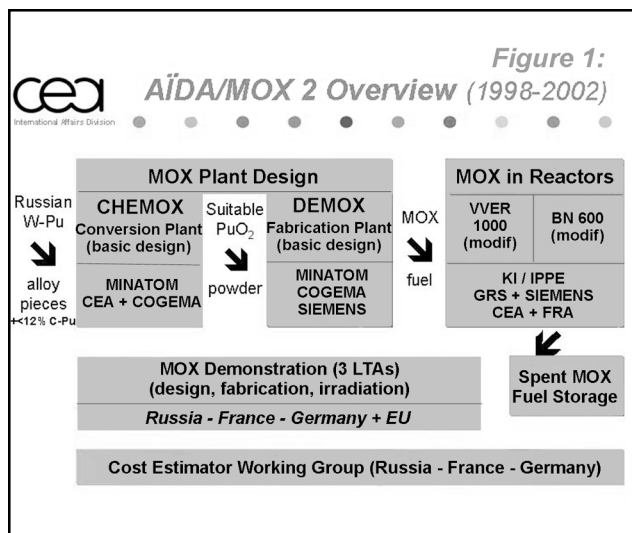
Another joint project team developed—and is completing—the basic design of a so-called CHEMOX plant, to be built at Mayak, where weapons-plutonium alloy will be converted into a plutonium oxide powder suitable for MOX fuel fabrication. The design is based on technology from Russia and France, and on processes that are used industrially in France and Russia.

Let me mention, as an example of the extensive work that has been done, that the processes selected for the CHEMOX plant were selected after four years of joint Russian-French screening studies of many alternatives.

A third joint project team developed—and is completing—the basic design of a so-called DEMOX plant, where MOX fuel assemblies will be fabricated using the plutonium oxide powder produced by CHEMOX. The design relies, for MOX pellet production, on the adaptation to the Russian context of the well-known MIMAS process—the one implemented in the MELOX plant and which has a cumulative production experience of over 1,300 tonnes of MOX fuel in Europe. This process makes the maximum use of the equipment from the Hanau MOX plant, which Siemens renounced to commission in the early 1990s. Use of this equipment is indeed crucial, not only to reduce the capital cost of the plant, but also to enable meeting the ambitious agenda by the September 2000 U.S.-Russian agreement, and starting actual disposition in early 2008.

To be exhaustive, let me mention that, in addition to these basic design studies, a so-called MOX demonstration program is being set up, whose scope is to irradiate, in a Russian VVER-1000, lead test assemblies fabricated in Russia from Russian weapons-grade plutonium using processes implemented in CHEMOX and DEMOX. The main objectives are to facilitate 30 percent MOX VVER loading approval by the Russian safety authorities, and to verify good MOX fuel flow line operation up to VVER reactor loading.

This MOX demonstration program will benefit from the financial support of a so-called “Joint Action” that the European Union adopted in 1999 to essentially supplement this trilateral French-German-Russian cooperative program. Already, 5.2 million Euros have been allocated on the EU 1999–2001 budgets for this Joint Action, whose technical implementation has been delegated to the French side.



Thus, this stimulating and fruitful technical cooperation, in which France and Germany invested 15 million Euros over just the last three years, resulted in the emergence of a jointly defined, flexible, integrated project of industrial size—code-named AÏDA/MOX 2—for the disposition of Russian excess weapon plutonium (figure 1). The project’s established credibility rests on thorough technical analysis, the use of industrially mature processes and technologies, and of the available Russian power reactor infrastructure.

In order to feed the discussions, which were developing within the G-8 in preparation of the Okinawa and then the Genoa summits, a rather

detailed assessment of the Russian plutonium disposition program was performed, on the basis of the data developed within the AÏDA/MOX project, by a dedicated joint Russian-French-German working group. This work was carried out in close interaction with the corresponding working group established under the U.S.-Russian 1998 cooperative agreement. Its results were published in April 2001.

In fact, two well-defined technical scenarios for the disposition of 34 tonnes of Russian weapon were assessed. The reference scenario precisely corresponds to the AÏDA/MOX project and fully relies on the operating experience of European MOX-fueled reactors. It is based on the use of the seven existing Russian VVER-1000 Balakovo and Kalinin reactors loaded with 33 percent with MOX fuel, plus the BN-600

fast reactor operating with an hybrid core with 23 percent MOX. This results in an annual disposition rate of 2.2 tonnes of plutonium. The cost estimates took into account that the designs of the CHEMOX and DEMOX plants were developed for this throughput, but also include provisions in the civil engineering for a possible extension of their capacity up to 4–5 tonnes per year.

A variant scenario is also analyzed. This scenario adopts more optimistic irradiation capacities of these reactors. The VVER-1000s are assumed to be operated with 41 percent MOX cores, and the BN-600 with a 100 percent MOX core. This, despite the lesser number of VVER-1000s used—only the four units of the Balakovo nuclear power plant—results in a higher disposition rate: 2.8 tonnes per year. However, this feasibility has not yet been established.

For the reference scenario, the Russian disposition program was found to require a capital cost of about \$ 900 million, plus operating costs amounting to about \$ 1.1 billion (figure 2). Since using MOX fuel enables us to avoid producing the uranium fuel it replaces, savings are generated. The savings, when assessed in the context of the Russian economy, amount to \$ 400 million, which can be deducted from the operating costs, and thus bring them down to \$ 700 million. So that, with this reference scenario, the net program cost is \$ 1.6 billion, of which \$ 900 million in capital investment is to be spent over the first 7–8 years, and operating costs of about \$ 40 million per year over 17 years.

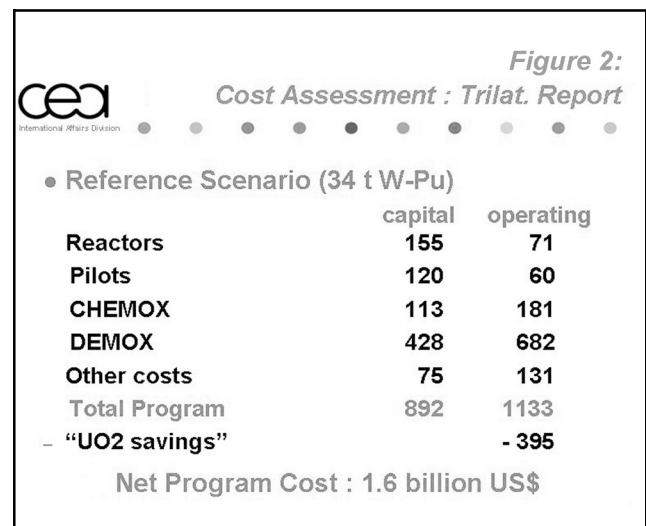
The variant scenario leads to a comparable net program cost.

Such costs do not seem to me to be out of proportion with the benefits of the program—the disposition of 34 tonnes of Russian excess weapon plutonium. Quite the contrary. This is all the more true when you consider the likely perspective of additional weapons-plutonium being declared in excess of defense needs in the future.

These additional amounts could indeed be processed in the CHEMOX and DEMOX plants at quite marginal costs. Extending the capacity of these plants up to 4–5 tonnes per year would only require a marginal additional investment, and using them over their whole industrial lifetime—30 years or more—and not only over the 15 year period necessary to dispose of 34 tonnes of plutonium, would make much more economic sense.

So, where do we stand today? Well, we are all waiting for the United States to complete the review of the plutonium disposition program. We hope that its conclusions will be soon brought to our knowledge. As Vladimir Rybachekov mentioned, there is some urgency here to dissipate the uncertainties, in particular following what was leaked to the U.S. press as to the possible new orientations of the U.S. government. These uncertainties have indeed a potentially negative impact, with—for instance—the decision by Siemens management to no longer maintain the Hanau equipment in a state to make it available for the Russian plutonium disposition program.

I am, however, personally confident for the future. The scenarios developed in the French-German-Russian framework with the AIDA/MOX project are the only ones for which a thorough technical analysis has been carried out. Their feasibility has been established, and the costs have realistically and comprehensively



been assessed by both the trilateral and U.S.-Russian cost groups. The credibility of these scenarios rest on the fact that they demonstrate the feasibility of establishing the necessary MOX fabrication facilities in Russia, as well as the feasibility of burning this MOX in identified Russian reactors.

The principal hurdle is the financing, and more precisely the difference about funding responsibilities for operational costs. But I am confident that the project can be made even more cost effective and more cost attractive, in particular by taking into account its potential beyond the disposition the 34 tonnes of weapons-plutonium presently declared by the Russian Federation in excess of its defense needs.

In this respect, the introduction of new reactors, based on similar or different technologies, could be a useful addition to the program in the long run, provided that this would not interfere with the overall schedule of the program or delay the start of actual disposition, and provided the issue of financial responsibilities is resolved.

I am, however, much more skeptical about the technical, commercial, and political feasibility of another idea that has been floating around already for some time—the so-called “Western option,” which would consist in irradiating Russian weapons-plutonium MOX fuel in Western reactors. And let me tell you that the interesting discussions on the management of civil plutonium that took place this morning are just confirming my feeling.

I would conclude by reaffirming that France is committed to contribute to the development of industrially-proven and rapidly achievable solutions for the disposition of excess weapons-plutonium in the Russian Federation, through consumption in MOX-fuelled Russian power reactors.

Thank you.

David Albright: Let us move on to questions.

Question: I have two questions for Vladimir Rybachenkov. One is: It sounds like you are saying that there is an opportunity to assist Russia and its civilian reprocessing program if adequate spent fuel storage can be provided for Russia’s VVER-440 reactors. Is this what you mean?

My second question is: You showed that President Yeltsin’s statement leads to an estimate of 125 tonnes of Russian weapons plutonium, which is about 40 tonnes more than the declared U.S. weapons stockpile. So, does this provide an opportunity for Russia to declare additional quantities of plutonium to be excess?

Vladimir Rybachenkov: Thank you for your questions. Regarding your first question, what I mean to say is that the sheer reality is that the RT-1 Plant cannot be shut down right now, because there is no place to store the spent fuel from six VVER-440 reactors. My idea was that if Russia reaches an agreement with the United States that allows Russia to import spent fuel from countries, like South Korea, where U.S. permission is first required, then we will start concluding contracts. The money from these contracts could be used, in part, for constructing the necessary storage facilities for storing the VVER-440 spent fuel. As you may recall, the Russian long-term strategy for the second part of the 21st century is to store spent fuel for a certain period of time—say, 15–20 years—after which it will be much easier to reprocess and separate plutonium, which will be used in the future generation of Russian fast neutron reactors.

Second, about the 125 tonnes—this calculation was really my own personal exercise. Yeltsin announced in Moscow in 1996 that Russia will put 50 tonnes of plutonium in storage facilities, and that this

quantity represents 40 percent of the overall stocks of military plutonium. This gives the figure of 125 tonnes. However, I have found many other estimates. Since there is no official announcement of the military plutonium in Russia, I really cannot give you any certainty about the size of the stocks.

David Albright: Vladimir, I think the question was whether Russia would declare additional plutonium to be excess.

Vladimir Rybachekov: My answer is that, until we start implementing the U.S-Russian disposition agreement, there is no possibility of discussing additional quantities of excess plutonium. This is my personal opinion.

Question: This is a question for Vladimir Rybachekov. There seems to be a broad consensus that openness and transparency are good ideas. There also is a similar consensus that there is concern about physical security in Russia. Of course, the international plutonium guidelines mandate a physical security requirement for materials that are excess to defense needs. So, I have two questions: First, would Russia be willing to open up its physical protection system and criteria to international verification? Second, if the answer to the first question is “no”: Would Russia be willing to open up if the other adherents to the guidelines agreed to similar openness?

Vladimir Rybachekov: I think that this question goes towards the framework of the work that is now being accomplished by the IAEA. If I am not mistaken, there has been a recent meeting to consider a revision of the International Convention on Physical Protection of Nuclear Materials.

Your question is really very important: Would a country permit the international verification of its system of physical protection? I would say that, so far, the Russian reaction has been negative towards this possibility.

The logic behind the Russian position is the following: Physical protection is such a sensitive topic that no one should be allowed to stick his nose inside. Russia is responsible for the physical protection and security of its nuclear material. Even the schedule of railroad transports of nuclear material cannot be revealed to anyone.

Maybe I did not understand your question correctly, but if I did, then the answer is that—for the moment—Russia would not be ready to open this system up to international inspections because it is a very internal affair. Every country should keep this information secret.

Question: To follow up: The Physical Protection Convention applies to materials in international transport, but given recent events, it seems that the physical protection of these materials in each and every country is of eminent concern to every other country. Without trying to affect a country’s sense of sovereignty, it still gets back to the question that, given the broad consensus that transparency and openness is a positive development, this is one area where it seems that transparency could contribute significantly to confidence worldwide.

Vladimir Rybachekov: I disagree that this a question of sovereignty. Rather, it is a question of assuring protection by our own means. We would not be ready to show the internal mechanisms of these security systems.

At the same time, I would agree with you. Everybody knows that the Convention on Physical Protection does not relate to the physical protection of materials that are stored, transported, or processed domestically. I think that Russia would support expanding the Convention to cover domestic operations.

Question: Back to the Hanau question. The Hanau option is indeed going to soon be no longer available. This is, to a great extent, due to the fact that Germany is now led by a rather weak coalition that cannot act affirmatively on this issue. Rather, the request to use the Hanau equipment for this program must come from the outside.

My government has been sleeping with open windows for months, but the call has never come. The program on the U.S. side has practically been scrapped, and only under the swords-to-ploughshares idea has this program been saleable to the public and, specifically, to the Greens.

Perhaps something can still be saved. One of the means would be for TVEL, itself, to start negotiating with Siemens about the price. This would buy some time. Then, on this side, other people can advocate for the sale.

My other point is—Eric, I am very sorry—I very much favor the Western option, despite the fact that it would be at the expense of COGEMA's uranium fuel market. But it is only three annual reloads. It would speed up the program very much.

Vladimir Rybachenkov: In response to your first question, I think that you are exaggerating a little bit by saying that your government has been sleeping with open windows and waiting for some signals. After all, German experts are fully participating in the Russian-French-German initiative. They were taking part in making cost estimates for the whole operation. They know that Hanau was included in these estimates.

I wonder: Who is representing Germany in the trilateral group? There are people from the Ministry of Foreign Affairs—I know several of them—and there are technical experts. There is a substantial German representation. So, to say that the German government is waiting for some kind of signal—well, I don't understand that. The signals were sent when the work on the cost estimates started about two years ago.

Eric Proust: I would like to clarify that, from my perspective, it is wrong to conclude that my opposition to the Western option has to do with reduced business for COGEMA. I think that, as you mentioned, this would have a completely marginal impact on COGEMA.

Maybe I was not very clear in my talk this morning, but I was referring to the fact that France is really committed to balancing supply and demand for its plutonium. I would guess that many other countries have the same concern with the mastery of their separated plutonium inventory. It would be important that any plan related to plutonium disposition would not displace or impact such policies that aim to mastering civil plutonium inventories. This was my point.

Question: Please let me follow up to the answers to my question. Everybody knew from the beginning that France would not participate in the Western option. But there was, theoretically, capacity available in Sweden, and the Swedes had declared themselves ready to consider it. The German utilities were waiting to be asked by their government; they will have burned their committed plutonium by 2010 or 2011, so they have some years available for further burning. There is capacity in Switzerland, as well. So one could have answered this question positively. Thank you.

David Albright: That is taken as a comment. Are there other questions?

Question: Thank you. I have a few questions. First, to Mr. Rybachenkov and Mr. Proust: Regarding the U.S. review of nonproliferation programs in Russia, you both referred to the negative effect of the extended

NSC review. In your view, is that damage irreparable, or if not, what does the U.S. administration need to do within the next 2–3 months to repair it?

For Laura Holgate: You referred to the problems between DOE and the state of South Carolina. In the correspondence between the two, DOE has said that it has essentially acceded to the South Carolina request make sure that they have an exit strategy. But DOE has also rather broadly hinted that if South Carolina continues to be difficult, then DOE will take its business to some other site. For your experience, what other viable options are there besides the Savannah River Site?

Vladimir Rybachenkov: To answer your first question, I have already heard from some of my American friends that there are good chances that the NSC review process will be finalized to the satisfaction of the Russian side. Second, as far as what the administration should do, I do not like to give any advice to foreign governments.

Laura Hogate: As to the geographic alternatives, I think that what the Department of Energy looked at as alternatives to Savannah River are a matter of public record, and I hesitate to run through them in a public meeting for fear of missing one and having people draw conclusions from that.

Your statement is also the first time that I have heard that the DOE would take its business elsewhere. But I think that it is clear that the Governor of South Carolina is interested in the most facilities, and therefore the most jobs, as possible, as well as getting the material out of his state. So I think that his motivations are pretty clear without going too deep below the surface. The administration is on record that—until it changes its mind—the current plan circa 2000 remains the current plan. We all know that they have been about to change their minds for about a year now, but the official policy is that the plan has not been changed.

Question: I have just a comment. The Physical Protection Convention negotiations were mentioned, and I have been following this. Since the end of 1998, there has been a negotiation in Vienna at the IAEA—privately—over whether to amend the Physical Protection Convention so that, among other things, it would apply within a country and not just to materials in international transport. That group reached a consensus in May that the convention should be so amended, but it also rejected inspections, verification, or international monitoring of physical protection systems. At one point, the United States proposed that there be a reporting system similar to those found in some of the safety conventions. Under this proposal, each country would report on its own physical protection systems and practices, and this could be discussed. The group failed to reach a consensus in favor of even that proposal.

After September 11, there was a major IAEA conference on nuclear terrorism, where this was debated a bit. My sense was that even after September 11, governments were still not ready to support the verification of physical protection systems. I had hoped that that had changed. They have been meeting now for the last few weeks to draft an amendment to the convention. The Director General has been trying hard to get this amendment drafted.

Question: I have a question for Mr. Proust about the Western option, which I think gets dismissed too quickly. It seems to me that you could do this, without any detriment to COGEMA, in the following way. First, you move 34 tonnes of plutonium from Russia to COGEMA. COGEMA then moves 3,400 tonnes of spent fuel—three years' worth of French reactor spent fuel—to Russia for storage. COGEMA keeps the profit that it would have gotten from the utility, it keeps the costs associated with the transportation, and transfers the remaining funds to Russia. Everybody comes out ahead.

Eric Proust: Well, I think that you should take your proposal to our utility, EDF. Because it is the utility that possesses the spent fuel...

Question: No, no. EDF sends its spent fuel to COGEMA, and pays what it costs to reprocess the fuel. So EDF is taken care of in my proposal. COGEMA arranges with the Russian government to send 3,400 tonnes of spent fuel—and if you think it is not sweet enough, send 5,000 tonnes of spent fuel.

Eric Proust: My point was that this is a question or suggestion that you can make to EDF. My second point—and this will allow me to complete my answer to a previous question—is that my primary concern with the Western option is its negative impact on the strategy of mastering separated civil plutonium stocks, which several governments are now pursuing.

There is also a question of when to implement this Western option. I think that the most reliable way to dispose of weapons plutonium through the MOX route is to do it first in Russia, where you can demonstrate the capacity to produce licensable Russian MOX fuel. Then, once this demonstration has been made, it will certainly facilitate to a large extent any attempt to license this Russian-made fuel in Western countries for use by Western utilities. But the time needed to obtain the regulatory authorization and to obtain the long-term commitment from the utility to purchase and use this MOX fuel will be lengthy. I am afraid that this could significantly delay the implementation of the program.

So, my personal point of view is that you may consider the Western option as a second step. The first stage, in my view, should be to start with existing Russian reactors, with an existing infrastructure, and with a government that is committed to the program.

Question: You've missed my point. It is unnecessary to put the MOX in Russian reactors. Minatom, as the previous speaker indicated, prefers to save the plutonium for breeders. It would be perfectly happy to store French spent fuel containing one percent plutonium...

Vladimir Rybachenkov: My friend, just a moment. Please do not mix these things up. I was speaking about civil plutonium, not military plutonium...

Question: I'm speaking about French civil plutonium that is stored in Russia for 20–30 years, and Russia provides weapons plutonium to COGEMA that is turned into MOX and burned in French reactors. There is no licensing problem; they already have the experience.

David Albright: Next question, please.

Question: I have a question for Mr. Rybachenkov. Have the events of September 11 made a difference in Russian thinking about materials protection, control, and accounting? Is there a need to do rather more in Russia? If so, what might be done? If not, why not?

Ms. Holgate suggested something about a more proactive Russian contribution to the funding effort; that is, to get out there and lead. I was wondering if that makes sense to you as well.

Vladimir Rybachenkov: My answer to your questions is very simple. On the 29th of November, the Secretary of Energy of the United States, Mr. Spencer Abraham, visited Russia where he met with Mr. Rummyantsev, the Russian Minister for Atomic Energy. At the end of the meeting, they issued a joint statement, most of which dealt with enhancing the Russian national system of physical protection, accounting, and control. This, I think, is the answer to your question.

Secondly, at the national level, Russia does everything within its financial capabilities to enhance its systems. But as I mentioned in my presentation, we have a very good record of cooperation with the United States in this field. We have good prospects for continuing this cooperation in the long term. A long-term plan has been established, and substantial sums of money have been allocated. Mr. Lyons stated earlier that it seems that additional sums will be added to these programs. Both countries obviously attach enormous importance to this field of cooperation.

David Albright: Are there any other questions or comments?

Question: Since I am from COGEMA, I would just like to say a few words about the previous proposal about swapping French spent fuel for Russian plutonium.

Of course, he is right. COGEMA has the solution for all of your problems. That is the first time that I have heard that, and it makes me very happy.

(laughter)

The second point: I fully agree with what Mr. Proust said. Of course, there is no difference on this between COGEMA and the government.

Question: My question gets back to what we have already been discussing too long, namely the Western fuel fabrication idea. Let me offer a version of this idea, which might address some of the concerns that have been expressed. When you think about the disposition of excess plutonium, you want a scheme that can get rid of the weapons-plutonium relatively quickly, that wouldn't cost an enormous sum to implement, and that would not interfere with individual the fuel-cycle policies of individual countries to any significant degree. I think that such a scheme exists.

This scheme is something that Tom Neff proposed a few years ago. Here is the basic idea: We already have in Western Europe a system that is burning up about ten tonnes of plutonium per year in commercial reactors. Why not send the Russian plutonium, and perhaps the U.S. plutonium, to Western Europe in the form of oxide? Fabricate MOX from this plutonium and irradiate it. Then give the title to that displaced European civil plutonium to Russia and the United States.

There are several benefits to this proposal. First, there is no accumulation of plutonium in the hands of countries that are currently burning civil plutonium. Second, Russia can now use the civil plutonium that it has title to in its future breeder program, if it so chooses. Third, the problem of 100 tonnes of plutonium under no safeguards in the United States and Russia is transformed into a problem of an equal amount of civil plutonium owned by the United States and Russia, but sitting in well-secured facilities under international safeguards in Europe at relatively low cost.

Rather than interfere with civil fuel cycles in Europe, this proposal effectively locks them in as an essential element for disarmament. You would have to continue forward with MOX contracts, because that would be the essential path to getting rid of excess weapons plutonium.

I've never quite understood why our European colleagues were not more supportive of this idea. It still seems to me to be the option that provides the cheapest cost and lowest disruption to the fuel cycle.

David Albright: Does any one want to comment? Any of our former speakers? Hal Bengelsdorf, do you want to comment?

Harold Bengelsdorf: My initial reaction is that the plan is too grandiose.

I will take this opportunity, however, to make an observation to my colleague from Germany, who raised a point earlier about the Western option. I think that each nation should address this issue for itself. I think that it is completely reasonable if France has a particular attitude. I also think that there are differing perceptions in Western Europe, in terms of being open to receiving some of this Russian material. There is a common interest in accelerating the burning of this material, but I would caution one from over-generalizing. If the Swiss and the Swedes are more open to exploring this idea, then I think that's fine. But it is a disservice to the objective to postulate some uniform West European attitude. I think that each state should have the ability to participate to the extent that it wants to do so.

This still bothers people. There is a germ of an idea in the Western option that was, perhaps, handled badly. Maybe the Americans, in their ham-fisted way, parachuted in on Monday and asked the French and the Germans: "Are you willing to buy this stuff? We are leaving on Friday; can you get us an answer by then?"

David Albright: Are there any final questions?

Question: I have a quick question. It is possible that MOX is not going to go anywhere because of grandiosity or cost, or because of the difficulties in getting the members of the European Union to pull in the same direction—or for all of those reasons. It also is possible that immobilization is not going to go anywhere because it does not meet the test of ideological purity, and because there may be some technical problems that would at least delay its prompt implementation. Therefore, I'd like to know whether there is a reality check here. Is the option of safe, secure storage of altered pits in unclassified form is ready to go? I wonder whether the Russian and U.S. participants on the panel could just give us a quick status report on whether or not, if everything else fails, we can proceed down that path quickly, easily, cheaply, and without controversy.

Vladimir Rybachenkov: My answer would be that, if we found ourselves to be in a situation when there is no other choice, then certainly we would do what you suggest. The storage facility is being constructed at Mayak and it is being finalized in 2002 or 2003. But in any case there will be operating costs for storage—as much as \$ 2 per gram of plutonium per year.

Question: But is there an agreement on the technology and procedures for mutual verification for classified nuclear materials?

Vladimir Rybachenkov: No, that has not been completed. The work is continuing.

Laura Holgate: I think that there has been a fair amount of progress over the past six years on confirming material in a particular form. But confirming the transition from one form to another gets at the most sensitive questions from a classification point of view. I am not aware of any verification technology that would support that.

David Albright: Well, I would like to thank the speakers very much. We will take a short break and then convene the final panel of the conference. □