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J. Benton, D. Wall, E. Parker, E. Rutkowski

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ACCELERATING THE REDUCTION OF EXCESS RUSSIAN HIGHLY ENRICHED URANIUM

Janie Benton
National Nuclear Security Administration
U.S. Department of Energy

David Wall and Elaine Parker
Y-12 National Security Complex

Ed Rutkowski
Lawrence Livermore National Laboratory

ABSTRACT

This paper presents the latest information on one of the Accelerated Highly Enriched Uranium (HEU) Disposition initiatives that resulted from the May 2002 Summit meeting between Presidents George W. Bush and Vladimir V. Putin. These initiatives are meant to strengthen nuclear nonproliferation objectives by accelerating the disposition of nuclear weapons-useable materials.

The HEU Transparency Implementation Program (TIP), within the National Nuclear Security Administration (NNSA) is working to implement one of the selected initiatives that would purchase excess Russian HEU (93% ^{235}U) for use as fuel in U.S. research reactors over the next ten years. This will parallel efforts to convert the reactors' fuel core from HEU to low enriched uranium (LEU) material, where feasible.

The paper will examine important aspects associated with the U.S. research reactor HEU purchase. In particular: 1) the establishment of specifications for the Russian HEU, and 2) transportation safeguard considerations for moving the HEU from the Mayak Production Facility in Ozersk, Russia, to the Y-12 National Security Complex in Oak Ridge, TN.

1. INTRODUCTION

After the May 2002 Summit meeting between Presidents George W. Bush and Vladimir V. Putin, a Working Group of representatives from Ministry of the Russian Federation of Atomic Energy (MinAtom) and the NNSA was formed to identify mutually agreeable approaches to accelerate the removal of HEU and excess plutonium from existing inventories in Russia. The Working Group investigated nearly a dozen proposals. One of the nonproliferation initiatives selected for accelerating the elimination of HEU, and the topic of this paper, is for NNSA to purchase enough HEU to supply fuel for four U.S. research reactors, which have yet to be converted to LEU, for up to ten years.

At this time, NNSA is fully prepared to complete final negotiations with the Russian Federation for delivery of the first shipment of HEU during 2004. A Government-to-Government Agreement was drafted and is currently under review by the Russian Federation. In addition to the Agreement, NNSA is negotiating a sales contract for the HEU Purchase. Discussions among NNSA, MinAtom and Techsnabexport (TENEX) have resulted in agreement on almost all major provisions of the sales contract.

2. ACCELERATED HEU DISPOSITION INITIATIVE

This initiative will result in a ten-year contract to purchase HEU for use as feed material required to produce fuel for the U.S. research and test reactors not yet converted to LEU. These reactors include the High Flux Isotope Reactor, and research reactors at the University of Missouri, the Massachusetts Institute of Technology, and the National Institute of Standards and Technology. NNSA has determined that approximately 166 kg of HEU per year, in the form of U_3O_8 and metal, is required for these reactors.

Specifications

There was careful consideration of potential technical issues surrounding the HEU material to be purchased. First, the HEU had to be in an acceptable form to transport, store and process at Y-12 and by reactor operators. NNSA negotiated a chemical specification that assures: 1) the HEU will meet Y-12 acceptance criteria; 2) the fuel fabricator can accept any deviations from the current research reactor fuel specifications without impact to the facilities NRC operating license; and 3) deviations from the existing specification will not cause any operational difficulties for the U.S. research reactors. The Y-12 acceptance criteria, as well as the fuel fabricator license requirements, are primarily concerned with the specific activity of the HEU, since it could affect the potential radiological dose to workers. The reactor operational considerations are concerned more with the fuel performance once the HEU is in the reactor. An agreement was reached with our Russian counterparts on all of the physical, chemical, and isotopic attributes of the HEU to be purchased.

Transportation and Security

Determining how best to transport the HEU to Y-12 was the next hurdle to be considered. NNSA requires such transport to have Category 1 Special Nuclear Material security. A number of transport options are being considered. The NNSA prefers that a U.S. military aircraft pick up the HEU in Russia and transport it to locations in the United States where it would be transferred to a DOE Safe Secure Transport vehicle for transport by road to Y-12. A second option, HEU is shipped from Russia to the United States via sea transport. A third option, and the one with the most potential, is for Russia to transport the HEU to a third country where it is transferred to a U.S. military aircraft and transported to the United States. Safeguard, security and safety measures will be implemented for all HEU shipments. The security for each move will be paramount and will include at least one face-to-face meeting with all the parties involved prior to each shipment. In addition, clear lines of responsibility and custody will be established for the HEU along each transport step.

The NNSA has also performed an environmental assessment (EA) to evaluate the impact of the transportation of the HEU. The conclusion of the EA was a “Finding of No Significant Impact.”

Safeguards

All issues regarding safeguards have been addressed. Although the agreement will not contain transparency provisions like the 1993 Russian HEU Purchase Agreement, NNSA representatives will physically witness the loading of each can and shipping container, and place Y-12 tamper indicating devices onto each can and shipping container. The tamper indicating devices on the shipping containers will be verified at the Russian airport of departure, at the third country location (if applicable), before loading on the Safe Secure Transport vehicle in the United States, and again upon arrival at Y-12. Once at Y-12, each can will be opened, weighed, sampled and

verified that it meets all specifications, and Nuclear Material Control and Accountability standards.

Shipping Containers

One of the limiting factors in planning for the transport of the HEU is to find a shipping container that is certified and licensed for the flight over and the landing in each country involved in the move, as well as flights over other countries. After careful research of the U.S., Russian, and the International Atomic Energy Agency regulations, as well as other individual countries involved, only the French TN-BGC1 shipping container, shown in figure 1 is currently suitable for this use. Although the certificate for the TN-BGC1 shipping container has recently expired, renewal of the certificate is expected in mid-2004. There is a project underway to build and certify a suitable U.S. shipping container called the ES 3100. This container should be available in about two years and may be an option for future international shipments of HEU. Until that time, the TN-BGC1 shipping container will used.

Project Management and Contingency Planning

We believe that the key to successfully packaging, witnessing, transporting, and verifying the HEU is the application of formal project management principles. A Project Manager is assigned and a formal working group formed. The Y-12 working group includes representatives from site organizations responsible for radiological control, security, material receipt, nuclear material control & accountability, and operations. All of the detailed planning and controls are basically complete for a 2004 shipment.

The assigned Project Manager directly manages all facets of the project with attention to the details, which includes a great deal of contingency planning. Although the likelihood of something going wrong is remote, the consequences of an event would be much too costly; therefore virtually every potential problem is considered and a contingency plan is developed.

The DOE Senior Aviation Policy Officer will take an important role to integrate the NNSA project plan with the U.S. Department of Defense. Integration of efforts with the Department of State is also required since some information needed by the Russian side must be conveyed through the diplomatic channel. In addition, some coordination is required with the U.S. Customs Service.

After the first shipment is made, we will do a “hot wash” or lessons learned review among all of the parties, internal and external to Y-12, to address any changes or improvements that should to be made for future shipments.

3. SUMMARY

NNSA anticipates that both the Government-to-Government Agreement and the final contract will be signed during 2004. Y-12 stands ready to receive the first shipment that could be executed during 2004. After the 2004 purchase, NNSA anticipates making periodic purchases through 2012, subject to the appropriation of funds.