

## **Russian Research Reactor Fuel Return to the Russian Federation**

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### **Abstract**

Beginning December 1999, and continuing to the present, representatives from the United States, the Russian Federation, and the International Atomic Energy Agency (IAEA) have been discussing a program to return to Russia Soviet- or Russian-supplied HEU fuel currently stored at foreign research reactors. Trilateral discussions among the United States, Russia, and the IAEA have identified more than 24 research reactors in 17 countries that have Soviet- or Russian-supplied fuel. The Russian Research Reactor Fuel Return Program is an important aspect of the US Government's commitment to cooperate with the other nations to prevent the proliferation of nuclear weapons and weapons-usable proliferation-attractive nuclear materials. Up to date 122 kg of Russian-origin highly enriched uranium have been shipped to Russia from Serbia, Latvia, Uzbekistan, Rumania, Bulgaria, and the Czech Republic. Preparations for the first spent fuel shipment from Uzbekistan to Russia are close to completion.

## **Background and History**

The primary goal of this Russian Research Reactor Fuel Return (RRRFR) Program is to advance U.S. and Russian nuclear nonproliferation objectives by eliminating stockpiles of high-enriched uranium (HEU) and encouraging eligible countries to convert their research reactors from HEU to low-enriched uranium (LEU) fuel upon availability, qualification, and licensing of suitable LEU fuel.

The goal of minimizing international commerce in HEU has been a pillar of U.S. nonproliferation policy since 1978. In that year, the Reduced Enrichment for Research and Test Reactors (RERTR) program was initiated to develop and qualify new LEU fuels that could replace HEU used in reactors of U.S. design. To complement the RERTR program, the Department of Energy (DOE) established the Foreign Research Reactor Spent Nuclear Fuel (FRRSNF) Acceptance Program in 1996. Under this program, the United States accepts specified types of U.S.-supplied spent and unused fresh fuel for management and disposition in the United States.

## **Research Reactor Fuel Return Program**

Based on the success of the FRRSNF program, the US Department of Energy, supported by the Department of State, is working to bring about a similar effort in Russia. Trilateral discussions among the United States, Russia, and the IAEA started in December 1999. The representatives from the United States, the Russian Federation, and the IAEA have been discussing a program to return to Russia Soviet- or Russian-supplied HEU fuel currently stored at more than 20 Soviet- or Russian-supplied research reactors in 17 countries.<sup>1</sup> Most of these reactors use at least some HEU fuel, and most have stocks of both fresh and irradiated fuel that must be carefully stored and managed for many years to come. The goal of DOE's/National Nuclear Security Administration (DOE/NNSA) has been to help the Russian Federation develop a broad-based HEU minimization policy under which it would accept the return of spent and fresh HEU fuel from Soviet- or Russian-supplied foreign research reactors and develop new fuels that will allow conversion of such reactors to LEU. DOE/NNSA officials have led discussions with representatives from Russia's Ministry of Atomic Energy (MinAtom/Rosatom) and the IAEA on this issue, with the IAEA agreeing to provide technical and organizational support.

Recognizing their common interest in strengthening nonproliferation and combating nuclear terrorism, Presidents Bush and Putin, in their Joint Declaration signed at the February 2005 Meeting in Bratislava, Slovak Republic, declared that the United States and Russia bear a special responsibility for the security of nuclear weapons and fissile material, in order to ensure that there is no possibility such weapons or materials would fall into terrorist hands. They established a bilateral Senior Interagency Group chaired by U.S. Secretary of Energy, Samuel Bodman, and Russian Federation Federal Atomic Energy Agency (Rosatom) Director, Aleksandr

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<sup>1</sup> Belarus, Bulgaria, China, Czech Republic, DPRK, Egypt, Germany, Hungary, Kazakhstan, Latvia, Libya, Poland, Romania, Ukraine, Uzbekistan, Vietnam, and Yugoslavia.

Rumyantsev, for cooperation on nuclear security to oversee implementation of these expanded cooperative efforts.

In the Report to Presidents from July 2005 U.S. – Russian Senior Interagency Group on Nuclear Security Cooperation stated:

- The United States and Russia agreed on a prioritized schedule for all remaining Russian-origin fresh fuel shipments and agreed they would be completed in 2006.
- With regard to Russian-origin spent fuel shipments, the United States and Russia agreed that the first spent fuel shipment would be the shipment of Russian-origin spent HEU fuel from Uzbekistan and all reasonable efforts would be undertaken to expedite the necessary preparations so that shipment from Uzbekistan could commence at the end of 2005.
- All remaining shipments of spent fuel would be completed in 2010.

In May 2004 the United States and the Russian Federation have signed a Government -to-Government Agreement CONCERNING COOPERATION FOR THE TRANSFER OF RUSSIAN-PRODUCED RESEARCH REACTOR NUCLEAR FUEL TO THE RUSSIAN FEDERATION. This agreement established the legal framework necessary for cooperation between the United States and the Russian Federation for the return of Russian-supplied research/test reactor fuel from eligible countries.

According to this agreement the United States provides funding to the RRRFR program based on the following criteria:

- the fuel return program will include only existing FSU- or Russian Federation research/test reactors in eligible countries that possess nuclear fuel supplied by the FSU or the Russian Federation.
- any country desiring to return fuel to the Russian Federation must agree to (a) convert its operating research/test reactor(s) using Soviet- or Russian-supplied nuclear fuel to LEU as soon as (i) suitable LEU, licensed by the country's national regulatory authority, is available, and (ii) the reactor's existing inventory of HEU is exhausted; or (b) permanently shut down the reactor(s).
- whenever possible, all available HEU must be made available for return to the Russian Federation before any LEU is returned.
- all nuclear fuel to be delivered to the Russian Federation under the Program must be handled in accordance with IAEA documents INFCIRC/225/REV.4 and INFCIRC/153 (corrected), and subsequent revisions thereto.

The Russian Federation agrees that it will accept nuclear fuel from eligible countries if the following conditions are met:

- The eligible country has expressed an interest in transferring nuclear fuel to Russia;
- The transfer of nuclear fuel will take place taking into account the laws of the Russian Federation related to nuclear safety and environmental protection;
- Program costs are paid by the eligible country, the United States, or a third country.

The Russian Federation also agreed that:

- Nuclear fuel received in Russia under the Program shall not be used for any nuclear explosive device or for research on, or development of, any nuclear explosive device, or for any other military purpose.
- Nuclear fuel received in Russia under the Program and any nuclear material derived therefrom shall not be exported, or transferred from the jurisdiction of Russia without prior written U.S. consent.

The U.S. and Russian Governments and the IAEA will seek to encourage financial support from other IAEA Member States, where required, for the fuel return program to supplement any U.S. Government financial contributions.

### **Fresh Fuel Shipments**

By the date RRRFR program shipped 122 kg of Russian-origin HEU from seven countries: Serbia, Romania, Bulgaria, Libya, Czech Republic, Uzbekistan, and Latvia. The last shipment of 14 kg of Russian-origin HEU from Czech Technical University in Prague, Czech Republic took place in October of this year. The Czech Technical University VR-1 research reactor is a low-power university training reactor that had been operating on HEU fuel core for many years. On September 26, 2005 the HEU fresh fuel from VR-1 reactor was packaged in Russian TK-S16 containers and on a next day HEU fuel was airlifted to the Russian Federation. Ten days later the replacement LEU IRT-4M fuel was delivered to the Czech Technical University and the VR-1 Sparrow research reactor went critical with LEU fuel soon thereafter.

All shipments of fresh HEU fuel have been conducted in a close cooperation with the IAEA and Rosatom. IAEA inspectors measured all HEU fuel before it's loaded in a transportation cask. In the Russian Federation the transported HEU will be down blended below 20% under another NNSA non-proliferation program – Material Consolidation and Conversion.

### **Pilot Spent Fuel Shipment**

The first candidate for a pilot shipment of spent fuel to Russia is Uzbekistan, whose government has expressed a strong interest in participation in the RRRFR program. Uzbekistan

possesses a VVR-SM research reactor at the Institute of Nuclear Physics, Uzbekistan Academy of Sciences, located in Ulugbek, about thirty kilometers northeast of Tashkent. It is a heavily used 10 Megawatt reactor of Soviet design that carries out an active program of research and isotope production. From its first criticality in 1959, it used 90 percent enriched HEU fuel, but was converted to 36 percent fuel in 1989. Over its lifetime, the reactor has generated a large amount of spent fuel and made a number of spent fuel shipments to the reprocessing facility at Mayak between 1973 and 1992. Personnel who participated in the early shipments are still at the facility, so experience is maintained. The facility has the necessary room and hardware to accommodate the transportation cask.

DOE has provided assistance to improve the physical protection system of the VVR-SM reactor, but it is located in a politically volatile region of Central Asia. All parties agree that the spent HEU and any remaining fresh HEU should be relocated to a more secure environment, thus removing it as a potential proliferation risk.

On March 12, 2002, DOE and Uzbekistan's Ministry of Foreign Affairs signed an Agreement to facilitate cooperation between the parties for the return of Uzbekistan's Soviet- or Russian-supplied nuclear fuel to Russia. This Agreement also addresses conversion of the VVR-SM reactor from use of HEU to use of LEU; safety upgrades of the VVR-SM reactor control system as part of its HEU-to-LEU conversion; security enhancement of the VVR-SM reactor site and nuclear materials stored at the site; and the safe and secure storage of Uzbekistan's nuclear materials, including improving methods of physical protection, control, and accountability of nuclear materials to reduce the risk of theft or possible diversion. DOE contemplates entering into similar agreements with other countries that seek to return their Soviet- or Russian-supplied nuclear fuel to Russia and commit to convert from HEU to LEU use.

At the present time the preparation for the first shipment of spent HEU fuel from Tashkent reactor is close to its completion. The Russian state ecological expertise of the Unified project has been completed; the necessary documents for spent fuel transit through Kazakhstan have been developed and will be approved soon. Mayak facility is completing the preparation of sixteen TK-19 casks, which will be transported to Uzbekistan in two TUK-5 railroad cars. Necessary regulatory approvals have been obtained in Uzbekistan. We are expecting to complete the first shipment of spent HEU fuel from Uzbekistan to Russia by the end of this year.

Preparations for spent fuel shipment have already started in Romania, Bulgaria, Czech Republic, Latvia, Ukraine, and Kazakhstan. We are working together with IAEA to introduce the high capacity casks to the program, which should allow us to complete the return of Russian-origin spent HEU fuel to Russia in 2010.