

**RERTR 2008 — 30<sup>th</sup> INTERNATIONAL MEETING ON  
REDUCED ENRICHMENT FOR RESEARCH AND TEST REACTORS**

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**STATUS AND PERSPECTIVE OF INTERNATIONAL EFFORTS OF  
HEU MINIMIZATION PROGRAM: RUSSIAN VIEW**

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*It is necessary to stop up the spread of nuclear weapons. This can be done, among other ways, by excluding the use of enriched uranium and pure plutonium in peaceful nuclear energy”- from the Statement of the President of the Russian Federation at the UN Headquarters on September 6, 2000.*

Scientists and representatives from many countries, united by a common cause to stop up the spread of nuclear weapons, have gathered here for this conference to review the major events, that have taken place in the past 30 years in the fuel enrichment reduction for research reactors, and to discuss plans for the future.

Unfortunately, the efforts of the global community aimed only at accounting for and control of nuclear material cannot provide full proof against the possibility of nuclear weapon, or rather nuclear material fit for the manufacture of nuclear explosives, getting into the hands of terrorists. For that reason the search for alternative methods of risk reduction of this kind of threat is of vital importance. The program aimed at the operation of research reactors using low enriched material, and thus reducing the circulation of material most fit for the manufacture of nuclear explosive devices, constitutes a scientific approach to the resolution of a political issue.

The Russian Federation sets as a priority the safety and security of nuclear power uses and calls for close cooperation in this area. It is our fundamental standpoint aimed at the reinforcement of the non-proliferation regime and the expansion of international collaboration in the field of nuclear energy uses for peaceful purposes.

The main platform for the implementation of international arrangements is the non-proliferation Treaty, that assures international stability and security and is an instrument that restrains and counteracts the terrorist threat.

Today, taking into account new challenges and threats faced by the global community, additional important leverage is bilateral cooperation between the leading states, which provides necessary balance between the development of the world nuclear energy sector and adherence to the nuclear non-proliferation regime.

Russia highly regards the interaction with the US, especially in such areas as the reduction of HEU in reactors and their conversion to LEU.

Rosatom works together with the DOE to implement the Agreement between the Government of Russia and the Government of the US on the repatriation of the Russian-origin research reactor nuclear fuel that was signed in May 2004.

This international initiative is carried out by the two countries with participation of the IAEA and is aimed at the prevention of nuclear weapons spread and the reduction of international terrorist threat by removing nuclear material fit for explosives manufacture from potential conflict areas.

This Agreement covers major activities related to providing assistance to return to Russia nuclear fuel from 13 countries that have confirmed their intention not to use HEU in their research reactors in the future.

Thus, unused fresh HEU has been removed from Serbia, Bulgaria, Romania, Lybia, the Czech Republic, Uzbekistan, Latvia, Vietnam and Germany. Unused HEU in Kazakhstan and Ukraine will be blended down on the spot.

Currently to implement the provisions of the Agreement we are under preparation to return irradiated fuel. Spent fuel has so far been removed from research reactors in Uzbekistan, the Czech Republic, Latvia, Bulgaria and Hungary. Next year spent fuel will be repatriated from Kazakhstan, Ukraine, Romania, Lybia and Poland.

In total by now about 700 kg. of highly enriched uranium 235 fuel has been returned to Russia where it is blended down to below 20% enrichment. Then non-irradiated low enriched nuclear material is used in peaceful nuclear energy. As for irradiated fuel, it is reprocessed at the Rosatom facility Mayak, and recycled material is subsequently used in nuclear industry while radioactive waste after 20 year long storage is either returned to the spent fuel supplier country or remains in Russia depending on the terms and provisions stipulated in international agreements.

Over 20 Rosatom enterprises and other Russian entities are involved in transportation of HEU to Russia, US labs and agencies included.

In parallel with repatriation of fresh highly enriched nuclear fuel to Russia we are working on the issue of substituting removed HEU fuel by LEU fuel. So far we have shipped LEU fuel for reactors that can operate on the licensed tested low enriched fuel IR-4M and VVR-2M developed in Russia to Lybia, the Czech technical University, Vietnam, Uzbekistan and Ukraine. Some of these reactors have already been converted and now operate on new, Russian fabricated, low enriched fuel. Currently we are working on contracts to ship this type of fuel to Bulgaria, Hungary and the Czech Republic in 2009.

Obviously, not all research reactors can be converted to use only one fuel type.

One of the aspects of the Russian program on enrichment reduction is the development of high density fuel with 20% uranium 235 enrichment and based on it fuel assemblies. The work is being done under the Federal Program called "The National Technology Base" and under the contract between the VNIINM (ФГУП ВНИИМН) and the US National Argon Laboratory in accordance with the international program for research reactor fuel enrichment reduction. The US partly funds activities related to pre-reactor, reactor and post-reactor studies in test assemblies. Russia funds the material, equipment, devices, facilities and other intellectual property related functions, necessary to perform this work.

Many Russian companies and institutes are engaged in these activities, among them: TVEL, ФГУП ВНИИМН, НИИАР, ИРМ, РАН ПИЯФ, ОАО НЗХК.

To fulfill the instructions of the Presidents of Russia and US based on the joint statement on

cooperation in the field of nuclear safety and security that was delivered in Bratislava on February 24, 2005 the Federal atomic energy agency (now State Corporation "Rosatom") and the National Nuclear Safety and Security Administration of the US Department of Energy developed and approved in September 2007 a "Joint Action Plan to convert to low enriched fuel Russian and US design research reactors in third countries", which covers mainly:

- conversion of Russian and US design reactors in third countries to LEU fuel in compliance with nuclear and radiation safety requirements and maintaining or minimizing their consumer property losses following conversion,
- extension of collaboration between Russia and US on enrichment reduction by developing, licensing, supply and use of LEU fuel in research reactors, operated in third countries, and by conducting comprehensive feasibility on safe operation of research reactors during conversion to LEU fuel.

Under the joint plan Rosatom and the Argon National Lab are conducting activities to develop new type of fuel based on high density uranium compounds, which includes development and licensing of high density uranium-molybdenum dispersion and monolithic fuel along with the development of manufacturing methods, fuel fabrication, chemical and physical tests of fuel and jacket/coating/blancket/shell compatibility, and LEU fuel radiation tests in fuel elements of pin and tubular types.

The outcome of the project will be:

- the development and licensing of new types of fuel based on U-Mo alloys, that ensure fuel radiation stability during high load and burn out;
- perfection of fabrication techniques for both dispersion and monolithic fuel;
- development of technology to manufacture new pin type fuel assemblies and their eventual production.

All this will contribute to the competitiveness of the Russian fuel elements and assemblies on the global market and the international non-proliferation of nuclear materials program.

The work is expected to be completed in 2012. Researches and research reactor operators in Kazakhstan, Uzbekistan, the Czeck Republic and Hungary are waiting for this fuel.

It is important to mention that the activities on the development of substitution low enriched fuel for research reactors and results to be obtained from its use is a unique process that requires individual approach to the concerns of the operators.

For the physicists of the Institute of Nuclear Research in Byelorussia (Sosny) the expectation is to develop and test types of nuclear fuel based on uranium enriched up to 20% (including the use of nanomaterials) for small and transportable nuclear power units and nuclear hydrogen energy. Rosatom institutes and enterprises, the Kurchatov research center and OKBM along with the Byelorussian research center Sosny and design institute "OKB Akademicheskoe", and together with the US National Labs will take part in this work.

However, joint research in this area is not focused entirely on new fuel types. The program also includes:

- physics and safety research for reactors operated on different types of fuel, including the assessment of irradiated fuel of various composition characteristics and its attractiveness in terms of unauthorized use and ways to reduce this attractiveness;
- research on justification of safety and security during transportation and storage of fresh and irradiated LEU fuel of different design;
- impact of change in fuel composition and enrichment on operational characteristics of research reactors, including nuclear safety and security issues.

Speaking about the activities of Russian entities involved in assuring nuclear safety and security and reduction of the number of storage sites for highly enriched nuclear material I would like to mention the joint US-Russian activities on consolidation and conversion of unrequired nuclear material.

Our cooperation on consolidation and conversion of nuclear material is focused both on the reduction of storage locations on sites, where unrequired nuclear material is stored, and the number of sites, that possess such material altogether. This program covers sites with nuclear material in Russia, and fresh HEU fuel, removed from Russian design research reactors in third countries. Contracts for consolidation and conversion pilot projects have been concluded with US and are underway at the Luch Facility and the ФГУП ГИЦ РФ НИИАР. Over 5.5 tons of U-235 highly enriched nuclear material, mostly research purpose material, have been brought to and reprocessed at the LUCH facility in the past few years.

I would like to touch upon one topic concerning the minimization of HEU use in civil sector. Leading nuclear states are working in this direction. The US colleagues declare that by the year 2014 they will convert all civil research reactors in US and countries under the enrichment reduction program (RERTR) to low enriched fuel.

So far, there is no single opinion in the global community on the possibility of excluding HEU entirely from use in research reactors. However, realistic and specific actions are taken by virtually all major operators of the existing nuclear facilities. Russia is also reviewing its engagement in optimizing the number of existing reactors, operated on HEU fuel.

We maintain that in some cases the use of HEU is of principal significance, thus Russia is not yet ready to have a comprehensive conversion of its research reactors, especially those that are under proper physical protection. However, certain steps in this direction are being taken.

Jointly with our US colleagues we are planning to conduct preliminary research on the possibility of converting a number of civil research reactors. And we will keep you informed of the results.

To conclude my presentation I would like to say, that scientists have a long history of cooperation in this area and the results achieved allow us to look into the future with optimism. It is vitally important to assure safe operation and functioning of civil nuclear power and scientific research, especially taking into account nuclear terrorist threat. The resolution of this complicated task is possible only on the basis of lasting international cooperation and interaction.

I wish this Conference all the success in identifying problems, coming up with specific recommendations and finding ways of their eventual resolution.