



Russian RERTR Program as a Part of Joint US DOE-RF MINATOM Collaboration on Elimination of the Threat Connected to the Use of HEU in Research Reactors

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Topics



- **Features of the Russian RERTR Program;
Current status**
- **Shipment of HEU from foreign research
reactors to Russia**
- **International collaboration**
- **Future plans**

Use of HEU in research reactors

- * rather weak physical protection of sites of research reactors; there are possibilities for the theft of HEU from these sites
- * absence of self-protection property of SNF of these reactors; it does HEU in SNF of research reactors more attractive for terrorism



Russian RERTR Program



- The program started at the end of 70's
- *The final goal of the program:*

the elimination of supplies of HEU in fuel elements and assemblies for foreign research reactors that were designed on Russian projects

Features of the Russian RERTR Program



- Broad using of uranium dioxide as material of the fuel meat
- Tube type of fuel elements

Current Status



Basic directions of the work:

- **The completion of the development of the fuel elements and assemblies on a basis of uranium dioxide**
- **The development of the fuel on a basis of U-Mo alloy**
- **The development of pin type fuel elements**

Current Status



- Fuel assemblies of WWR-M2 type with LEU were developed and qualified for using in foreign research reactors that use such type of fuel assemblies;
- These assemblies are *ready* for the supply to several operating foreign research reactors and reactors that are planned now for construction

Development of pin type fuel



- **The technology of the fabrication of pin type fuel elements was developed**
- **The experimental fuel elements and assemblies are made**
- **In a near future irradiation tests will be start**

Shipment of fresh and spent HEU from foreign research reactors to Russia

- Problems of the final stage of fuel cycle do not concern directly to the RERTR program but these tasks are very closely connected with each other
- Unfortunately at the start of the program the sufficient attention was not paid on this problem; by this reason now it is necessary to apply significant efforts to decide it



Shipment of fresh and spent HEU from foreign research reactors to Russia

- There are **more than 20 sites** in Eastern European countries, former Soviet republics and another countries that have big amount of Russian origin HEU in fresh and spent fuel
- The problem of the shipment of SNF from sites of research reactors is also very important for domestic Russian research reactors



International Collaboration



More than ten years from its beginning the Russian RERTR program developed practically independently from the international RERTR program and only at the begin of 90's the Russian specialists started to contact with foreign scientists and the exchange of the scientific information has become more intensive

International Collaboration



Gore-Chernomyrdin Commission Meeting

June 1994

Minatom Minister V.Mikhailov and

U.S. Secretary H.R.O'Leary

agreed to collaborate in the field of conversion
from HEU to LEU of research reactors with
Russian origin fuel

sides also agreed to discuss the question of return
of spent HEU from sites of research reactors to
the country of origin

International Collaboration



At several **next Gore-Chernomyrdin Commission meetings** parties of meetings have confirmed the support to the collaboration in the field of reducing enrichment of uranium in research reactors

International Collaboration



September 1994

Representatives of Minatom and DOE signed
a protocol of intent to reduce an enrichment
of uranium in research reactors

International Collaboration



Main aspects of collaboration

- **the choice of the optimum composition of the fuel**
- **the choice of the optimal variant of the core conversion**
- **the neutron-physical analyses of the conversion**

International Collaboration



Main aspects of collaboration

- Several domestic Russian research reactors such as WWR-M, IR-8 and others were investigated from the point of view of possibility of reducing of enrichment
- And at last an important aspect is **financial support** of the program from US DOE; but it is clear however that the funding of the program is insufficient and it limits its progress

International Collaboration



Joint Statement Secretary Abraham and Minister Rummyantsev

September 16, 2002

“...one of the important area of joint cooperation that could lead to reduction of HEU is:

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work on accelerated development of LEU fuel for both Soviet-designed and United States-designed research reactors”

International Collaboration



- **The important part of international collaboration is the import of Russian origin spent and fresh fuel of research reactors to Russia**

International Collaboration



In August this year the impressive result of the Russian-American collaboration with support of IAEA and with the help and assistance of Yugoslavian side was achieved when the fresh fuel from research reactor in Yugoslavia was shipped to Russia for the safe storage and subsequent blending

International Collaboration



**At the 46 General Conference of IAEA in
September, 2002**

Minister A.Rumyantsev said:

“Russia highly appreciates results of the carried out operation as from the point of view of maintenance of nuclear safety, and from nonproliferation aspect, and also as a sign element of the international cooperation in business of an opposition to potential threat of nuclear terrorism. We are going to continue with our partners to carry out activity in the given direction”.

Future Plans



- **Continuation of the development of pin type fuel on the base of U-Mo fuel**
- **Conversion of reactor in Uzbekistan and shipment of SNF from the site of this reactor to Russia**
- **Conversion of other Russian design reactors to LEU**
- **Continuation of investigations of the possibility of conversion of Russian domestic reactors to LEU**

Future Plans cont'd



- **Consecutive implementation of the take-back program of Russian origin fuel**
- **Study of other aspects of elimination of the use of HEU in research reactors**

CONCLUSION

- **Russian RERTR program has reached the definite progress but its main goal is not yet achieved**
- **Recent successes in the development and qualification of WWR-M2 fuel elements allow to begin delivery of fuel elements with LEU**

CONCLUSION

- **International collaboration is an important stimulus for the continuation of the activity on the elimination of HEU from research reactors; recently US DOE-RF MINATOM collaboration has received a new pulse and support in the Joint Statement of Secretary Abraham and Minister Rumyantsev**



CONCLUSION

US DOE-RF MINATOM collaboration promoted progress of the Russian RERTR program and it will be continued both in the development of new fuel elements and assemblies and in the import of fresh and spent fuel of research reactors to Russia