Implementing Arrangement #3 - Depleted Uranium

under

Memorandum of Understanding

between

The United States Department of Energy
and
The Russian Academy of Sciences

on

Cooperation in Science and Technology

Implementing Arrangement #3 - Depleted Uranium

Authority:

This Implementing Arrangement has as its aim the practical implementation of the Memorandum of Understanding (MOU) between the U.S. Department of Energy and the Russian Academy of Sciences on Cooperation in Science and Technology, which was signed on March 24, 1999.

This Implementing Arrangement will facilitate collaboration on scientific problems of mutual interest, and identify potential beneficial uses of depleted uranium (DU) of common interest to both parties. This new cooperation between the US Department of Energy and the Russian Academy of Sciences will serve to strengthen a long history of interaction between the two organizations.

Collaborative opportunities for depleted uranium were framed during a US/Russian Federation workshop on "Management of Depleted Uranium", conducted on December 9-10, 2002 at the Institute of Geology of Ore Deposits, Petrography and Mineralogy (IGEM) of the Russian Academy of Sciences in Moscow.

Objectives/Scope:

The objective of the workshop was to identify potential beneficial uses of DU of common interest to both the U.S. and Russian sides, as listed below, in the hopes of initiating collaborative work in this area:

1) Repository uses of DU.

2) Uranium as a shielding material.

3) Innovative uses of uranium compounds (basic electronic properties of uranium, phosphors, magnets, batteries, fuel cells, fluorine reuse, and others).

4) UF_6 and UF_4 as fluorinating agents for production of high-value fluorine-containing compounds.

5) DU electrodes for hydrogen production, for batteries, or for fuel cells.

6) DU (urania) semiconductor material properties.

7) DUO_2 geologic chemistry material properties.

8) Luminescent, phosphorescent properties of UO_2 for light electron conversion.

9) Magnetic properties of uranium metal.

10) Elimination of rebar in concrete through the use of microstructures.

11) Control and/or suppression of cement pore water gaseous radiolysis products in the sealed annulus of a concrete/steel cask shell.

12) Interaction of DUO_2 and iron in geological, geochemistry environment.

13) Depleted uranium dioxide radionuclide power source.

14) Radiation and chemical safety of DU.

15) Physical-chemical study of urania used in production of cermets and concrete.

16) Use of cold-wall melter for the production of UO_2 particulates for cermets and direct formation of aggregate for DUCRETE.

17) Utilization of $USiO_4$ to replace UO_2 as an aggregate for UO_2-cement.

18) Other areas as decided by the U.S. or Russian side.

Expected Results

The disposition of depleted uranium "tails" from uranium enrichment facilities is a worldwide problem in which the U.S. and the Russian Federation can collaborate. Collaboration can result in cost savings of several hundreds of millions of dollars to both governments if beneficial uses for depleted uranium can be identified rather than simply transporting and disposing of this material as waste at disposal sites. Expected results of the research delineated above may include, but not be limited to the following:

1. Potential to reduce the cost of DU disposal through the identification of beneficial uses of DU.

2. Research that will provide supporting information to U.S. geological repository licensing activities.

3. Potential for increased understanding of the chemical alteration of DUO_2 by Yucca Mountain ground water, e.g., DUO_2 solubility, kinetics, alteration product characteristics, resulting water chemistry, and interactions of the resulting solution with other waste package constituents. Such repository applications could consume the entire inventory of DOE and Russian surplus depleted uranium (DUF_6) from gaseous enrichment plants, if the research and subsequent demonstration are successful.

4. Potential for the removal of several process steps in the fabrication of both depleted uranium aggregate (DUAGG) for heavy concrete (DUCRETE), and depleted uranium – steel cermets, which are high technology materials for use in the construction of the next generation high level waste and spent nuclear fuel storage, transport, and repository casks and waste packages.

5. Potential for increasing heavy concrete fracture toughness and its ability to absorb energy. If successful, this research may reduce, or eliminate, the need for rebar reinforcement in concrete structures and thereby reduce fabrication costs.

6. Potential development of a depleted uranium dioxide (UO_2), long-lived (centuries) battery for safety and nuclear non-proliferation purposes. The lifetime of such a power device would far

exceed other power sources. The battery would provide a power source that enables (1) long-term monitoring of spent nuclear fuel casks and (2) repository conditions after repository closure.

7. Potential development of dual (storage, transport), or possibly multipurpose (storage, transport, disposal) spent nuclear fuel casks, that are smaller, lighter weight, have a higher heat load (i.e. shorter cooled fuel), be more resistant to terrorist assault (e.g. rocket attack), and be more proliferation resistant.

8. There is the potential for additional valuable benefits through basic science research on DU uses, such as novel direct energy conversion processes (e.g. photovoltaics) and energy production (e.g. hydrogen/fuel cells).

Funding:

Funding arrangements shall be delineated in attached Appendices. All funding commitments contained herein shall be subject to the availability of appropriated funds.

Participating Organizations:

US DOE National Laboratories, scientific institutions of the Russian Academy of Sciences, and other research institutions of both countries as mutually agreed.

Appendices
Please see attached Appendices under this Implementing Arrangement for detailed project descriptions, including funding arrangements.

For the US Department of Energy: _____ **Date:** 9/23/03

For the Russian Academy of Sciences: _____ **Date:** 24/09/03