Results of Depleted Uranium Workshop

Dr. M. Jonathan Haire
Oak Ridge National Laboratory*
P.O. Box 2008
Oak Ridge, Tennessee USA 37831-6166

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Background and Status

- A Russian–American workshop on Management of Depleted Uranium (DU) was held December 9–10, 2002, in Moscow, Russia
- Approximately 20 potential research activities were discussed
- Three full proposals were developed, submitted, and approved for funding ($800K) by the International Science and Technology Center (ISTC)
- DOE-EM will provide $250K of funding to RAS for DU research
- Three research proposals were submitted, July 28, to DOE-RW, Office of Civilian Radioactive Waste Management (OCRWM)
- An International Proliferation Prevention (IPP) proposal ($1.0M) has been drafted

Three DU Research Projects were Approved by the ISTC, April 2003

1. ISTC #2691, "Production and Testing of Heavy Concretes Including DU Dioxide Concerning Their Use as Shielding Materials in Construction of Casks for SNF"

2. ISTC #2693, "Production and Testing of Cast Cermet on the Base of Stainless Steel and DU Dioxide as Applied to Its Use in Construction of Casks for SNF and Radioactive Wastes"

3. ISTC #2694, "Investigation of Sorption Capture of Long-Lived Radionuclides from Underground Waters by DU Oxides and Hydroxides"

Proposed New Depleted Uranium Research

1. "Geochemistry"

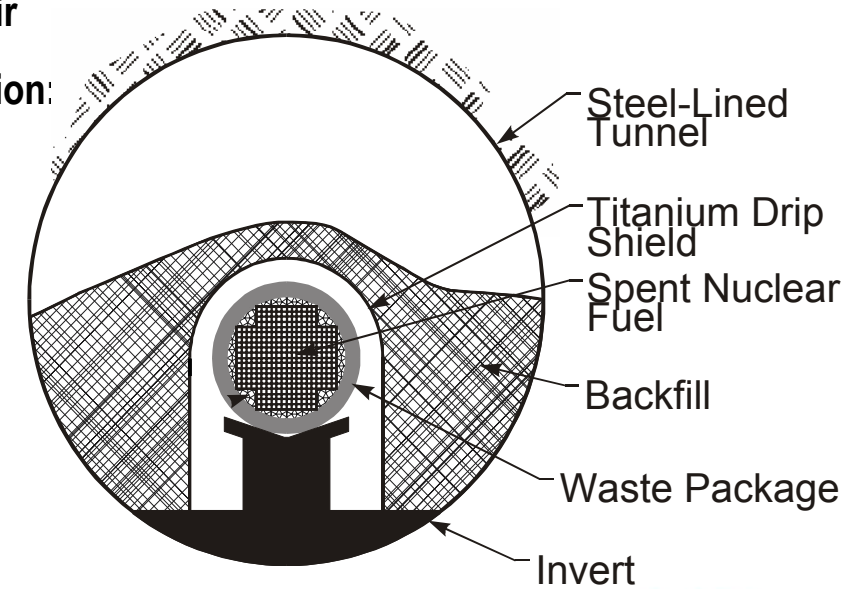
"The Use of Depleted Uranium Dioxide (DUO_2) As An Internal Yucca Mountain Repository Waste Package Geochemical Barrier to Reduce Radionuclide Releases and Reduce Costs"

- **Performers:** Lead Institution: Russian Academy of Sciences (RAS) Institute of Physical Chemistry (IPC)– Prof. V. Gromov and Elena V. Zakharova; other participating institutes VNIIEF–V. Shapovalov; Partners: Oak Ridge National Laboratory and Lawrence Livermore National Laboratory

- **Approach:** Use DU as geochemical barrier to water/air ingress, spent fuel degradation, and radionuclide migration. Investigate three key aspects of DU alteration: (1) impact of alteration products on permeability as a function of time, (2) sorption of key radionuclides on alteration products, and (3) modeling of the foregoing

- **Benefits:** Success would contribute to elimination of costly [Yucca Mountain (YM)] geologic repository baseline components such as C-22 alloy clad on the waste package (WP) and/or titanium drip shields

- **Cost in Russia:** $450K over 4 years



2. "Cold Wall Melter"

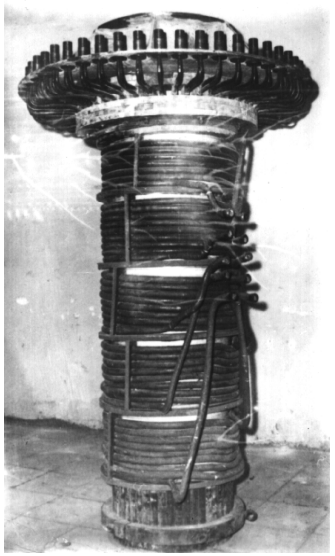
"Use of a Cold Wall Melter for the Production of UO_2 Particulates for Cermets and Direct Formation of DUCRETE"

- **Performers:** VNIIKhT–V. A. Seredenko, V. T. Gotovchikov; Partners: Oak Ridge National Laboratory and Mississippi State University

- **Approach:** Develop cold wall melter technology to inexpensively manufacture DUO_2 particles: (a) Russians will test new cold wall melter technology (particle formation) and (b) ORNL will perform cask design and economic studies and interface with commercial vendors

- **Benefits:** This work will dramatically lower the costs of producing DU dioxide particles for use in DUCRETE and cermet fuel cycle and repository components

- **Cost in Russia:** Phase 1, $450K over 3 years



Russian Cold Crucible

3. "Concrete"

"Develop Cementitious Materials Compatible with YM Geochemistry to Extend Drift and Waste Package (WP) Life and to Retard Radionuclide Migration"

- **Performers:** Lead Institution: Research Institute of Experimental Physics (VNIIEF), S. Ermichev; Partners: ORNL, The University of Tennessee, the University of California–Berkeley

- **Approach:** Develop and test inexpensive cementitious materials that are alternatives to ordinary Portland cement to be used for construction of inverts, drift liners, bulkheads, etc., that are compatible with YM groundwater and WP life (concrete not limited to DU)

- **Benefits:** Substantially reduce repository subsurface construction costs and improve repository performance.

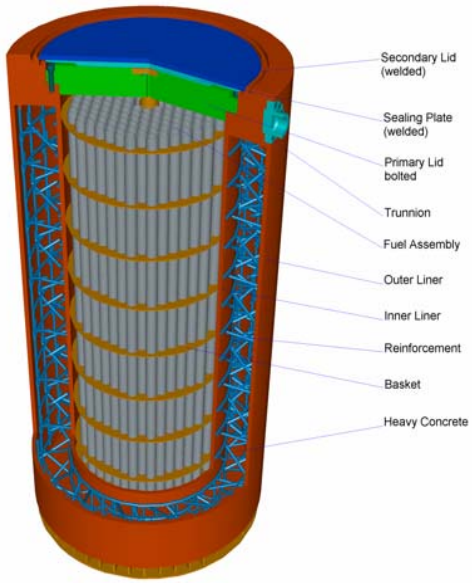
- **Cost in Russia:** $480K over 4 years

Micro-reinforced concrete

4. Advanced Transportation Cask

"Design and Fabricate a Next Generation ¼ Scale Spent Nuclear Fuel Cask Utilizing Advanced Depleted Uranium Oxide Materials," an International Proliferation Prevention (IPP) Proposal

- **Performers:** Research Institute of Experimental Physics (VNIIEF); Research Institute of Chemical Technology (VNIIKhT); Oak Ridge National Laboratory, Holtec International (U.S. private company)
- **Approach:** Fabricate and test next generation dual purpose cask
- **Benefits:** A cask that is lighter weight, smaller, dimensions, capable of higher heat loads, terrorist assault resistant, more proliferation resistant
- **Cost in Russia:** $1.0M over 3 years



CONSTOR Spent Nuclear Fuel Storage Cask

The Objective of U.S./Russia/Private Industry Spent Nuclear Fuel Cask Development

- To design, license, and deploy next-generation casks that
  - Have smaller dimensions
  - Weigh less
  - Are capable of higher heat loads from shorter-cooled SNF
  - Are more resistant to terrorist attack
  - Are more proliferation resistant