

Global Threat Reduction Activities at the Y-12 National Security Complex

Presented

at the

*10th International Topical Meeting on Research
Reactor Fuel Management*

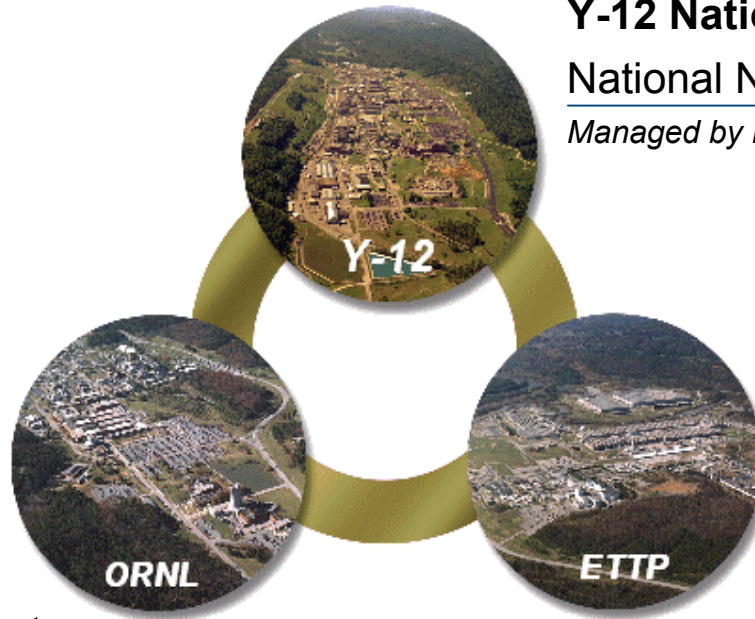
May 2006

Trent C. Andes

BWXT Y-12



Oak Ridge Complex



Y-12 National Security Complex

National Nuclear Security Administration

Managed by BWXT Y-12

Oak Ridge National Laboratory

Department of Energy - ORO

Managed by UT-Battelle

Research and Development

- Neutron science
- Energy
- High-performance computing
- Complex biological systems
- Advanced materials
- National security

East Tennessee Technology Park

Department Of Energy - ORO

Managed by Bechtel Jacobs Company

Former gaseous diffusion plant

- Reindustrialization of former enrichment plant
- Defense conversion

Y-12 National Security Complex

- Built in 1943 to make enriched uranium from the electromagnetic separation process
- Managed by BWXT Y-12 for the National Nuclear Security Administration (NNSA)
- ~ \$850 million annual budget
- 4700 employees
- 811-acre site, with 500 buildings and 7-million square feet of laboratory, research and development, machining, dismantlement, and storage areas



Y-12 ca. 1944



Y-12 today

Y-12 National Security Complex

- **Primary missions**
 - **NNSA's Lead Material Management Center for Uranium**
 - **Defense Programs**
 - **Non-Proliferation**
 - **Non-Commercial Reactor Supply**

- **Capabilities and Key Assets**
 - **Enriched uranium operations**
 - **HEU purification and down blending**
 - **Analytical laboratories**
 - **Supplier of special nuclear materials**
 - **Transportation expertise – commercial, military, international, and safe secure transport**
 - **Material safeguards expertise**

GTRI Mandate

“Title XXXI, SEC. 3132 – DOE National Security Programs

- **(1)(c) Program Elements**
 - **(A) Accelerated efforts to secure, remove, or eliminate proliferation-attractive fissile materials or radiological materials in research reactors, other reactors, and other facilities worldwide; and**
 - **(K) Accelerated actions for the blend down of highly-enriched uranium to low-enriched uranium.”**
- **(2) A survey by the Secretary of the facilities and sites worldwide that contain proliferation-attractive fissile materials, radiological materials, or related equipment.**

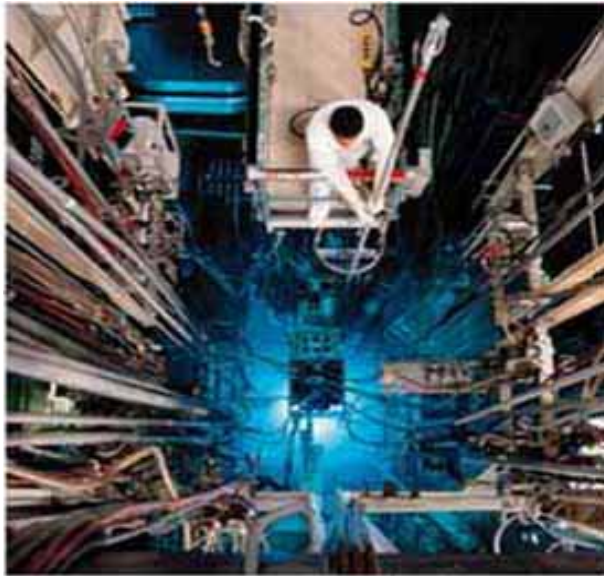
Linking Y-12's NNSA Uranium Missions

- Y-12 proactively develops solutions that bridge across multiple Y-12 programs domestically and abroad:
 - University Assistance Program / Office of Nuclear Energy
 - Office of Fissile Materials Disposition
 - Central Scrap Management Office
 - Foreign Research Reactor (FRR) Uranium Supply Program
 - Domestic Research Reactor Supply



Foreign and Domestic Research Reactors Uranium Supply

- Y-12 is one of two primary suppliers of low enriched uranium (LEU) and limited quantities of highly enriched uranium (HEU) to foreign and domestic research reactors
 - Supply of uranium metal and oxides
 - Multiple long-term contracts



CEA OSIRIS Reactor



ORNL HFIR Reactor

Nonproliferation Benefits of the Y-12 Uranium Supply Program

- Support the Foreign Research Reactor (FRR) Spent Nuclear Fuel Acceptance Program and Reduced Enrichment Research and Test Reactors (RERTR) Program - - which require that the U.S. Department of Energy (DOE) act as a *reliable* and *cost-effective supplier* of uranium for production of research reactor fuel
- Y-12 provides LEU to convert research reactors in support of the RERTR Program – Including:
 - Romania, University of Florida, Purdue and Texas A&M
 - Other LEU shipments are planned for FY2006 for additional reactor conversions
- LEU at 19.75 wt. % ^{235}U is produced by down blending surplus HEU at Y-12 under the Office of Fissile Materials Disposition (NA-261)

Y-12's Ability to Utilize FRR Uranium Sales Program for GTRI Success

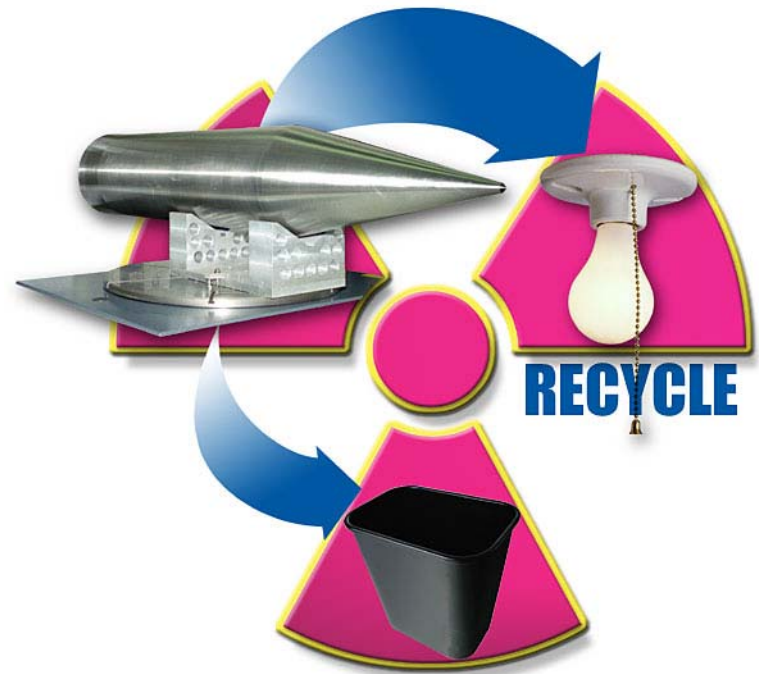
- Existing personal contacts with research reactors can be used to meet Global Threat Reduction Initiatives (GTRI) objectives
- Utilize uranium supply contracts – trade returned HEU for equivalent LEU
- Ability to simply amend existing NNSA Y-12 uranium supply contracts
- Reduced transportation costs by “piggy backing” with other shipments or in use of containers, within transportation regulations
- Daily logistical and packaging experience with both commercial and military transport (U.S. and foreign) and DOE’s Safe Secure Transport
- Strong existing working relationships with other agencies: DOE, U.S. Department of Transportation, Nuclear Regulatory Commission, Military, International Atomic Energy Agency
 - Daily interaction on import / export licensing
 - Agreements for Cooperation
- Existing commercial contracts with fuel fabricators, commercial processors, and transporters
- Revenues are being sent to the U.S. Treasury to recover a portion of the historic costs that were required in the original production of the HEU

LEU CREDITS FOR HEU

| Enriched Uranium Market Value Calculation Inputs | | | | | | | |
|---|----------|-----------|---|--|---------|-----------------------------------|----------|
| Disposition Product Assay | Xp | 4.950% | | Current Market Values taken from The Ux Consulting Company, L.L.C. http://www.uxc.com | | | |
| Reference Feed Assay | Xf | 0.711% | | | | | |
| Reference Tails Assay | Xw | 0.30% | | | | | |
| Natural Uranium | NU Cost | \$96.05 | \$/kgU Feed | Component values taken as 2 quarter average as of 2QFY06 (i.e. average of 4QFY05 & 1QFY06). | | | |
| SWU Value | SWU Cost | \$113.67 | \$/SWU | | | | |
| Value of Disposition Product Derived from Returned Material (includes Disposition Costs) | | | | | | | |
| Item | Assay | Mass, kgU | Derived Disposition Product, kgU | Eq. Feed, kgU | Eq. SWU | Credited Value \$ (w/Disposition) | |
| Uranium Alloy | 93.15% | 4 | 87.15 | 986 | 619 | \$89,877 | |
| Oxide | 93.15% | 5 | 108.93 | 1232 | 774 | \$118,504 | |
| Assemblies | 93.15% | 3 | 65.36 | 739 | 464 | (\$23,278) | |
| Totals | 93.15% | 12 | 261.44 | 2958 | 1856 | \$185,103 | |
| Market Value of Ordered LEU Material (per kgU) | | | | | | | |
| Item | Assay | Mass, kgU | Feed, kgU | SWU | Feed \$ | SWU \$ | Total \$ |
| LEU Metal | 19.75% | 1 | 47.32 | 37.78 | \$4,546 | \$4,295 | \$8,840 |
| Equivalent LEU Credits | | | | | | | |
| Item | Assay | Mass, kgU | Credits (kgU) are equal to the Total Returned Material Value (\$) divided by the Market Value of the ordered LEU (\$/kgU) | | | | |
| LEU Metal | 19.75% | 20.94 | | | | | |

HEU Disposition Program Objectives

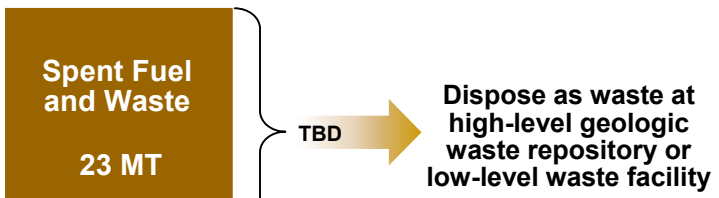
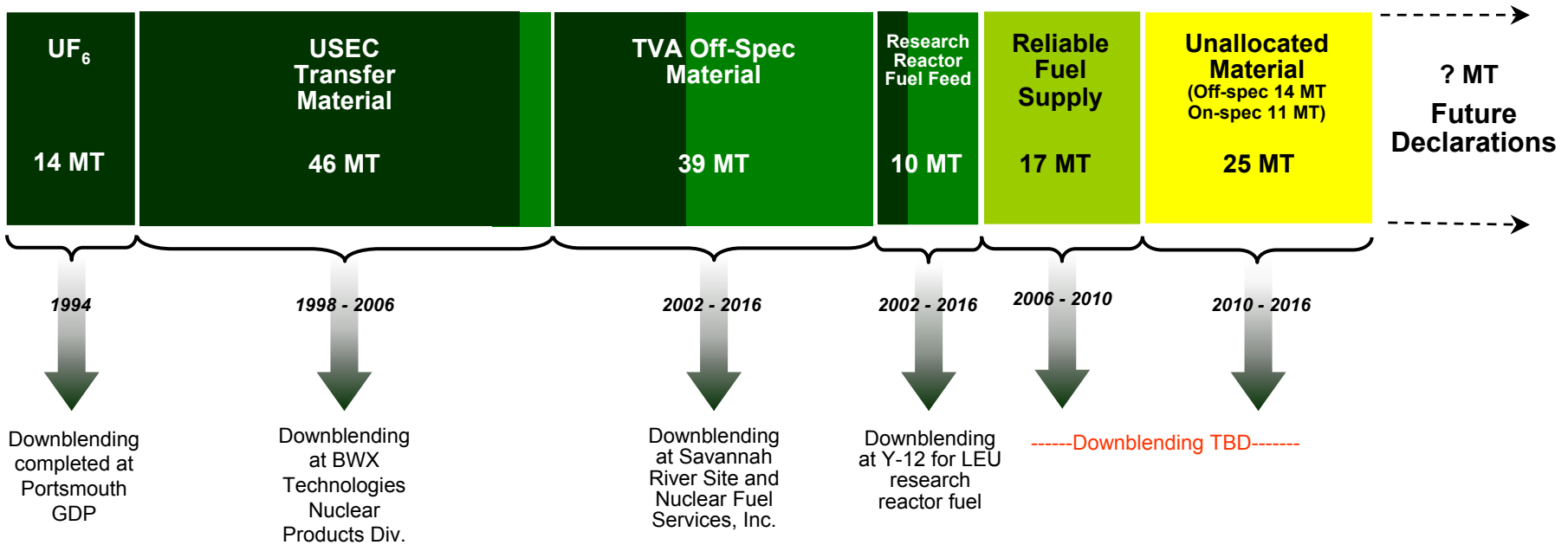
- Support U.S. nonproliferation objectives - make surplus HEU nonweapons-usable by blending it down to LEU
- Recover the economic value of the material by using the LEU as reactor fuel to the extent practical



Utilize the Fissile Materials Disposition Program to Support GTRI Objectives

- **The HEU Disposition Program Office (HDPO) at Y-12 supports DOE in the disposition and down blending of U.S. surplus HEU**
 - Existing HEU recovery and down blending projects are already in place
 - Disposition of the foreign HEU can be accomplished utilizing existing projects – kilograms vs. metric tons
 - Timing of such projects is critical

U.S. Surplus HEU Disposition Paths

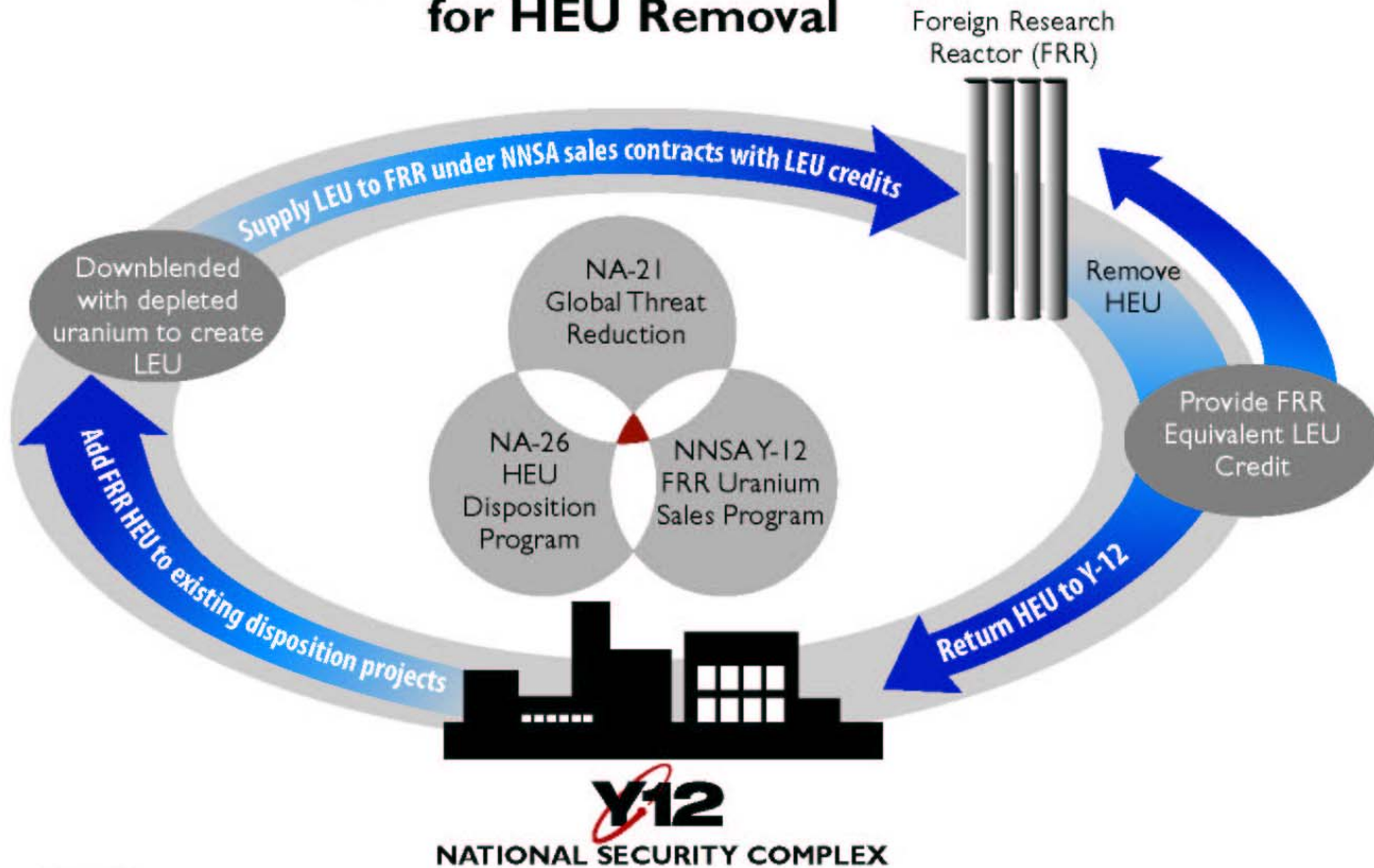


Total = 174 MT



Existing NNSA Programs Can Be Leveraged to Maximize GTRI Successes

Leveraging Existing NNSA Programs for HEU Removal



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Y-12 GTRI Activities to Date

- Helped author sections of the Removal and Research Reactor Security Study
- Conducted technical assessments of special nuclear materials at four domestic sites and five foreign sites
- Y-12 Removals
 - Completed HEU removals from two U.S. sites during FY 2005
 - Two additional domestic HEU recoveries planned for FY 2006
 - HEU removal projects from six countries, four of which are planned for FY 2006

Some of the HEU materials assessed...



Conclusion

- **Y-12 has a dedicated team that is making real progress in recovering HEU from domestic and foreign sites**
- **Y-12 has existing personal and contractual relationships with domestic and foreign research reactors, which can be utilized to trade HEU for equivalent LEU**
- **Y-12 proposes a Work-for-Others mechanism that will provide “win/win” opportunities for the U.S. Government and foreign research reactors alike**
- **Y-12 has contractual and working relationships with other NNSA/DOE sites, domestic and foreign commercial processors; this will enable NNSA to determine the most cost-effective disposition paths for returned HEU**
- **Y-12 management of HDPO offers an opportunity to disposition much of the foreign HEU within existing projects; however, timing of such projects is critical**