Disposition of Surplus HEU through Downblending and Purification for Placement in the Nuclear Fuel Cycle

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Disclaimer - The opinions expressed by the author of this paper are his own and do not necessarily reflect the opinions of Nuclear Fuel Services, Inc.
- Sole supplier of HEU fuel material to U.S. Navy
- A world leader in HEU-to-LEU conversion
- Source for dispositioning U materials
- Helping to spark the nuclear renaissance
HEU Recovery Flowsheet

HEU Receipt and Storage

HEU Sampling and Analysis
- HEU Feed Amenity/Validation Testing
  - Dissolution Rates
  - Filtration Rates
  - Chemical Addition
  - Effluent Treatment

U Metal

U Metal Size Reduction/Shearing

Oxide Formation

U Metal Oxide Dissolution

Blendstock Receipt and Storage

Blendstock Sampling and Analysis

Prepare Blendstock

Purification
- U Oxides Dissolution
- Oxide Solids Dissolution

Purification Required

Down blending to 4.95% U-235

Certify and Ship LEUN

Liquid Effluent Treatment

CD Line
- Options
  - Ammonium Diuranate
  - U3O8
  - UO2

Filtrate

Raffinate

Caustic Filtrate

No Purification Required

Options

Downblending Economics

- Downblended U as a commercial reactor fuel saves hundreds of millions of $ when compared to conventional means.
  - SRNS made 252 MTU of LEU from BLEU Project HEU
  - NFS has made > 225 MTU of LEU from BLEU Project HEU
  - NFS has made > 30 MTU of LEU from RFS Program HEU

“Megatons to Megawatts”
Blended Low Enriched Uranium (BLEU) Project – 23 MT HEU
Reliable Fuel Supply (RFS) Program – 17 MT HEU

- Metal 84%
- Oxides 13%
- Reactor Fuel 3%
Typical RFS HEU Metal Feed

HEU Slug Castings

HEU Broken Metal

NFS
NUCLEAR FUEL SERVICES, INC.
the smart alternative
CD-Line

The NFS CD-Line will come of line in early 2009. The skid-mounted process line equipment has been fabricated and tested and most of the equipment is on site awaiting installation, testing and operational readiness reviews.

The CD-Line is a logical extension of NFS’ focus of providing turn key storage, processing and dispositioning of “Stranded” Materials, including downblending of proper materials for reuse.
CD-Line HEUF$_6$ Flowsheet

Vaporize UF$_6$(s) to UF$_6$(g)

HEU Oxide

UO$_2$F$_2$ Receiving Columns

NH$_4$OH

ADU Precipitation

HEUN

Y-12

BPF SX
The CD-Line is an extension of the NFS downblending process which addresses small quantities of HEU stranded materials with various physical, chemical and radiological attributes.

In early 2009, operations will start with dispositioning of a variety of U-bearing scrap materials as well as HEUF₆.
Summary

- Over 500 MT of 4.95% enriched LEU has been produced via downblending HEU from the BLEU Project and RFS Program.
- This LEU product has produced savings of several hundred million dollars for commercial nuclear fuel users.
- CD-Line adds new processing capabilities for the nuclear industry.
- NFS can handle a variety of HEU feeds, including: metal, U/Al alloy, U oxides, U fluorides, plates, rods, etc.
- NFS stands ready to assist the industry with downblending and disposition of stranded materials.