

Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning the Disposition of Highly Enriched Uranium From Nuclear Weapons

Highly Enriched Uranium Transparency Program
Office of Nonproliferation and International Security
National Nuclear Security Administration
United States Department of Energy

Overview

- The 1993 Agreement
- The highly enriched uranium (HEU) to low enriched uranium (LEU) conversion process
- Transparency monitoring
- Results

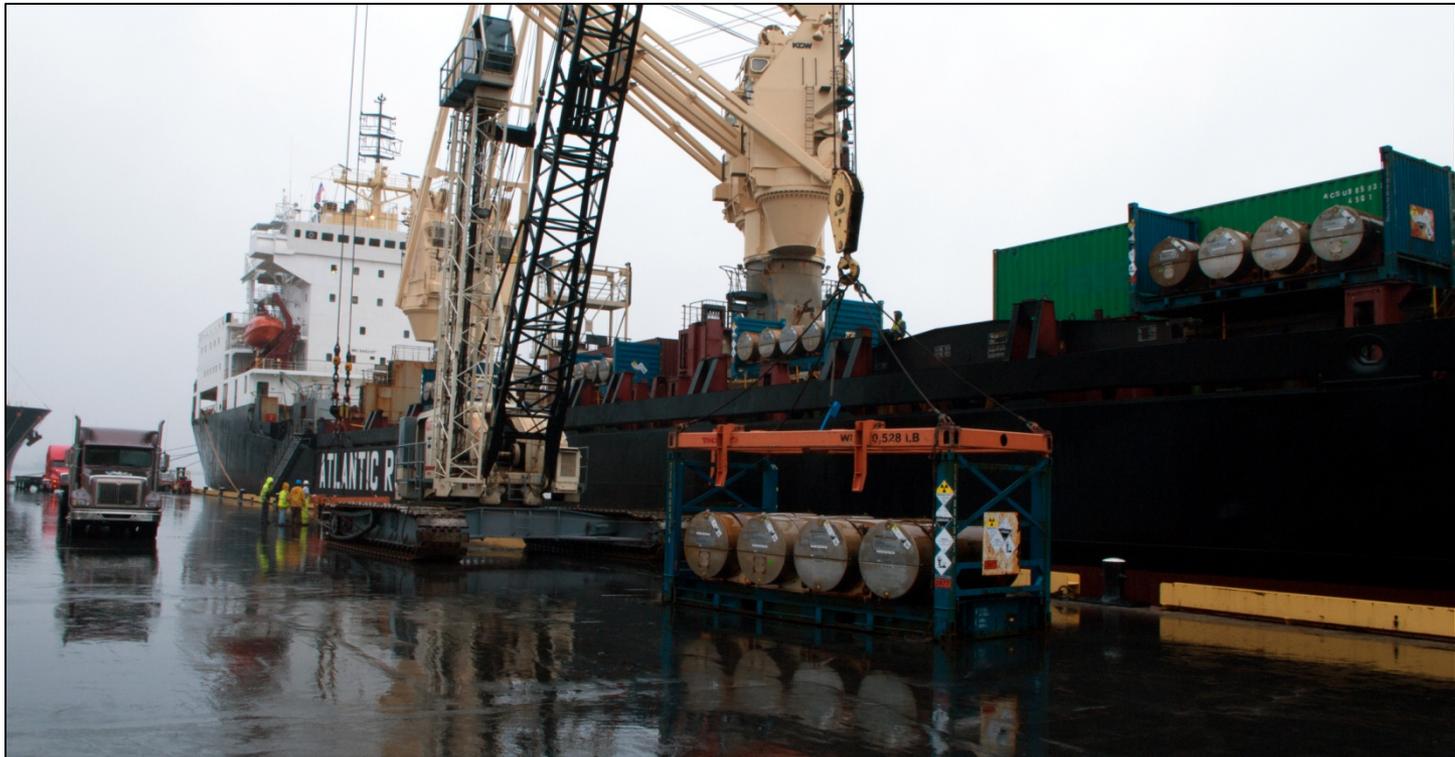
The HEU Purchase Agreement

1993 HEU Purchase Agreement

- Provides for the safe and permanent disposition of highly enriched uranium (HEU) extracted from nuclear weapons rendered excess by arms control agreements
- United States committed to purchase low enriched uranium (LEU) derived from 500 metric tons (MT) Russian weapons-origin HEU
- Requires reciprocal transparency measures to ensure nonproliferation goals are met
- Commercial implementation by Executive Agents
 - U.S. Executive Agent is the United States Enrichment Corporation (USEC)
 - Russian Executive Agent is Techsnabexport (Tenex)

Commercial Implementation

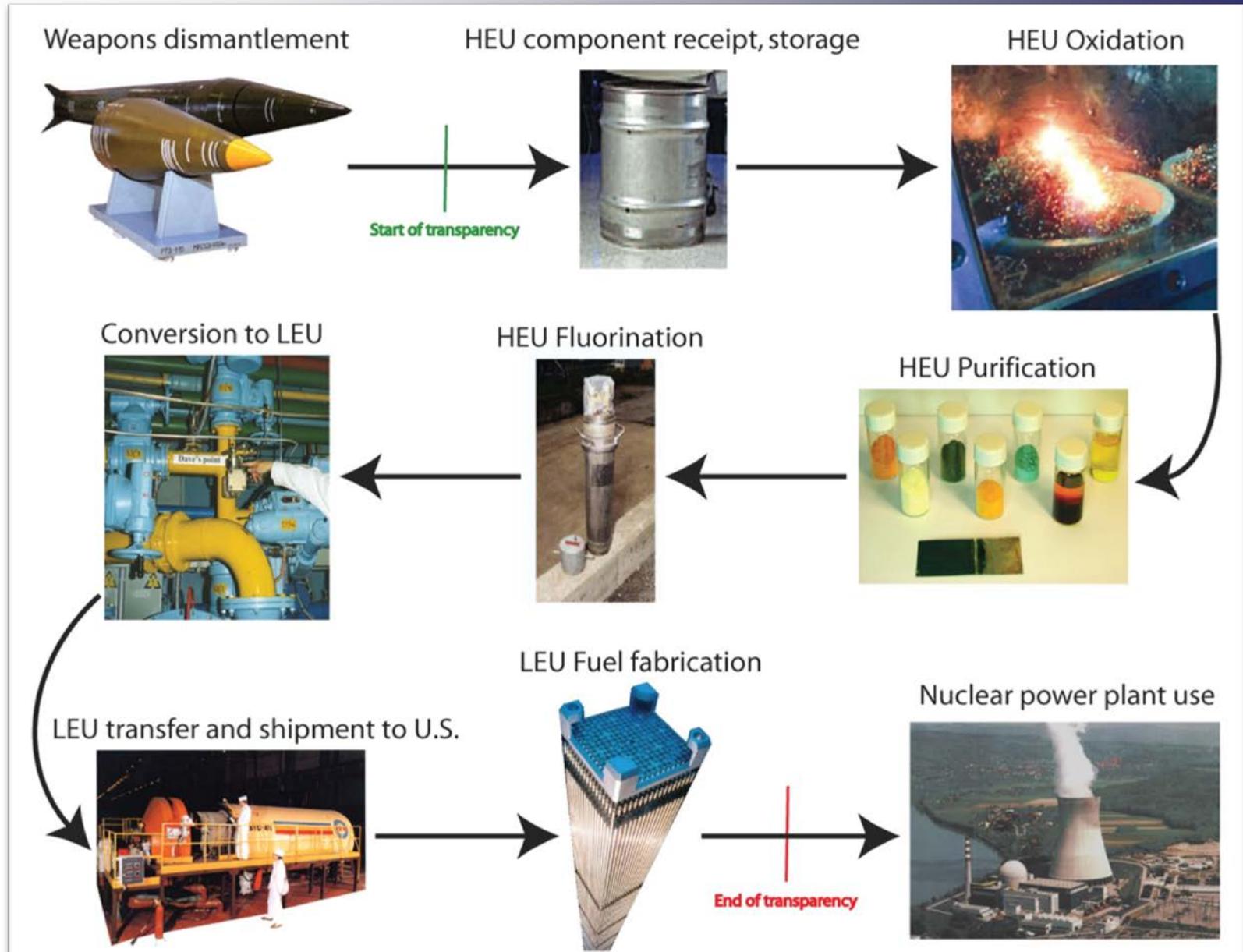
- USEC and Tenex specified annual delivery terms for LEU containing 30 MT 90% HEU
- USEC received LEU in St. Petersburg from Tenex
 - USEC paid Tenex for separative work unit (SWU) component of LEU
 - USEC transferred title of an equivalent amount of natural uranium to Tenex



Mutual Benefits

- Russian weapons-derived LEU provides nearly half of all U.S. nuclear fuel and has generated approximately 10% of U.S. electricity consumed over the past fifteen years
- Stable Russian access to U.S. SWU and uranium markets
- Stable employment for Russian and American HEU scientists, engineers, and technicians for twenty years
- 500 MT of 90% HEU converted into LEU is equal to approximately 20,000 nuclear warheads permanently eliminated

The Conversion Process



Material Flow: Russia

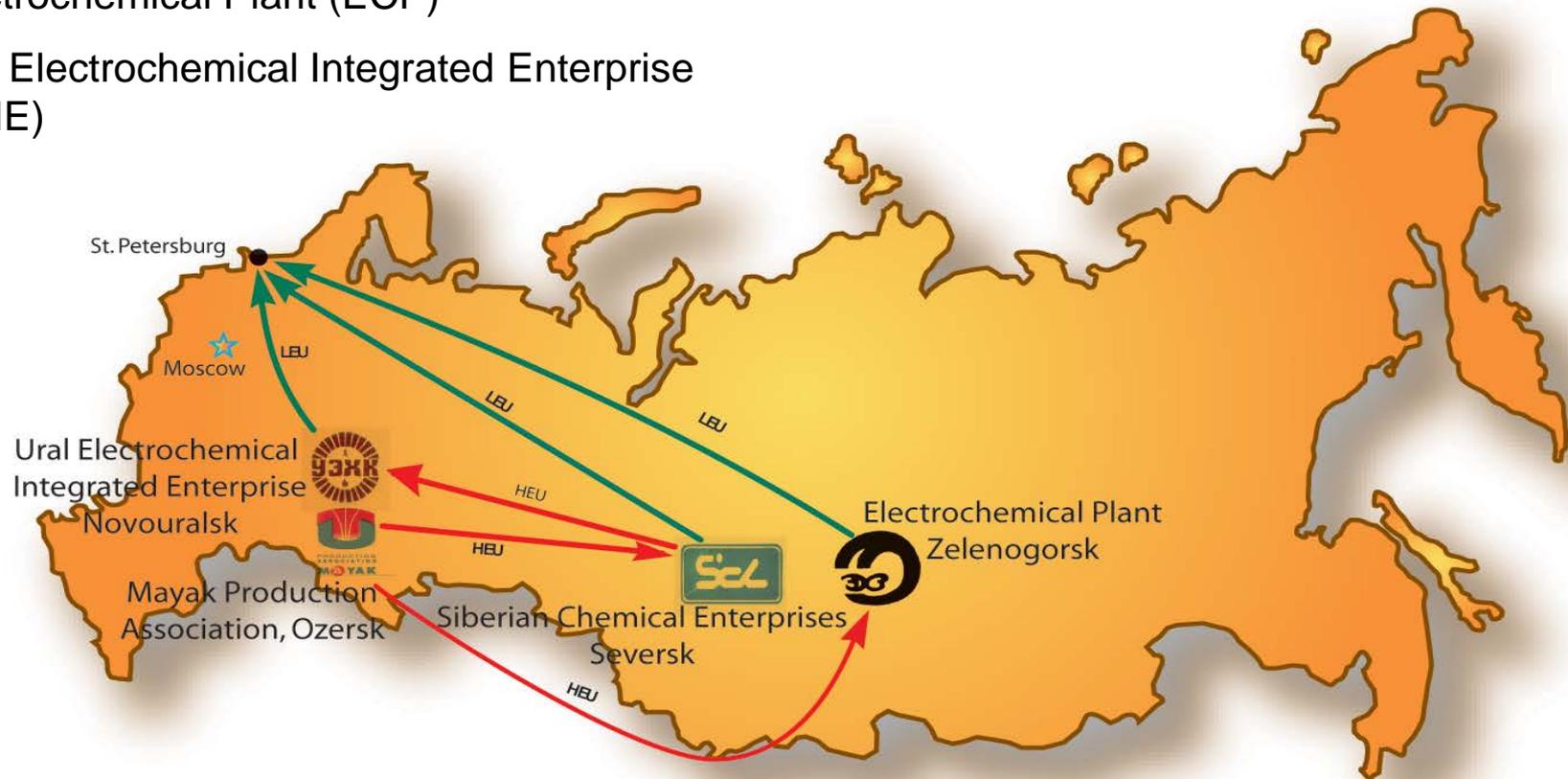
Russia processes HEU at four sites:

Mayak Production Association (MPA)

Siberian Group of Chemical Enterprises (SChE)

Electrochemical Plant (ECP)

Ural Electrochemical Integrated Enterprise (UEIE)



Material Flow: United States

USEC receives weapons-origin LEU from Russia:

USEC Paducah

*USEC Portsmouth

The LEU is fabricated into nuclear fuel at four sites:

Areva-Richland

Areva-Lynchburg*

Global Nuclear Fuel

Westinghouse



*LEU shipments to the Areva-Lynchburg facility ended in March 2011

*LEU receipts and processing at USEC's Portsmouth facility ended in March 2010



Basis for Transparency Monitoring

- The 1993 Agreement broadly mandates “the parties shall establish transparency measures to ensure the objectives of this Agreement are met. . .”
- The 1993 Memorandum of Understanding specifically requires “Transparency and access measures to guarantee that...”:
 - HEU is extracted from nuclear weapons
 - The same HEU is oxidized
 - The HEU is blended down to LEU
 - The LEU delivered to the United States is fabricated into fuel for commercial reactors
- The 1994 Protocol and its 18 Annexes detail monitoring access and activity rights in each U.S. and Russian facility subject to the Agreement.

Implementing Transparency

- Both countries may conduct monitoring visits and establish a permanent monitoring office
- In Russia
 - Up to six annual U.S. visits to each of the four Russian HEU-LEU processing facilities
 - U.S. monitoring office at Ural Electrochemical Integrated Enterprise (closed in 2012)
- In the United States
 - Up to six annual visits to the Paducah Plant
 - Up to two annual visits to each U.S. fuel fabricator
 - Russia briefly maintained a monitoring office in Portsmouth, Ohio



U.S. Monitoring Objectives

Monitoring Objectives

- For each criterion, ensure consistency among Russian documentation, U.S. expert observations, and measurements from U.S.-designed instruments
- Develop overall confidence that Russian weapons-origin HEU is converted to LEU under the Agreement

Monitoring Tools

- **Document Exchanges** of Russian shipping, sampling, and process activities
- **Observations** of significant process steps
- **Measurements** on uranium at key processing points



Document Exchanges

- The United States and Russia exchange documentation of all material shipped, processed, and sampled under the Agreement



Observations

- U.S. Experts observe plant operations and major material transformations firsthand



Measurements

- U.S. non-destructive assay equipment confirmed presence of 90% enriched HEU in sealed containers
- Measured HEU metal, oxide, and hexafluoride in storage and in process
- The Blend Down Monitoring System (BDMS) performed continuous, unattended HEU flow and enrichment measurements
- BDMS was installed at all three Russian blending facilities



Results After 20 Years

- 500 MT HEU (20,000 nuclear warhead equivalents) converted into LEU
- One of the world's most successful nuclear threat reduction programs
- Unique government-industry partnership to convert excess nuclear weapons material into a major source of U.S. electricity



IAEA Safeguards and the 1993 HEU Purchase Agreement

- Article V of the 1993 Agreement States:
 - 4. “The United States shall use LEU acquired pursuant to this Agreement...for peaceful purposes only.”
 - 5. “LEU acquired by the United States...shall be subject to safeguards.”
 - 6. “The parties shall maintain physical protection of HEU and LEU subject to this Agreement. Such protection shall, at a minimum, provide protection comparable to...INFCIRC/225/REV 2.”
- In practice, all LEU material has been fabricated into fuel in facilities subject to IAEA safeguards reporting and used in power reactors that are eligible for IAEA safeguards under the U.S. voluntary offer safeguards agreement with the IAEA.

- **Highly Enriched Uranium**

- In 1994 and 2005, the United States declared that a total of 374 MT of HEU would be removed from further use as fissile material in nuclear warheads
- 140 MT has been downblended into LEU. Downblending of 46.6 MT HEU, or more than one-third of the total to date, occurred under IAEA safeguards. This amount will continue to grow as downblending progresses.
- 17.4 MT HEU was down-blended for American Assured Fuel Supply, a back-up fuel assurance of ~230 MT LEU for use in the event of a supply disruption

- **Plutonium**

- In 1994 and 2007, the United States declared that a total of 61.5 MT of plutonium would be removed from further use as fissile material for use in nuclear warheads
- Under the U.S.-Russian Plutonium Management and Disposition Agreement, the United States and Russia each will dispose of no less than 34 MT of plutonium declared excess to defense needs.