Joint US/RF Work on Cost Estimating for the Russian Pu-Disposition Program: History and Current Status Summary

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SYNOPSIS

- History
- Basic Assumptions
- Estimating Categories
- Similarities to U.S.
- Differences from U.S.
- Types of Estimates
- Relationships Between Cost Studies
- EEDB (Energy Economic Data Base) Approach

History of ORNL Involvement in Cost Estimating for Russian Pu-Disposition Scenarios

- **Nov 1995** **Past attempts at cost estimating in Russia examined (JPNAS)**
- **Dec 1995** **First Joint Steering Committee meeting in Oak Ridge**

  Temporary cost subcommittee set up to prepare preliminary estimate (Williams/Malenkov)

History of ORNL Involvement in Cost Estimating for Russian Pu-Disposition Scenarios

- **Dec 1995** — **A. Malenkov (IPPE) spends two weeks at ORNL learning Western cost estimating methodology**
- **March 1996** — **Working meeting at IPPE, Obninsk**
- **Oct 1996** — **Joint US/Russian Pu-Disposition Study published**
- **Oct 1997** — **First draft of BN-600 conversion study received from IPPE**

History of ORNL Involvement in Cost Estimating for Russian Pu-Disposition Scenarios

- **April 1998** — **Draft Joint US/RF Report on BN-600 Hybrid and Full MOX Core Conversion issued**
- **May 1998** — **Proposal prepared for economic evaluation of VVER-1000 Pu-Disposition Scenarios**
- **Aug 1998** — **Meeting at Kurchatov Institute to plan for VVER-1000 estimates**

History of ORNL Involvement in Cost Estimating for Russian Pu-Disposition Scenarios

- **Jan 1999** — **JSC approves VVER-1000 work**
- **May 1999** — **First Joint US/RF Cost Estimating Workshop held at IPPE, Obninsk**
- **Sept 1999** — **Draft VVER Cost Evaluation Received from KI**
- **Oct 1999** — **JSC Agrees to Set-up Regulatory and Economics Subcommittees**
- **Nov 1999** — **ISTC 1058 Proposal Approval**

Basic U.S. Generated Assumptions Regarding Russian Cost Estimates

- **Estimates to be Prepared by Russian Engineers and Estimators**
- **Life Cycle Cost Approach by Facility or Crosscutting Activity**
  - **Pu-Conversion (Metal to Oxide)**
  - **MOX Fuel Fabrication (including bundling)**
  - **MOX Irradiation**
  - **Waste Disposal**
  - **Transportation**
  - **Lead Assemblies and R&D**

Basic U.S. Generated Assumptions Regarding Russian Cost Estimates

- **Facility/Activity Pu-Conversion-Related Costs Only; Estimates Should Not Include Electricity Generation Costs**
- **No <u>New</u> Fast Reactors**
- **Credit for Enriched -U Displaced**
- **No Charge to U.S. for Pu Feed**
- **No Amortization or Taxes**

Unique Attributes of Cost Estimating for Russian Facilities

- **Unstable currency**
- **Russians not used to concept of paying for all equipment and services (such as transportation)**
- **Large resident workforce applied to projects at closed cities (higher overhead and lower productivity than in U.S.)**

Unique Attributes of Cost Estimating for Russian Facilities (cont.)

- **At reactor sites, manpower loading per craft-hour is 2 to 3 times that in U.S.**
- **Russians do not always include regulatory costs in their estimates**
- **Labor rates are a factor of 10 lower than in U.S.**
- **Russian Regulatory and HS&E Environment is in evolving stage**
- **Taxes can consume significant percentage of funding**

Life Cycle Cost Estimating Categories

Up-Front Costs:

- RD&D
- Planning
- Licensing & Permits
- Design
- Construction
- Construction Management
- “Cold” Start-up
- Financing (AFUDC)

Life Cycle Cost Estimating Categories

Recurring Costs:

- **Operations (Material & Labor)**
- **Maintenance (Materials & Labor)**
- **Utilities**
- **Capital Replacements**
- **Waste Handling**
- **Regulation**
- **Overheads**
- **Taxes**
- **“Hot” Start-up**

End-of-Life Costs

- **Deactivation**
- **D&D**

Assumed Similarities to U.S. Domestic Pu-Disposition Program

- **Same Facilities Needed**
  - **Pu Metal to Oxide Conversion**
  - **Fuel Fabrication**
  - **Reactors**
  - **Spent Fuel Storage/Disposal**
- **Facilities to be Government-Owned, But Paid for by West (Mostly U.S.)**
- **MOX Fuel Will Displace Enriched Uranium Fuel**

Assumed Similarities to U.S. Domestic Pu-Disposition Program

- **National Regulatory/ES&H Agencies will be Involved in Licensing/Permitting**
  - **RF: GAN, etc.**
  - **US: NRC, DNFSB, EPA, etc.**
- **Initial Studies Assume 50MT Pu Each Dispositioned by Both Countries**
- **Multiple Laboratories/Institutes Involved in Joint R&D**
- **Both Nations Will Irradiate Lead Assemblies**

Differences From U.S. Domestic Pu-Disposition Program

- **By Use of a Fabrication/Irradiation Consortium, The U.S. Has Fully Engaged A Commercial Fuel Fabricator and Two Utilities.**
- **TVEL and Rosenergoatom Not yet Actively Participating in Russian Program**
- **ES&H, Regulatory, and Construction Standards in RF are in High State of Flux Compared to U.S.**
- **Two Reactor Types to be Used in RF (Fast and PWR Reactors)**

Differences From U.S. Domestic Pu-Disposition Program

- **RF has not Agreed to "Credit" for Enriched Uranium Fuel Displaced**
- **RF Sites and Industrial Processes (Conversion and Fabrication) Not Yet Selected**
- **U.S. Should Have Firm "Record of Decision" (Sites and Process) This Month. RF Decisions Still Many Months Away.**

There are Different Types of Estimates, Each Based on Where Project is Located in its Life Cycle

- **Scoping or Feasibility Estimates**
- **Pre-Conceptual Estimates**
- **Conceptual Estimates**
- **Preliminary Estimates**
- **Final Estimates**
- **Russian Estimates in First Three Levels**

Presently Planned and Possible Future Cost Studies

- **Revised ISTC 1058 (Kurchatov/ORNL)**
  - **Augments above studies with improved cost data on transportation and spent fuel storage**
  - **Recently approved**
- **Phase II Water Reactor Study**
  - **(ISTC/Kurchatov/IPPE/ORNL/AECL) Augments VVER-1000 study with possible foreign reactors, including CANDUs.**

EEDB Format