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

K. A. Williams

1 December 1999
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 New 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


• 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