

Portsmouth EM Project(s)
Baseline Summary
February 2009

BACKGROUND

The Portsmouth site is located approximately 75 miles south of Columbus, Ohio in the foothills of the Appalachian Mountains. For approximately 50 years, the Portsmouth Gaseous Diffusion Plant in Portsmouth, Ohio supported the Federal Government and commercial nuclear power missions.

Construction of the Portsmouth Gaseous Diffusion Plant began in late 1952 with a mission to increase the national production of enriched uranium and maintain the nation's superiority in the development and use of nuclear energy. The first enrichment diffusion cells went on line in September 1954, and the facility was fully operational in March 1956. Both government and commercial uses required the enriched uranium.

In the mid-1980s, the facilities and equipment required for the next generation of enrichment facility technology, the Gas Centrifuge Enrichment Plant (GCEP), were constructed and installed at Portsmouth. However, the project was terminated in 1985 before going into full production due to a significant reduction in the worldwide market for enriched material. In 2004, the United States Enrichment Corporation selected the Portsmouth site as the location for deployment of a commercial centrifuge plant. As a result, the United States Enrichment Corporation identified a number of buildings and areas that are or will be transitioning to the Department of Energy (DOE) under the terms of the lease agreement.

From 1991 until production ceased in 2001, the Portsmouth Gaseous Diffusion Plant produced only low enriched uranium for commercial power plants. In 1993, uranium enrichment operations were turned over to the United States Enrichment Corporation in accordance with the Energy Policy Act of 1992. The United States Enrichment Corporation was privatized in 1998, and corporate business decisions were made in 2000 to terminate uranium enrichment at Portsmouth and to keep the Paducah facility operating. Some of the facilities were no longer required by the United States Enrichment Corporation and subsequently returned to DOE.

The Department maintained the Portsmouth Gaseous Diffusion Plant facilities in cold standby from 2001 to 2005. In 2005, the facilities were transitioned to cold shutdown, and decontamination and decommissioning (D&D) of the Portsmouth Gaseous Diffusion Plant were initiated. In FY 2007, the Department formally established the approach to be taken to implement D&D activities and cleanup of the site.

Five decades of uranium enrichment operations resulted in the Department's inventory of depleted uranium hexafluoride. A contract was awarded a contract in August 2002 to design, build, and initially operate two depleted uranium hexafluoride conversion facilities (Paducah, KY and Portsmouth, OH). The Project's mission is to provide for the conversion of the U.S. Department of Energy (DOE) inventory of depleted uranium hexafluoride (DUF₆) to a more

stable chemical form (uranium oxide) suitable for beneficial reuse and/or disposal. The construction and operation of these plants was mandated by Congress (Public Laws 105-204 and 107-206), and construction began in 2004.

The Department is committed to clean up of the Portsmouth site to industrial standards. Limited land areas will require institutional controls following remediation. Equipment and material removed from buildings will be decontaminated, reused, or recycled to the extent practicable.

SCOPE DESCRIPTION

The decades of nuclear energy and national security missions left a legacy of radioactive and chemical contamination. Therefore, the mission of the site is transitioning from primarily enrichment operations to environmental cleanup, waste management, depleted uranium conversion, deactivation and decommissioning, re-industrialization, and long-term stewardship. DOE has focused environmental cleanup on high-risk areas first, and has completed all initial assessments required under the Resource Conservation and Recovery Act and remediated several hazardous and solid waste sites.

The Portsmouth site's use of recycled reactor fuel (or reactor returns) as feed material in the 1950's introduced fission products such as technetium, cesium, and strontium into the system, as well as small quantities of transuranics, primarily plutonium and neptunium. Spills and waste disposal during past operations also resulted in contamination from various industrial solvents (e.g., trichloroethylene), uranium, technetium, and metals. Groundwater contamination is limited to a shallow aquifer that is not used as a drinking water source. A layer of bedrock only 30 feet beneath the surface has helped to contain the groundwater plumes. Since the early years of plant operation, all direct discharges from DOE operations have been monitored through a National Pollutant Discharge Elimination System permit; however, minor levels of contaminants have been detected in nearby stream sediments.

The United States Enrichment Corporation-leased facilities are presently being deactivated to minimize future surveillance and maintenance costs. The deactivation is conducted to address the higher risk conditions in the facilities, including the removal of large uranium deposits, and to stabilize the facilities for future D&D activities.

A significant portion of the Department's surplus (excess to defense requirements) uranium inventory is contaminated with technetium-99, eliminating the value of this asset in commercial markets. The only operational facility for removing technetium-99 contamination from uranium feed in the United States is leased and operated by the United States Enrichment Corporation under their Nuclear Regulatory Commission operating certificate at Portsmouth with the resultant product being further processed at the Paducah Gaseous Diffusion Plant. The United States Enrichment Corporation processes the contaminated uranium for the Department.

DOE is responsible for the management of the approximately 700,000 metric tons of depleted uranium hexafluoride (DUF₆), a result of uranium enrichment operations, stored in about 60,000 cylinders at the Portsmouth and Paducah sites (~250,046 metric tons at Portsmouth). The conversion project contractor will be using a dry conversion process in which DUF₆ is vaporized and converted to uranium oxide in fluidized bed conversion units. The conversion to an oxide is

accomplished through the reaction of DUF_6 gas with steam and hydrogen; Hydrofluoric Acid (HF) is produced as a co-product. An HF recovery system will collect the HF produced and prepare it for unrestricted release in the commercial market. Resulting uranium oxide powder is collected and packaged for beneficial reuse and/or disposal. Conversion of this facility's DUF_6 inventory will be accomplished within the next two decades. DOE is ultimately responsible for the deactivation and decommissioning of this facility.

PROJECT MANAGEMENT

Based on the direction from EM Headquarters, the near-term baseline was developed for the Portsmouth site for each of its projects. These project baselines have undergone an independent review to verify the reasonableness of the scope, cost, and schedule for each project. An approved near-term baseline reflects the identified scope that can reasonably be accomplished for the identified cost in the identified time period if near-term baselines are funded as profiled and contingency funds are provided as required during project execution. It also establishes the baseline as an acceptable point from which to track and control future change. The review and approval process accommodates the likely changes in the EM complex, site priorities and funding plans. These changes could affect both near-term (within the next five years) and life-cycle cost, schedule and scope. Such future changes may be required to comply with applicable environmental legal obligations while maintaining essential functions necessary to protect human health, the environment and national security; reflect funding different from the baseline assumptions; incorporate technological advances; realize specific programmatic risks; or implement programmatic business cases. Because the cleanup extends beyond the near-term, out-year planning estimates (ranges) have also been developed and will be independently reviewed.

LIST OF PROJECTS

The Near-Term Baseline (NTB) for the Portsmouth EM program consists of three projects as shown below. The NTB for these projects is from FY 2007 – FY 2012. The Out Year Planning Estimate Range (OPER) is from FY13 through FY 2044 and is captured in the Critical Decision-1 approval for the Gaseous Diffusion Plant Decontamination and Decommissioning.

The values for the OPER do not reflect a mature LCC baseline and do not reflect the D&D project's baseline at the 50% and 80% confidence level. As a result of the site having to manage simultaneous Critical Decisions (Operating and D&D projects), a portion of the D&D CD-1 approved cost range is a component of the PO-0040 CD-2/3 approved NTB.

The Portsmouth EM program also includes the Depleted Uranium Hexafluoride Conversion Project (shown below) with a baseline validated separately from the Portsmouth NTB. Critical Decision-2/3 for the design and construction of the facility was approved in September 2005. A baseline change was approved in December 2008. An External Independent Review of the new performance baseline was conducted in July 2008, in accordance with DOE Order 413.3A. Construction of the Portsmouth facility was completed in May 2008. Following the physical construction completion, the project will undergo an extensive commissioning period followed

by an operational readiness review. Once successfully passed, this will be the completion of the line item project. Baselines will be developed for the operations period. The first operations baseline is expected to be approved in FY 2011.

Project	Date Approved	
	Near Term Baseline (NTB)	Out Year Planning Estimate Range (OPER)
PO-0011 Nuclear Material Stabilization and Disposition	January 2008	N/A
PO-0013 Solid Waste Management and Disposition	January 2008	N/A
PO-0040 Nuclear Facility D&D	January 2008	August 2007 ¹
PO-0011X Nuclear Material Stabilization and Disposition - Depleted Uranium Conversion Project	September 2005	TBD

¹ Reflects approval of Critical Decision-1 Alternative Selection and Cost Range for the D&D of the Portsmouth Gaseous Diffusion Plant

PROJECT SCOPE

PO-0011, Nuclear Material (NM) Stabilization and Disposition-Portsmouth Uranium Facilities Management

This PBS scope manages the Highly Enriched Uranium Program, performs surveillance and maintenance of the former Uranium Program facilities, and manages legacy polychlorinated biphenyl (PCB) contamination. The Highly Enriched Uranium Program, scheduled for final disposition in FY 2009, performs interim storage and eventual processing of highly enriched uranium materials and performs surveillance and maintenance on the 158 permanently shut down cells in X-326. Surveillance and maintenance of DOE non-leased facilities, two cylinder yards, inventories of special nuclear materials, and technical support activities are performed. Polychlorinated biphenyl activities include inspections of transformers, checks of spill sites, inspections, repair, and maintenance of troughs and collection systems to maintain compliance with the Toxic Substances Control Act (40 CFR 761), the Uranium Enrichment Toxic Substances Control Act Federal Facilities Compliance Agreement of 1992, as well as DOE Orders and other applicable requirements. Gaskets impregnated with polychlorinated biphenyl were used in the ventilation duct systems of the Portsmouth Gaseous Diffusion Plant, and operations have resulted in leaks of PCB contaminated lubrication oils used in motor and compressor bearings. A Baseline Change Proposal is pending to transfer scope resulting from a reclassification of material inventories from recovery operations (PO-0011) to waste disposition (PO-0013).

PO-0013, Solid Waste Stabilization and Disposition

This project scope stores, characterizes, treats, and disposes of legacy waste generated by activities at the Portsmouth Gaseous Diffusion Plant. This activity will reduce risks and storage costs. The primary waste streams are low-level, mixed low-level, Toxic Substances Control Act low-level, hazardous, and sanitary wastes. The waste streams were ranked for treatment and

disposal using a risk-based prioritization system, and all legacy waste was dispositioned by the end of FY 2007. This project includes the disposition of inventory stored at the Uranium Management Center (Building X-744G) which has no economic value or identifiable reuse. The Uranium Management Center was part of a complex-wide effort to consolidate uranium in a central location for storage and disposition. This project also implements pollution prevention projects to reduce the generation, volume, toxicity, and release of multi-media waste, to promote the use of non-hazardous materials, and to achieve operating efficiency through the application of pollution prevention principles.

PO-0040, Nuclear Facility D&D-Portsmouth

This project scope consists of remedial action, inactive facility D&D and surveillance and maintenance activities necessary due to contamination resulting from the plant's historical uranium enrichment operations. Groundwater, sediment, and soil contamination exist at the site, and contaminants of concern include radioactive technetium-99, polychlorinated biphenyls, trichloroethylene, and Resource Conservation and Recovery Act heavy metals. DOE will continue to operate active and passive groundwater treatment systems until regulatory cleanup levels are achieved. Approximately 16 excess non-leased facilities have been decontaminated and decommissioned, thus reducing surveillance and maintenance costs. Portsmouth began the transition from cold standby to final shutdown and initiated preliminary D&D activities in FY 2006. These activities include initiating plans for an integrated final decommissioning strategy for the diffusion facilities. DOE is developing procurement strategies and evaluating the regulatory transition from the Nuclear Regulatory Commission to the DOE. This will require additional regulatory coordination with the state and the Environmental Protection Agency and public involvement on the planning efforts. To date, three corrective actions were completed, and all initial remedial investigations and corrective measures studies required under the applicable regulations and agreements were completed. Corrective measures have been implemented at the five groundwater plumes. One of the plumes is migrating off the southern reservation boundary onto private property, and additional remedial actions are being implemented to address the off-site migration.

PO-0011X, NM Stabilization and Disposition-Depleted Uranium Hexafluoride

This PBS scope will design, permit, build, and commission one depleted uranium hexafluoride conversion facility at the Portsmouth Gaseous Diffusion Plant site to convert DUF_6 into a more stable form, a depleted uranium oxide, suitable for beneficial reuse or disposition. Converted oxide, without beneficial reuse, will be sent to an authorized disposal facility. The HF co-product will be sold on the commercial market, and the empty cylinders will be sent to disposal or reused. This project also includes surveillance and maintenance of all cylinders during conversion of the existing DUF_6 stockpile, which should take about 18 years. The Department is examining alternatives to increase production capacity at the Portsmouth facility to accelerate conversion of the current inventory.

PROJECT COST (\$M)

(dollars in millions)

Cost Element	Project Baseline Summary Number			
	PO-0011	PO-0013	PO-0040	PO-0011X ¹
1. Prior Year Costs (1997-2006)	\$76.2	\$306.0	\$377.5	\$98.9
2. Total Near-Term Baseline (50% Confidence Level)	\$54.6	\$184.4	\$1,055.1	\$402.3
3. Unfunded Contingency	\$0.5	\$1.2	\$7.7	N/A
4. Performance Baseline (80% Confidence Level)	\$55.1	\$185.6	\$1,062.8	\$411.2 ²
5. Out Year Planning Estimate Range	N/A	N/A	\$4,410.8 - \$11,300.0	N/A
6. Total Life Cycle Cost	\$131.3	\$491.6	\$5,851.1 ³	\$1,707.8

¹ Includes PBS 02-U-101 line item project.

² 95% confidence level based on OECM recommendation.

³ Reflects Critical Decision-1 approval and will change with approval of Critical Decision-2.