

**Portsmouth / Paducah Project Office EM Project(s)**  
**Paducah Gaseous Diffusion Plant**  
**Baseline Summary**  
**June 2008**

**BACKGROUND**

The Paducah site, comprising approximately 3,400 acres, is located in rural western Kentucky, 15 miles west of Paducah, Kentucky, near the confluence of the Ohio and Mississippi rivers.

For approximately 50 years, the Paducah Gaseous Diffusion Plant (PGDP) supported the Federal Government and commercial nuclear power missions. Decades of nuclear energy and national security missions left radioactive and chemical contamination. The mission of the site has transitioned from primarily enrichment operations to shared missions with environmental cleanup, waste management, depleted uranium conversion, deactivation and decommissioning, and long-term stewardship.

The original mission at the PGDP was to produce low-assay enriched uranium for further enrichment at other Department of Energy (DOE) sites and then for use as commercial nuclear reactor fuel. In 1993, uranium enrichment operations were turned over to the United States Enrichment Corporation (USEC) in accordance with the Energy Policy Act of 1992. Under USEC, production of enriched uranium for use in the United States and abroad continues today. While USEC leases and operates the enrichment program under NRC regulation, the Department owns the physical plant and is responsible for the environmental cleanup. USEC is responsible for the operation and maintenance of all primary process facilities and auxiliary facilities at Paducah.

**SCOPE DESCRIPTION**

Historic operations at Paducah produced contaminated areas onsite and beyond site boundaries. Principal contaminants of concern include uranium (from enrichment processing), technetium, trichloroethylene, and polychlorinated biphenyls. Through spills and disposal operations, these contaminants have entered groundwater aquifers, formed plumes, and in some cases, have migrated offsite and contaminated private drinking water wells. Since its inception, the Paducah site has generated, stored, and disposed of hazardous, nonhazardous, radioactive, polychlorinated biphenyls, small quantities of transuranic waste, and mixed waste as well as large quantities of scrap metal.

Paducah is focusing on cleanup of high-risk areas first. The site has completed a wide variety of characterization projects, installed groundwater treatment facilities, put in place institutional controls for offsite drinking water, removed two major sources of surface water contamination, removed one subsurface trichloroethylene groundwater contamination source, removed five inactive facilities, and dispositioned scrap materials, and disposed of legacy waste streams. Additional remediation activities include completing legacy waste disposal, removing additional subsurface trichloroethylene groundwater contamination sources, remediation of buried wastes, remediation of groundwater plumes, and decontamination and decommissioning of multiple facilities.

Since the 1950s, the depleted uranium hexafluoride produced during enrichment operations at the Portsmouth and Paducah Gaseous Diffusion Plants (and the East Tennessee Technology Park in Tennessee) has been stored in large steel cylinders at the sites. DOE is currently responsible for the management of approximately 700,000 metric tons of depleted uranium hexafluoride at Paducah and Portsmouth (about 39,000 cylinders at Paducah). DOE awarded a contract and started construction in July 2004 on a depleted uranium hexafluoride conversion facility at Paducah, to convert the depleted uranium hexafluoride to a more stable form for reuse or disposal. This facility will operate over the next two decades. DOE is ultimately responsible for the deactivation and decommissioning of the facilities.

The Department is committed to the cleanup of the PGDP to industrial standards for the portion of the site currently supporting the site's mission, and to recreational standards for the remainder of the site. Limited land areas will require institutional controls following remediation. Excess buildings at Paducah that are not being leased are being assessed for reuse by the Department and will be scheduled for demolition if they are not suitable for reuse. Equipment and material removed from buildings will be decontaminated, reused, or recycled to the extent practicable.

Regulatory requirements to address contaminated groundwater at the Paducah site were initially included in an Administrative Consent Order issued by the Environmental Protection Agency in 1988. The Commonwealth of Kentucky and the Environmental Protection Agency issued a Resource Conservation and Recovery Act permit in 1991 for storage and treatment of hazardous wastes at Paducah and a permit for the remediation of solid waste management units under Resource Conservation and Recovery Act. In May 1994, the Paducah site was placed on the Environmental Protection Agency's National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. The 1997 Federal Facility Agreement among the Department, the Commonwealth of Kentucky, and the Environmental Protection Agency Region IV established the framework for cleanup at Paducah, instituted enforceable milestones, and coordinates site-specific cleanup requirements under the Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act. The Department also achieved resolution of long-standing regulatory disputes through the Agreed Order with the Commonwealth of Kentucky.

The Environmental Protection Agency and the Kentucky Division of Waste Management are the regulatory agencies for DOE waste management operations. Applicable requirements and the DOE Order governing waste management include: Resource Conservation and Recovery Act, Part B, Hazardous Waste Management Permit; Toxic Substances Control Act regulations for polychlorinated biphenyl wastes; DOE Order 435.1 Radioactive Waste Management; and Kentucky solid waste regulations for other wastes.

## **PROJECT MANAGEMENT**

Based on the direction from EM Headquarters, the Portsmouth / Paducah Project Office (PPPO) developed the near-term baseline for each of the projects at the Paducah Gaseous Diffusion Plant (PGDP). 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 independently reviewed.

## LIST OF PROJECTS

The PGDP consists of two projects with certified baselines as shown below. The Near-Term Baseline (NTB) for the PGDP projects is from FY 2007 - FY 2012 and the Out Year Planning Estimate Range (OPER) is from FY2013 through FY 2019. Not included in the CD-2 approval letter for PA-0040 is the D&D cost of the Paducah Gaseous Diffusion Plant once it has been returned by USEC to the Department. However, Paducah has developed some preliminary baseline cost information regarding the D&D of the GDP so that a full lifecycle cost estimate is available for PA-0040. The D&D of the GDP will also add OPER costs to other PBSs at Paducah. These are PA-0020, PA-0102, and PA-0103.

The Paducah EM program also includes the Depleted Uranium Hexafluoride Conversion Project (shown below) with a baseline validated separately from the Paducah NTB. Critical Decision-2/3 for the design and construction of the facility was approved in September 2005. Following physical construction completion, the project will undergo an extensive operational readiness review. Once successfully passed, this will be the completion of the line item project. An estimate for the completion of the construction project to Critical Decision-4, Approve Start of Operations, is still being developed. An External Independent Review of this new performance baseline will be conducted in accordance with DOE Order 413.3A.

Project	Date Approved	
	Near-Term Baseline (NTB)	Out Year Planning Estimate Range (OPER)
PA-0013 - Solid Waste Stabilization and Disposition	January 11, 2008	January 11, 2008
PA-0040 - Nuclear Facility D&D-Paducah ( <i>does not include D&amp;D of the GDP</i> )	January 11, 2008	January 11, 2008
PA-0011X - NM Stabilization and Disposition-Depleted Uranium Hexafluoride Conversion	September 2005	TBD

Table 1: Projects and Dates of Approval of Planning Data

### PA-0013 – Solid Waste Stabilization and Disposition

This PBS scope stores, treats, and disposes of all legacy waste generated by activities at the PGDP prior to 7/1/93, and small quantities of newly generated waste (NGW) from waste storage, treatment, and disposal operations. Also, included in this PBS is the operation of an on-site landfill. Although the United States Enrichment Corporation (USEC) handles its own waste storage, treatment, and disposal as specified in DOE's lease agreement with USEC, DOE remains responsible for some waste streams which are generated by the USEC operation of the plant.

DOE handles this waste as NGW. The primary waste streams are low-level, mixed low-level (RCRA/RAD, TSCA/RAD and RCRA/TSCA/RAD), hazardous, transuranic, small quantities of TRU wastes, PCBs and sanitary/industrial/construction wastes.

**PA-0040 – Nuclear Facility D&D-Paducah**

This PBS addresses environmental cleanup, D&D of inactive facilities, DOE Material Storage Areas (DMSAs), D&D of the Gaseous Diffusion Plant (GDP), and surveillance and maintenance activities at the PGDP. The scope of the environmental problems include DNAPL releases (e.g., C-400), numerous burial grounds containing a variety of radioactive and hazardous constituents, two large off-site groundwater plumes, as well as a number of release sites that have potentially contaminated on-site soils and sediment in ditches and creeks. The inactive facilities include two large facility complexes (C-410 & C-340), as well as 15 smaller surplus facilities, which require decontamination and decommissioning. The site also contains 160 DMSAs that must be characterized and dispositioned. The risk-based actions will be implemented in accordance with the prioritization criteria contained in the Site Management Plan - 1) imminent threat; 2) reduce further off-site migration; 3) address sources of off-site contamination; 4) groundwater and surface water contamination; and 5) address remaining sources.

The CD-2/3 approval letter for this PBS does not include any activities associated with the D&D of the GDP. Currently, this project is in the pre CD-0 stage. An order of magnitude estimate has been created for planning purposes and is reflected in the Triennial Report to Congress. The current estimate would extend PA-0040 to FY 2040 and add approximately \$11B to the funding needed for the lifecycle of this PBS. Tables have been developed to show this later in the summary.

**PA-0011X – NM Stabilization and Disposition-Depleted Uranium Hexafluoride** This PBS scope will design, permit, build, and initially operate one depleted uranium hexafluoride conversion facility at the Paducah Gaseous Diffusion Plant site to convert DUF<sub>6</sub> 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<sub>6</sub> stockpile, which should take about 18 years.

**PROJECT COST** (*Excludes D&D of the GDP*)

(dollars in millions)

Cost Element	Project		
	PA-0013	PA-0040 <sup>2</sup>	PA-0011X <sup>3</sup>
1. Prior Year Costs (1997-2006)	\$196.5	\$521.6	\$100
2. Total Near-Term Baseline (50% Confidence Level)	\$82.0	\$491.3	\$116.6
3. Unfunded Contingency	\$15.2	\$83.1	N/A
4. Performance Baseline (80% Confidence Level)	\$97.2	\$574.4	\$122.7
5. Out Year Planning Estimate Range (2013-2019) <sup>1</sup>	\$60-70	\$970.0-1,060	\$1,077
<b>6. Total Life Cycle Cost</b>	<b>\$362.9</b>	<b>\$2,146.9</b>	<b>\$1,299</b>

<sup>1</sup> Data does not consider the D&D of the GDP.

<sup>2</sup> Costs associated with the D&D of the GDP have been removed.

<sup>3</sup> Includes PBS 02-U-101 line item project.

Table 2: Total Project costs by data element through FY 2019 (not including D&D of the GDP)

**PROJECT COST (Includes D&D of the GDP)**

(dollars in millions)

Cost Element	Project Number	
	PA-0013	PA-0040
1. Prior Year Costs (1997-2006)	\$196.5	\$521.6
2. Total Near-Term Baseline (50% Confidence Level)	\$82.0	\$553.7
3. Unfunded Contingency	\$15.2	\$155.2
4. Performance Baseline (80% Confidence Level)	\$97.2	\$708.9
5. Out Year Planning Estimate Range (2013-2040)	\$60-70	\$6,754.2- 13,416.4
<b>6. Total Life Cycle Cost</b>	<b>\$362.9</b>	<b>\$14,646.9</b>

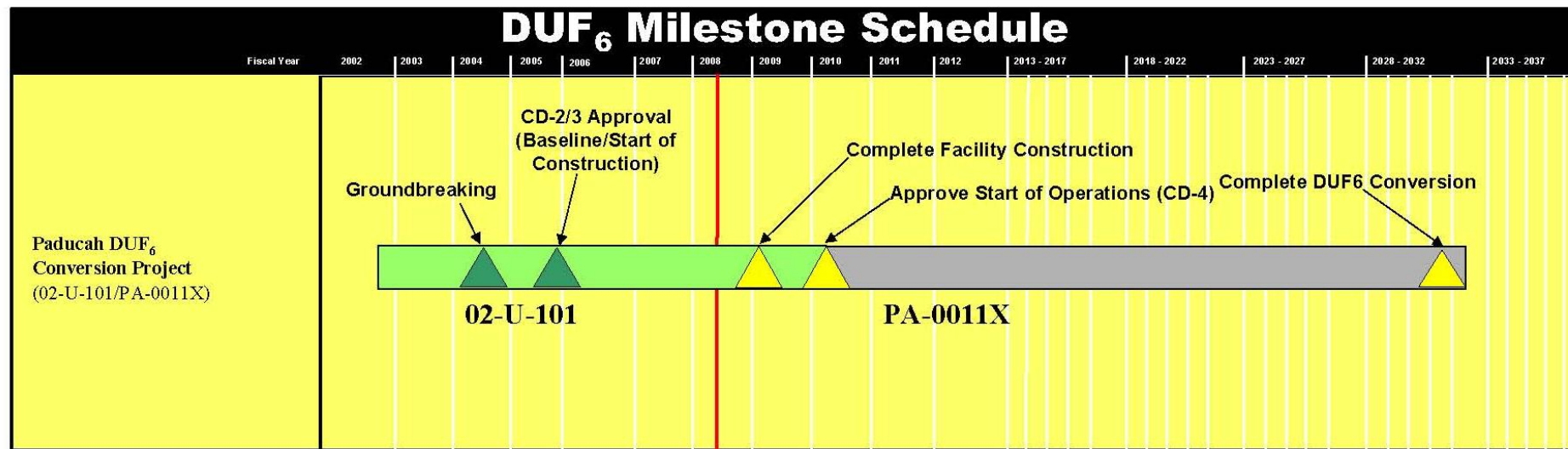
Table 3: Total Project costs by data element through FY 2040 (Estimated end date for D&D of the GDP)

## SUMMARY LIFECYCLE BASELINE SCHEDULE

Activity ID	Activity Description	Finish	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	
<b>Paducah Site</b>																																						
<b>PBS PA-0011</b>			◆ Complete PCB Activities																																			
CA9999999	Complete PCB Activities	30-Sep-19																																				
<b>PBS PA-0013</b>			◆ Complete Disposal of all Legacy MLLW																																			
BA12M00233	Complete Disposal of all Legacy MLLW	31-Jan-08																																				
BA12T00074	Complete Disposal of all Legacy TSCA Waste	7-Oct-08	◆ Complete Disposal of all Legacy TSCA Waste																																			
BA9999999	Complete Disposal of all Legacy LLW	30-Sep-09	◆ Complete Disposal of all Legacy LLW																																			
BD11500003	Complete Site Treatment Plan	30-Sep-15	◆ Complete Site Treatment Plan																																			
BD11700003	Complete Disposal of PCB Capacitors (Currently in use)	29-Sep-17	◆ Complete Site Treatment Plan																																			
<b>PBS PA-0020</b>			Complete PBS PA-0020 ◆																																			
DA9999999	Complete PBS PA-0020	8-Nov-39																																				
<b>PBS PA-0040</b>			◆ Complete Priority B Characterization ◆ Complete Disposal of Outside DMSAs																																			
AH00004940	Complete Priority B Characterization Complete Disposal of Outside DMSAs	29-Sep-06																																				
AK00001335	Complete D&D of C-405	3-Jul-07	◆ Complete D&D of C-405																																			
AG00001750	Complete Scrap Metal Field Work	28-Jul-07	◆ Complete Scrap Metal Field Work																																			
AK00003955	Complete D&D of C-746-A	30-Oct-07	◆ Complete Scrap Metal Field Work																																			
AR00001250	Submit D1 Soils Inactive Facilities AM to Regs	25-Jan-08	◆ Submit D1 Soils Inactive Facilities AM to Regs																																			
AG00001670	Scrap Metal RACR Approval	4-Jun-08	◆ Scrap Metal RACR Approval																																			
AN00001250	Submit D1 Surface Water Action Memo to Regulator	5-Jun-08	◆ Submit D1 Surface Water Action Memo to Regulator																																			
AC00002440	Submit D1 Southwest Plume ROD to Regulators	13-Jun-08	◆ Submit D1 Southwest Plume ROD to Regulators																																			
AR02000099	Submit D1 Soil Piles Action Memo to Regs	1-Aug-08	◆ Submit D1 Soil Piles Action Memo to Regs																																			
AK00003570	Complete D&D of C-611 M&N	23-Feb-09	◆ Complete D&D of C-611 M&N																																			
AJ00000750	Complete Infrastructure Removal of Sectors 1-3	11-Sep-09	◆ Complete Infrastructure Removal of Sectors 1-3																																			
AH00004950	Complete Characterization & Disposal of all DMSA	30-Sep-09	◆ Complete Characterization & Disposal of all DMSA																																			
AK00006662	Complete D&D of C-342	30-Sep-09	◆ Complete D&D of C-342																																			
AY00001250	Submit D1 Soils Removal Action AM to Regs	31-Mar-10	◆ Submit D1 Soils Removal Action AM to Regs																																			
AQ00002440	Submit D1 CERCLA Cell ROD to the Regulators	21-May-10	◆ Submit D1 CERCLA Cell ROD to the Regulators																																			
A500204300	Submit D1 C-340 Action Memo to Regulators	23-Jul-10	◆ Submit D1 C-340 Action Memo to Regulators																																			
AT10000056	Submit D1 BGOU ROD	9-Aug-10	◆ Submit D1 BGOU ROD																																			
AE00007835	Groundwater Source Action Complete	29-Oct-10	◆ Groundwater Source Action Complete																																			
AZ00001630	Submit D1 Soils Remedial ROD to Regulators	9-Feb-12	◆ Submit D1 Soils Remedial ROD to Regulators																																			
AU01571521	Complete D&D of C-410	18-Jan-13	◆ Complete D&D of C-410																																			
A310000116	Submit D1 Offsite Plume ROD to the Regs	16-May-13	◆ Submit D1 Offsite Plume ROD to the Regs																																			
A200000330	Submit D1 GW Fenceline Action ROD to Regs	3-Feb-14	◆ Submit D1 GW Fenceline Action ROD to Regs																																			

## SUMMARY LIFECYCLE BASELINE SCHEDULE

Activity ID	Activity Description	Finish	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	
<b>Paducah Site</b>																																						
A420000110	Submit D1 Surface Water Offsite ROD to Regs	4-Sep-14																																				
AZ00000001	Complete Soils Remedial Action	25-Sep-15																																				
A420000241	Complete Surface Water Offsite Action	7-Sep-17																																				
A500000001	Complete D&D of C-340	2-Oct-17																																				
A200002290	Complete GW Fenceline Action	19-Jul-19																																				
AT00000001	Complete BGOU Action	20-Sep-19																																				
A300001700	Complete GW Offsite Plume Action	31-Mar-21																																				
DD00000421	Complete D&D of GDP	8-Nov-39																																				
<b>PBS PA-0103</b>																																						
EA99999999	Complete PBS PA-0103	8-Nov-39																																				
<b>PBS PA-0102</b>																																						



- ▲ PLANNED MILESTONES
- ◆ PLANNED OTHER TARGETS
- ▲ MISSED MILESTONE WITH COMPLETION
- ▲ COMPLETED SELECTED MILESTONES
- ◆ COMPLETED OTHER TARGETS

Data as of June 30, 2006

