

KENTUCKY

Paducah Gaseous Diffusion Plant

Background

The Paducah Gaseous Diffusion Plant sits on a 3,556-acre site located in rural western Kentucky, ten miles west of Paducah. For more than 60 years, the Paducah Gaseous Diffusion Plant enriched uranium, first supporting the nation's nuclear weapons program and then producing fuel for commercial nuclear power plants. Enrichment operations ended in July 2013, and the facility, now referred to as the Paducah Site, transitioned to the United States (U.S.) Department of Energy's Office of Environmental Management (DOE) in 2014.¹



FIGURE 1: Aerial view of Paducah Gaseous Diffusion Plant. Photo courtesy of state of Kentucky.

Cleanup at the site is driven by the 1998 Federal Facilities Agreement (FFA) between DOE, U.S. Environmental Protection Agency (EPA) Region 4 and the Commonwealth of Kentucky's Energy and Environment Cabinet (Kentucky). The three parties to the FFA annually revisit and update the Site Management Plan to prioritize building demolition and environmental cleanup of the Paducah Site.² The current date projected to complete all of the remaining demolition and environmental cleanup activities is 2065.³

Major Accomplishments

DOE EM worked with EPA and Kentucky to achieve the following outcomes:

- Removal of 8,167 gallons of trichloroethylene (TCE) from groundwater and soils from multiple actions; including ~4,325 gallons captured and removed by two groundwater pump-and-treat-systems. The pump-and-treat systems have been in operation for over 27 years and combined have treated more than 4.87 billion gallons of groundwater;⁴
- Depleted uranium hexafluoride (DUF6) conversion facility has converted over 53,000 metric tons (as of November 30, 2022) of DUF6 inventory at its Paducah facility since operations began in 2011.⁵ The

¹ U.S. Department of Energy, Portsmouth/Paducah Project Office, Paducah Site. Reference: <https://www.energy.gov/pppo/paducah-site>.

² Kentucky Energy and Environment Cabinet, (2022) Paducah Site. Reference: <https://eec.ky.gov/Environmental-Protection/Waste/hazardous-waste/Pages/paducah-gaseous-diffusion-plant>.

³ Paducah Strategic Vision: 2022-2032. Reference: <https://www.energy.gov/em/articles/paducah-strategic-vision-2022-2032>.

⁴ U.S. Department of Energy, Reference: PGDP Federal Facility Agreement Semiannual Progress Report for the Second Half of FY2021 (DOE/LX/07-2468/V2).

⁵ U.S. Department of Energy, Office of Environmental Management - Paducah by the Numbers (September 2022). Reference: <https://www.energy.gov/em/articles/paducah-numbers>.

current estimated completion date to convert the remaining inventory at the current design process rate is 2057;⁶

- A total of 143 inactive facilities, trailers, and structures have been demolished which represents more than 478,000 square feet in area;⁷
- In total, 68.5 million pounds (~34,000 tons) of contaminated metal and 8.2 million cubic feet (ft³) of waste were disposed;^{8, 9} and
- As of late 2022, DOE removed ~3.4 million pounds of hazardous refrigerant (R-114) from the Paducah Site.

Site-Specific Issues

In August 2017, DOE, EPA Region 4 and Kentucky signed a memorandum of agreement to re-sequence all the environmental remediation work at the Paducah Site to concentrate on the C-400 cleaning building, the main source of two 4-mile-long trichloroethylene groundwater contamination plumes. A year-long subsurface investigation of the C-400 Building and surrounding area wrapped up in January 2022. The comprehensive investigation focused on defining the type and distribution of contamination present around and under the C-400 Building. The anticipated timeline for public release of near-term C-400 documents in January 2023 for the Remedial Investigation/Feasibility and

2023 for the public comment period for the Proposed Plan for cleanup of the C-400 area.¹⁰ Field Work initiated in March 2022 on an enhanced in-situ bioremediation cleanup at the northeast corner of the C-720 “Machine Shop” building (referred to as SWMU 211-A). After this remedial work, the vast majority of remaining remediation projects are not scheduled for decades into the future.¹¹

Since DOE resumed control of the Paducah Gaseous Diffusion Plant in October 2014, limited resources were realigned to support reducing operational costs and deactivation activities. More than 500 structures/systems will eventually undergo deactivation and demolition. The estimated volume of waste material that requires disposal from deactivation and demolition operations is about 3.6 million cubic yards.¹² As deactivation and demolition operations progress, it is anticipated that opportunities will arise to address contamination previously considered inaccessible (underneath buildings and near critical infrastructure). Since deactivation began, more than 100,000 gallons of PCB oil, 371,000 gallons of



FIGURE 2: Paducah Gaseous Diffusion Plant. Photo courtesy of state of Kentucky.

⁶ Paducah Strategic Vision: 2022-2032. Reference: <https://www.energy.gov/em/articles/paducah-strategic-vision-2022-2032>.

⁷ U.S. Department of Energy, Office of Environmental Management - Paducah by the Numbers (September 2022). Reference: <https://www.energy.gov/em/articles/paducah-numbers>.

⁸ U.S. Department of Energy, Office of Environmental Management - Paducah by the Numbers (September 2022). Reference: <https://www.energy.gov/em/articles/paducah-numbers>.

⁹ Paducah Site Environmental Remediation. Reference: <https://www.energy.gov/pppo/Paducah-site/Paducah-environmental-remediation>.

¹⁰ Paducah Strategic Vision: 2022-2032. Reference: <https://www.energy.gov/em/articles/paducah-strategic-vision-2022-2032>.

¹¹ 2022 Site Management Plan – Annual Revision, Paducah Gaseous Diffusion Plant, December 16, 2021 (DOE/LX/07-2473&D2). Reference: <https://www.emcbc.doe.gov/SEB/osms/Documents/Document%20Library/Site%20Management%20Plan%20FY%202022%20D2.pdf>.

¹² Paducah Site Environmental Remediation. Reference: <https://www.energy.gov/pppo/Paducah-site/Paducah-environmental-remediation>.

lubrication oil and 8.5 million pounds of refrigerant have been removed from the process buildings.¹³ A detailed deactivation project scope and Life Cycle Baseline (timeline) is available as an appendix to the annual Site Management Plan.¹⁴

Relationships to Other Sites in the Complex

- Portsmouth and Paducah are managed out of the Portsmouth Paducah Project Office (PPPO), located in Lexington, Kentucky;
- Portsmouth, Ohio, and Oak Ridge, Tennessee, also had gaseous diffusion plants, and while Tennessee's buildings are demolished, Portsmouth is in process and Paducah is beginning to prepare for demolition;¹⁵
- Portsmouth, Ohio, and Oak Ridge, Tennessee, also receive federally appropriated funding from the Uranium Enrichment Decontamination and Decommissioning Fund (UED&D) which was established in The Energy Policy Act of 1992;
- Paducah has the longest offsite groundwater contaminant plumes in the entire DOE EM Complex; and
- Portsmouth also has large inventory of DUF6 cylinders and an on-site conversion facility.

¹³ U.S. Department of Energy, Office of Environmental management. (n.d.). DOE Paducah site tour. Reference: <https://www.emcbc.doe.gov/SEB/PGDP%20Deactivation/Documents/Site%20Tours/DOE%20Paducah%20Site%20Tour-deactivation%20Task%20Order.pdf>.

¹⁴ 2022 Site Management Plan – Annual Revision, Paducah Gaseous Diffusion Plant, December 16, 2021 (DOE/LX/07-2473&D2). Reference: <https://www.emcbc.doe.gov/SEB/osms/Documents/Document%20Library/Site%20Management%20Plan%20FY%202022%20D2.pdf>.

¹⁵ Paducah Site Environmental Remediation. Reference: <https://www.energy.gov/pppo/Paducah-gdp-shutdown-and-deactivation>.