Oversight News

Newsletter of the Commonwealth's Environmental Oversight Section for the Department of Energy's Paducah Site

TEAM KENTUCKY

ENERGY AND ENVIRONMENT CABINET

Kentucky Department for Environmental Protection
Division of Waste Management
Hazardous Waste Branch
Paducah Site Section
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Paducah Site On-Site Waste Disposal Facility

The ultimate goals of the Department of Energy (DOE), Kentucky Division of Waste Management (Kentucky) and the Environmental Protection Agency (EPA) for the former Paducah Gaseous Diffusion Plant (Paducah Site) are to return the 1,450 acres of the industrial portion of the Paducah Site to a condition that is protective to human health and the environment and allow land reuse which will benefit the community. This involves much planning, investigation, collecting of data, and decision making. There are several ways in which the land can be used to fulfill this goal. Land transfers or leases that will allow for new businesses, and Land Management for recreational areas, such as currently being utilized by the Kentucky Fish and Wildlife. Recently, Paducah Area Community Reuse Organization (PACRO) submitted a letter requesting a land transfer for Parcel 1 consisting of a 209-acre tract, which will allow the community to reindustrialize the area. The land transfer is in process. In addition, Global Laser Enrichment LLC purchased 665-acres of land adjacent to the Depleted Uranium Hexafluoride (DUF_6) cylinder yard in November 2024 to build a more than $1 billion dollar facility using molecular process to enrich the depleted uranium "tails" stored at the Paducah Site. The estimated annual reoccurring economic impact to the area is $125 million.

Over the next several decades, decontamination and decommissioning (D&D) of large process buildings at the Paducah Site will result in an estimated 1.5 million cubic yards of demolition debris in the form of concrete, structural steel, and decommissioned equipment. Additionally, approximately 2.3 million cubic yards of contaminated soil will be excavated as part of the Environmental Media project. It has been determined that the debris and contaminated soil can be disposed of by either shipping it off-site, which is a substantially higher cost and will extend the cleanup time by decades, or by disposing the waste on-site in a highly specially designed disposal unit known as an On-Site Waste Disposal Facility (OSWDF).

Tentative discussion of a OSWDF at the Paducah Site began as early as 2000. In 2010, discussions between DOE, EPA, and Kentucky began in earnest as to the viability of an on-site waste disposal unit. A remedial investigation/feasibility study report (RI/FS) at the Paducah Site was started. The RI/FS study report took years of planning, gathering, compiling and analyzing data, ensuring compliance with applicable regulations, community input, and cooperation between all involved. In 2016, DOE approached EPA and Kentucky with a proposal to reprioritize all work at the Paducah Site, including delay of the remedy selection, design, construction and operation of the proposed OSWDF for ten or more

years. In July 2018, EPA and Kentucky approved the RI/FS for the Administrative Record, while at the same time, identifying that the RI/FS would need to be modified and updated to reflect the most current information if the project was revived at a later date.

In 2024, DOE introduced a new sitewide remediation strategy which would shift work from a piecemeal approach to a more holistic effort. This strategy was entitled Decision 2029. The plan includes an accelerated and holistic approach for clean up at the Paducah Site, reducing the cost and amount of years associated with the cleanup. The plan called for additional information to be collected to update the 2018 OSWDF RI/FS to make the best determination in placement and design of a potential OWDSF. Historical documents were studied to discover any data gaps that needed to be addressed. A sampling and analysis plan addressing these gaps was prepared and submitted for comment to EPA and Kentucky in August of 2024. Sampling and analysis include collecting soil and groundwater samples and conducting seismic surveys.

In November 2024, the seismic study investigation field work began. The Paducah Site is located between two major seismic zones, the New Madrid Zone and the Wabash Valley Zone. Federal regulations requires that disposal facilities be located more than 200 feet from a fault that has had surface displacement in the past 11,000 years. To understand the spatial and temporal seismotectonic characteristic at the Paducah Site, DOE tasked the University of Kentucky - Kentucky Research Consortium for Energy and Environment (KRCEE) to conduct the investigation. A portion of the investigation involves inserting probes into the ground, spaced approximately a meter apart for one kilometer (km), which is referred to as a line. The probes have x, y, and z axes (resembling a jack) and are laid true north and east. Once multiple lines are laid, signals are sent down, which is referred to as thumping. Approximately 3,000 thumps are made per line. The sound waves created by the thumping are reflected back to the probes. The sound waves are then analyzed and used to provide information about the Earth's structure and provide additional data needed to make informed decisions. To supplement the seismic investigation and design of a potential OSWDF, suspension logging will be done by way of a single, deep soil boring into the bedrock to obtain the physical properties of the rock. When the investigation is complete, the findings will be added to the 2018 OSWDF RI/FS.

Image of the probe used to measure the soundwaves for the KRCEE seismic investigation.

During 2025, DOE is planning to install several additional groundwater monitoring wells and to complete soil borings to collect further information in the sites under consideration for a potential OSWDF site. The water table varies across the Paducah Site; from 5-10 feet below ground surface in some areas to as much as 40 feet in others. Data on the chemistry and possible components of the groundwater will be collected from the new monitoring wells, analyzed, and added to the existing database. Geotechnical information concerning the composition and behavior of the soil will be collected and analyzed via soil borings at various points within the areas. After all data has been collected and analyzed, the area for the OSWDF will be chosen and construction can begin if that remedy decision is made. Construction is anticipated to begin in 2029.

Paducah Site Depleted Uranium Oxide Conversion Facility Current Operations and Future Plans

United States industrial uranium enrichment, which is the increase of the proportion of the fissile isotope uranium-235, began as part of the Manhattan Project, which developed the first atomic weapons. Depleted uranium hexafluoride (DUF_6) is a co-product of the gaseous diffusion process used to enrich uranium. Uranium ore, and the corresponding DUF_6 feedstock, typically has a concentration of 0.7% of the U-235 isotope. As the U-235 isotope was enriched to concentrations ranging from 3.5% to 5%, the residual material became depleted, containing approximately 0.2% – 0.4 weight-percent U-235. Due to the large electrical load used in the gaseous diffusion process, it was not cost-effective to continue enrichment of the DUF_6 after the first pass. As DUF_6 was generated, it was stored in several cylinder storage

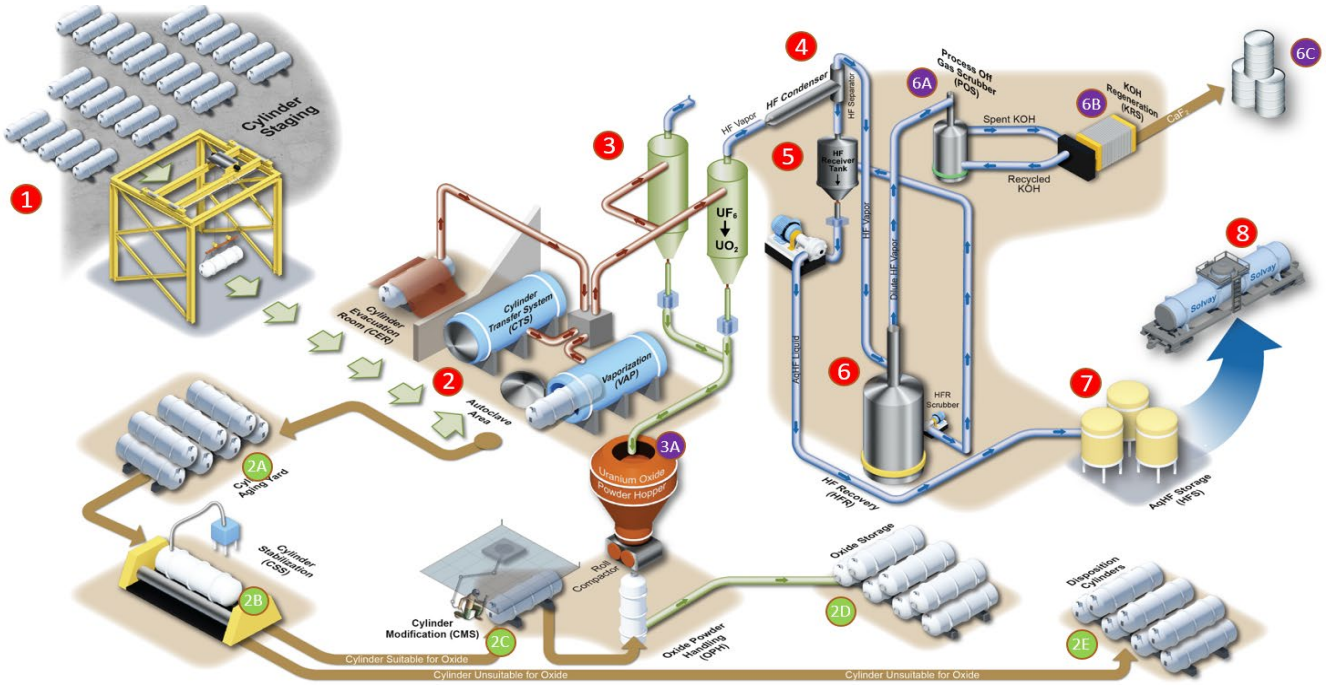
"yards", which total approximately 3.6 million square feet (or 83 acres). Each yard is constructed of either dense-grade aggregate or concrete, and cylinders were stacked two layers high. The Paducah Site DUF_6 Conversion Facility was completed and began operation in early 2011, and it functions to convert DUF_6 to depleted uranium oxide (DUO_X), a significantly more stable and less toxic form. Once converted, the DUO_X could be either used as future feedstock or placed into long-term storage.

DUF_6 Cylinder Storage Yard (Source: BWXT 2016b)

Prior to the start of conversion operations, the Paducah Site DUF_6 cylinder inventory contains approximately, 560,000 metric tons of DUF_6 in about 46,000 cylinders. DUF_6 is typically stored in quarter inch-thick steel cylinders that are 30 and 48 inches (76 and 122 centimeters) in diameter with the majority being 48-inch diameter cylinders. The 48-inch-diameter cylinders are either 116 inches (248 centimeters) or 147 inches (360 centimeters) long, depending on the cylinder model. The 48-inch-diameter cylinders hold from 9 to 12 metric tons (10 to 13 tons) of material.

The DUF_6 conversion process involves vaporizing and converting to a mixture of uranium oxides (primarily U_3O_8) by reaction with steam and hydrogen. After conversion, the DU oxide is roll compacted to ensure the ratio of oxide filled cylinders leaving the facility is equal to the DUF6 cylinders being fed into the conversion lines. The DU oxide conversion product is routinely sampled and analyzed to determine radiological, chemical, and physical characteristics.

After conversion, each DUO_X cylinder weighs approximately 12 tons. In 2024, the Conversion Facility converted over 8,000 metric tons (over 600 cylinders) of DUF_6 to uranium oxides and hydrofluoric acid (HF). The DUO_X is stored in modified cylinders that previously contained DUF6 and the HF is sold commercially. To date, the Paducah Site has converted over 5,400 cylinders of DUF_6. Currently, the Paducah Site has approximately 490,000 metric tons of remaining DUF_6 stored in approximately 41,000 cylinders.



Depleted Uranium Hexafluoride Conversion Process (Source DOE PPPO)

In December 2024, Global Laser Enrichment (GLE), a North Carolina-based company, announced the acquisition of 665 acres in the vicinity of the Paducah Site. GLE plans to use the 665-acres of land adjacent to the DUF_6 cylinder yard to build a more than $1 billion dollar facility using molecular process (laser enrichment) to enrich the depleted uranium "tails" stored at the Paducah Site. Laser enrichment uses laser light to excite U-235 isotopes to separate from the other, non-fissile, isotopes. This method is different than utilizing centrifuge technology, which is the primary method currently used worldwide for uranium enrichment. The estimated annual reoccurring economic impact to the area is $125 million.

The laser enrichment process is efficient at extracting U-235 isotopes from the DUF_6 cylinders stored at the Paducah Site. GLE is in the process of finalizing their application with the Nuclear Regulatory Commission in mid-2025, with a decision to be made within 30 months. Once completed, the facility plans on producing five million pounds of U-235 annually, which would account for approximately 10% of the 45 – 50 million pounds of current U.S. demand. The DUF_6 Facility is preferentially converting cylinders with the lowest assay concentrations first, leaving the higher assay concentrations for laser enrichment. GLE is optimistic that the Paducah Laser Enrichment Facility will be operational by 2030.

DOE Pursues Plans to Transfer 209 Acres for Reuse

Before DOE operations, from December 1942 until August 1945, a portion of the site was a part of the former Kentucky Ordnance Works, a World War II explosives manufacturing facility. The PGDP site began operations in 1952 to produce enriched uranium for further enrichment and eventual use in nuclear weapons production. DOE land holdings at the PGDP site encompass 3,556 acres. In 1993, the DOE leased the uranium enrichment facilities to USEC, which operated the facilities to produce commercial nuclear reactor fuel. USEC ceased uranium enrichment in May 2014 and returned the facilities to DOE control in October 2014.

Following the cessation of uranium enrichment at the PGDP, one of the objectives of DOE has been to relinquish portions of the property suitable for reuse to the local community. Following discussions with the Paducah-McCracken County Industrial Development Authority, DOE evaluated approximately 752 acres adjacent to the western and southern boundary of the secure area. Since plans for the specific use of the land require less acreage at the present time, a 209-acre subunit of the 752 acres was identified as suitable for use. This specific 209-acre part of the property has been named "Parcel 1."

Location of Parcel 1

An *Environmental Baseline Survey Report for Title Transfer of Parcel 1* (EBS) was submitted to EPA and KDEP on November 7, 2024. The EBS contains information that details how the Parcel was evaluated for suitability for reuse. This included records reviews of the property such as aerial photos, sampling data, and property ownership records. The EBS also included records of employee interviews conducted regarding past use of the property and its surroundings, records of physical inspections conducted, and findings from a radiological survey conducted on the Parcel.

After completing the study, DOE concluded that there is no evidence that hazardous substances were stored, released or disposed of on Parcel 1. DOE intends to transfer the property under CERCLA Section 120(h)(3)(A). This applies to properties where a remedy has been implemented. The land that comprises Parcel 1 is included within the Water Policy Box, and therefore is included in the remedial decision that prohibits use of groundwater on all land within the Water Policy Box. In addition, residential use of Parcel 1 will be prohibited.

Personnel from EPA and KDEP reviewed the EBS and provided feedback to DOE. On January 15, 2025, EPA provided DOE with acknowledgment of receipt of the document and comments requesting revisions. On the same day, KDEP notified DOE of their acknowledgment of receipt of the document and stated that they supported the comments made by EPA. DOE intends to revise the EBS in accordance with at least some of the comments provided. If any comments remain unresolved, they will be included as an attachment to DOE's Finding of Suitability to Transfer for Parcel 1.

Kentucky Division of Waste Management Personnel Changes

Sonja Smiley Becomes New Section Supervisor

On January 16, 2024, the Paducah Site Section welcomed a new Supervisor, Sonja Triska Smiley. Born and raised in rural West Virginia, Sonja received her bachelor's degree from Marshall University, majoring in Biology with a minor in Chemistry. She came to work for the Commonwealth of Kentucky with the Division for Air Quality in 2007. She worked as an Environmental Inspector, Environmental Scientist and Environmental Scientist Advisor before taking the Environmental Control Supervisor position for the Division of Waste Management, Paducah Gaseous Diffusion Plant Section in January 2024. Prior to her career with the State, she worked for the Northern Center for Independent Living as an Assistant Field Operations Manager for the WV AgrAbility Project. She also worked for several years as a Paralegal and Land Agent while working in Charleston, WV. Sonja is married and currently resides in Harrison County, Kentucky on a small farm with a variety of animals including horses, cows, goats, dogs, and cats. She has three children and two grandchildren. Sonja is an avid horse lover and enjoys trail riding (horse and ATV) and mounted cowboy shooting. In addition, she loves to bake desserts and traditional country meals.

Sonja Smiley

Brandon Marshall Begins in the Paducah Regional Office

On December 16, 2024, the Paducah Site Section welcomed Brandon Marshall as a new Environmental Scientist. Brandon is originally from Paris, Kentucky. He served in the Navy for 8 years, retired and finished his bachelor's degree at Murray State University in Fisheries and Aquatic Biology. He worked for the EEC as an intern in the DWM and has worked for Kentucky Department of Fish and Wildlife Resources for the past two years. He was recently married and is expecting a baby boy in July. He enjoys his free time fishing and tending to their garden.

Brandon Marshall

EPA Personnel Changes

Brian Begley started working for the U.S. EPA as a Remedial Project Manager in Region 4 on September 10, 2023. He officially assumed the role of EPA Paducah Site Federal Facility Agreement Manager on February 27, 2025. Brian succeeded Victor Weeks, the previous Project Manager, who retired on February 28, 2025.

Brian worked 23-years for the Kentucky Department for Environmental Protection on the Paducah Site, where he held various technical, managerial, and project management roles, up until his retirement on July 31, 2023. Mr. Begley earned his Professional Geologist License in 2003. He holds a M.S. degree in Geology (1998) with emphasis in hydrogeology/environmental from the University of Akron and a B.A. degree in Geology (1996) from Hanover College. Brian's vast knowledge and decades of experience on all topics related to the Paducah Site will continue to be a tremendous asset to making meaningful progress towards cleanup and fulfilling a core mission of protecting human health and the environment.

Brian Begley

Kentucky Environmental Oversight News is published semi-annually by the Kentucky Department for Environmental Protection's Division of Waste Management. It features information regarding environmental cleanup activities at the DOE Paducah Site and related topics. Additional information is available from:

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The mission of the Kentucky Division of Waste Management is to protect human health and the environment by minimizing adverse impacts on all citizens of the Commonwealth through the development of fair, equitable, and effective waste management programs.

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