Per- and polyfluoroalkyl substances (PFAS) Update

US Department of Energy (DOE)
Background: Uranium Separation and PFAS

PFAS were first produced on an industrial scale for use in uranium separation activities during the Manhattan Project.

- 1938 - Teflon® (polytetrafluoroethylene, PTFE) discovered by DuPont scientists
- Development of atomic bomb involved enrichment of U235 using gaseous UF6 (highly corrosive)
- Teflon® and other liquid fluorocarbons found to be highly resistant to corrosion
- First (classified) industrial use of PFAS
- Declassified after the war, and widespread commercial use began in 1949
DOE PFAS Mission Statement

Protect human health and the environment by assessing and addressing PFAS at DOE sites while deploying the Department’s scientific expertise to solve PFAS challenges

DOE is committed to:

- Coordinating with other agencies and working groups
- Staying informed on activities, updates and challenges related to PFAS contamination and regulation
- Continuing investigations and finding solutions for PFAS contamination at DOE sites
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>September 2019</td>
<td>DOE PFAS Work Group established</td>
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<td>September 2019</td>
<td>Operating Experience Level 3 Document <em>PFAS Awareness</em>, published</td>
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<tr>
<td>March 2020</td>
<td>Operating Experience Summary, <em>Emerging Contaminants in Groundwater at Brookhaven National Laboratory</em>, published</td>
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<tr>
<td>December 2021</td>
<td><em>DOE Guidance on Reporting PFAS-Containing AFFF Releases or Spills to the Environment</em> issued</td>
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<td>November 2021</td>
<td>PFAS Coordinating Committee (PCC) established</td>
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<td>September 2021</td>
<td>Deputy Secretary David Turk signed a <em>memorandum</em> addressing PFAS at DOE</td>
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<td>August 2022</td>
<td><em>DOE PFAS Website</em> went live</td>
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<td>August 2022</td>
<td><em>PFAS Roadmap</em> released</td>
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<td>November 2022</td>
<td>Initial Assessment Report</td>
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<tr>
<td>Ongoing</td>
<td>DOE Research</td>
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DOE Actions: Deputy Secretary Memorandum

Deputy Secretary David Turk issued a PFAS Policy Memorandum on September 16, 2021. The memo established the Department’s initial framework for addressing PFAS.

- **Discontinuation of Aqueous Film Forming Foam (AFFF)** except in emergencies:
  - Any discharge to be contained/collection to the maximum extent
  - Fire personnel will be equipped with personal protective equipment

- **Storage and disposal:**
  - Sites may store AFFF on site as required for safety systems and lifesaving emergencies
  - Disposal of PFAS is suspended pending further guidance

- **Report** any PFAS release or spill to DOE HQ

- Establish a **PFAS Coordinating Committee (PCC)** to guide implementation of the memo’s requirements
DOE Actions: DOE PFAS Roadmap

UNDERSTAND

GOAL: Develop information concerning PFAS uses and environmental releases to characterize and assess the Department’s potential liabilities and risks

OBJECTIVES

ACTIONS

MANAGE & PROTECT

GOAL: Safeguard the health and well-being of our employees, the public, and the environment by minimizing exposure to PFAS and addressing PFAS releases

OBJECTIVES

ACTIONS

ADVANCE SOLUTIONS

GOAL: Leverage expertise at DOE’s National Laboratories and collaborate with research partners to enhance PFAS knowledge and develop technological solutions

OBJECTIVES

ACTIONS

COMMUNICATE & COLLABORATE

GOAL: Engage with regulators, tribal nations, local communities, and stakeholders to ensure transparency on DOE’s PFAS progress and develop effective PFAS strategies

OBJECTIVES

ACTIONS
DOE will release its *Initial Assessment of Per- and Polyfluoroalkyl Substances (PFAS) at Department of Energy Sites* on November 22, 2022.
DOE Actions: PFAS Initial Assessment

- DOE program offices (EM, NE, NNSA, LM, SC, FECM, CESER, EE) conducted a survey of PFAS inventories, usage and existing historical information

- **Survey Objective**- To provide an initial understanding of PFAS use and presence at DOE sites, including:
  - Historical usage
  - Potential sources and inventories
  - Drinking water supply and sampling status
  - Regulator or other stakeholder inquiries and requests
  - Detections in environment
  - Routine monitoring programs
  - Potential or known off-site migration
Participating Sites in the DOE PFAS Survey
DOE Actions: PFAS Initial Assessment Key Takeaways

Drinking Water

- Most DOE sites surveyed are supplied by offsite public water systems
- PFOA/PFOS were detected in two on-site drinking water systems (Idaho and Brookhaven)
- DOE will soon have PFAS data on drinking water from the few sites that need to sample their on-site sources

Historical and Current Uses

- Many DOE facilities stored, used, and disposed of PFAS-containing products in the past, and several continue to manage inventories of PFAS on-site
- Identifying historical and current PFAS inventories continues as DOE better understands its past and present inventories
DOE Actions: PFAS Initial Assessment Key Takeaways

Occurrence in the Environment

- A limited number of sites have sampled for PFAS
- Most sites that have sampled for PFAS have detected PFAS
- Groundwater is the primary media sampled for PFAS
- Four sites have active PFAS monitoring programs (BNL, LANL, Rocky Flats, SRS)

Regulatory and Stakeholder Engagement

- Engagement has resulted in:
  - additional records searches
  - discrete environmental sampling events
  - establishment of environmental monitoring programs.
DOE Actions: Ongoing Research

Examples of Detection Research

- **Argonne National Laboratory** in Illinois is developing a field-effect transistor platform for rapid electronic detection of PFAS in water, including the use of AI/machine learning for the design of molecular probes toward selective detection and separation of PFAS.

- **Pacific Northwest National Laboratory** in Washington created a PFAS capture probe that is tailored for highly selective analyte recognition and detection which can also be used for quantification.

Examples of Destruction Research

- **Brookhaven National Laboratory** in New York is developing a plasma-based technique to destroy PFAS and related components in water.

- **Fermi National Accelerator Laboratory** in Illinois conducting research on the degradation of PFAS in water via high power, energy-efficient electron beam accelerator
### Next Steps

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<th>Understand</th>
<th>Implement DOE Commitments on PFAS</th>
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<td>Gather and analyze PFAS data to fill knowledge gaps and inform site-specific risk management</td>
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<td>Manage and Protect</td>
<td>Take steps to protect DOE workers, the public and the environment</td>
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<td>Advance Solutions</td>
<td>Expand the body of knowledge and develop technological solutions to address PFAS issues</td>
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<td>Communicate and Collaborate</td>
<td>Inform and engage stakeholders</td>
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