

Per- and polyfluoroalkyl substances (PFAS) Update

Analytical Services Program Annual Training Workshop

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EHSS-20*

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AGENDA

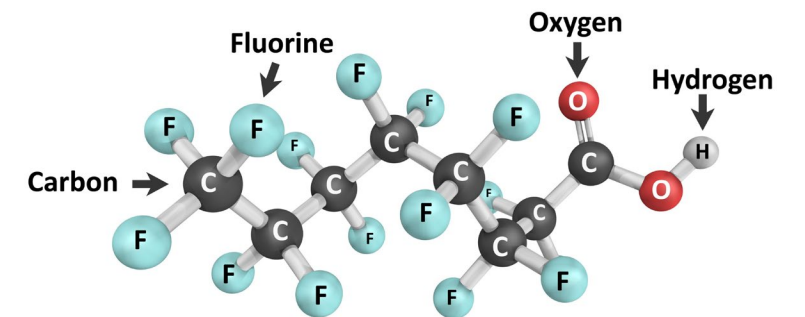
- Background
- DOE Actions
 - Policy Memo
 - Road Map
 - Initial Assessment
- Continued Efforts
- PFAS Resources





Background: What are PFAS?

- Group of thousands of man-made chemicals
- First manufactured in the 1940s
- Known as “forever chemicals”
- Contamination in land, air, water, plants and animals
- Two most studied PFAS - PFOA and PFOS





Background: PFAS Impacts



Health Impacts

- Recent studies estimate that over 98% of the US population has PFAS in their blood¹
- Links to cancer, ulcerative colitis, thyroid disease, high cholesterol, high blood pressure during pregnancy, fetal and neonatal developmental effects, and accelerated puberty.
- Evidence of both PFOA and PFOS affecting immune systems

1. Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES).
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4483690/>

Background: PFAS Impacts



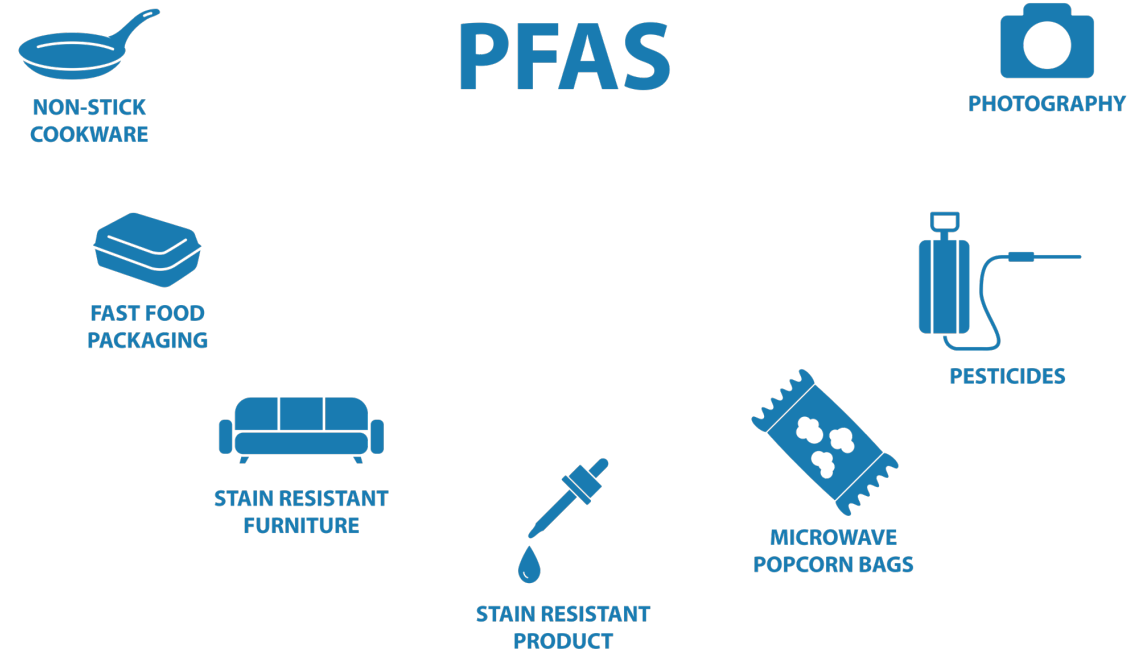
Environmental Impacts

- Do not break down easily in the environment
- Accumulate over time
- Can spread broadly in groundwater
- Can be released into the air as vapors or fine particles

Background: Common Uses



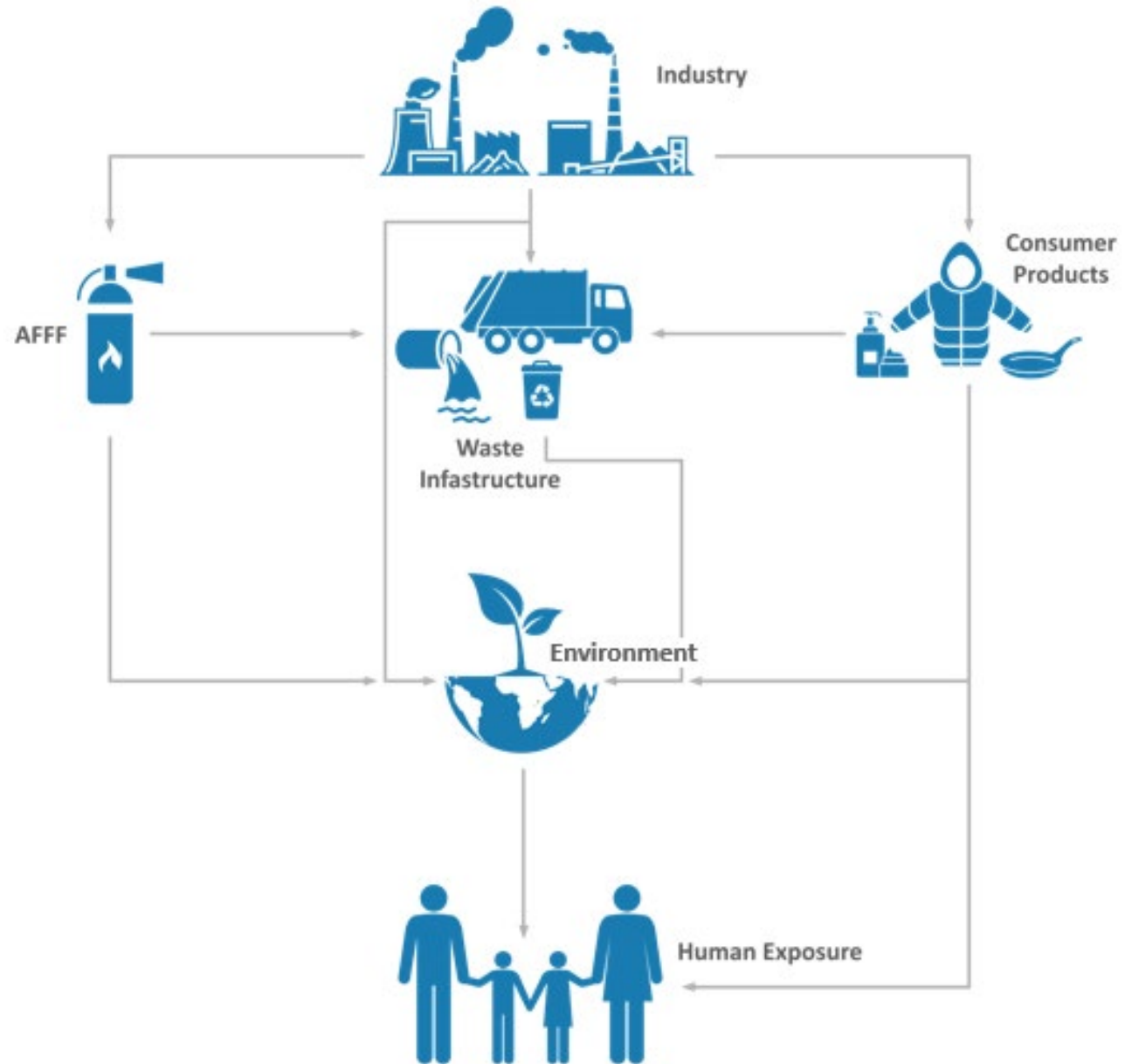
Products Containing PFAS



PFAS

Background: Exposure

PFAS Exposure Pathways



Background: Common Industrial Uses of PFAS



Industry

Use and Examples



**Firefighting/
Safety**

Aqueous Film Forming Foam (AFFF); firefighting equipment and protective clothing

Metal Plating

Wetting agent, mist suppression for harmful vapors



**Building and
Construction**

Fabrics, roofing membranes, metals, stone, tiles, concrete, adhesives, seals caulks, additives in paints, varnishes, dyes, stains, sealants, surface treatment agent and laminates

Energy

Fluoropolymer films that cover solar panel collectors, electrolyte fuel cells, PTFE expansion joint materials for power plants

**Herbicides and
Pesticides**

Plant growth regulators and herbicides, ant and termite baits, mosquito repellent



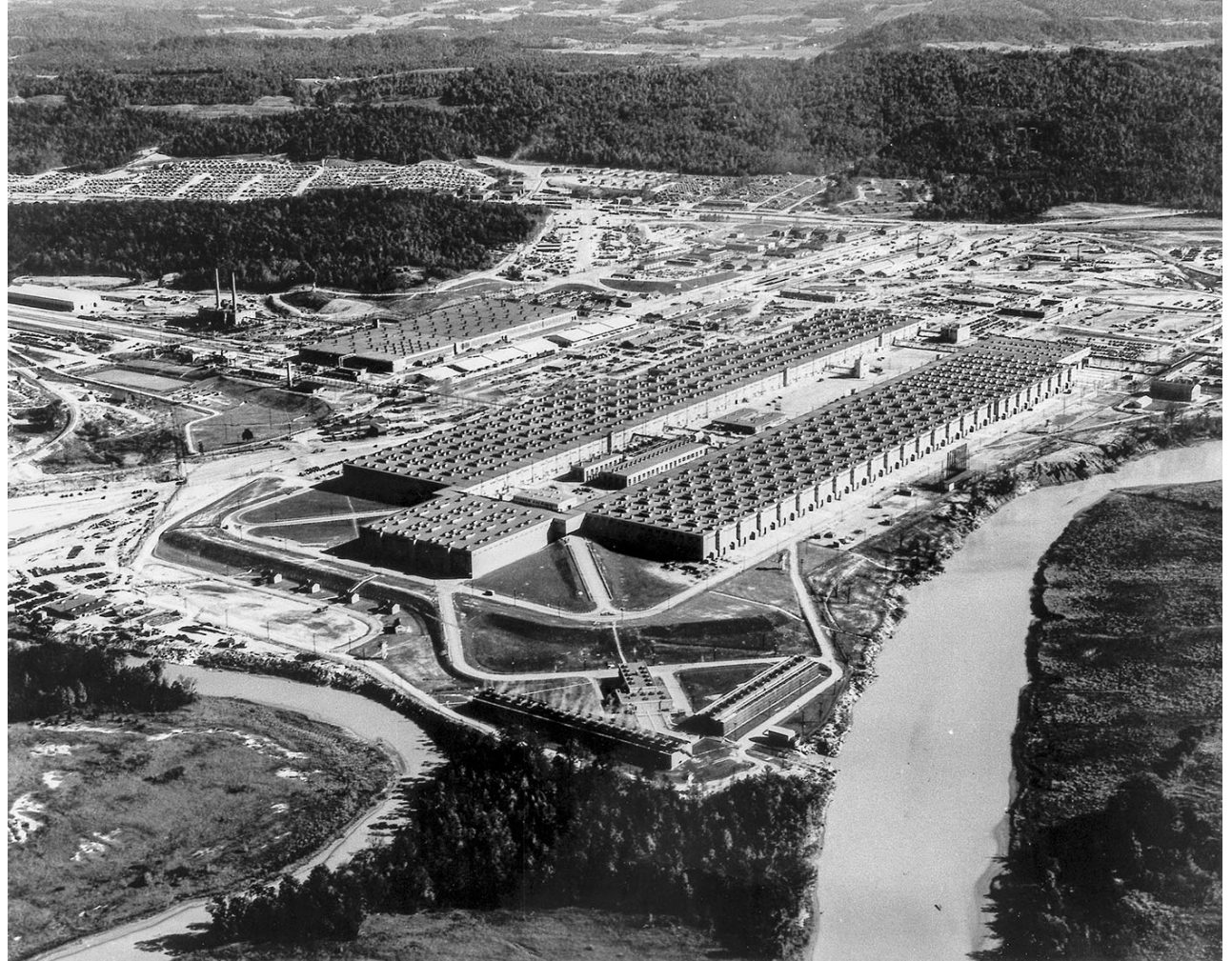
**Aviation/
Automotive**

Mechanical components, wiring and cable, fuel delivery tubing, seals, bearings, gaskets and lubricants

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



DOE Actions: Timeline



September 2019

DOE PFAS Work Group established

September 2019

Operating Experience Level 3 Document [PFAS Awareness](#), published

March 2020

Operating Experience Summary, [Emerging Contaminants in Groundwater at Brookhaven National Laboratory](#), published

December 2021

[DOE Guidance on Reporting PFAS-Containing AFFF Releases or Spills to the Environment](#) issued

November 2021

PFAS Coordinating Committee (PCC) established

September 2021

Deputy Secretary David Turk signed a [memorandum](#) addressing PFAS at DOE

↑
Ongoing
DOE
Research
↓

August 2022

[DOE PFAS Website](#) went live

August 2022

[PFAS Roadmap](#) released

November 2022

Initial Assessment Report Operating Experience Summary Document [Operating Experience Summary – 2022-04 – November 14, 2022 | Department of Energy](#)



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/collected to the maximum extent
 - Fire personnel will be equipped with personal protective equipment
- Sites may **store** AFFF on site however **disposal** of PFAS is suspended
- **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: PFAS Coordinating Committee (PCC)



PCC Mission: Track progress in meeting the requirements identified in the Policy, identify necessary changes to Departmental orders and directives or regulations to achieve Policy objectives, and initiate coordination with the DOE Directives Review Board to implement necessary changes to Departmental directives.

Explore

Explore opportunities for DOE laboratories to work with interagency and external partners

Clarify

Clarify the additional resources needed to support research, testing, characterization, and possible remediation activities

Serve

Serve as a management-level counterpart to the existing DOE PFAS Working Group

Provide

Provide guidance and interpretation on aspects of the Policy, and support a collaborative, consistent enterprise approach to the Policy's implementation

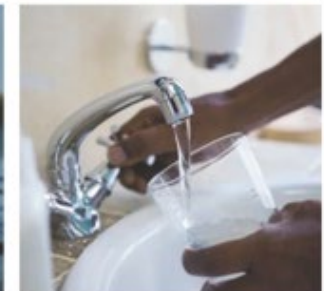
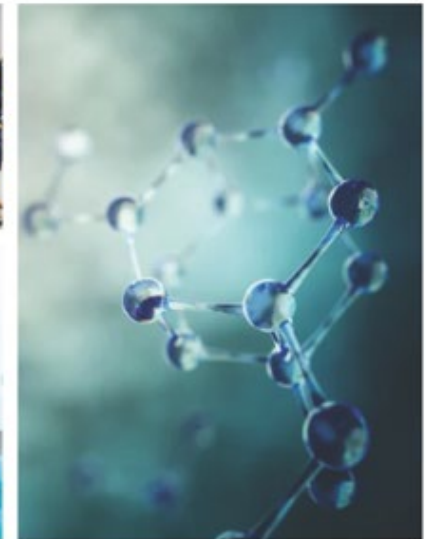
DOE Actions: DOE PFAS Roadmap

The *PFAS Strategic Roadmap: DOE Commitments to Action 2022-2025* was published on August 18, 2022.



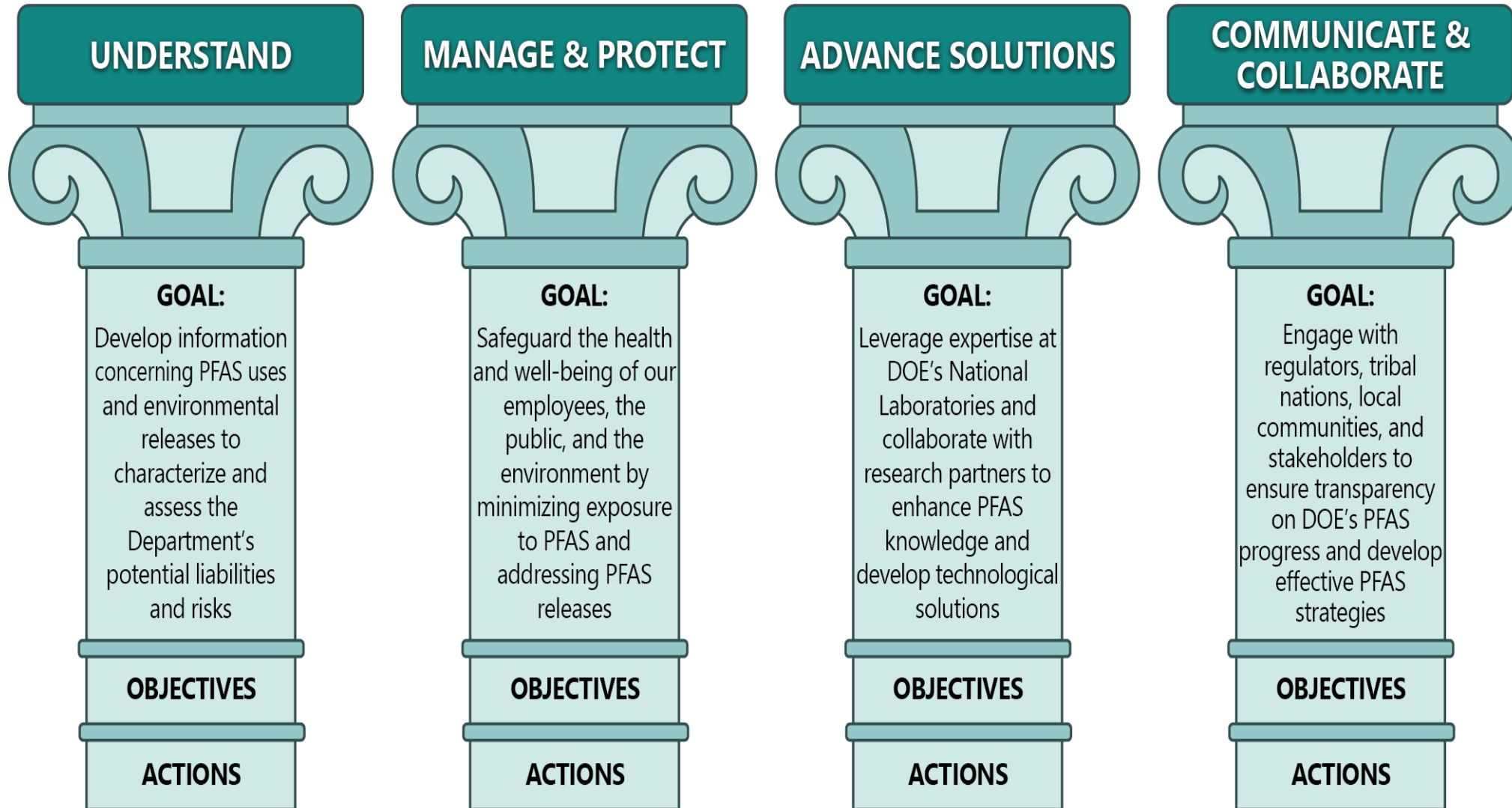
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PFAS Strategic Roadmap: DOE Commitments to Action 2022-2025







DOE Actions: DOE PFAS Roadmap



Pillar 1: Understand

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

- Obj. 1 – Understand the Manhattan Project and Cold War-era sources and volumes of PFAS used and disposed of, with initial focus on uranium processing operations.
- Obj. 2 – Assess AFFF releases to the environment from fire suppression systems, firefighter training operations, and emergencies resulting in AFFF use.
- Obj. 3 – Identify other PFAS uses and disposal activities associated with research, operations, and equipment maintenance.
- Obj. 4 – Understand the presence of PFAS in drinking water and the environment.
- Obj. 5 – Catalogue and track current PFAS inventories and uses.

	Description	Completion Date	
Action 1.1	Publish DOE PFAS <u>Initial Assessment Report</u> .	4 Q FY 2022	
Action 1.2	Publish <u>DOE guidance on historical and current use</u> searches.	1 Q FY 2023	
Action 1.3	<u>Test for PFAS at all DOE-owned water systems</u> , where DOE supplies drinking water to a site, using the most recent U.S. EPA test methods (e.g., 537.1).	1 Q FY 2023 (Initial Testing)	
Action 1.4	Complete <u>initial assessment of classified records</u> for information regarding PFAS use during the early Cold War.	4 Q FY 2022	
Action 1.5	Identify <u>relevant records</u> to identify likely PFAS use in historical and current DOE production and research activities.	2 Q FY 2023 (Initial Effort)	
Action 1.6	Publish <u>environmental sampling guidance</u> to support determining the nature and extent of PFAS releases at DOE sites.	2 Q FY 2023	
Action 1.7	Perform Site field assessments, as appropriate, and provide an <u>annual site-specific status update</u> to the PCC.	Ongoing (Initial reports completed January 2022)	
Action 1.8	Publish DOE PFAS <u>Updated Status Report</u> .	1 Q FY 2025	

Pillar 2: Manage and 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

- Obj. 1 – Minimize risks to the DOE workforce from exposure to PFAS.
- Obj. 2 – Reduce potential risk to the public and environment.
- Obj. 3 – Restrict procurement and use of PFAS-containing products and identify alternatives.

	Description	Completion Date
Action 2.1	Provide <u>alternative drinking water</u> supply to DOE sites where PFAS is detected in on-site drinking water at concentrations exceeding federal or state regulatory limits or voluntary standards.	Immediate
Action 2.2	Establish requirements to <u>restrict</u> any non-emergency use of PFAS-containing AFFF, suspend disposal actions unless approved by the head of the program element, require PPE for operations with known PFAS exposure, and report PFAS spills and releases.	September 2021
Action 2.3	Properly manage and dispose of PFAS-contaminated materials and wastes. Develop <u>disposal guidance</u> .	2 Q FY 2023
Action 2.4	Compile, maintain, and share a set of <u>applicable resources to assist</u> DOE sites with identifying and minimizing PFAS risks.	4 Q FY 2022
Action 2.5	Develop/update <u>procurement guidance</u> to restrict the purchase of PFAS-containing products.	2 Q FY 2022 (GreenBuy Guide)
Action 2.6	Issue Departmental Guidance on <u>identifying PFAS</u> and other emerging contaminants as a significant aspect <u>within site EMSs</u> as appropriate, perhaps in the framework of the policy/directives changes identified by the PCC.	4 Q FY 2022 (Begin Coordination w/ DOE Directives Review Board)



Pillar 3: Advance Solutions

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

- Obj. 1 – Leverage the expertise of DOE National Laboratories and research partners to identify and advance research objectives.
- Obj. 2 – Coordinate with Federal agencies and research partners to solve challenges.
- Obj. 3 – Conduct research and adapt resultant strategies, as needed.
- Obj. 4 – Support Department-wide collaboration to enable deployment of solutions for PFAS-related challenges.





	Description	Completion Date
Action 3.1	Publish a <u>PFAS Research Plan</u> that identifies research gaps and establishes DOE research priorities to ensure a coordinated effort across DOE laboratories and other federal research partners.	1 Q FY 2023 (Initial research plan published) 1 st Q FY 2025 (next update)
Action 3.2	<u>Engage</u> with interagency partners and external organizations to inform the Department's PFAS research activities and strategy.	Ongoing
Action 3.3	<u>Advance</u> technologies and applied research at DOE National Laboratories and affiliate research programs.	Ongoing



Pillar 4: Communicate and Collaborate

Goal: Engage with regulators, Tribal nations, local communities, and stakeholders to ensure transparency on DOE's PFAS progress and develop effective PFAS strategies

- Obj. 1 – Develop publicly-available resources to provide timely updates on Departmental progress in assessing and managing PFAS risks.
- Obj. 2 – Ensure effective engagement with community stakeholders, Tribal, state and local governments, regulatory entities, and others.

	Description	Completion Date	
Action 4.1	Release a <u>publicly available platform</u> to serve as a central hub and resource center.	3 Q FY 2022	
Action 4.2	Develop <u>informational materials</u> conveying DOE-wide and site-specific information, including updates on PFAS developments.	Ongoing	
Action 4.3	Identify <u>opportunities</u> at the enterprise and site level <u>to discuss PFAS issues</u> with Tribal, state and local governments, and interagency and external stakeholders.	Ongoing	
Action 4.4	Establish <u>open communication channels</u> to receive stakeholder-provided information and answer public inquiries, to support transparency in Departmental PFAS posture, policy and actions.	3 Q FY 2022	

DOE Actions: PFAS Initial Assessment

The *Initial Assessment of Per- and Polyfluoroalkyl Substances (PFAS) at Department of Energy (DOE) Sites* was published on November 22nd, 2022.



Initial Assessment of Per- and Polyfluoroalkyl Substances (PFAS) at Department of Energy (DOE) Sites



Preamplifier at the National Ignition Facility by Lawrence Livermore National Laboratory. CC-BY-SA-3.0 via Wikimedia Commons.

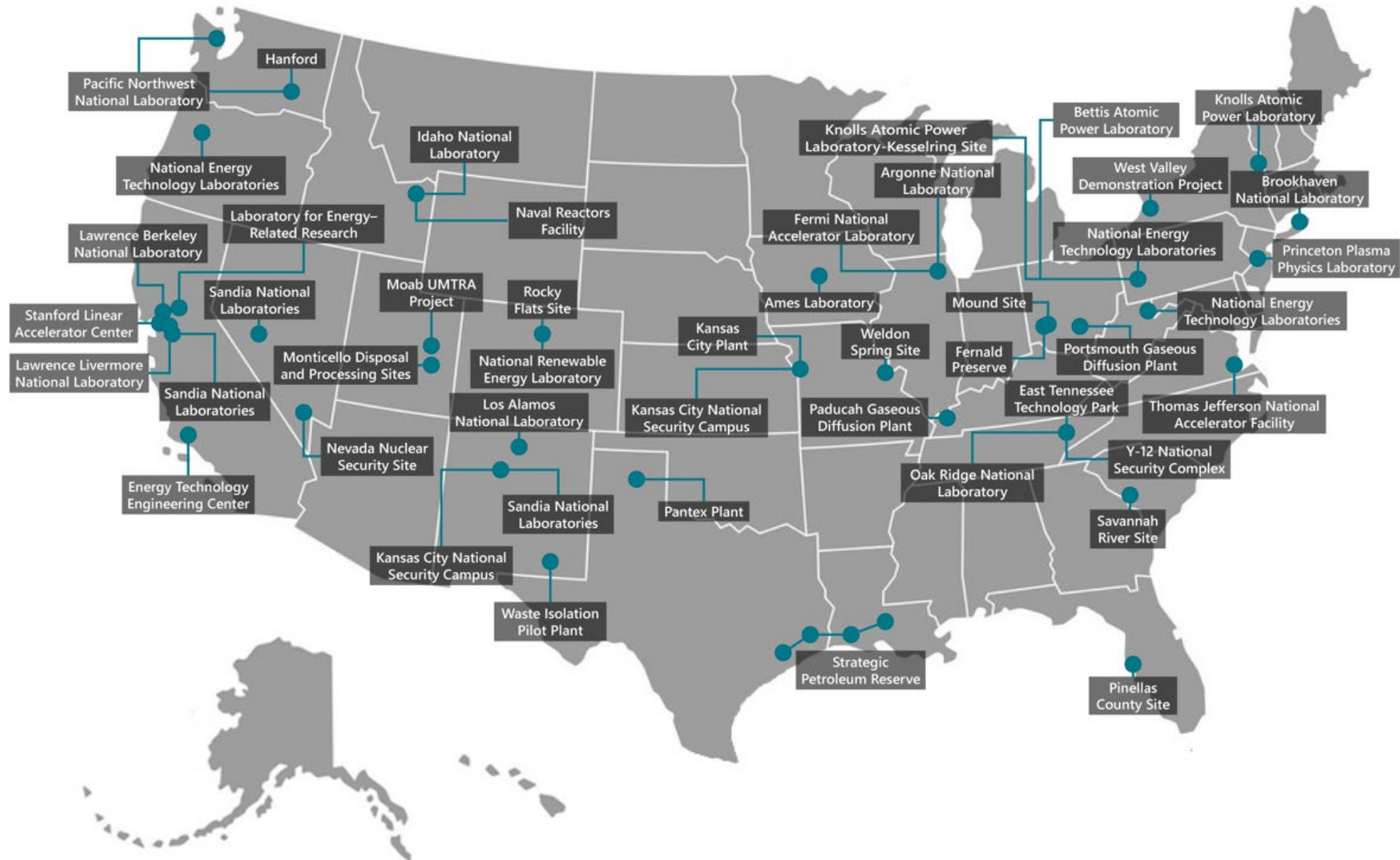


DOE Actions: PFAS Initial Assessment



- 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 use
 - 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 Initial Assessment



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

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

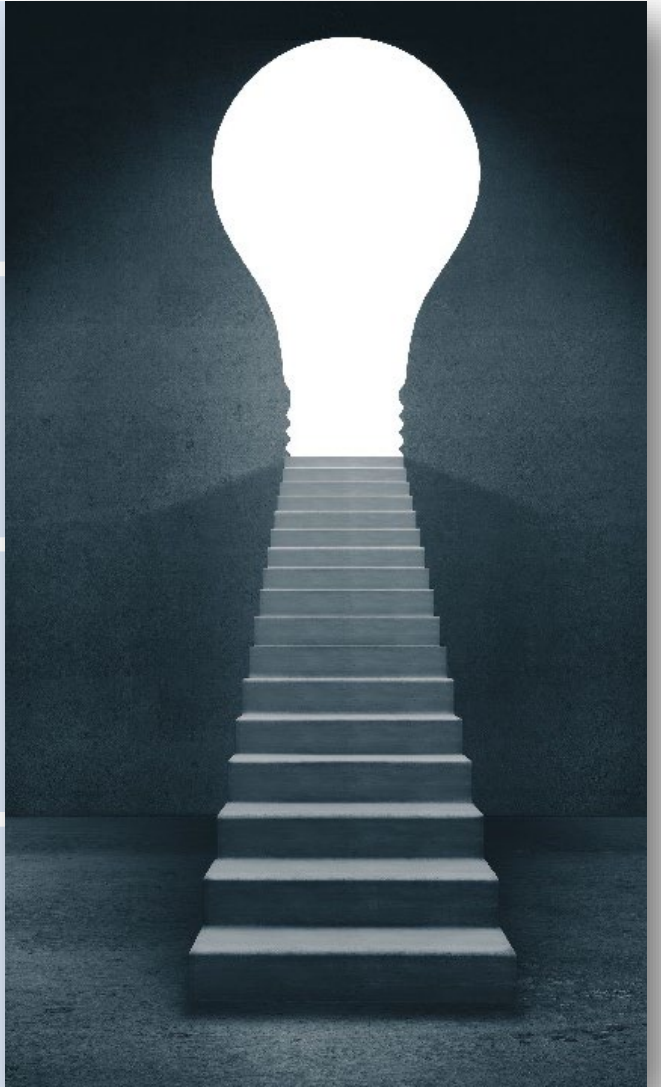
- **Brookhaven National Laboratory** in New York is developing a plasma-based technique to destroy PFAS and related components in water.
- **Fermi National Accelerator Laboratory** in Illinois conducting research on the degradation of PFAS in water via high power, energy-efficient electron beam accelerator



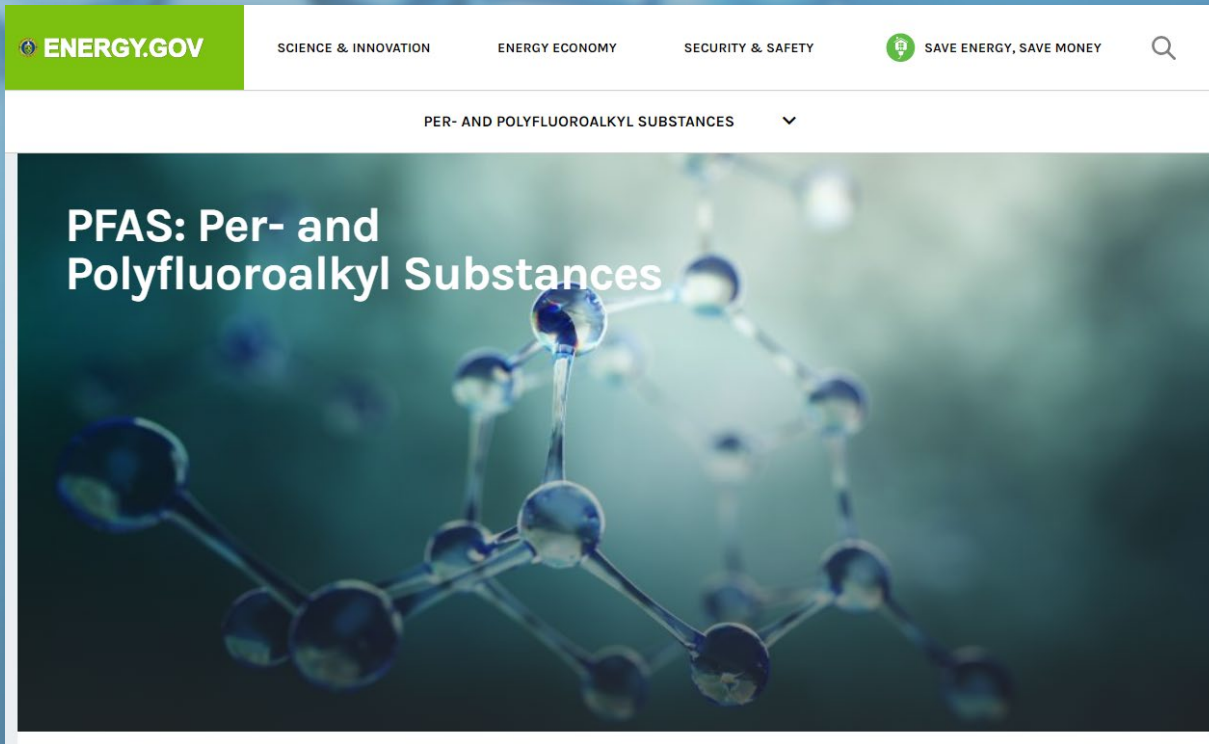
Continued Efforts



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



PFAS Resources



[DOE PFAS Website](#)



DOE PFAS Mailbox:

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