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# Per- and polyfluoroalkyl substances (PFAS) Update

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US Department of Energy (DOE)



# AGENDA

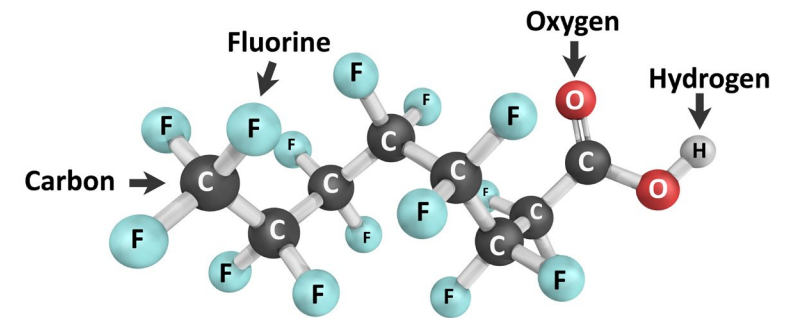
- Background
- DOE Actions
- Continuing Efforts
- PFAS Resources





# 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- perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS)
- Aqueous film-forming foam (AFFF) is the most widely studied cause of PFAS release into the environment

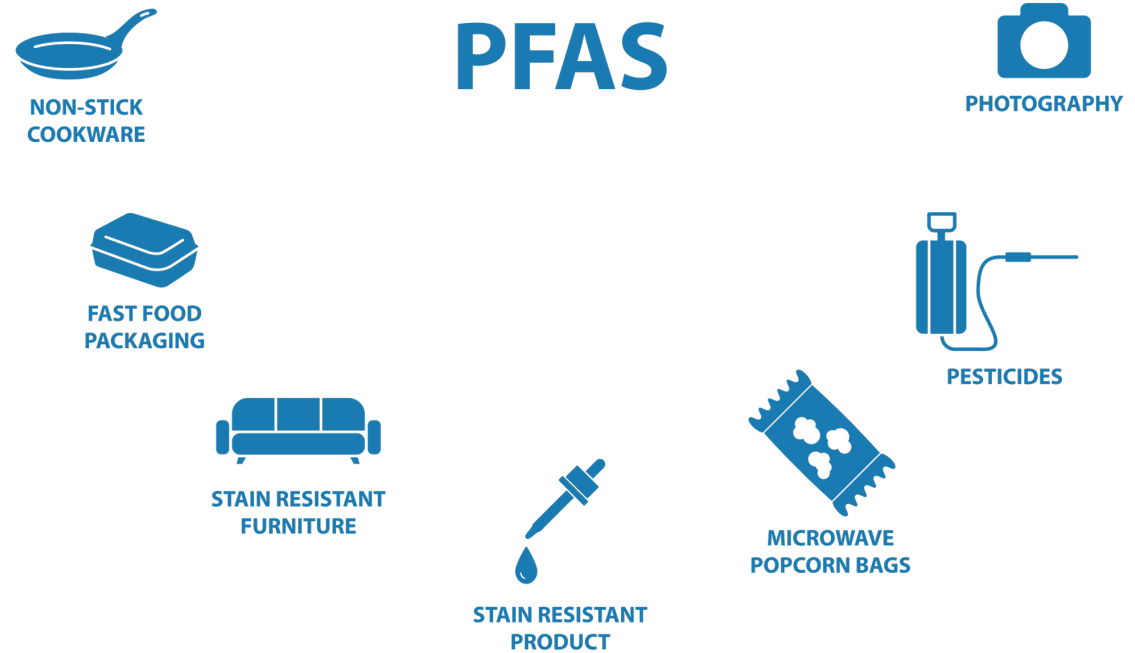


*PFOA Molecule*

# Background: Common Uses



## Products Containing PFAS

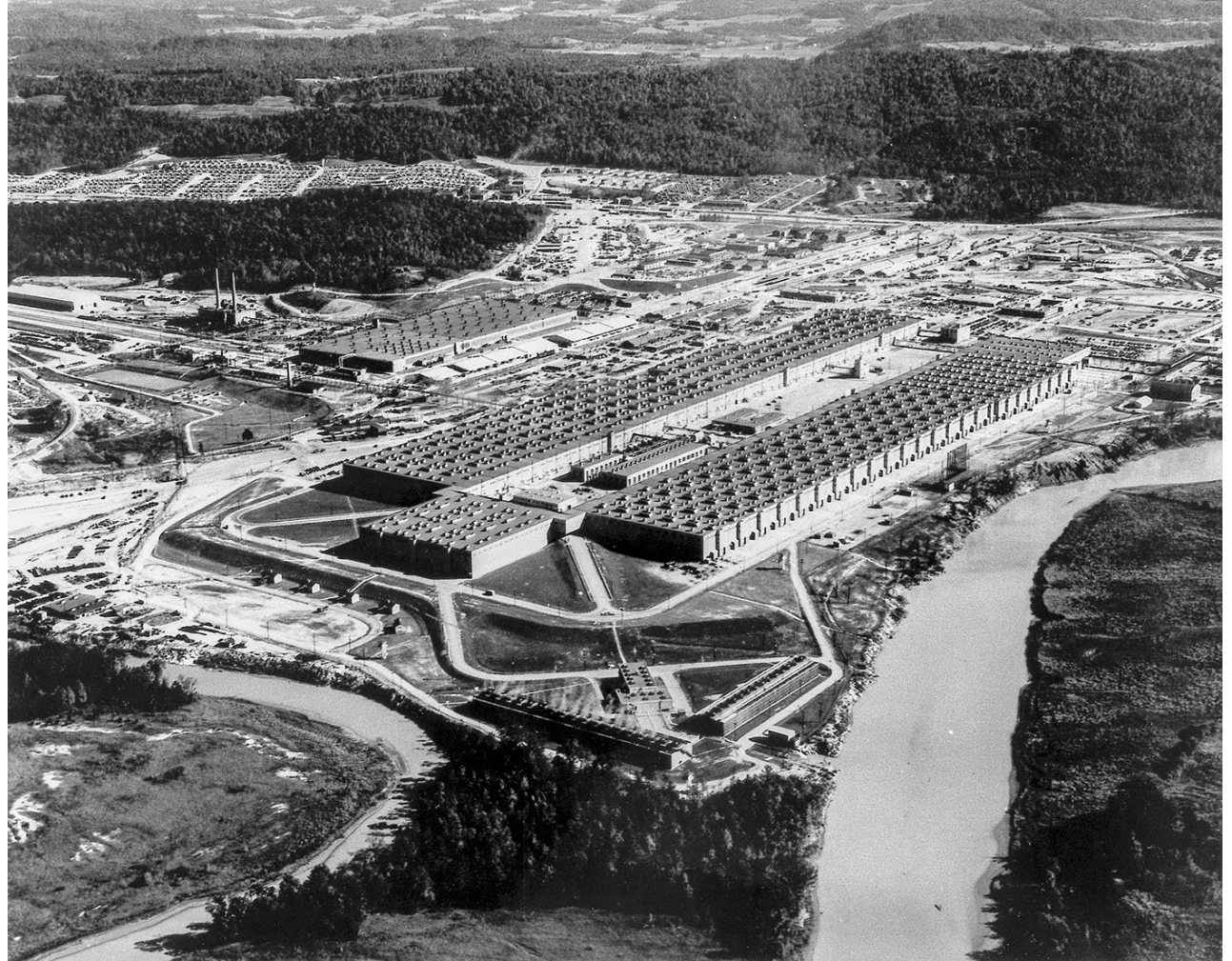


**PFAS**

# 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 UF<sub>6</sub> (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



# 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**

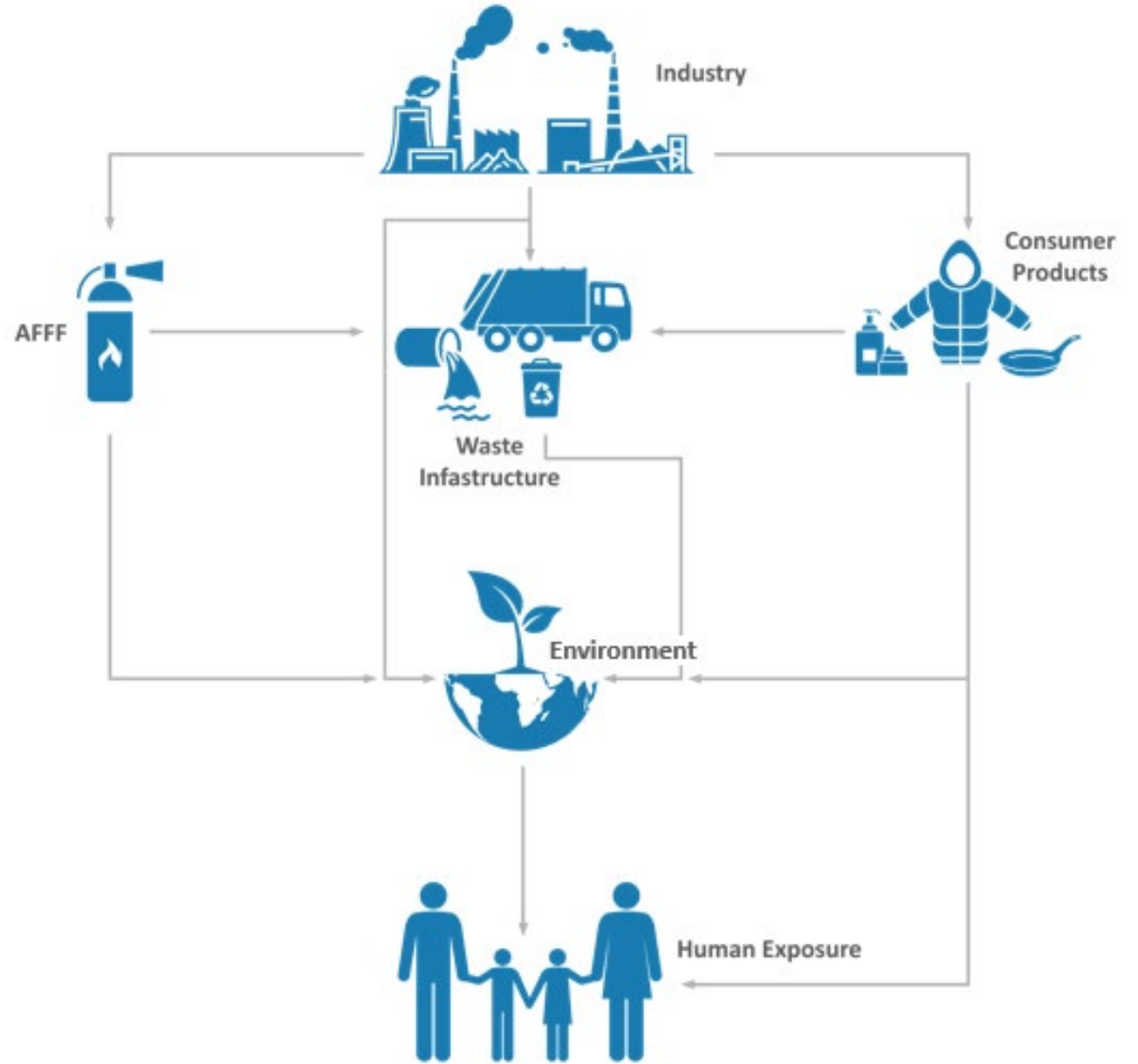
Plant growth regulators and herbicides, ant and termite baits, mosquito repellent

**Aviation/  
Automotive**

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



# Background: Exposure



## PFAS Exposure Pathways



# Background: PFAS Impacts

## Health Impacts



- Recent studies estimate that over 98% of the US population has PFAS in their blood<sup>1</sup>
- May lead to increased cholesterol levels, changes in liver enzymes, small decreases in infant birth weights, decreased vaccine response in children, increased risk of high blood pressure or preeclampsia in pregnant women, increased risk of kidney or testicular cancer<sup>2</sup>

1. Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES).

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4483690/>

2. Agency for Toxic Substances and Disease Registry (ATSDR). [Potential health effects of PFAS chemicals | ATSDR \(cdc.gov\)](#)





# Background: PFAS Impacts



## Environmental Impacts

- Do not break down easily in the environment
- Accumulate over time
- Highly mobile in groundwater
- Can be released into the air as vapors or fine particles
- PFAS bioaccumulate in fish and other wildlife

[https://www.cdc.gov/biomonitoring/PFAS\\_FactSheet.html#:~:text=Many%20PFAS%2C%20including%20perfluorooctane%20sulfonic,bioaccumulate\)%20in%20fish%20and%20wildlife.](https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html#:~:text=Many%20PFAS%2C%20including%20perfluorooctane%20sulfonic,bioaccumulate)%20in%20fish%20and%20wildlife.)

# 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

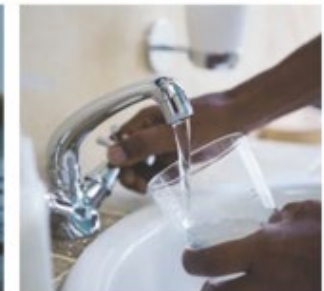
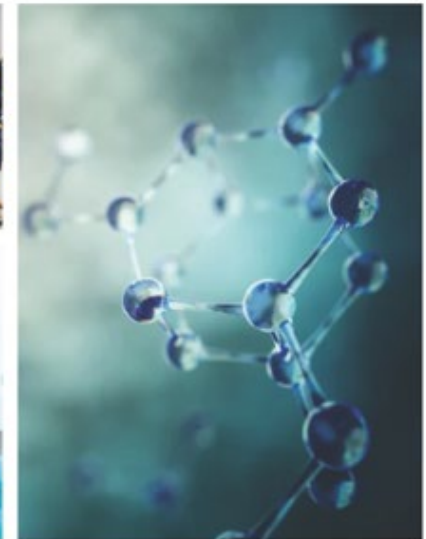
[Initial Assessment Report](#) released

# DOE Actions: DOE PFAS Roadmap

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

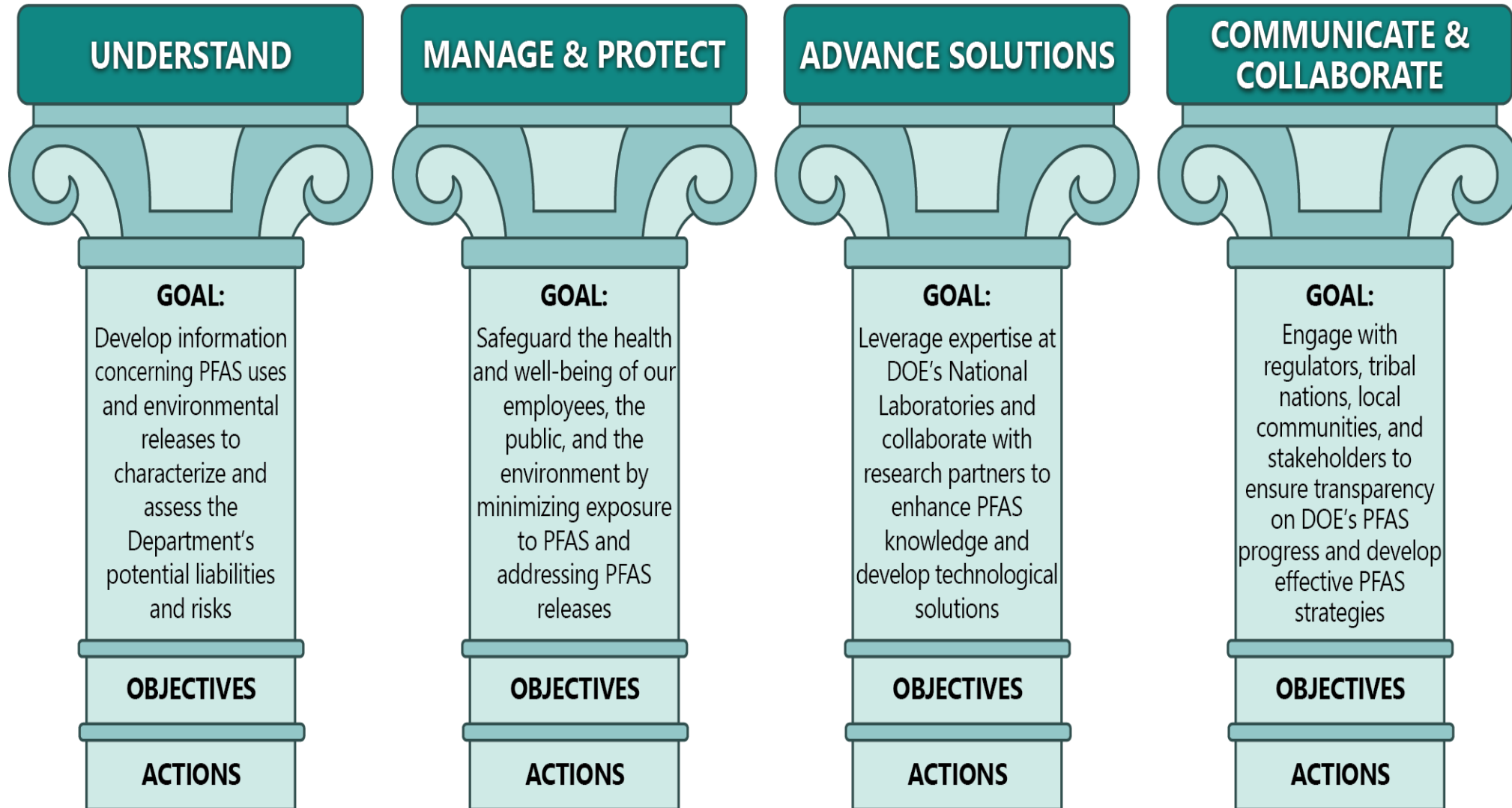


## PFAS Strategic Roadmap: DOE Commitments to Action 2022-2025





# DOE Actions: DOE PFAS Roadmap



# DOE Actions: PFAS Initial Assessment

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



## Initial Assessment of Per- and Polyfluoroalkyl Substances at Department of Energy Sites



# 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

# 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 in groundwater
- Groundwater is the primary media sampled for PFAS
- Four sites have active PFAS monitoring programs - Brookhaven National Lab, Los Alamos National Lab, Rocky Flats, and Savannah River Site)

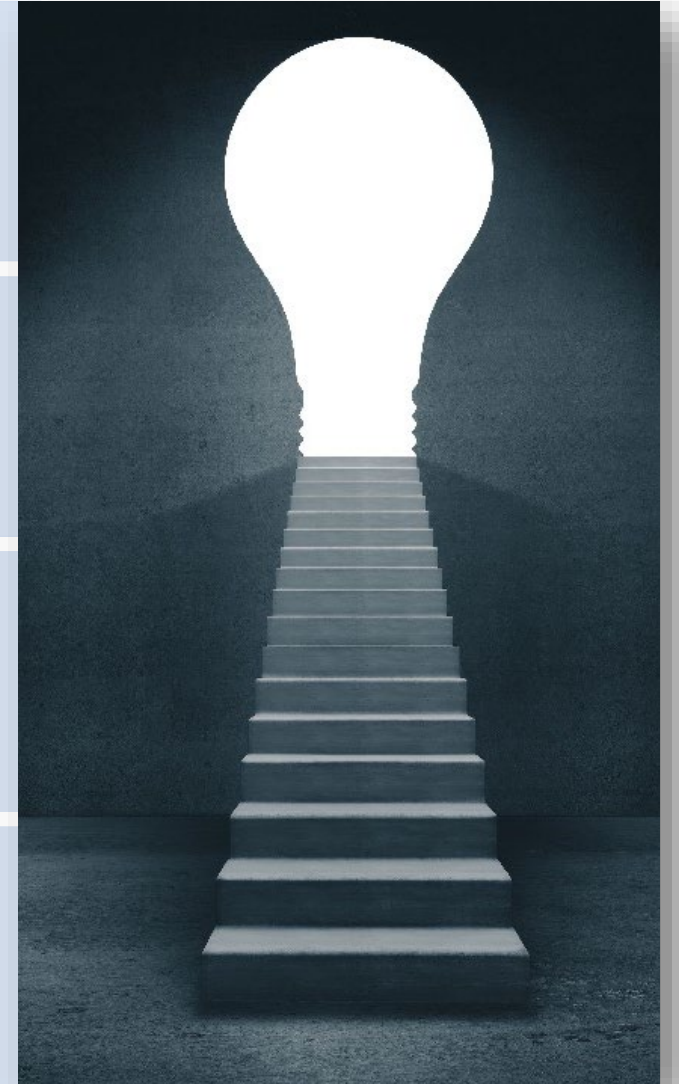
## Regulatory and Stakeholder Engagement

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

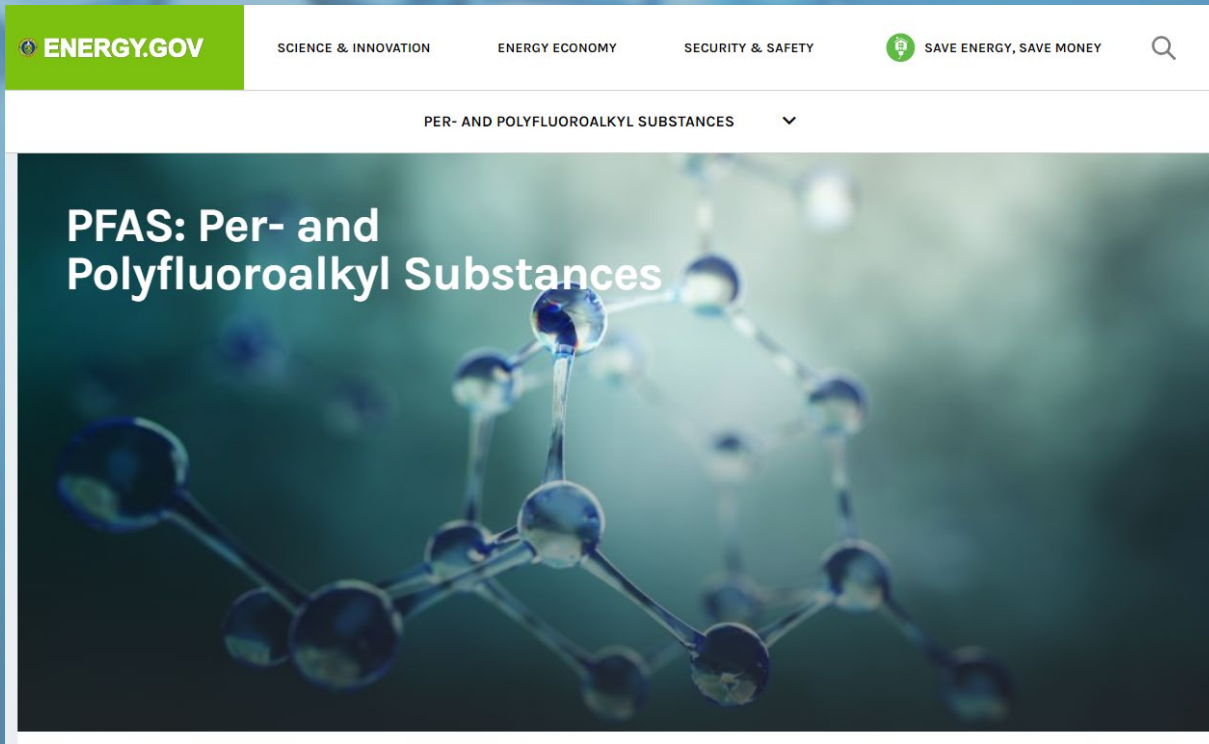
# Continuing Efforts



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:**

*Contact us with  
questions or  
feedback at*

[PFASInfo@hq.doe.gov](mailto:PFASInfo@hq.doe.gov)