

A detailed 3D ball-and-stick model of a per- and polyfluoroalkyl substance (PFAS) molecule. The structure features a central carbon chain with multiple fluorine atoms (represented by light blue spheres) and several hydrogen atoms (represented by white spheres). The molecule is shown in a perspective view, with some parts in sharp focus and others blurred in the background.

Per- and polyfluoroalkyl substances (PFAS) Update

Shelby Goodwin

Water Program SME

April 27, 2023



AGENDA

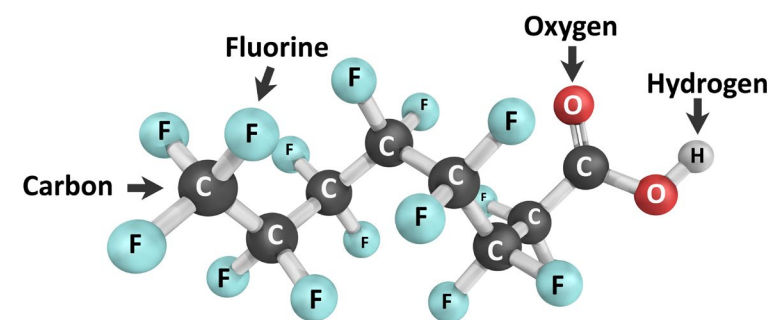
- Background
- DOE Actions
 - Timeline
 - Roadmap
 - Initial Assessment
- Continuing Efforts
- PFAS Resources





Background: What are PFAS?

- Collective term that stands for per- and polyfluoroalkyl substances (PFAS)
- Group of thousands of man-made chemicals
- First manufactured in the 1940s
- Known as “forever chemicals”
- 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 and Industrial Uses of PFAS



Industry	Use and Examples
Firefighting/ Safety	AFPP, 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: PFAS Impacts

Health Impacts



- Recent studies estimate that over 98% of the US population has PFAS in their blood¹
- 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 cancer²

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 \(cdc.gov\)](https://www.atsdr.cdc.gov/toxsubstances/chemicals/PFAS/PFAS_Health_Effects.pdf)



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

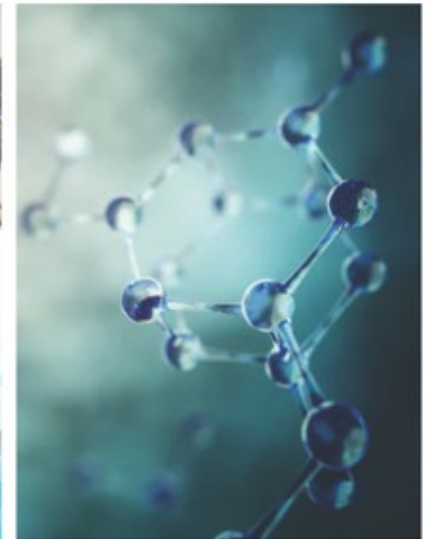
DOE Actions: DOE PFAS Roadmap

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



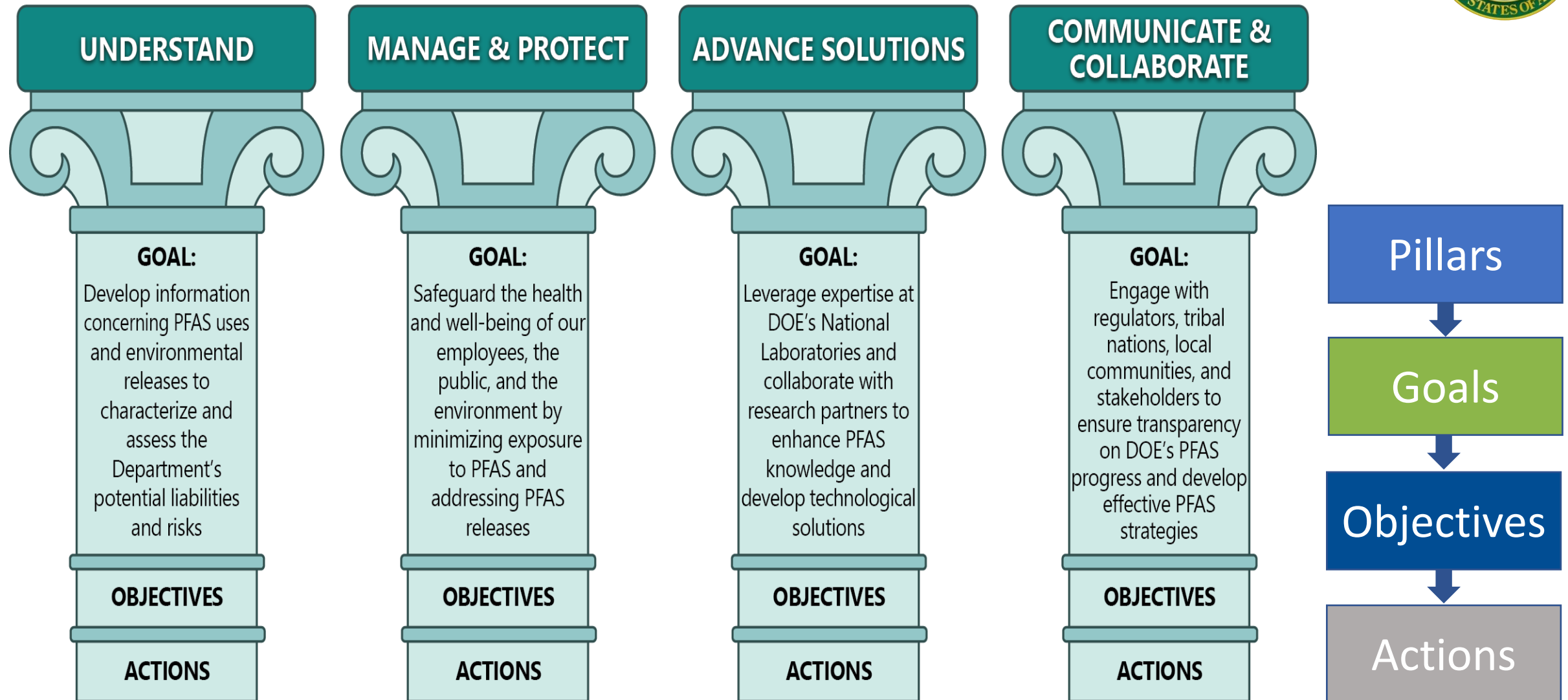
SCAN ME

PFAS Strategic Roadmap: DOE Commitments to Action 2022-2025





DOE Actions: DOE PFAS Roadmap

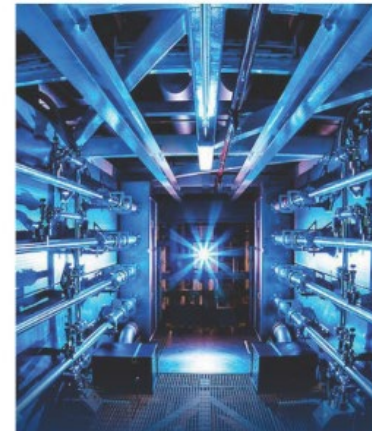


DOE Actions: PFAS Initial Assessment

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



- Surveys of PFAS inventories, usage, and existing historical information at DOE program offices (EM, NE, NNSA, LM, SC, FECM, CESER, EE)
- **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

INITIAL ASSESSMENT

KEY TAKEAWAYS BY SITE



- The INL site provides drinking water to fewer than 10,000 people from on-site groundwater.
- INL and Idaho Cleanup Project (ICP) performed voluntary sampling of all drinking water systems for PFAS, at the request of the state, and reported results to the state of Idaho. One of the ten drinking water systems had low-level concentrations of PFOA/PFOS; the remainder of the drinking water systems were non-detect.
- Historical activities:
 - The Subsurface Disposal Area, which accepted waste from the Rocky Flats site, the INL site, and other DOE facilities, landfills, wastewater treatment plants, and a fire department facility are present on the site.
 - Cold War-era liquid wastes were discharged into two on-site wells; wells have since been grouted or have undergone remediation.

Idaho National Laboratory (INL)

Office of Nuclear Energy and
Office of Environmental Management
Bonneville County, ID

Summary of Max PFAS Detections

Site	Media	PFAS Type	2022 Maximum Detection	EPA's Proposed MCL in the National Primary Drinking Water Regulation (2023)
INL	Groundwater	PFOS	1.25 ppt @ CFA*	4 ppt*
		PFOA	1.77 ppt @ CFA*	4 ppt*
		HFPO-DA (GenX)	<i>Undetected*</i>	1.0 (unitless) Hazard Index (combined)*
		PFBS	1.29 ppt @ CFA*	
		PFNA	<i>Undetected*</i>	
		PFHxS	7.48 ppt @ CFA*	

GenX PFBS PFNA PFHxS

10 + 2000 + 10 + 9 = Hazard Index Value

*EPA's proposed maximum contaminant level (MCL) and Hazard Index is applied to the entry point with the maximum concentration. The entry point is right after treatment. The provided maximum detection was collected at the wellhead (raw groundwater) before the entry point and would not be considered the point of compliance.

INL Activities: Timeline

Oct/Nov 2021:
Sampling of
drinking water
systems
March 2022:
Resample at one
facility

2020-2022:
Contribution to
Initial
Assessment
Report

Dec 2022:
ICP PFAS
Implementation
Plan
Feb 2023:
INL PFAS
Implementation
Plan

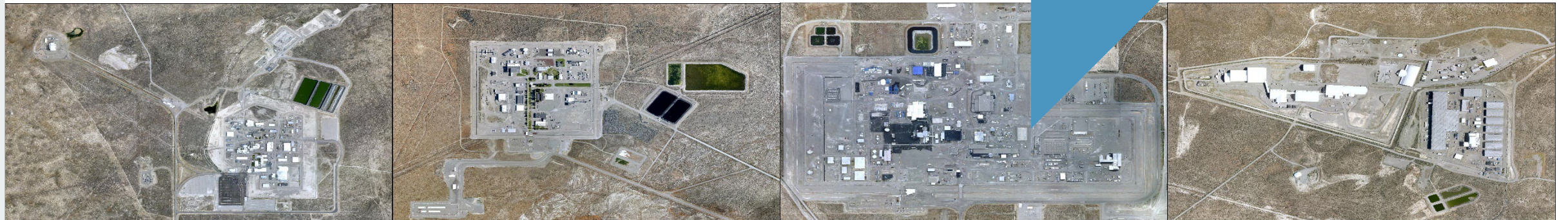
March 2023:
Annual sampling
of drinking
water systems

April 2023:
Add
Implementation
Plans to
contracts

~Oct 2023:
Start Phase I
(process similar
to Preliminary
Assessment)

TBD:
Start Phase II
(process similar
to Site
Inspection)

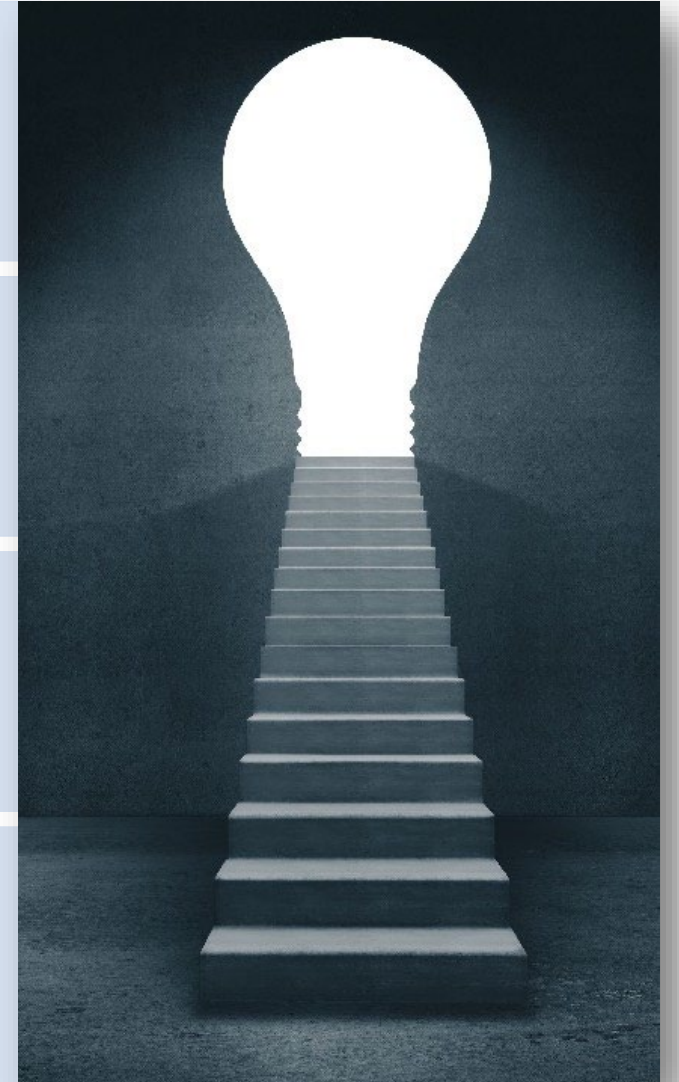
TBD: Start
Remedial
Investigation/
Feasibility Study
(RI/FS) as
necessary.



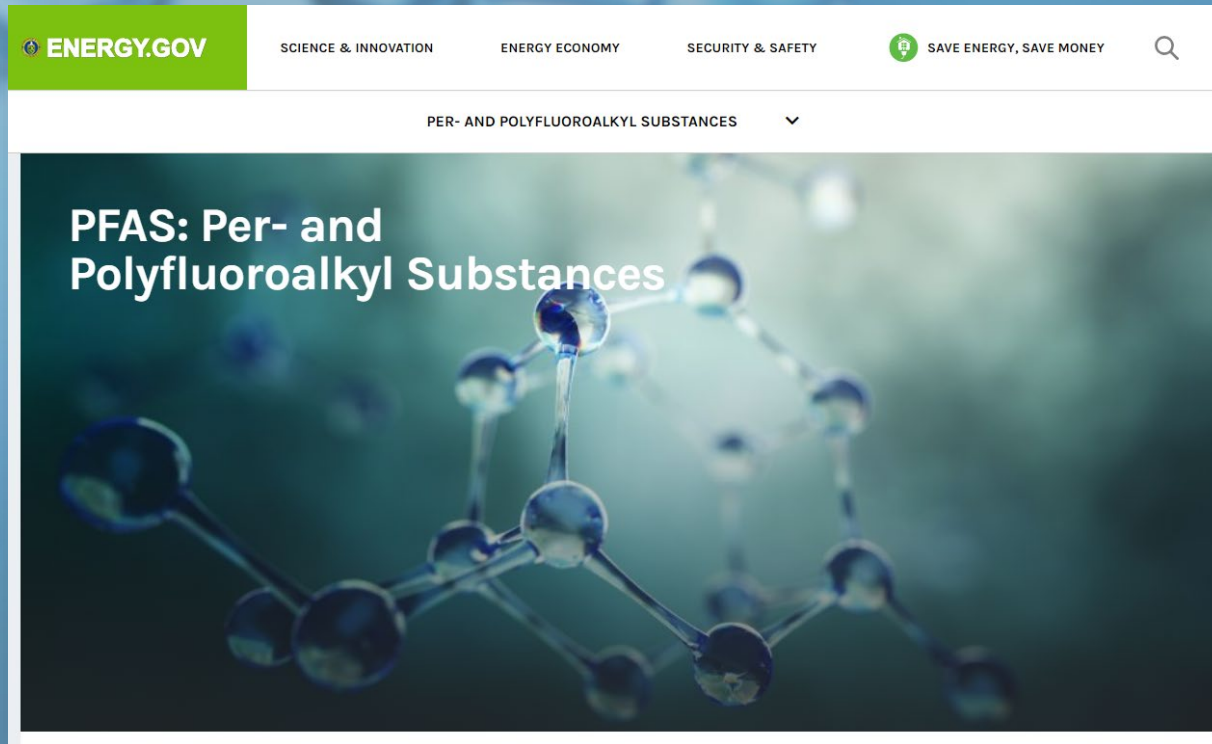
Continuing Efforts



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*

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