



## Produced Water Management

Increasing the production of U.S. oil and natural gas resources is crucial to providing affordable, reliable, and secure energy for all Americans. However, during hydrocarbon production substantial amounts of water are often brought to the surface, known as “produced water.” Managing and treating this produced water is a key aspect of ensuring sustainable domestic energy production.

### What is Produced Water?

Produced water is a byproduct of the oil, gas, and geothermal extraction process, originating from the geological formations alongside the hydrocarbons. It often contains a mixture of components that may include salts, dissolved gases, critical minerals, and various other materials. The U.S. Department of Energy (DOE) and industry are exploring methods to economically extract valuable critical minerals and materials such as lithium, magnesium, gallium, and germanium from produced water.

The volume and characteristics of produced water can vary significantly between reservoirs and over time, influenced by the type of formation, the type of hydrocarbon being extracted, and the age and operational methods of the well. Produced water’s diverse composition presents unique challenges for its management and disposal and requires energy intensive and costly treatment to enable alternative uses.

### How is Produced Water Used?

Produced water is primarily reused in oil and gas field operations, most commonly for enhanced oil recovery (EOR) and hydraulic fracturing. In EOR, treated produced water is injected back into reservoirs to maintain pressure and sweep remaining oil towards production wells, thereby maximizing resource recovery. For hydraulic fracturing, it can serve as a significant component of the fracking fluid, reducing the demand for freshwater resources.

Beyond oil and gas field operations, there is growing interest and technological advancement in non-oilfield reuse applications for produced water. This is driven by increasing water scarcity in many regions and the potential economic and environmental benefits of transforming this waste product into a valuable resource. Potential uses may include agricultural irrigation, industrial processes, livestock watering, and even municipal water supplies, although these uses require stringent treatment to meet regulatory standards.

Also, the critical minerals and other precious metals found in produced water can be recovered and used for other industrial purposes.



Producing wells and irrigation pond in the Elk Basin of Wyoming

Source: National Energy Technology Laboratory

## Where Does the Department of Energy Come In?

As of 2025, approximately 22 million barrels per day of produced water from oil and natural gas production were generated across the U.S. Permian Basin alone, highlighting the need for advancing innovative technologies and practices for its cost-effective treatment and reuse.

DOE’s Hydrocarbons and Geothermal Energy Office (HGEO) has a long history of research and development to address modern water challenges and expand its reuse in other industries. HGEO supports projects conducted with a multi-disciplinary team that includes DOE’s National Laboratories, American universities, industry/technology developers, and state, local, and tribal government entities. These projects focus on:

- **Brine Concentration Technologies:** Reducing the volume of water requiring disposal.
- **Critical Mineral Extraction:** Developing technologies to recover valuable resources like lithium from brines.
- **Fit-for-Purpose Treatment:** Creating cost-effective treatment systems to turn produced water into a safe and reliable resource for agriculture and communities.

HGEO also supports innovation and technology development to advance the commercial pursuit of lithium extraction from produced water, fundamentally changing the economic equation.

By facilitating responsible water management in the energy industry, HGEO is advancing increased domestic energy output, creating jobs, and maintaining America’s position as a global energy leader, all while safeguarding vital water resources for other essential uses.

### Learn More

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