



**HAWAI'I
STATE
ENERGY
OFFICE**

What is Hydrogen Energy?

Hydrogen is a clean fuel and an energy carrier, which means that it can:



Store

As we make more energy with intermittent renewable resources that don't generate 24/7, we also need to store it. Hydrogen is a form of energy storage that allows extra energy to be saved and used when needed.



Move

Hydrogen can move energy from one place to another. For example, hydrogen can be made on one island, then stored and shipped to another island.



Deliver

Hydrogen can deliver energy to many different industries, including transportation and electric utilities.

Where Does Hydrogen Come From?

Hydrogen rarely exists in nature by itself; it has to be made. We can make hydrogen with electricity from any energy technology, including:



Geothermal



Wind



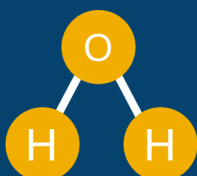
Solar



Bioenergy



Fossil Fuels



Electricity is used to split water molecules into hydrogen and oxygen in a process called electrolysis.

The Challenge of Hydrogen

Today, most hydrogen is made from natural gas or crude oil refining, also called "gray hydrogen", which contributes to climate change. We can use renewable energy to make clean, or "green," hydrogen, but high costs and low efficiency make production difficult. Costs to make "green hydrogen" could go down over the next decade with:



Improved Technology



Economies of Scale



Government Support

Hydrogen Fuel Cells & Transportation

Hydrogen can be used to make hydrogen fuel cells, which are portable power sources. A hydrogen fuel cell uses a chemical reaction to break apart hydrogen gas and turn it into electricity. The only byproducts of this process are water and heat.



Hydrogen can help us transition away from fossil fuels in transportation. Electricity from hydrogen fuel cells can power zero-emission vehicles, like trucks and buses.

Hydrogen Energy: Key Takeaways



Better for the Environment: Unlike fossil fuels, green hydrogen energy releases no harmful air pollutants when used, only water and heat.



Home Grown: Green hydrogen can be made here in Hawai'i with renewable energy technologies.



Expensive: Green hydrogen is expensive because of high infrastructure, technology, and renewable electricity costs.



Energy Intensive: Hydrogen can require significant amounts of energy to produce.



Learn more about hydrogen energy at
www.energy.hawaii.gov