

State of Oregon
Senate Committee on Energy and
Environment
Public Hearing - SB 333

2/4/2021

Kris Nelson, Oregon Policy Subcommittee chair
Renewable Hydrogen Alliance

Our Mission

Renewable Hydrogen Alliance promotes using renewable electricity to produce climate-neutral hydrogen and other energy-intensive products that reduce dependence on fossil fuels.

RHA is an Oregon-based trade association with 70+ members from diverse industries:

Utilities (gas and/or electric)

Manufacturers

Clean Energy & Clean Transportation Advocacy Groups

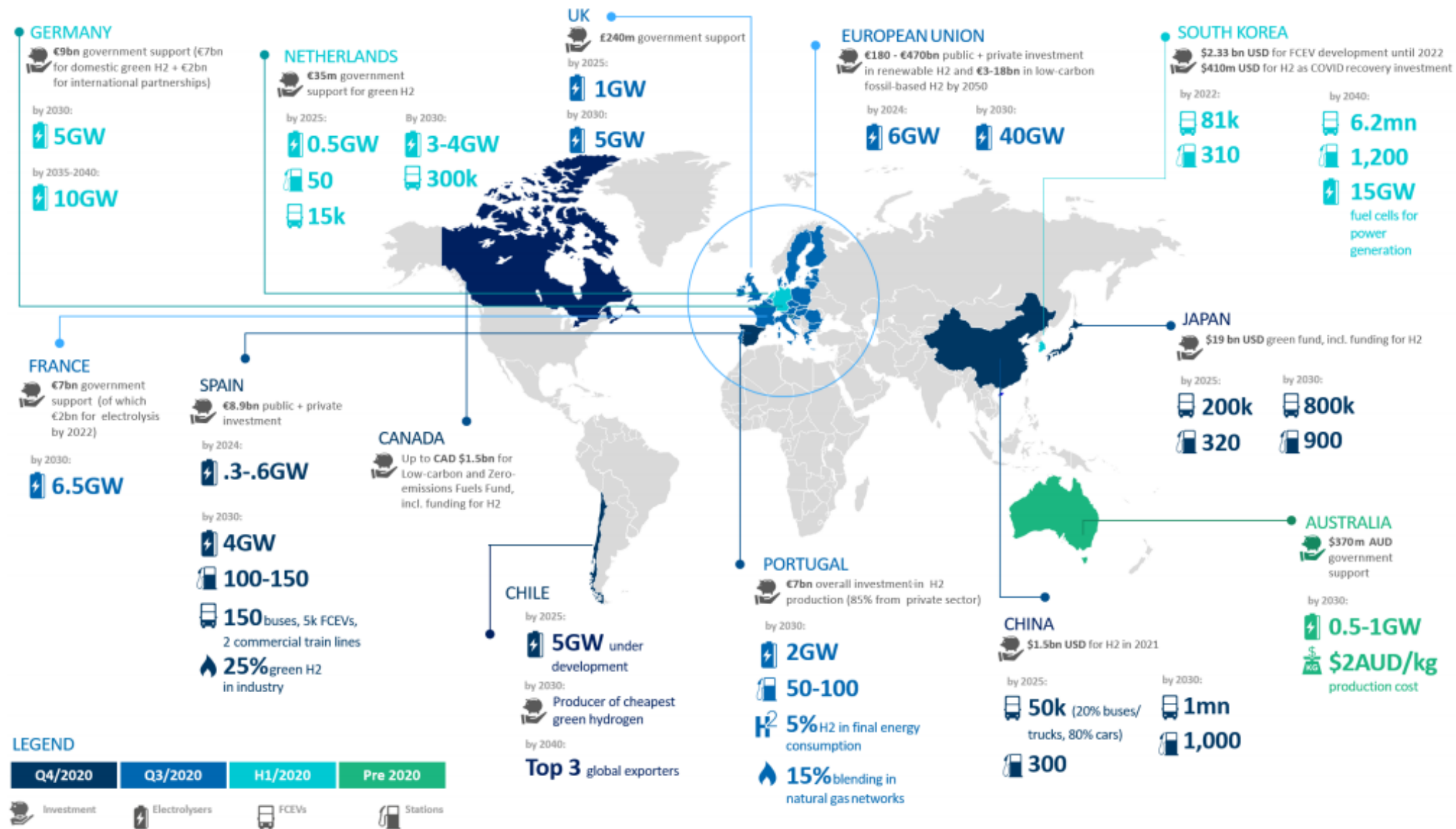
Native American Tribe

Project Developers

Law Firms

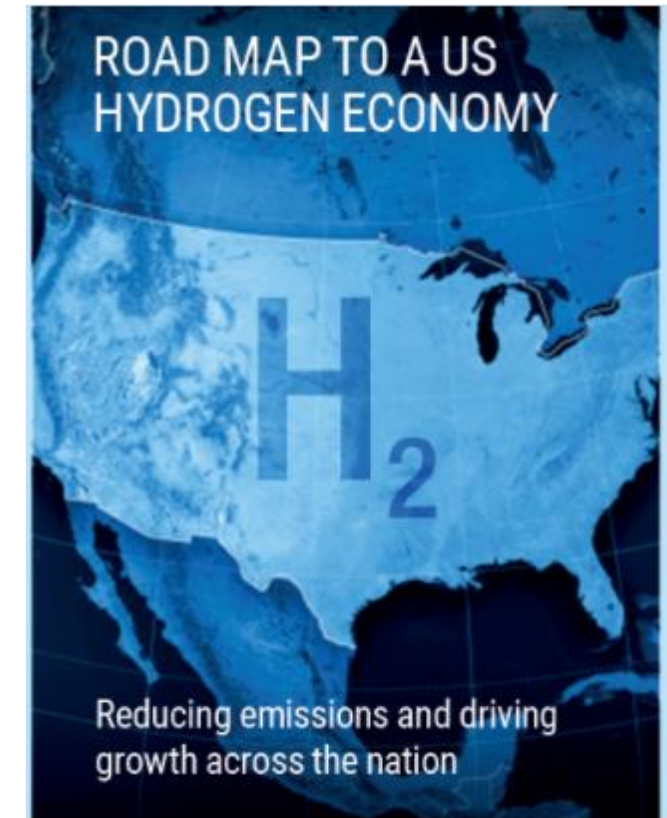
Consultants & many more

Global Hydrogen Industry Profile



National (Renewable) Hydrogen Industry Profile

- Biden's climate plan includes developing green hydrogen cheap enough to fuel power plants within a decade.
- In the US, hydrogen could enable a market of \$750 billion per year with 3.4 million new jobs.



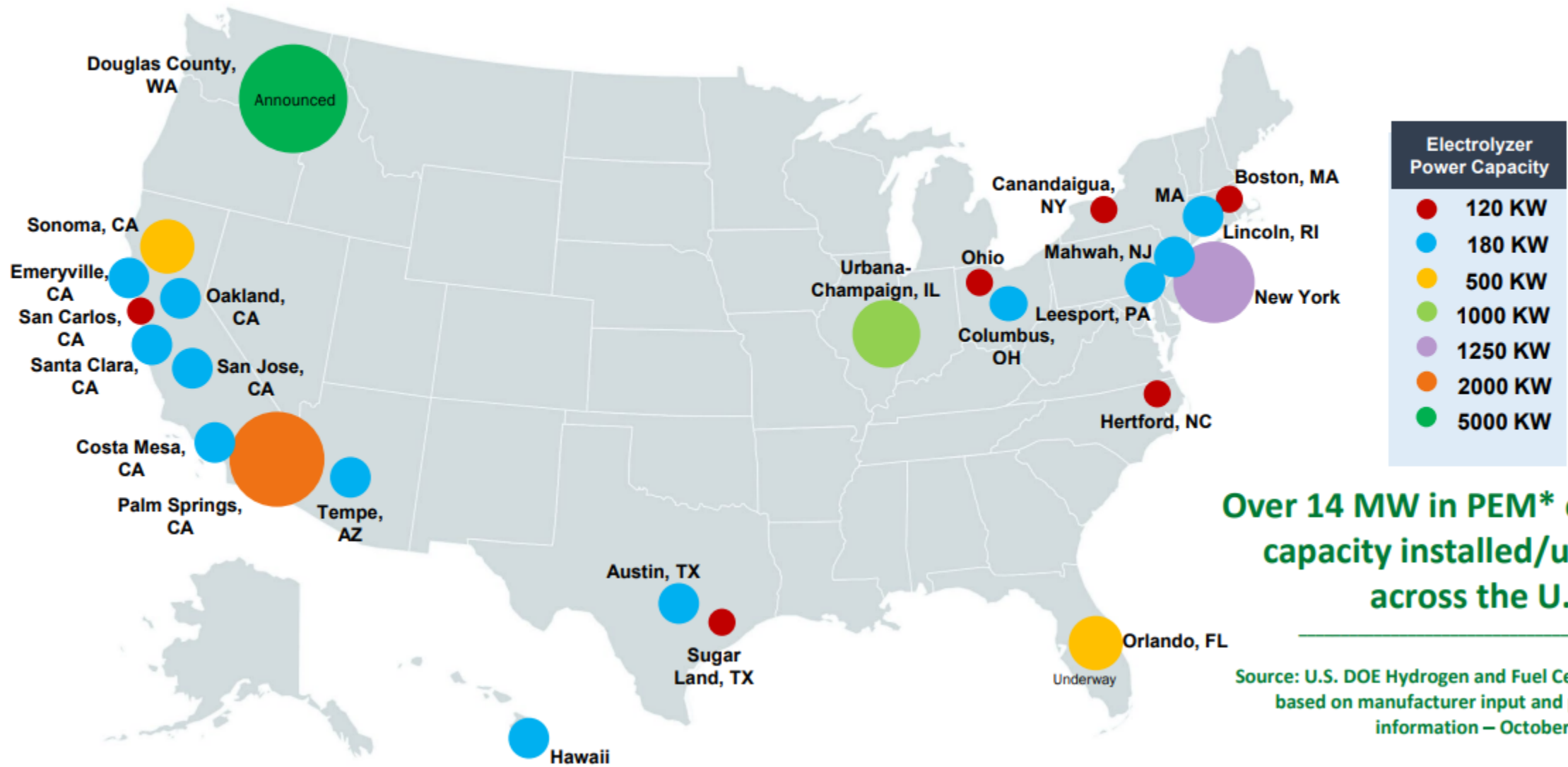
Job multipliers

Jobs per \$m (jobs created for each \$m revenue)

Jobs per revenue created in the machinery and equipment industry	12.2
Jobs per revenue created in the automotive industry	10.2
Jobs per revenue created in industrial gases	6.7
Jobs per revenue created in manufacturing of other transport equipment	14.5
Jobs multiplier – hydrogen	6.7
Jobs multiplier – equipment	12.3
Jobs multiplier – aftermarket	14.3

Source: McKinsey Global Institute Economics Research, GTAP input-output data

U.S. Hydrogen Electrolyzer Locations and Capacity (KW)



Over 14 MW in PEM* electrolyzer capacity installed/underway across the U.S.

Source: U.S. DOE Hydrogen and Fuel Cell Technologies Office based on manufacturer input and publicly available information – October 2020

* Polymer electrolyte membrane

Oregon's Predicament: Power Storage

- Oregon is endowed with a rare mix of renewable energy resources: abundant wind, solar, wave, and geothermal. Surplus renewable energy is wasted.
- As we strive to achieve our Renewable Portfolio Standard (RPS), the need for utility-scale, long-term power storage rises: generation times don't match demand.
- Battery storage is only cost-effective for short-term load balancing.
- Other renewables-driven economies are investing heavily in renewable hydrogen production for storage: California, Germany, Spain, China, Australia, Chile, etc.
- If Oregon produces renewable hydrogen from 10 percent of its renewable portfolio, we can probably replace fossil fuel generation.

How does renewable hydrogen fit into a clean environment?

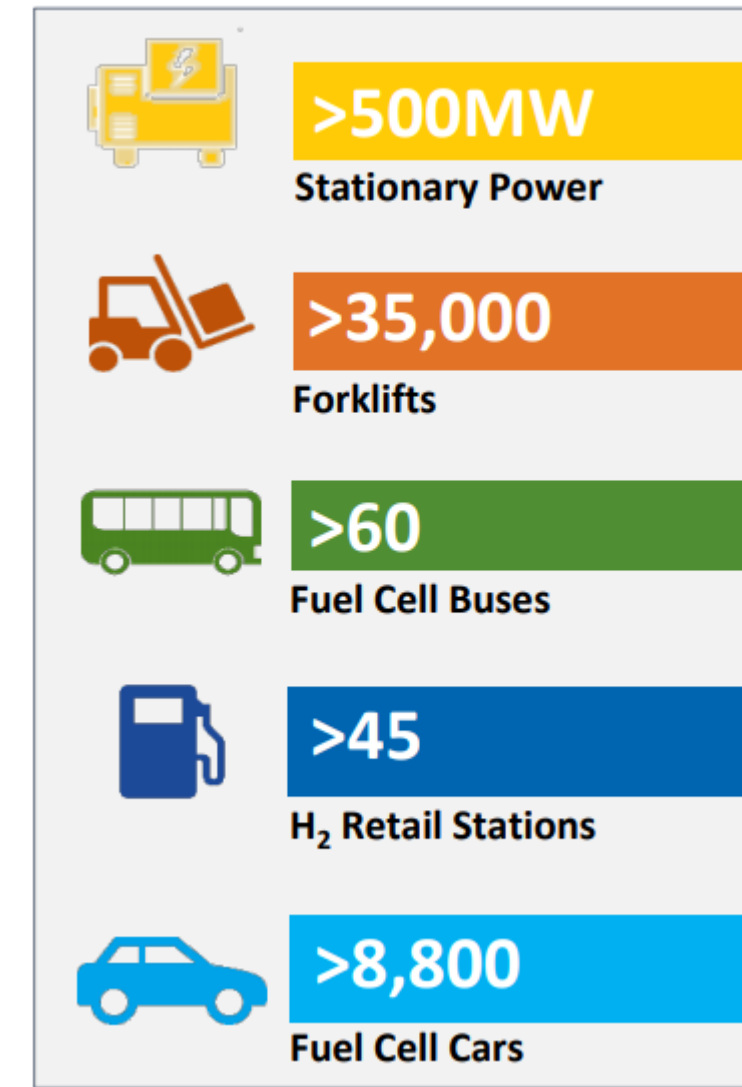
- To achieve Oregon's greenhouse gas reduction (GHG) targets and its renewable portfolio standards (RPS), renewable hydrogen would bridge gaps in renewable power generation and fossil fuel replacement.
- As surplus renewable power increases, renewable hydrogen can be used as fuel for gas plants, fuel cell electric vehicles (FCEVs), heating, and manufacturing: cross-sector carbon cuts.
- Renewable hydrogen deployment enables climate justice:
→fixes toxic emissions in disproportionately impacted areas.



How does renewable hydrogen relate to transportation?

- Hydrogen has high value in replacing fossil fuels in vehicles that are tough to electrify: heavy and medium-duty trucks, buses, high-mileage fleets, trains, ships, and airplanes.
- Hydrogen fuel cells cost about half of prices eight years ago and operate reliably.
- Toyota, Nikola Motors, Daimler Trucks, and others are testing long-haul, heavy-duty fuel cell trucks.
- A hydrogen-fueled ferry is being built in Bellingham, WA, a hydrogen-fueled train is contracted for San Bernardino County, CA.
- A MT lumber company is investing in a green hydrogen refueling project for logging specific vehicles.

Examples of Applications



How does it relate as a storage "battery" for electric generation?

- Renewable hydrogen can replace natural gas:
 - Province of British Columbia has mandated that by 2030, 15% of the gas energy delivered in the province must be Renewable Gas, namely renewable hydrogen or renewable natural gas
- Natural gas utilities are already using “power-to-gas”:
 - UC Irvine injects local hydrogen into its campus pipeline for heating.

- In Millard Co., UT, Mitsubishi Power plans to
 - store up to 1,000 MW of renewable energy as hydrogen gas year-round
 - By 2025, use 30% renewable hydrogen
 - Eventually fuel an 840 MW plant (IPP) with 100% renewable hydrogen.

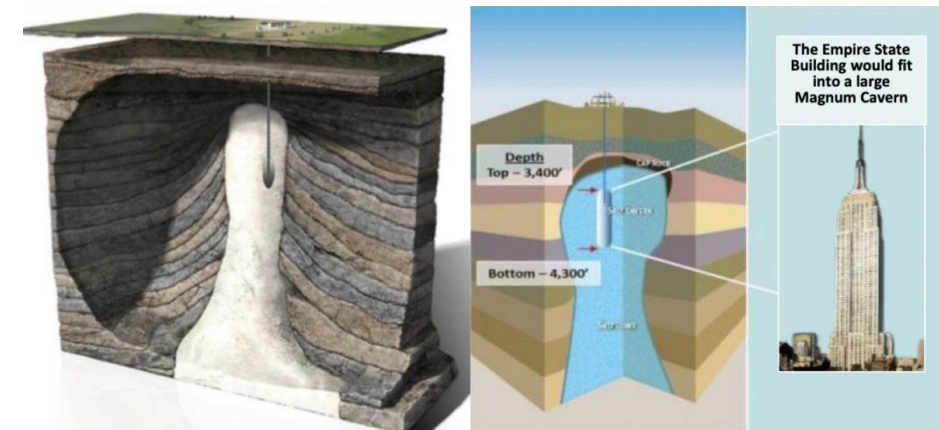


Image Source: Los Angeles Department of Water and Power

SB 333 - Study renewable hydrogen benefits in Oregon

Purpose: assess the economic effects of rapid development of renewable hydrogen infrastructure.

Benefits of accelerating the decarbonization of this state's economy and **advancing this state's greenhouse gas emissions reduction goals using renewable hydrogen produced in Oregon?**

Potential for new jobs in renewable hydrogen research, infrastructure construction, and production and utilization facilities, including among transit fleets, heavy-duty vehicles and light-duty fleets, and for natural gas power plant cofiring.

Value to Oregon's economy of replacing fossil fuel imports with renewable hydrogen, in light of this state's greenhouse gas emissions reduction goals and the renewable portfolio standards

An assessment of the benefits of **coupling renewable electricity generation and renewable hydrogen production to increase grid resiliency and enhance utility load balancing.**

Potential for large, rapid growth in renewable hydrogen **demand**, based on the assumption that dedicated **hydrogen stations for fuel cell trucks will be deployed near ports and along Oregon's freight corridors.**

Estimate of the **cost of renewable hydrogen** using projected power rates for 2025 and 2030.

Why does a benefits study make sense?

- Provides the State of Oregon with data and an assessment of the economic benefits associated with a rapidly growing global industry, the renewable hydrogen industry.
- SB 333 would study and assess pathways for Oregon to meet its critical decarbonization goals by facilitating the production and use of renewable hydrogen.
- Advancing economic intelligence of renewable hydrogen allows Oregon to accelerate its decarbonization targets across the power sector and many hard-to-abate industries, including industrial end uses, maritime, aviation, and heavy-duty transportation.



RHA welcomes your
questions and
comments.

Kris Nelson

RHA Oregon Policy Subcommittee chair

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Renewable Hydrogen Alliance

www.renewableh2.org