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

2/9/2021

Kris Nelson, Oregon Policy Subcommittee chair

Renewable Hydrogen Alliance

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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.

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RHA is an Oregon-based trade association with 70+ members from diverse industries in multiple Western US States & Canada:

Utilities (gas and/or electric)

Manufacturers

Clean Energy & Clean Transportation Advocacy Groups

Native American Tribe

Project Developers

Law Firms

Consultants & many more

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RHA Milestones

Washington State Policy

2018 - SB 5588:

- *authorizes Public Utility Districts (PUDs) to produce and sell renewable hydrogen.*

2019 - amendments to HB 2042, the Green Transportation Act:

- *includes renewable hydrogen production and fueling infrastructure and fuel cell electric vehicles in the tax exemptions and grant programs offered to battery-electric vehicles (BEVs) and related charging infrastructure.*

Washington State Projects

RHA Members:

Douglas County PUD, WA, is installing a 5 MW electrolyzer to use surplus hydropower. Paying for itself.

Tacoma Power adopts North America's first electrofuel tariff.

RHA & Members:

Collaborated to win a $2 m grant to develop the first renewable hydrogen fueling station in the NW. Start construction this year near Chehalis.

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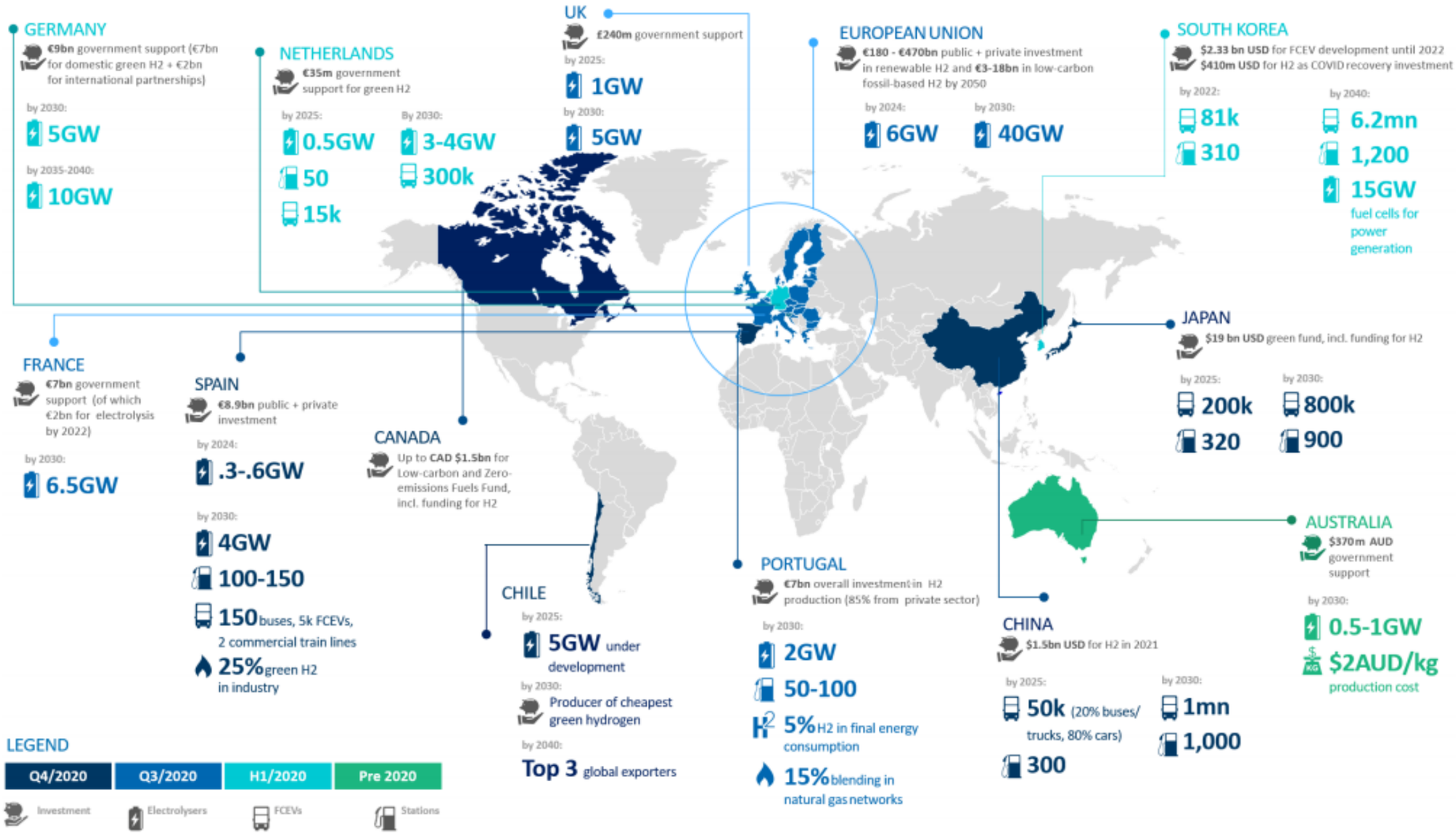
Global Hydrogen Industry Profile



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Source: FTI Consulting, Dec 2020

Global Hydrogen Industry Profile

- Japan, China, Spain, and the EU have committed $46.5 billion to develop clean hydrogen infrastructure.
- Japan invested about $560 million in hydrogen funding in 2019. They planned to power the Tokyo 2020 Olympics largely on hydrogen.
- The EU plans to develop six gigawatts in green hydrogen production in three years; by 2030: 40 GW.

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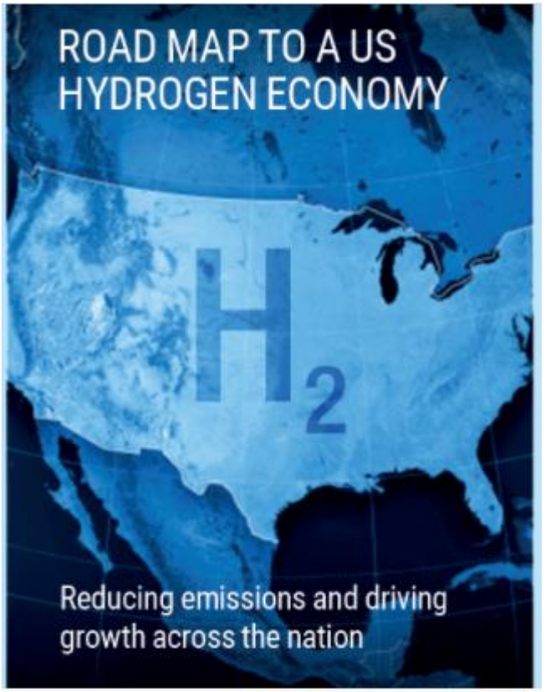
Source: FTI Consulting, Dec 2020

National (Renewable) Hydrogen Industry Profile

- Biden's climate plan includes developing green hydrogen cheap enough to fuel power plants within a decade.
- Hydrogen could enable a market of $750 billion per year with 3.4 million new jobs ("Road Map to a US Hydrogen Economy," McKinsey & Co.).
- About 3 GW in hydrogen-fueled gas plants are under Mitsubishi Power contracts in Utah, New York, Ohio, and Virginia and use 30% renewable hydrogen with storage.



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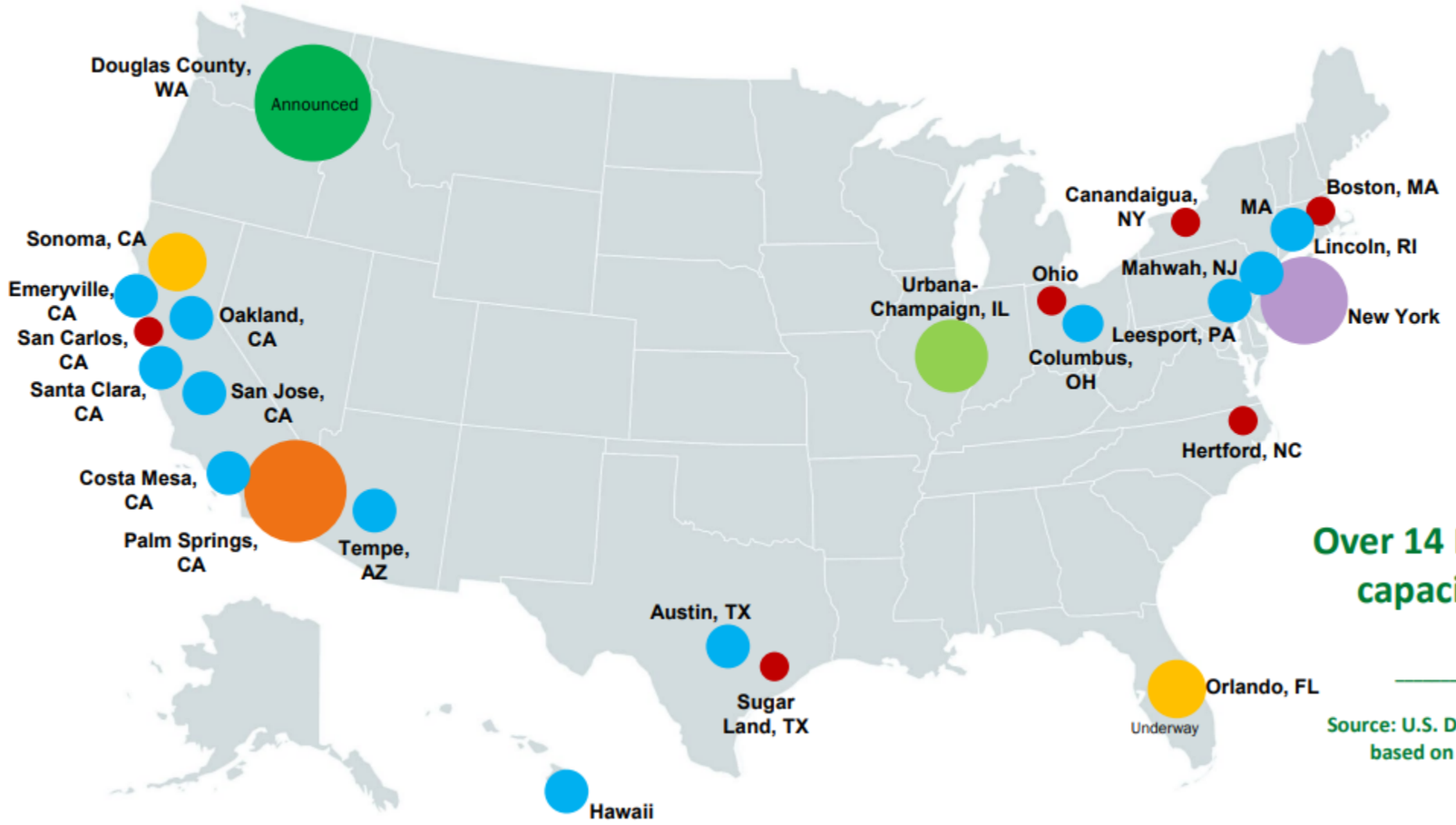
U.S. Hydrogen Electrolyzer Locations and Capacity (KW)



Electrolyzer Power Capacity

- 120 KW
- 180 KW
- 500 KW
- 1000 KW
- 1250 KW
- 2000 KW
- 5000 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

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Oregon's Predicament: Power Storage

- Oregon is endowed with a rare mix of renewable energy resources: abundant wind, solar, wave, biomass, 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, Japan, 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. Potential to export ren. hydrogen.

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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.
- An additional build-out of renewable energy sources is not required to create renewable hydrogen due to existing untapped renewable energy surpluses. However, as Oregon is on a path to expand renewable energy sources, Oregon will have even more unused renewable energy surpluses that could be turned into renewable hydrogen.
- Renewable hydrogen can be used as a replacement fuel for gas plants, as a fuel for 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.

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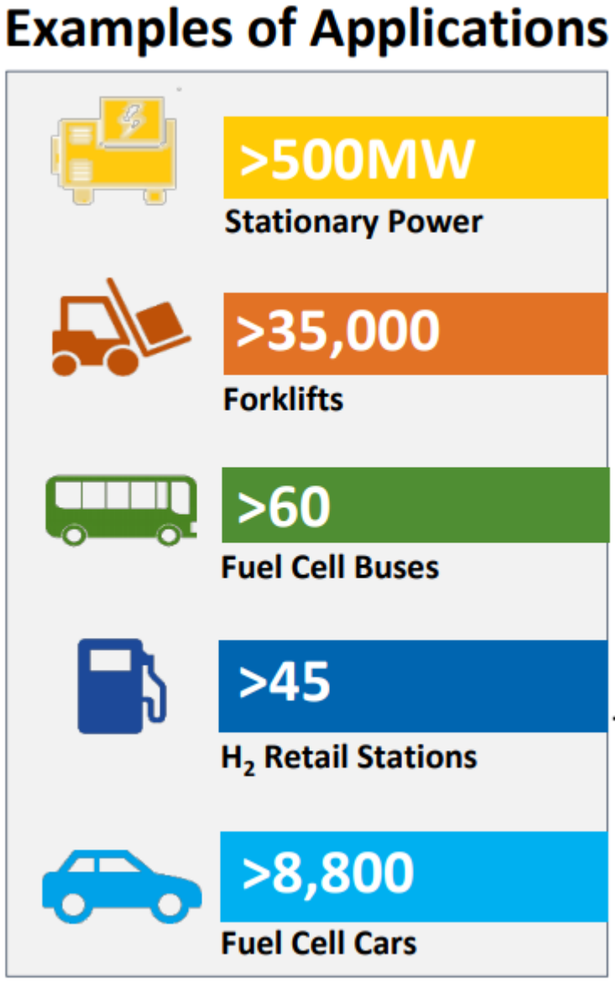
How does renewable hydrogen relate to transportation?

- 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, 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. will connect to an 8 MW solar farm; start in 2nd quarter this year. Will install a 5 MW Oregon-made electrolyzer: Hydrostar.



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Source: DOE, Dec 2020

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 (ACES).
  - By 2025, use 30% renewable hydrogen to fuel an 840 MW plant (IPP).
  - Eventually fuel with 100% renewable hydrogen.

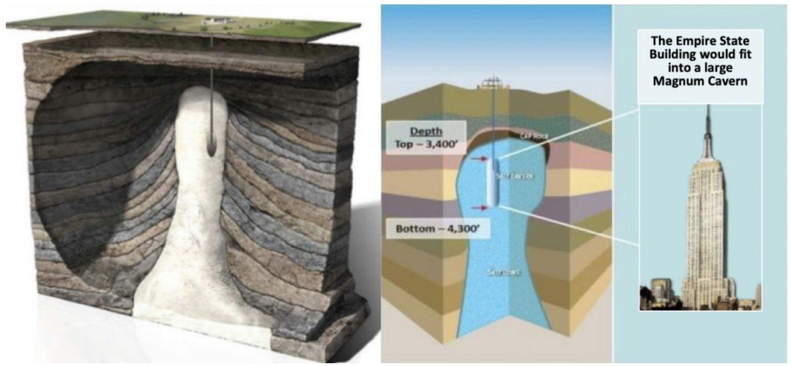

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Image Source: Los Angeles Department of Water and Power

SB 333 - Study renewable hydrogen benefits in Oregon

Intent: How competitive can Oregon be in a burgeoning new economy and marketplace?

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.

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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.
- Assist decision-makers in prioritizing any industry incentives, government-industry partnerships, and the need for world-class regulatory framework.

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RHA welcomes your questions and comments.

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