

Renewable Hydrogen in Oregon: Overview and Opportunities

Presentation to the Oregon Senate Energy & Environment Committee

Renewable Hydrogen Alliance

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Renewable Hydrogen Alliance – About Us

- Established in 2018
- Non-profit trade association focused on advancing the renewable hydrogen sector throughout the NW
- Over 75 members representing full hydrogen value chain
- Advocate for effective hydrogen policy to help meet statutory GHG emission reduction goals
- Recognized and regularly sought out as a source of reliable, timely information on issues related to hydrogen and specific to the NW region

Renewable Hydrogen: A Cleaner, Better Way

- Producing Renewable Hydrogen
 - Using a device called an electrolyzer, electricity from renewable energy (wind, solar, hydropower) is used to split water into its component parts of oxygen and hydrogen
 - Can replace fossil produced hydrogen in all applications where used today
- Goal – use it in traditional industries and in new applications like:
 - Hard to abate high emission industries – steel, glass & cement manufacturing, aviation, heavy & medium duty truck, and maritime transportation
 - Energy storage = grid resiliency & economic value for excess renewable energy

Why Do We Need Hydrogen?

- Impossible to fully decarbonize the economy without it
- Benefits include:
 - Availability (relatively simple to produce)
 - Transportability (not temporally or locationally constrained)
 - Long-duration energy storage capability
 - Only way to enable a reliable supply of power and a resilient grid when have lots of intermittent renewables (e.g., wind and solar) on the system

Hydrogen By the Numbers in the US

- Hydrogen Use: 11m tons
- 1m+ tons used for fertilizer production
- 1600 miles of dedicated hydrogen pipelines
- 14,000+ Hydrogen Fuel Cell Vehicles
- 87 Fuel Cell Buses
- 62 Light Duty Hydrogen Fueling Stations with 32 more in construction or permitting, and 6 Heavy Duty Stations with 5 more planned (CA)
- 20k+ Fuel Cell Forklifts

Hydrogen Industry Economic & Jobs Impact

- By 2050, the USDOE estimates that the clean hydrogen economy in the US will generate:
 - \$140 billion in revenue
 - 700,000 jobs
- A Pacific NW hydrogen economy is forecasted to create 8 jobs for every \$1 million invested in clean hydrogen
- Average pay for a hydrogen fueling station operation and maintenance job = \$84,000/yr (excluding benefits)
- H₂ production facilities permanent jobs average pay = >\$91,000/year

Federal and State Hydrogen Policy



Federal Hydrogen Policy and Funding

USDOE “Hydrogen Earthshot”: \$1 for 1 kg of renewable hydrogen (gallon of gasoline equivalent) in 1 decade

\$9.5b for hydrogen technology and project development including \$8b for at least 4 regional clean hydrogen demonstration hubs in Bipartisan Infrastructure Law (BIL)

BIL required development of the Clean Hydrogen Production Standard and the National Hydrogen Strategy and Roadmap which we expect to be released in final form soon.

\$3/kg Production Tax Credit (PTC) and Investment Tax Credit (ITC) included in the Inflation Reduction Act (IRA)

State Hydrogen Policy

- Climate policies enacted in Oregon have laid a foundation of necessity to pursue renewable hydrogen as an additional clean energy and clean fuel pathway;
- Hydrogen is an eligible fuel to generate credits under the **Clean Fuels Program**
- Hydrogen fuel cell vehicles are considered Zero Emission Vehicles (ZEV) under Oregon law, therefore, eligible for rebates under the **Oregon Clean Vehicle Rebate Program**
- **SB 124** and **SB 125** have been proposed as ways to implement the recommendations of 2022 ODOT and ODOE hydrogen related studies and to kick start the hydrogen economy in the state

Projects



Douglas County PUD (WA) Wells Dam Renewable H2 Production Project

Cummins 5MW PEM Electrolyzer

Capacity: 2000 kg/day (2 metric tons)

Enough to fuel over 330 fuel cell
cars/day

Size: 27 ft x 7.5 ft

Expandable

Cost: \$9.5 million

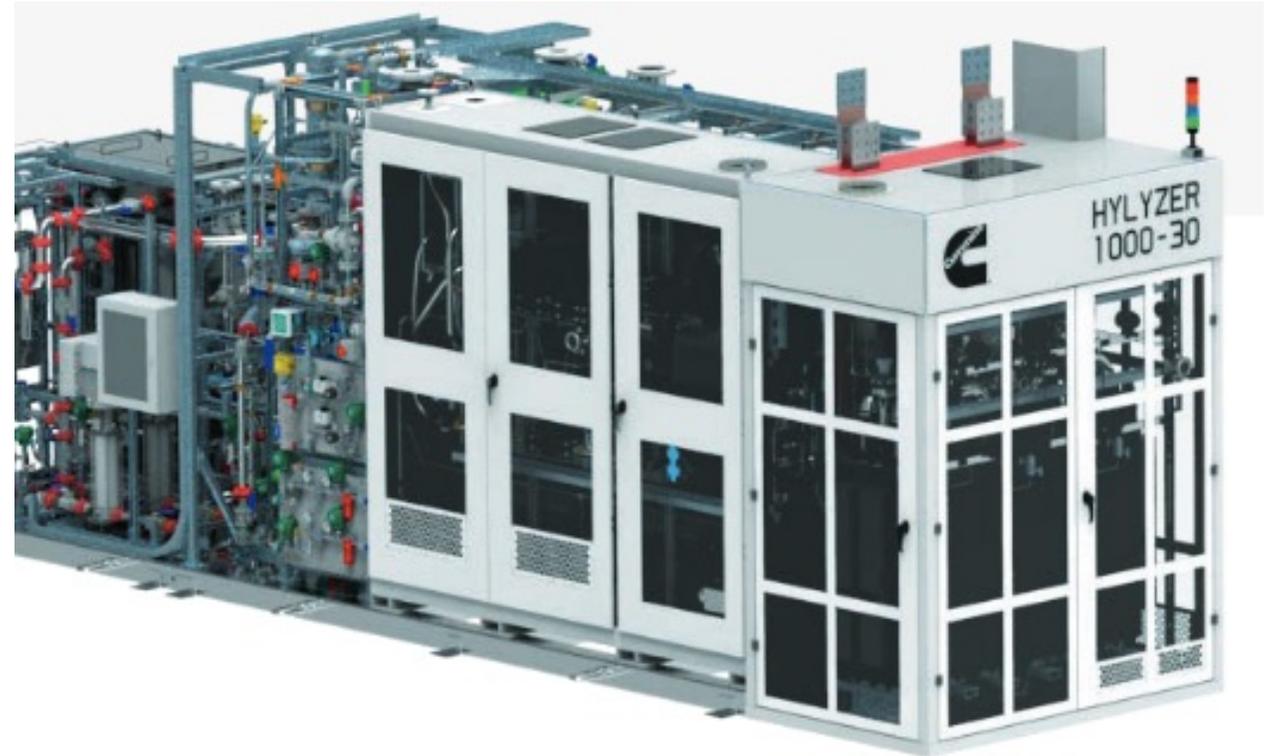
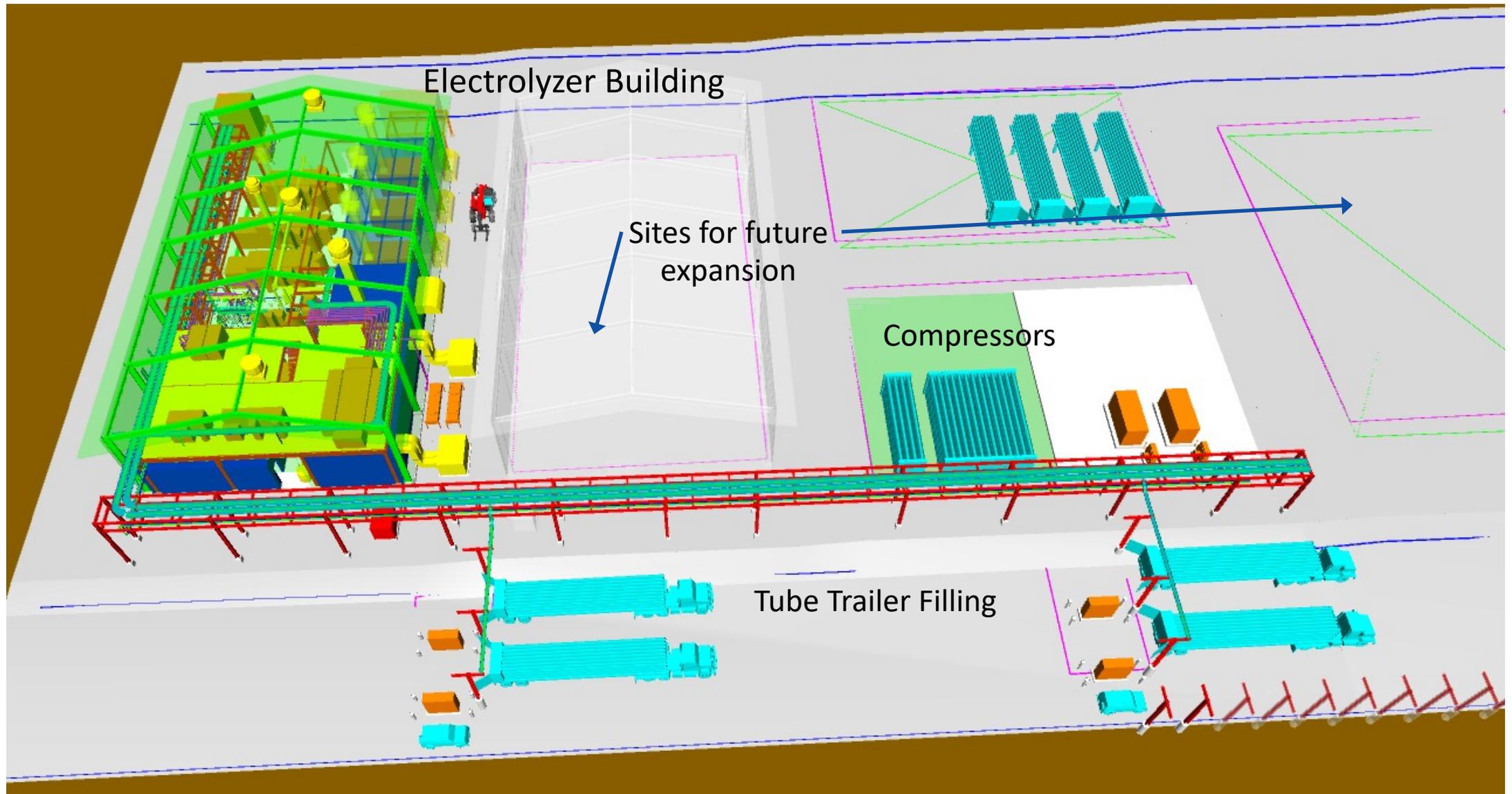


Image courtesy of Cummins, Inc.



Electrolyzer Building

Sites for future expansion

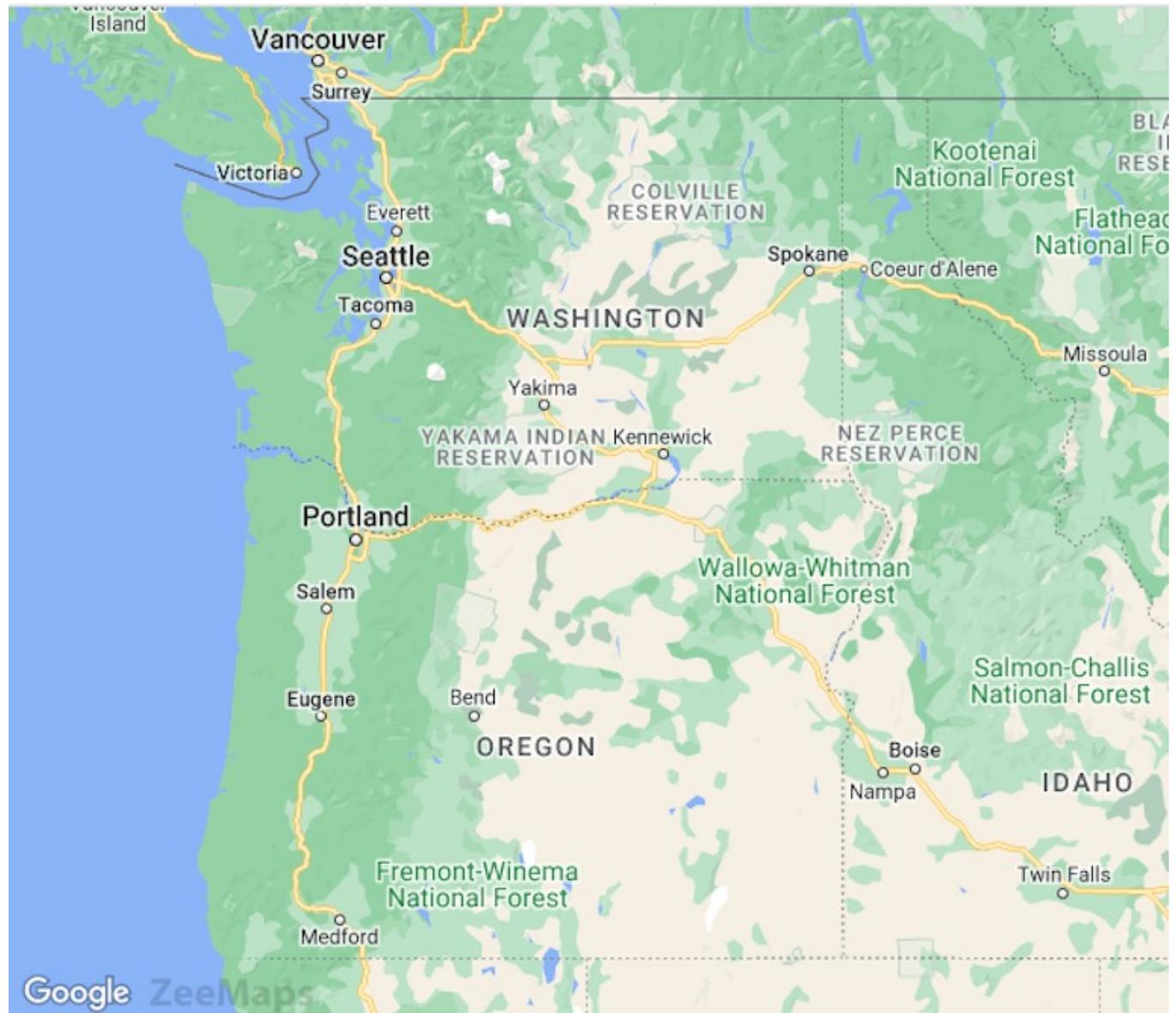
Compressors

Tube Trailer Filling

Image courtesy of Douglas County PUD

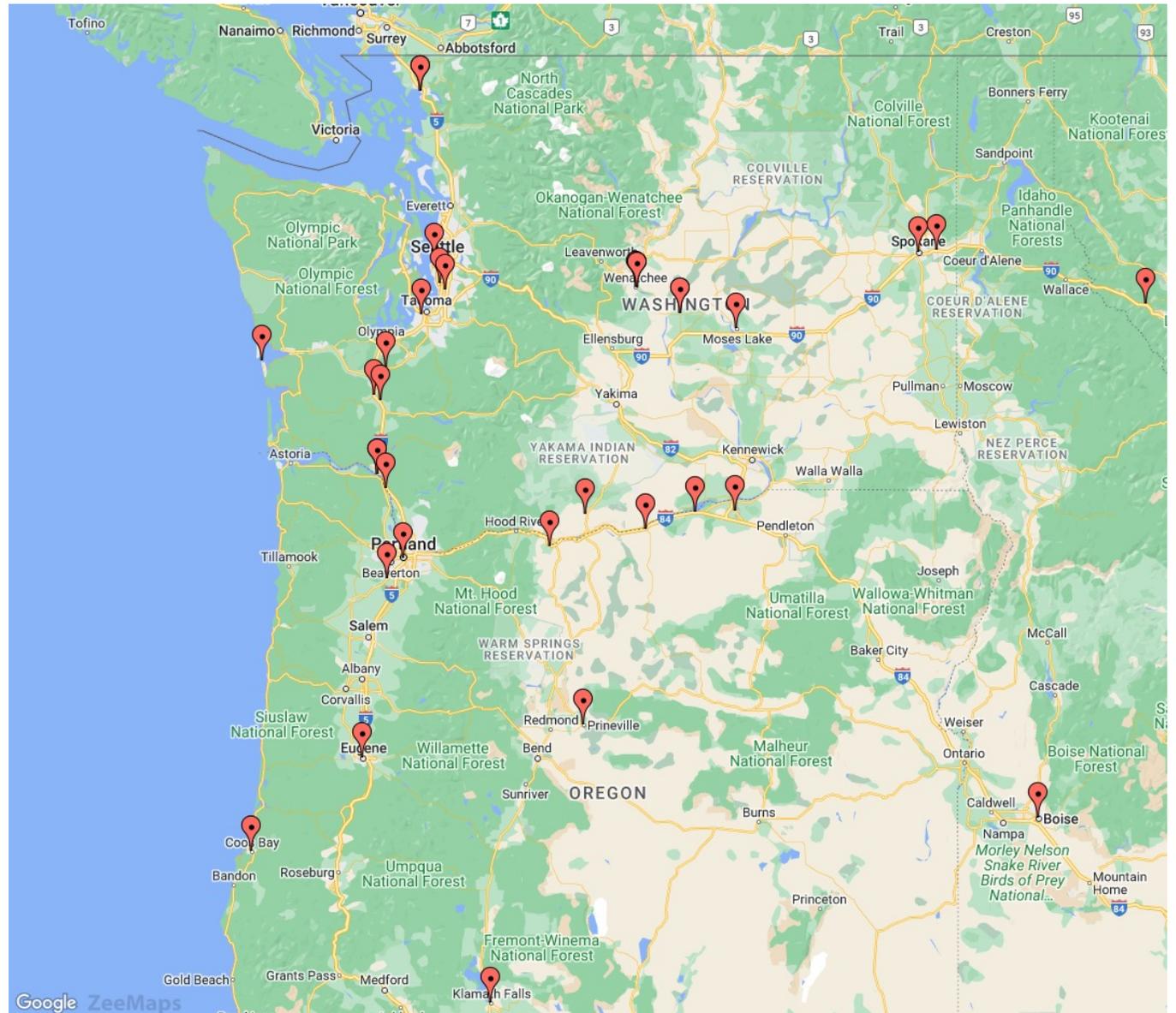
Project Landscape Then and Now

Hydrogen Projects
Planned, In Development
or Under Construction
2018



Project Landscape Then and Now

- As of January 2023
- Over 35 projects publicly announced
- Multiple sectors
 - Light duty to heavy duty transportation infrastructure
 - Maritime
 - Agriculture
 - Distribution infrastructure
 - Energy production
- Link to map:
<https://www.zeemaps.com/map?group=4243516>



Hydrogen Safety

- Using hydrogen in the US and around the world is not new, it's been in widespread industrial use for more than 70 years and codes, standards, and design practices have been developed by independent expert third party national and international standards organizations
- All fuels contain energy and can be hazardous if handled improperly and like other fuels, hydrogen must be used with care
- Less ignition risk than other fuels since it's 14 times lighter than air, rises at almost 44 miles per hour and disperses rapidly
- Nontoxic, colorless, and odorless gas that does not threaten human or environmental health if leaked or released into the environment.



Water Consumption

- It takes about 9kg of water to produce 1 kg of renewable hydrogen or 2.4 gallons and can be recycled/reused
 - 4-6 gallons/gal of gasoline, water is not reusable
 - 93 gallons/kg lithium, water is not reusable
- Water availability and scarcity are important factors to consider before siting a project
- Extensive research going into purifying and using industrial wastewater for electrolysis





Questions?

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