

Renewable Hydrogen

House Interim Committee on Energy and Environment

Chris Kroeker - Renewables

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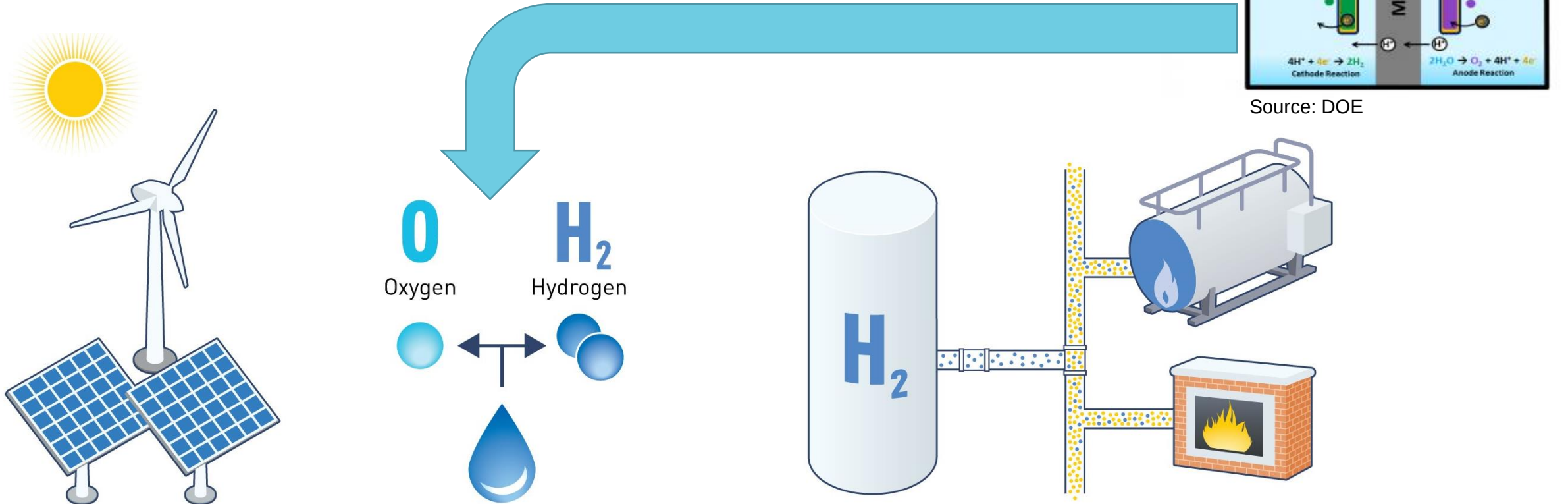


About NW Natural

- Celebrating 162 years of service
- Largest stand-alone gas utility in the Pacific Northwest
- Serving 2.5 million people in Oregon and SW Washington through 770,000 meters
- One of the tightest, most modern distribution systems in the country
- Nearly 1,200 employees



Electrolysis & Blending



Wind and solar energy
that can't be stored



Goes through electrolysis
which splits the molecule



Can be blended as hydrogen
directly into the pipeline or
combined with waste carbon to
create renewable natural gas



Can be used immediately
or stored seasonally
for future use

Destination Zero:

The pathway to our vision of carbon neutral

A decarbonized network:

- Deep energy efficiency
- Renewable natural gas
- Renewable hydrogen
- Blended and dedicated hydrogen systems



- Renewable Natural Gas
- - - Dedicated Hydrogen
- - - Waste CO2
- - - Renewable Electricity

Renewable Hydrogen Benefits

- **Decarbonize our natural gas supply**
 - Resilience
 - Use existing infrastructure and appliances
- **Decarbonize hard-to-decarbonize industries**
 - Medium and heavy duty transportation
 - Shipping
 - Aviation
 - Steel production, and other high heat processes
- **Multiple energy delivery pathways**
 - Gas or electric grid (coupled)
 - Transportation fuels



Source: Airbus

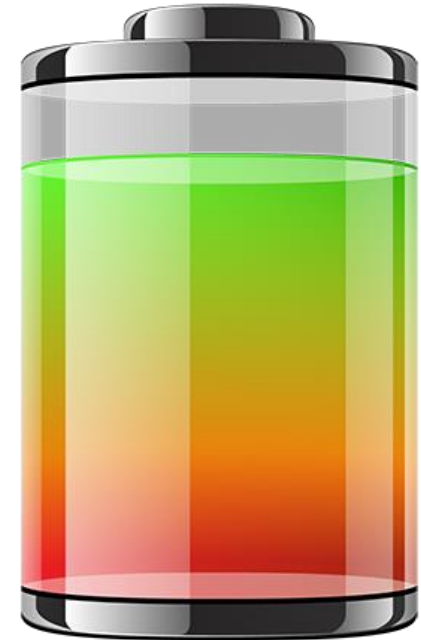
Renewable Hydrogen Grid Benefits

- Alleviate transmission congestion
- Demand response
- Voltage and frequency stabilization
- Use existing thermal generation assets
- Seasonal renewable energy storage
 - Curtailed energy
 - Hydro



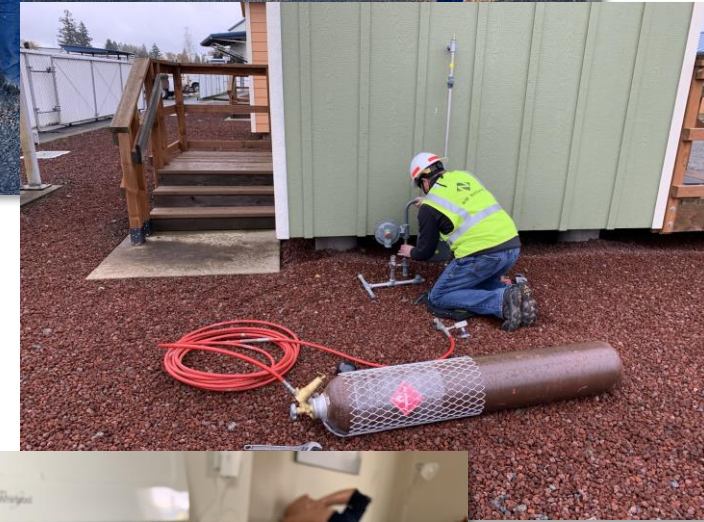
Renewable Energy Storage

- NW Natural has ≈ 6 million MWh of energy storage
- Equivalent annual electric energy $\approx 600,000$ average Oregon residential customers
- In terms of lithium-ion batteries: \$2 trillion
- 50,000x larger than the largest battery project in Oregon
- Lowest capital cost storage available:
 - Lithium-Ion $\approx \$375/\text{kWh}$
 - Pumped hydro $\approx \$165/\text{kWh}$
 - Hydrogen (electrolyzer) $< \$1/\text{kWh}$
- Building access to storage creates cost efficiencies



Next Steps

- Continue preparing for blending
- Joint utility pilot on sustainable hydrogen production
- Exploring large scale hydrogen
- Policy recommendations:
 - Expedite hydrogen economy
 - Need to think about energy delivery regionally with coupled electric and gas
 - Storage is built – need to build access to it



THANK YOU