

# ONSITE HYDROGEN

**NO NEW PIPES  
NO TRANSPORTATION  
NO H<sub>2</sub> STORAGE  
NO CO<sub>2</sub>**

# WHY ALL OF THE HYDROGEN INTEREST?

## STRENGTHS

Abundant

Energy dense

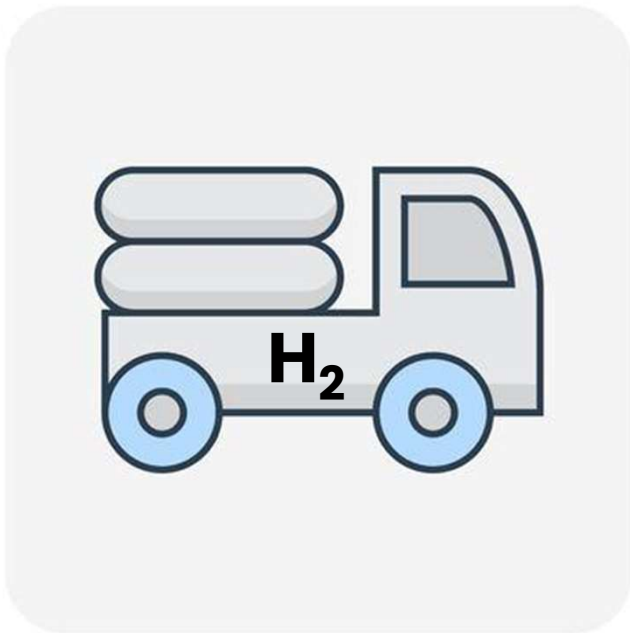
Burns without CO<sub>2</sub> emissions

**“Fuel of the future”**

# ... BUT SUCH LIMITED USE?

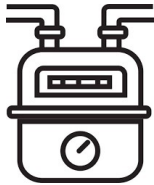
STRENGTHS	HISTORICAL WEAKNESSES
Abundant	Traditional reforming = high CO <sub>2</sub>
Energy dense	Difficult to transport
Burns without CO <sub>2</sub> emissions	Difficult to store
<b>“Fuel of the future”</b>	<b>Expensive</b>

# H<sub>2</sub> RATE-LIMITING STEP: LOGISTICS

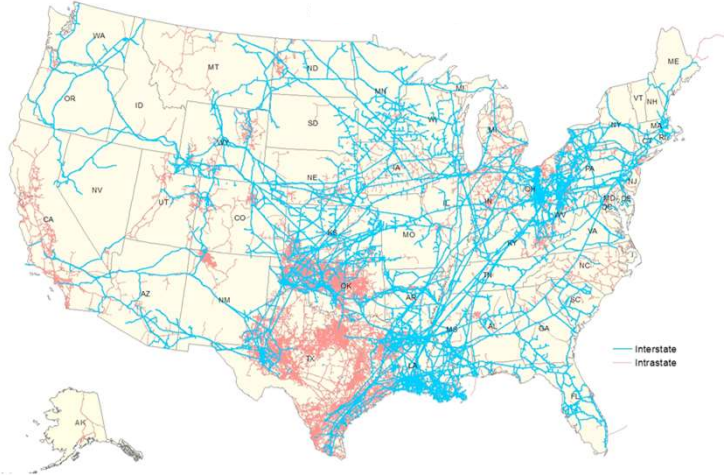
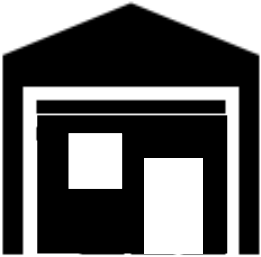


- **LOGISTICS LIABILITY**
- **SUPPLY CHAIN RISK**
- **CURRENT GRID <20% H<sub>2</sub>**

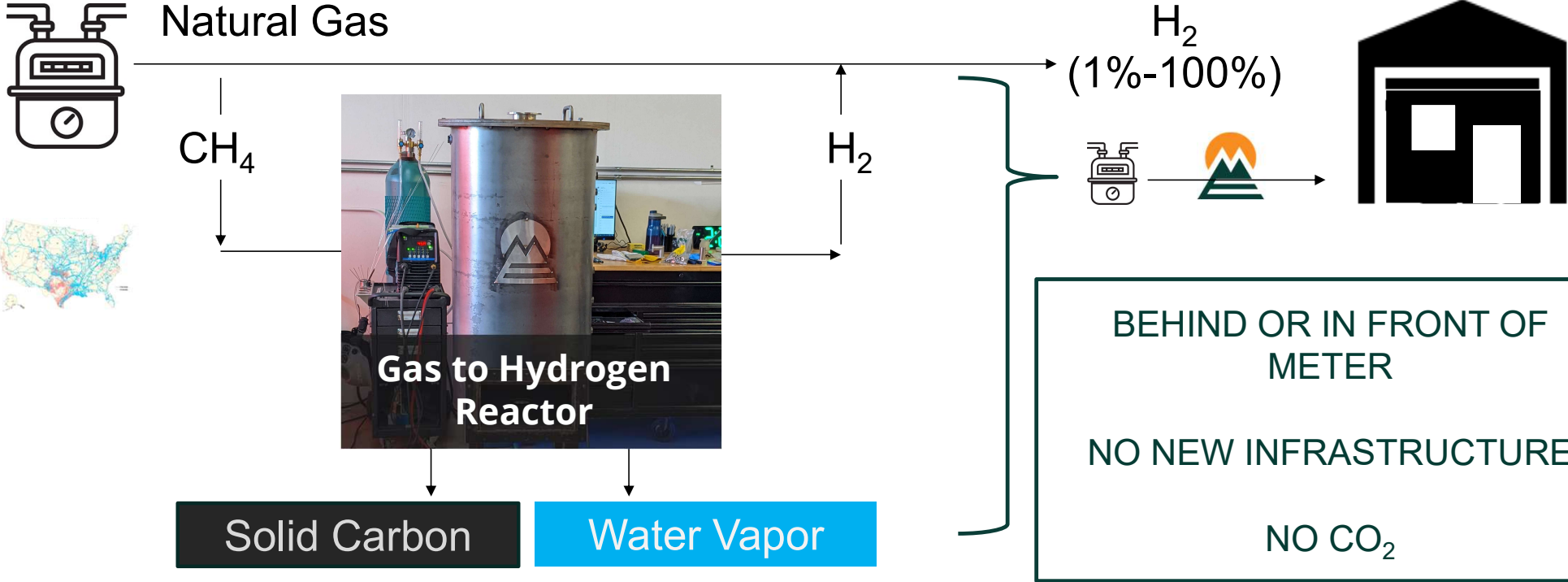
# ONSITE H<sub>2</sub> & DECARBONIZED GAS



Natural Gas



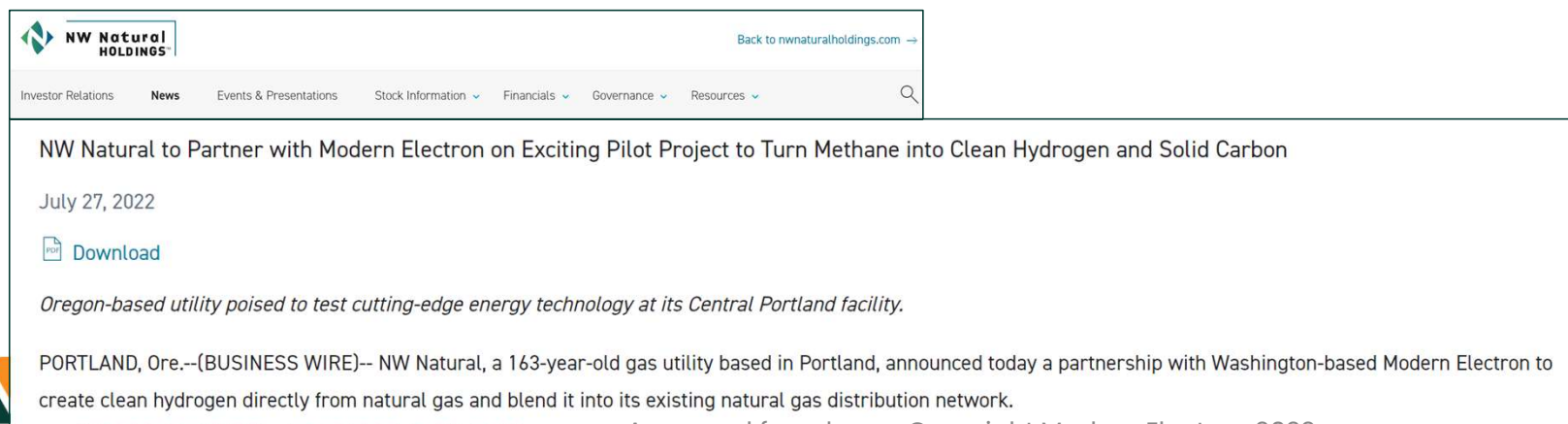
# ONSITE H<sub>2</sub> & DECARBONIZED GAS



# TWO EXAMPLE PROJECTS IN THE PNW

## NW NATURAL

- H<sub>2</sub> generated at gate station from natural gas
- H<sub>2</sub> blended into local distribution network
- H<sub>2</sub> used to help local industrials decarbonize impractical-to-electrify process heat



The screenshot shows the NW Natural Holdings website. The top navigation bar includes links for Investor Relations, News, Events & Presentations, Stock Information, Financials, Governance, and Resources. A search icon is also present. The main content area features a news article titled "NW Natural to Partner with Modern Electron on Exciting Pilot Project to Turn Methane into Clean Hydrogen and Solid Carbon" dated July 27, 2022. A "Download" button is visible. The article text states: "Oregon-based utility poised to test cutting-edge energy technology at its Central Portland facility. PORTLAND, Ore.--(BUSINESS WIRE)-- NW Natural, a 163-year-old gas utility based in Portland, announced today a partnership with Washington-based Modern Electron to create clean hydrogen directly from natural gas and blend it into its existing natural gas distribution network."

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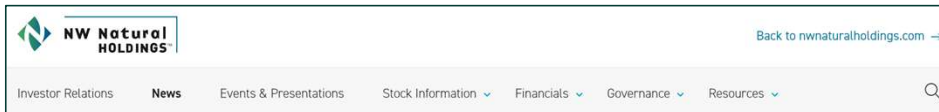
# EXAMPLE CUSTOMERS IN THE PNW

## NW NATURAL

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## QUALCO + TULALIP TRIBES

- H<sub>2</sub> generated from biogas at dairy digester
- H<sub>2</sub> used for generator; power supplied to Snohomish PUD
- Carbon tilled back into farm soil for water retention
- -> 'negative' emissions power gen



NW Natural to Partner with Modern Electron on Exciting Pilot Project to Turn Methane into Clean Hydrogen and Solid Carbon

July 27, 2022

 [Download](#)

*Oregon-based utility poised to test cutting-edge energy technology at its Central Portland facility.*

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