Developing Minnesota’s Hydrogen Economy with Community Engagement

An introduction to hydrogen, the hydrogen economy, and the federal Hydrogen Hub funding opportunity

March 21, 2023

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THEORY OF CHANGE

It's about finding transformative solutions, *together*.

Photo courtesy of Great Plains Institute

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Webinar Best Practices

- Please keep yourself muted until the end of all presentations
- Please use the chat to introduce yourself, ask questions, or make comments
- Please turn your camera on if you are able and feel comfortable doing so
- Share air space--please leave room for others to engage as well

Photo courtesy of Great Plains Institute

Agenda and Speaker Overview

Topic	Speaker
Welcome by The Governor's Office	Sasha Bergman, Assistant Chief of Staff for Policy, Administration, and Federal Affairs, Governor’s Office
Hydrogen 101	Val Stori, Sr. Program Manager, Great Plains Institute
Minnesota Memorandum of Understanding with other Midwest states and Governor Walz' Executive Order 22-22	Sasha Bergman, Assistant Chief of Staff for Policy, Administration, and Federal Affairs, Governor’s Office
The Hydrogen Hub opportunity	Val Stori, Sr. Program Manager, Great Plains Institute
Community Benefits Plan	Rachel Percy, Program Assistant, Great Plains Institute
Q&A	

Hydrogen 101

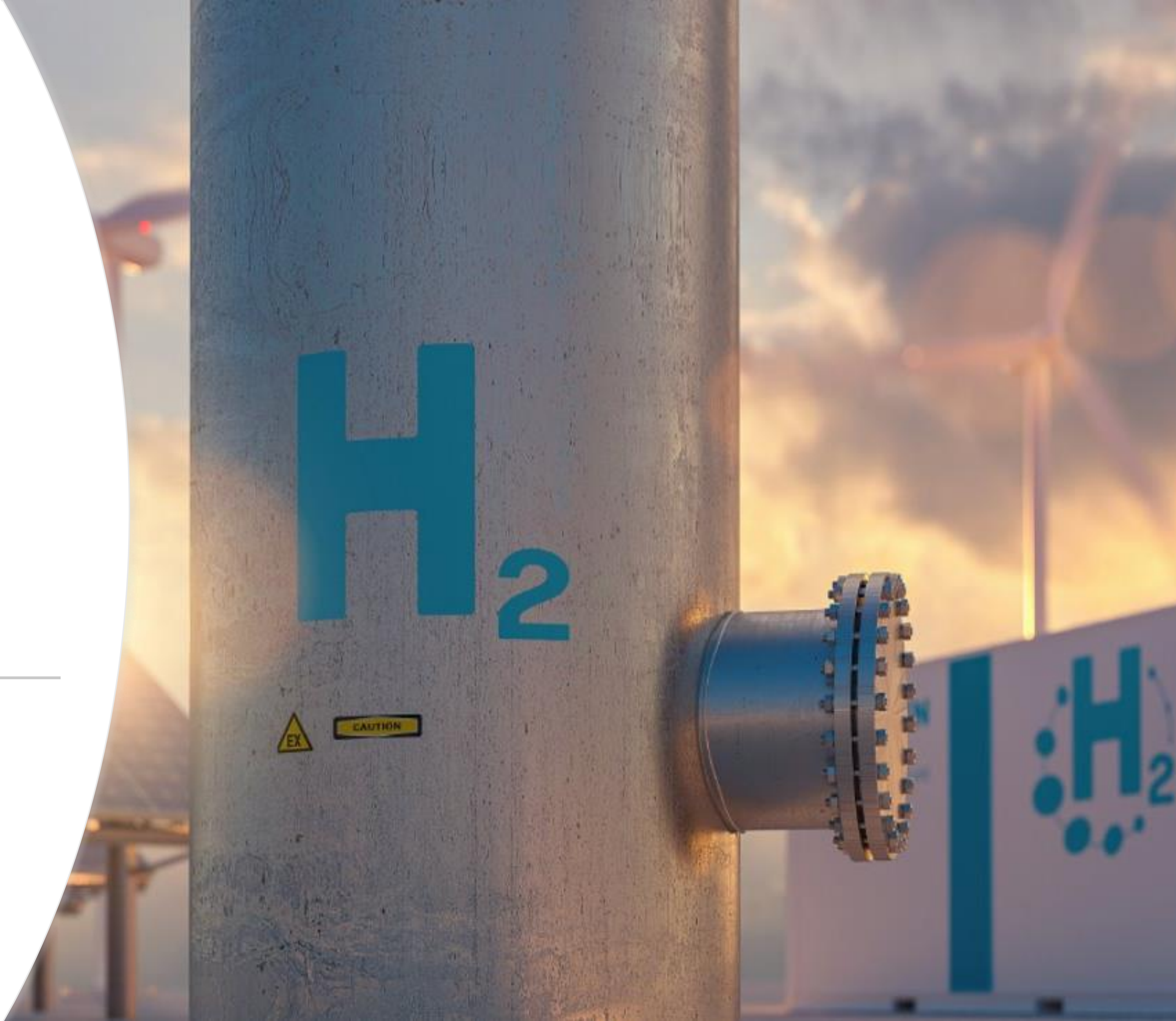
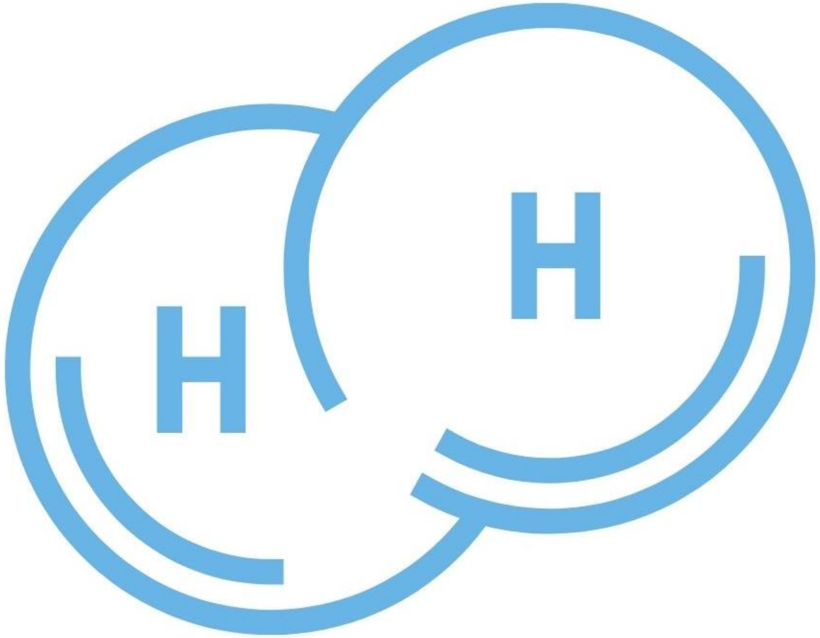


Photo courtesy of Great Plains Institute

What is Hydrogen?

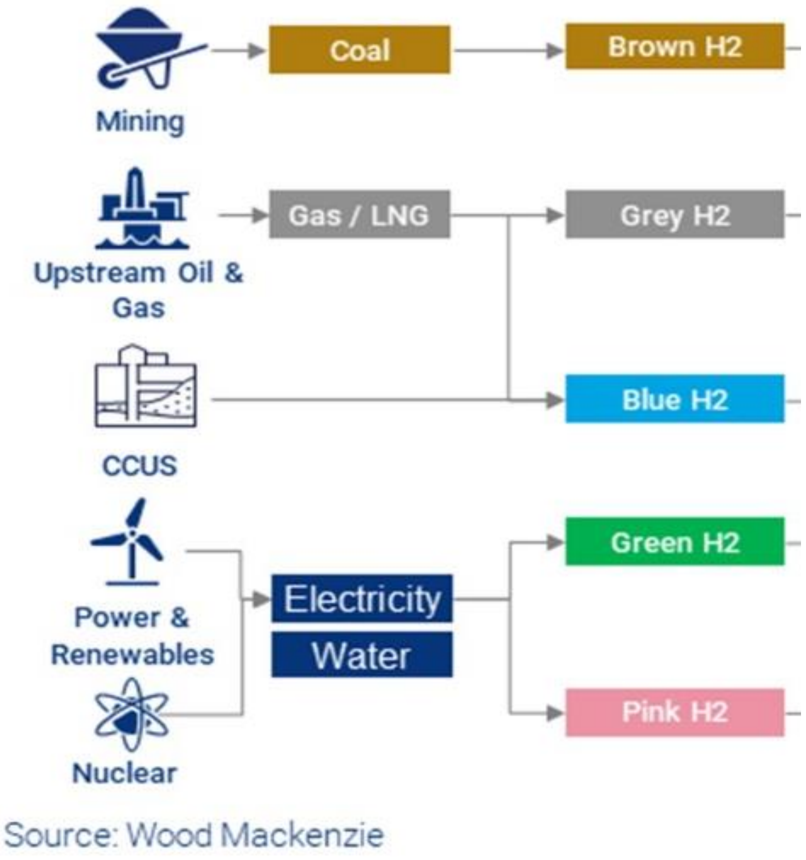
Key points:

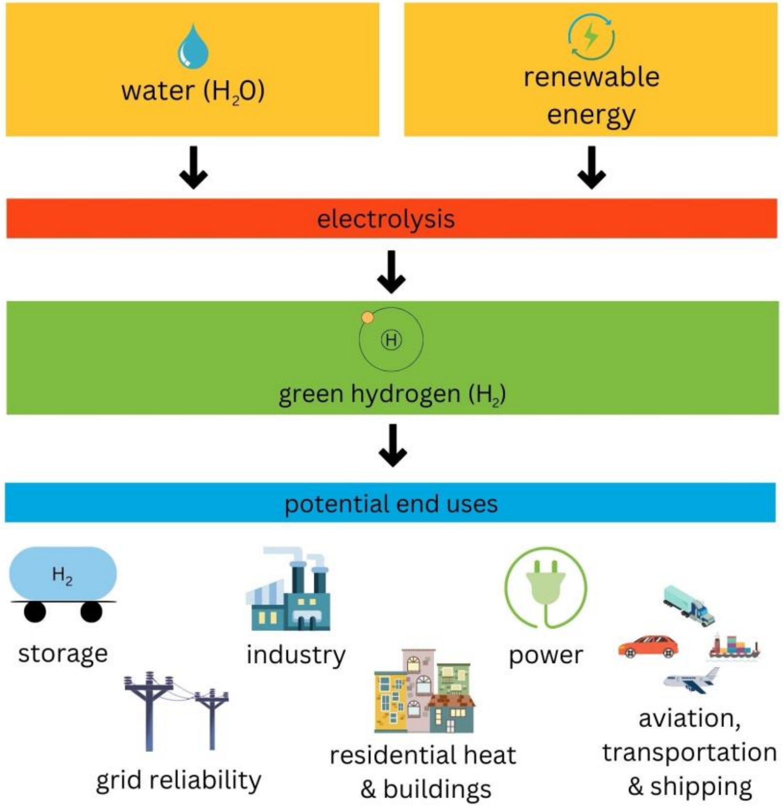
- It’s a gas
- It's a very small molecule
- It has low energy density
- It does not exist in nature
- It is an energy carrier



Source: iStock/onurdongel

The Hydrogen Rainbow





"Decoding the hydrogen rainbow". Used with permission from Wood Mackenzie. https://www.woodmac.com/news/opinion/decoding-the-hydrogen-rainbow/

Source: Graphic designed by Sydne Tursky, Great Plains Institute

From Rainbows to a Clean Hydrogen Production Standard

Life Cycle Emission (kg CO2e/kg H2)	PTC Value $/kg H2
4-2.5	0.60
2.5-1.5	0.75
1.5-0.45	1.00
0.45-0	3.00

Carbon intensity thresholds and their corresponding production tax credit value. Source: Great Plains Institute

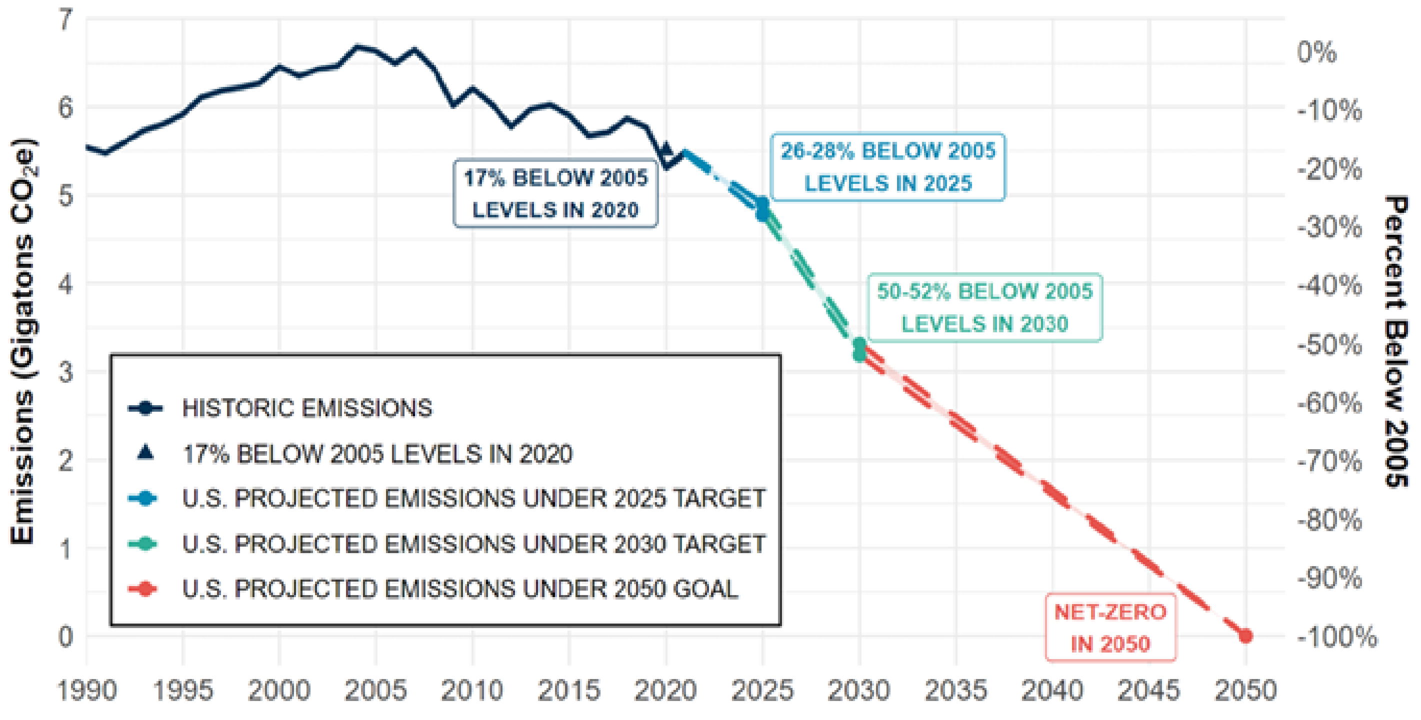
Potential Hydrogen End Uses

Hydrogen is already in use in some of these applications, but there are new opportunities that could open as electrification meets its limits.

This includes marine and aviation transport, where hydrogen would need to be further transformed into a drop-in synthetic fuel such as ammonia and e-methanol.

Source: Graphic designed by Sydne Tursky, Great Plains Institute

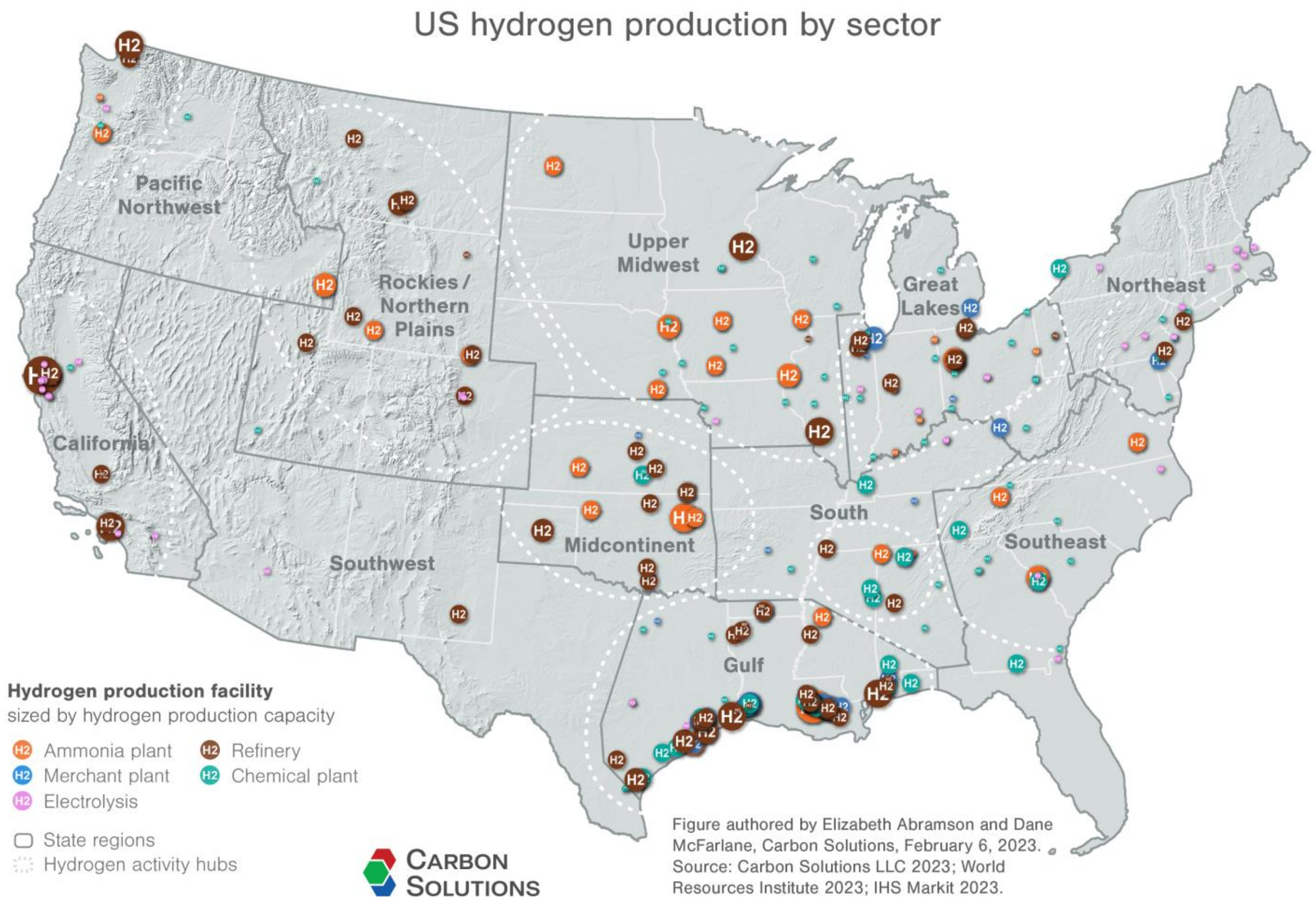
Why a Hydrogen Economy?



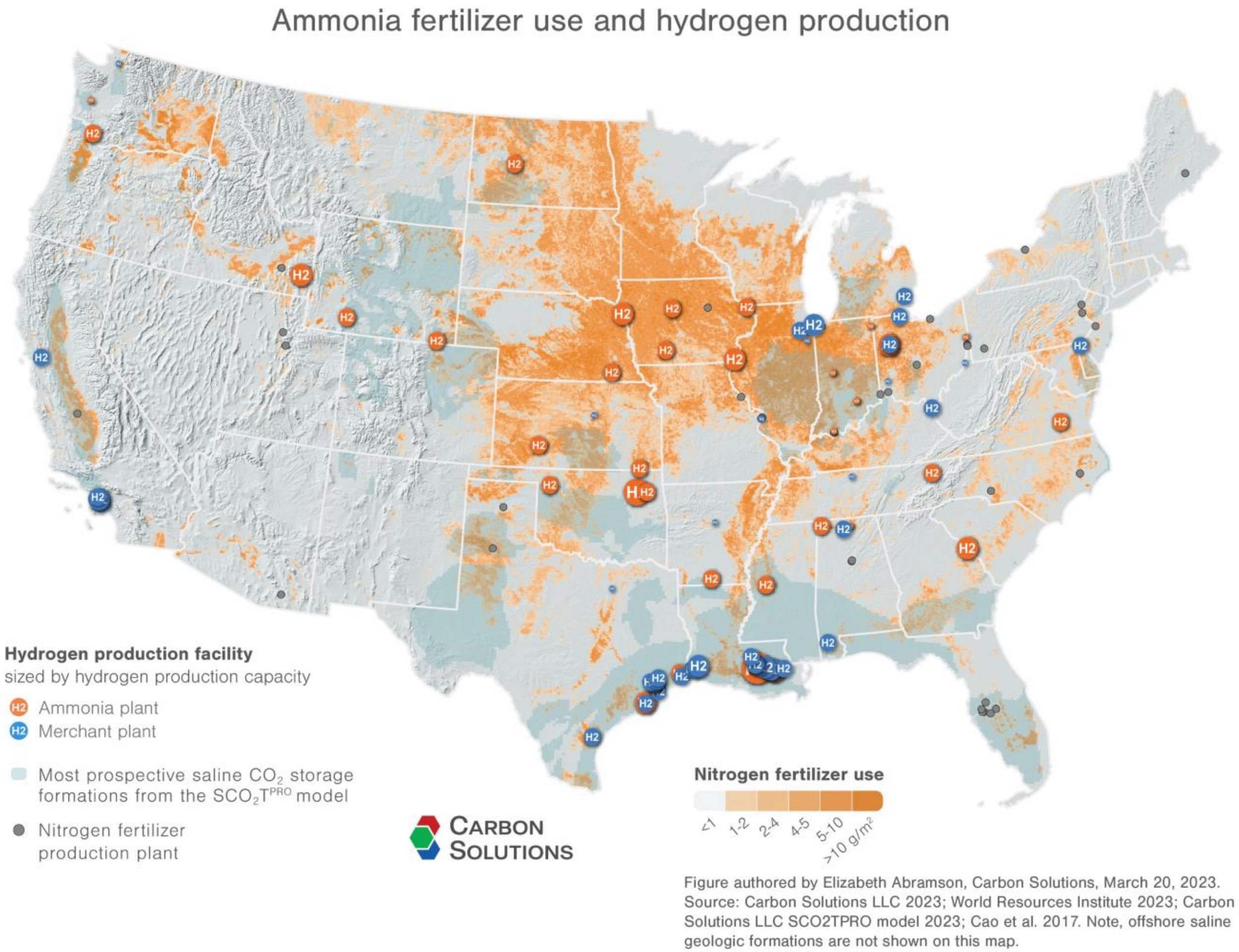
•Biden Administration's target to achieve 50% greenhouse gas emissions reduction by 2030 and 100% economy-wide by 2050.
Minnesota's new climate legislations targeting 100% carbon emissions free electricity by 2040

Source: U.S. Dept. Of Energy. Clean Hydrogen Strategy Roadmap

US Hydrogen Production Facilities



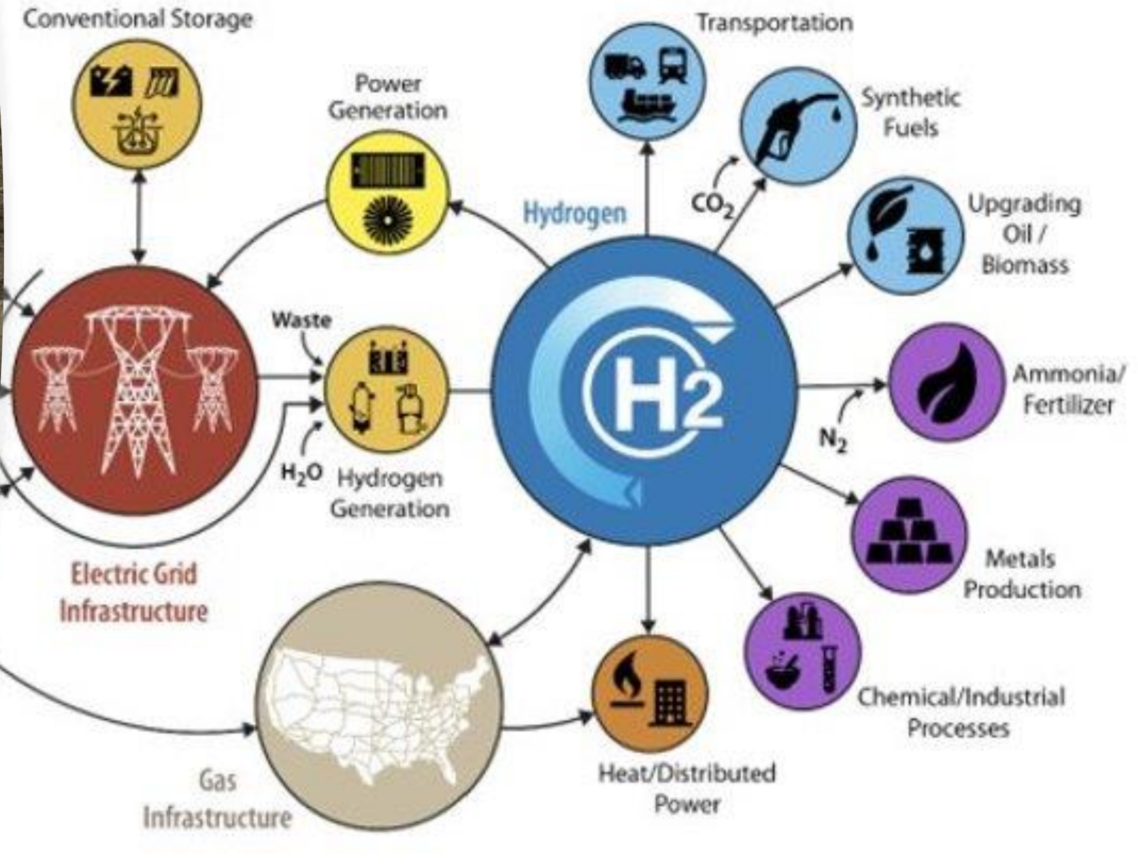
US Hydrogen Production and Potential Opportunity Applications



Current Nitrogen fertilizer use approx. 10 g/m2 in MN.
Nitrogen fertilizer accounts for approximately 78% of the fossil energy footprint from corn production.

iStock.com/TheBusman

How Does a Hydrogen Economy Work?



Decarbonization of Different Sectors Using Hydrogen. Source: US DOE H2@Scale Initiative

How Could the Hydrogen Economy Impact Minnesotans?

Workforce development opportunities across multiple sectors that include:

- R&D
- Manufacturing
- Engineering
- O&M
- Communications
- Policy and regulatory affairs
- Construction and trade

Visit the DOE's [Hydrogen and Fuel Cells Career Map]()

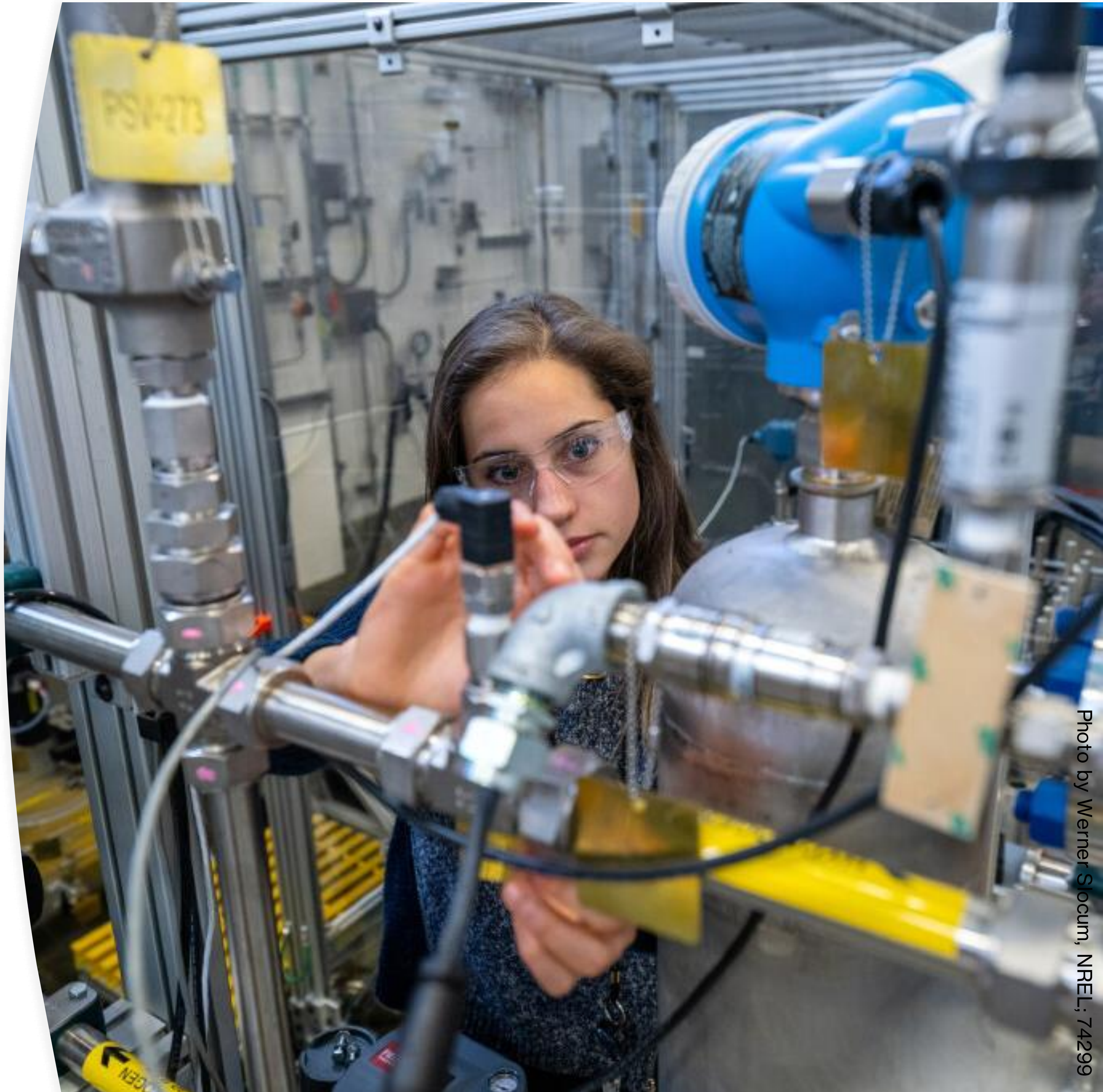


Photo by Werner Slocum, NREL, 74299

Too Good to be True?

Hydrogen can do everything – but should it?

Consider:

- Increased NOx emissions from combustion
- Potential for leakage from pipelines
- The non-linear relationship between the amount of H2 in a natural gas blend and the carbon emissions reduction

Photo by Warren Gretz, NREL 10933

Minnesota Memorandum of Understanding

Sasha Bergman, Assistant Chief of Staff for Policy, Administration, and Federal Affairs, Governor's Office

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Supporting the Development of Hydrogen Markets in Minnesota

- Governor Walz' Executive Order 22-22
- Quad-state MOU on joint development of a proposal for the Heartland Hub's application to the U.S. Dept. of Energy's Hydrogen Hubs funding opportunity

STATE OF MINNESOTA
Executive Department

Governor Tim Walz

Executive Order 22-22

Directing State Agencies to Pursue Federal Funding for Clean Hydrogen Market Development in Minnesota

Hydrogen Hubs

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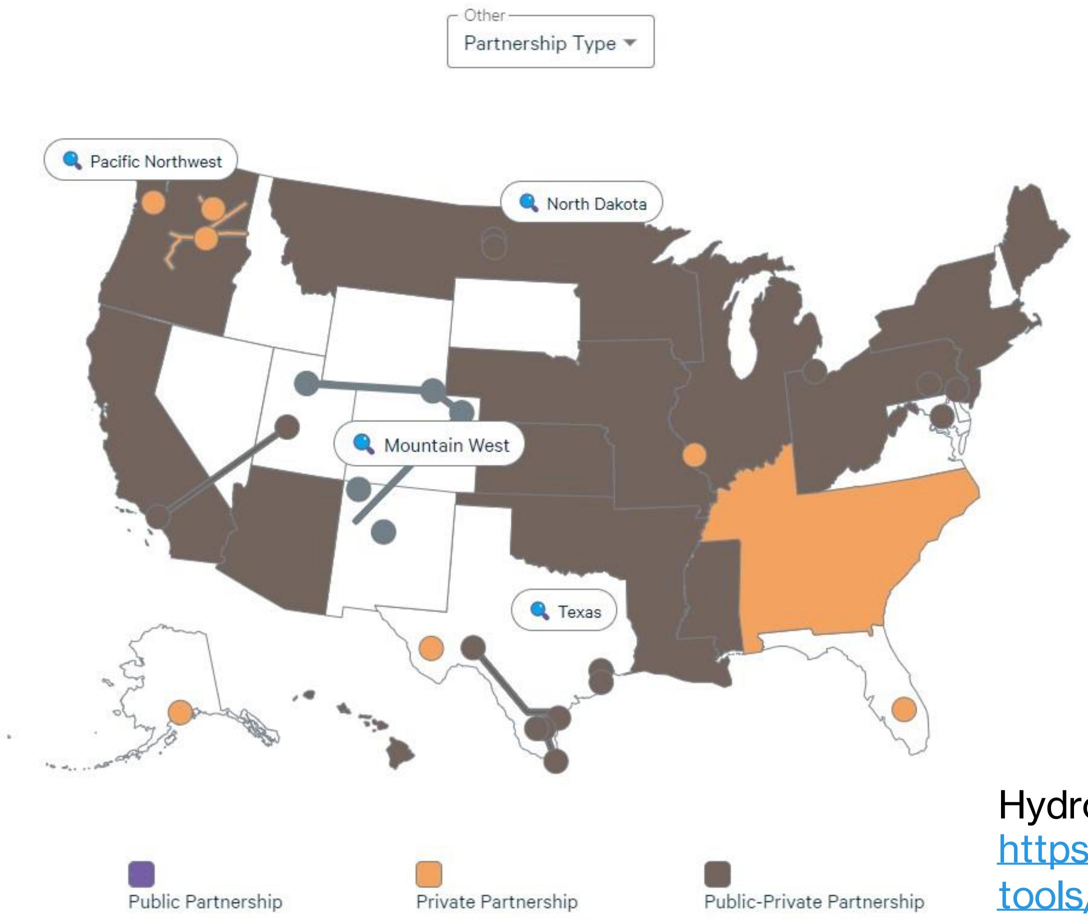
What are Hydrogen Hubs?



Hydrogen Hub Explorer
https://www.rff.org/publications/data-tools/hydrogen-hub-explorer/

Timeline for the Hydrogen Hubs

Funding opportunity announcement (FOA) released	September 22, 2022
Submission deadline for concept papers	November 7, 2022
Concept paper encourage/discourage notifications	December 2022
Submission deadline for full applications	April 7, 2023
Pre-selection interviews	Summer 2023
Expected date for selection notifications	Fall 2023
Expected timeframe for award negotiations	Winter 2023-2024

The Heartland Hub/UND-EERC

- Region: Minnesota, Montana, North Dakota, Wisconsin
- Focus: Converting heavy-duty trucking fuel and other long-distance transportation from diesel to hydrogen and producing carbon-neutral fertilizer from clean hydrogen.

Midwest Alliance for Clean Hydrogen (MACH2)

- Region: Indiana, Illinois, Michigan with UMN as a key partner
- Focus: transportation, agricultural sector, process heat (steel sector)
- Recent merger with the Midwest Alliance for Clean Hydrogen

Photo by Dennis Schroeder, NREL; 46486

Community Benefits Plan

Investing in America’s workforce

Implementing the Justice40 initiative

Community and labor engagement

Advancing Diversity, Equity, Inclusion, and Accessibility

Source: “Guidance for Creating a Community Benefits Plan for the Regional Clean Hydrogen Hubs”. US Office of Clean Energy Demonstrations. [Regional Clean Hydrogen Hubs | Department of Energy]

Join us for the follow-up Hydrogen 101 Workshop Q&A!

Tuesday, March 28th
9 am CST | Zoom
RSVP here: https://betterenergy.zoom.us/meeting/register/tZAtd--uqzspG9LtGg5MKqJjkp87_9fLZNH7

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