

School of Mines
Hydrogen Symposium
8 April 2025

“The Hydrogen Ecosystem in Colorado”

Overview

- The Colorado Hydrogen Network
 - About, mission, history, initiatives, podcast
- Colorado Hydrogen Accomplishments
 - Hydrogen support, programs, incentives
 - Hydrogen fuel station grant
- What's next
 - Geologic hydrogen, Clean Energy Hub

The Colorado Hydrogen Network

The Colorado Hydrogen Network

- A non-profit hydrogen advocacy organization with the mission to help start the hydrogen market, by bringing together suppliers, users, infrastructure and funding
 - To overcome the existing market stalemate
- Founded in 2019 by
 - Brian DeBruine – 36-year career with Honeywell Aerospace as engineer and project developer
 - Dr. Bryan Willson – Executive Director of the CSU Energy Institute
 - Frans Westenbrink – Retired General Manager Woodward, Inc.
 - Charter meeting attended by NREL, CDOT, the DoE, the Colorado Energy Office, Colorado Cleantech Industries Association and hydrogen companies
- Director – Brian DeBruine (full time, pro bono)
- Podcast – the *HydrogenNowCast*.



The Colorado Hydrogen Network



*Regional Air Quality Council
 Colorado Energy Office
 Colo Dept of Public Health & Environment
 Division of Oil & Public Safety
 Colo Dept of Transportation (CDOT)
 Department of Energy (DoE)
 NREL



Colorado Hydrogen Network Services

- Thought leadership
 - Integrating technology ideas and business ideas
- Networking hub for stakeholders
- Monthly meetings and newsletter
- Working initiatives.

Colorado Hydrogen Network - Initiatives





HydrogenNowCast Podcast Highlights

- 1 – Fundamentals of Fuel Cell EV's & Hydrogen Fueling
- 4 - Ammonia as a Hydrogen Carrier with Starfire Energy
- 11 & 46 – Home Hydrogen Generators with ElektrikGreen
- 13 – Hydrogen From Petroleum Wells with Proton H2**
- 18 – Interview with New Day Hydrogen
- 20 – Addressing Environmental Criticisms of Hydrogen
- 26 – Which EV Would Einstein Buy?
- 29 – Resolving the Hydrogen Color Chaos
- 31 – Comparing EV Fueling and Battery Charging at Scale
- 34 – Hydrogen for Hydrogen Skeptics
- 36 – Hydrogen for Fleets with AAA and New Day Hydrogen
- 43 – Hydrogen Piston Engines with Cummins
- 51 & 70 – Practical Direct-Air Carbon Capture with Algae**
- 61 – Natural Hydrogen with Natural Hydrogen Energy**
- 63 – New Electrolyzer Catalysts with H2U Technologies
- 64 – Geothermal Energy to Hydrogen with H2 Synergy
- 69 – Hydrogen for light-duty vehicles
- 71 – Deploying FCEV's outside California
- 74 – Element One low-cost hydrogen detectors
- 75 – 45V PTC and the fallacy of temporal matching**
- 79 – Where will we use hydrogen?
- 80 – DOT Grant for three hydrogen fuel stations
- 82 - Natural Hydrogen wells with Geoff Ellis USGS**
- 83 – Electrochemical Compressors & Purification with HyET**
- 89 - Clean Hydrogen from Oil Reservoirs using biology**
- 90 - The Psychology of Existential Threats

Colorado Hydrogen Accomplishments

Colorado Hydrogen History 2019 - 2021

Jan 2017	Colorado releases “Retail Hydrogen Fueling Regulations”
Sept 2019	Colorado passes Zero Emission Vehicle (ZEV) Rule
Dec 2019	<ul style="list-style-type: none">▪ CHN launched via charter meeting with NREL, CDOT, DoE, Energy Office, CSU & EPC▪ CHN website launched
May 2020	HydrogenNowCast podcast launched
Jul 2020	Colorado signs Multi-State MD/HD ZEV MOU
Sept 2020	CHN & NREL achieve modular hydrogen fuel station donation to CSU Energy Institute
Dec 2020	New Day Hydrogen launched to deploy hydrogen fuel stations
May 2021	Colorado passes SB21-260 “Sustainable Transportation System” to form Clean “Enterprises” with funding for ZEV’s and hydrogen fueling
Oct 2021	Colorado Energy Office publishes “Opportunities for Low-Carbon Hydrogen in Colorado: A Roadmap”

Colorado Hydrogen History 2022 - Present

Mid-2022	Advanced Industry Investment Tax Credit (AITC) – Colorado House Bill HB22-1149 Provides investors and advanced industries with 25% to 35% credit per investment up to \$100,000
May 2023	Colorado passes HB23-1281 “Advance the Use of Clean Hydrogen” production tax credit of \$1 per kg
Jan 2024	US Federal Highway Administration awards \$9M grant to CSU and New Day Hydrogen to deploy three hydrogen fuel stations
Mid-2024	New Day Hydrogen & Drive Clean Colorado receive \$946k grant from DoE VTO for hydrogen fleet vehicle demonstration
Oct 2024	CHN hosts First Annual Colorado Hydrogen Day trade show
Early 2026	Three hydrogen fuel stations to begin service along I-25 corridor (Ft. Collins, Denver, Pueblo) (full J2601 compliance)

Hydrogen Fuel Station Grant

- \$9M from the Federal Highway Administration
 - Three fuel stations (Fort Collins, Denver, Pueblo) along the I-25 corridor
- Prime contractor
 - Colorado State University
- Design, build & operation of the modular stations
 - New Day Hydrogen, Inc. www.newdayhydrogen.com
 - \$2.2M grant match additional funding
- Modular station design, fabrication and installation
 - EPC, Inc. epc4h2.com.

Deploying Hydrogen Fueling

- California model of state-funded fuel stations unlikely to be deployed in Colorado or elsewhere because of cost
- An alternative model is being deployed in Colorado
 1. Hydrogen users enlisted (commercial fleets)
 2. Investor-funded public fuel stations deployed to service users
 3. Commercial vehicles identified and recommended to the fleets
 4. State of Colorado funding assistance to defray higher cost of hydrogen trucks

*Fuel stations are open to all vehicles and customers
But initial focus is on commercial vehicles which use more hydrogen*

Hydrogen Fuel Stations Under Contract

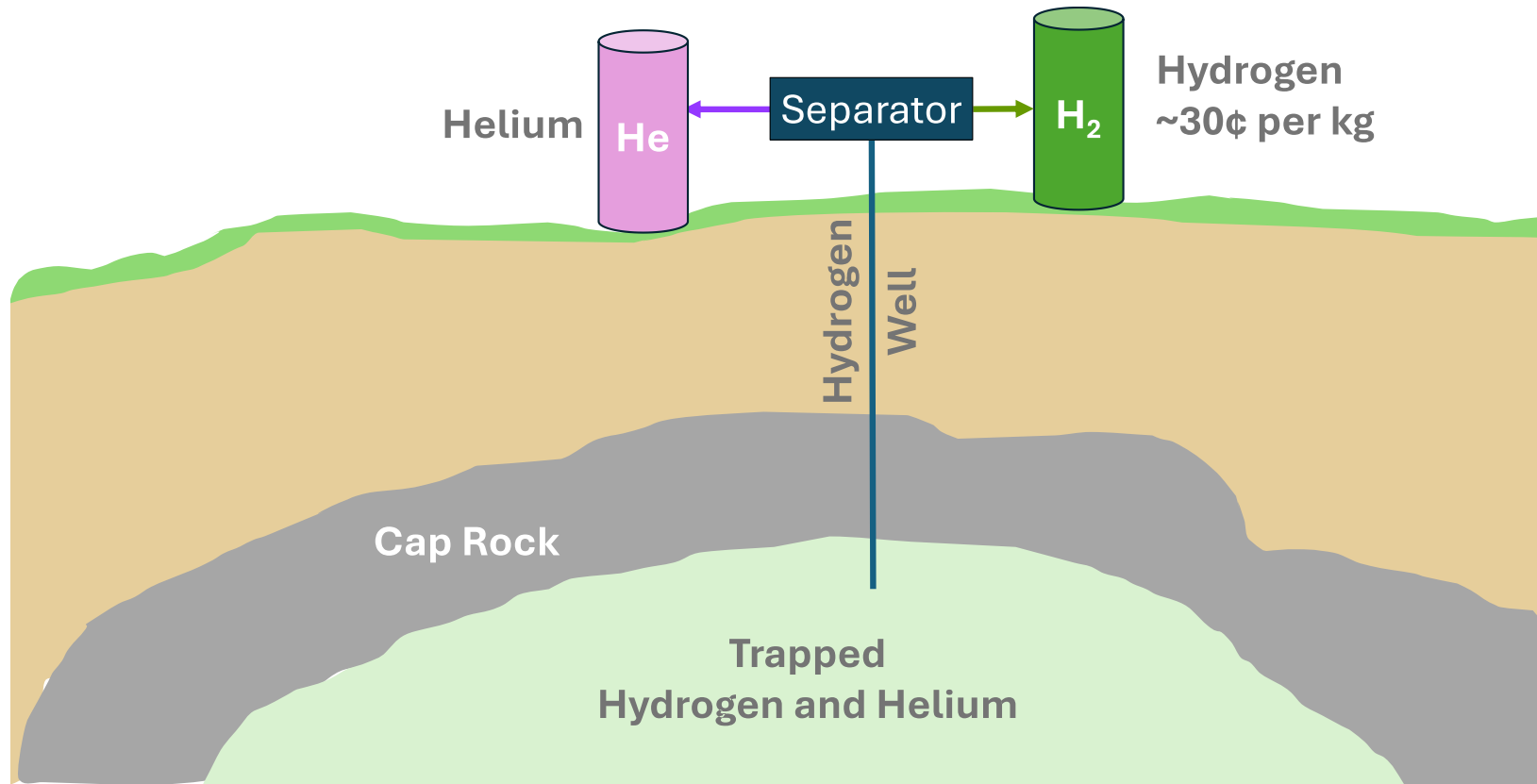
- Initial stations modular and self-contained (350 & 700 bar, J2601 compliant)
- On-site hydrogen generation via electrolysis
 - Avoids hydrogen supply interruptions and high prices seen in California



NEW DAY
HYDROGEN 

What's Next For Hydrogen in Colorado

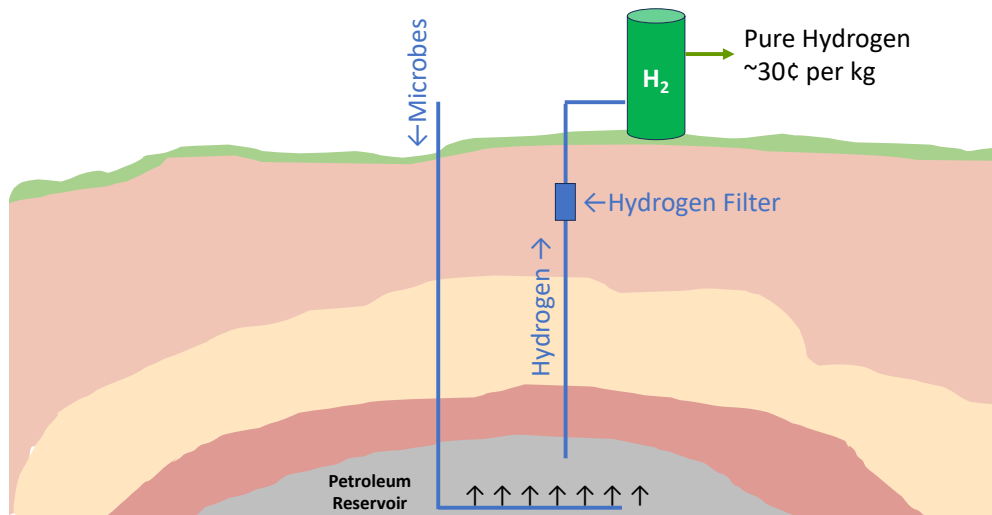
Natural Hydrogen Wells



Clean Hydrogen from Petroleum Wells

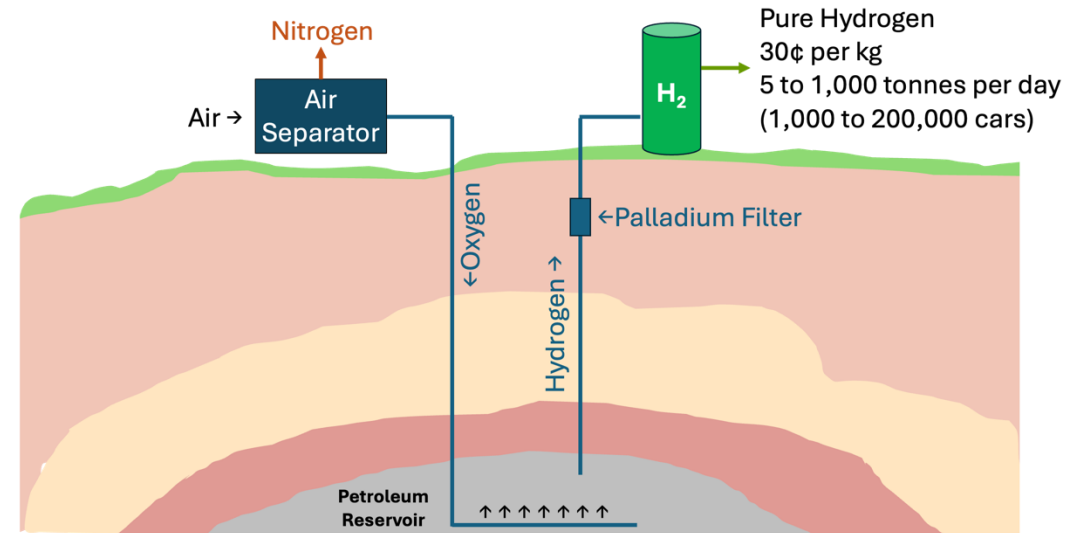
Method 1

Using Microbes to Release Hydrogen



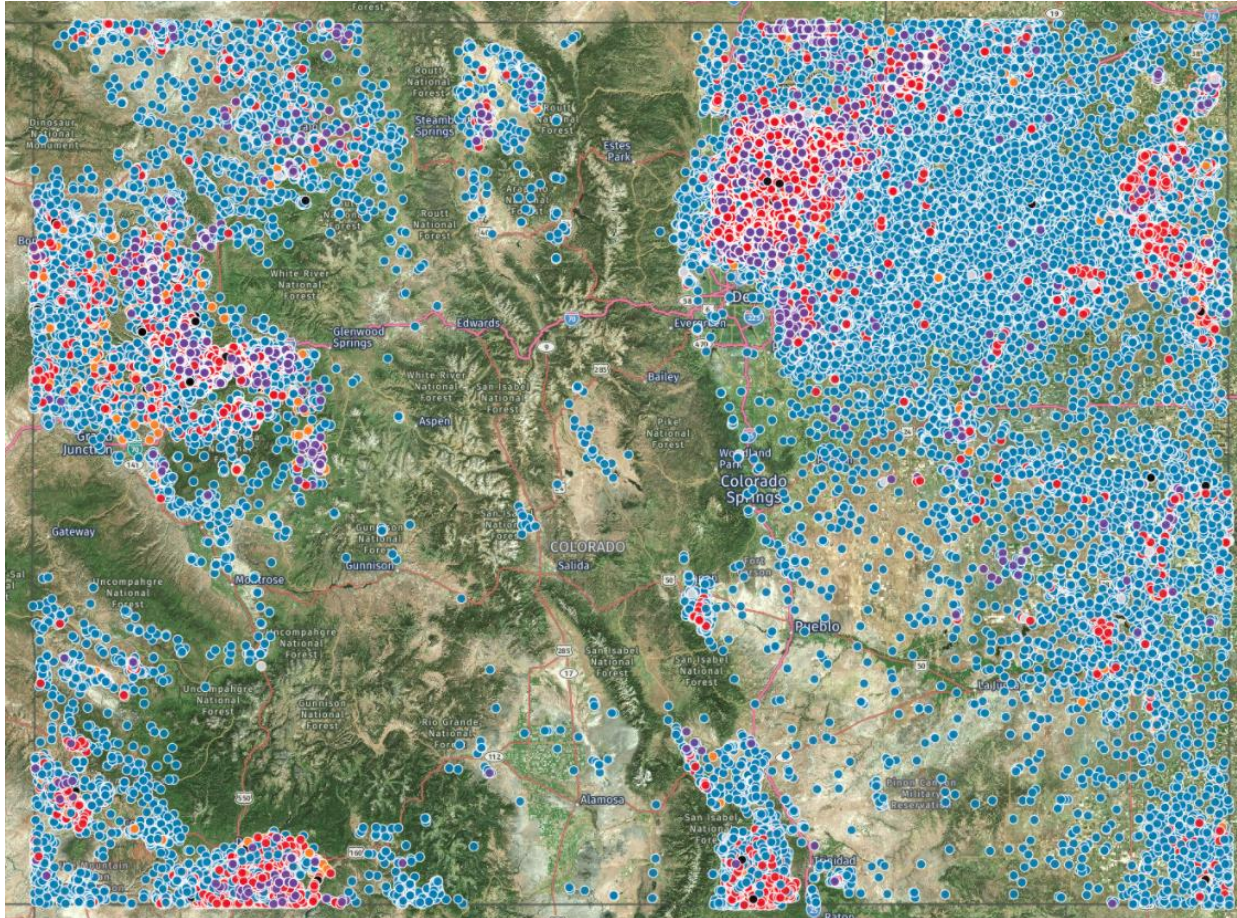
Method 2

Using Oxygen to Release Hydrogen



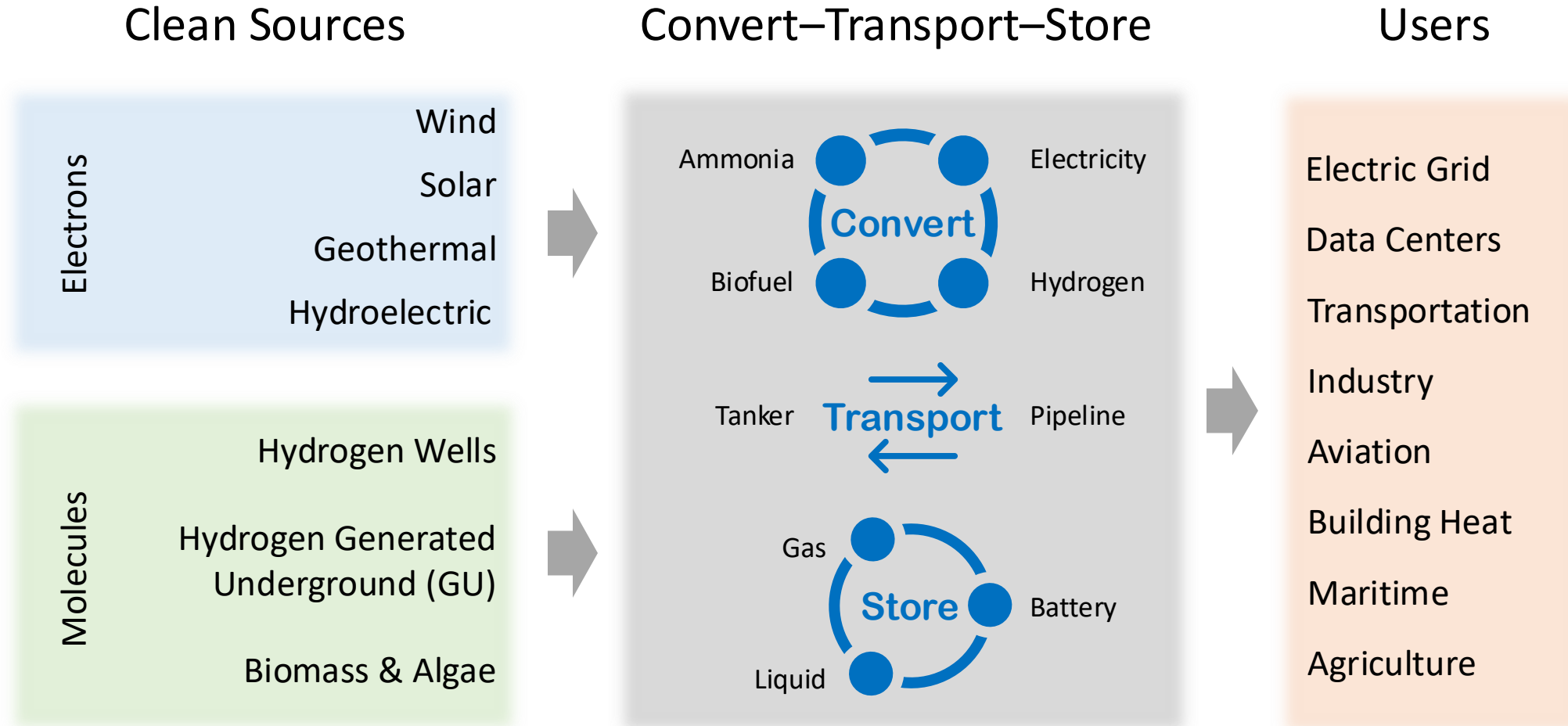
Clean Because No Carbon Leaves the Ground

Petroleum Wells in Colorado



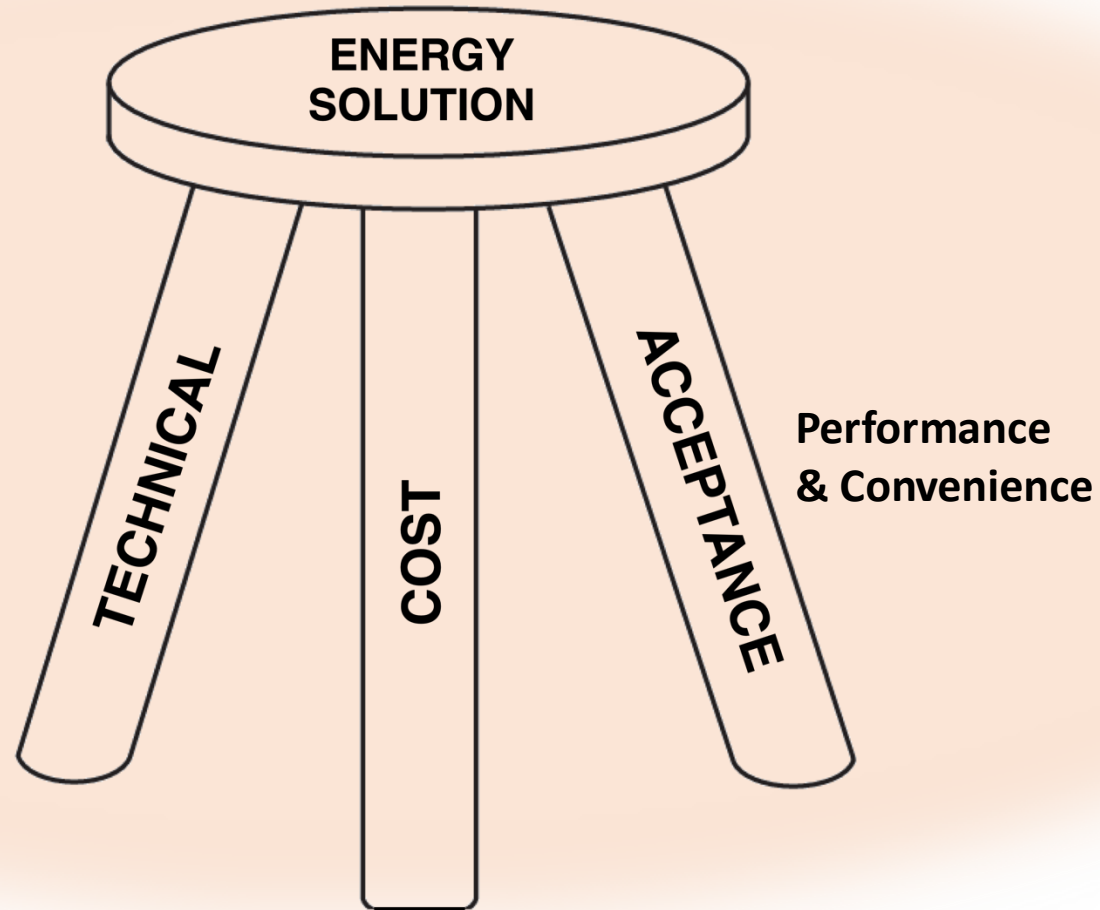
- Red are active
- Blue are abandoned
- Colorado has over 20,000 abandoned wells
- Many of the abandoned wells can be used to produce Clean hydrogen

Clean Energy Hub (Market Ecosystem)



Which Form of Energy Is Right for Each Use?

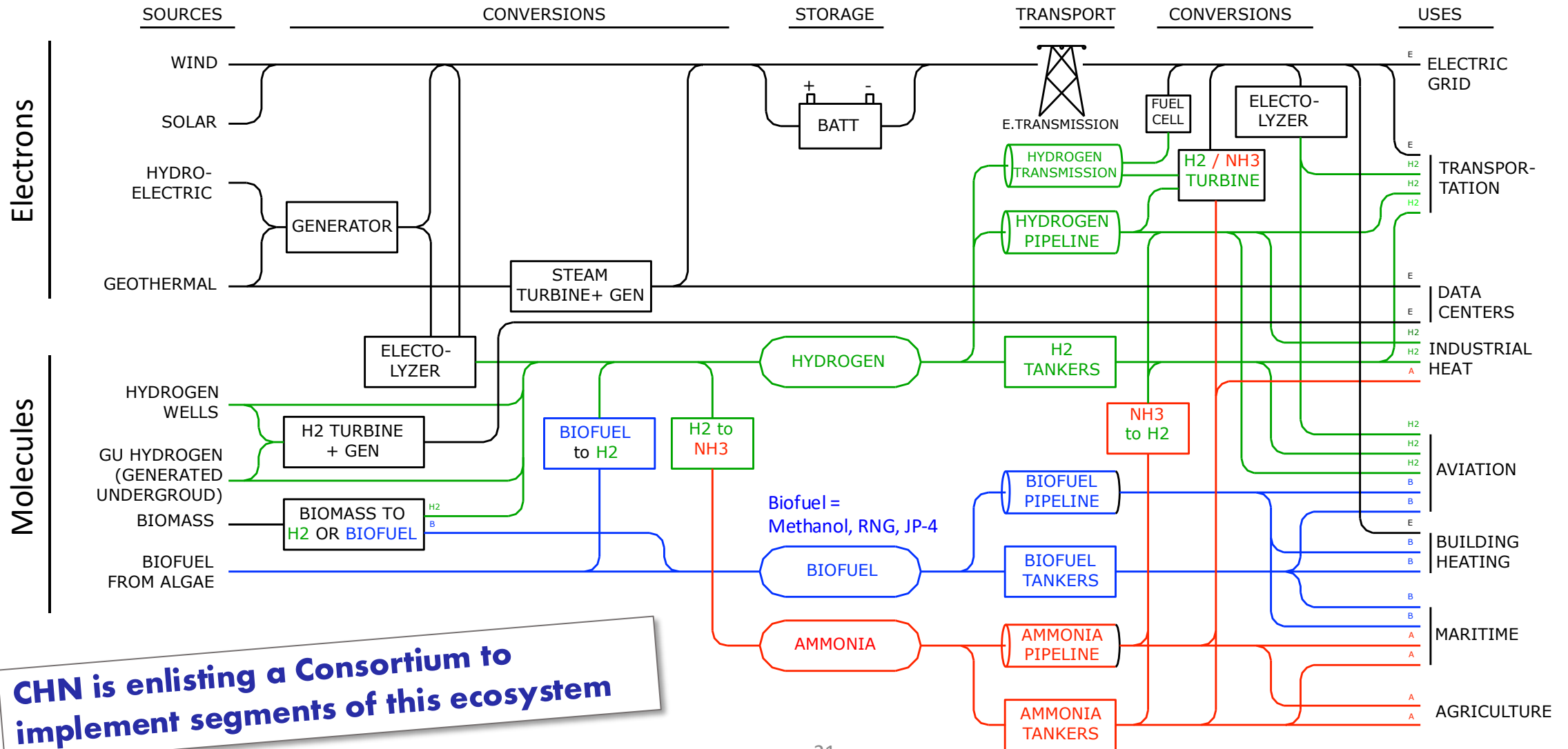
**Energy Solutions Must Meet
Three Criteria**



Likely Fuel Type for Each Use

Use	Electricity	Hydrogen	Biofuel	Key Discriminator
Electric Grid	✓			
Data Centers	✓	✓		Technical & Cost
Transportation	✓	✓		Performance & Convenience
Industrial Heat		✓		Technical
Aviation		✓ Short Range	✓ Long Range	Technical
Building Heat	✓ New Construction		✓ Existing Buildings	Cost
Maritime			✓	Technical & Cost

Proposed Clean Energy Hub



CHN is enlisting a Consortium to implement segments of this ecosystem



www.colorado-hydrogen.org

HydrogenNowCast



Podcast