

NGL Supply Co. Ltd.

Delivering Energy Across North America

Hydrogen 101



Hydrogen Overview

Hydrogen is the smallest atom in the universe, yet this tiny molecule has huge potential to serve energy demand in power generation, energy storage, transportation, and industrial sectors. Hydrogen, in its natural state, is composed of two hydrogen atoms linked together that store energy.

Basic H₂ Questions:

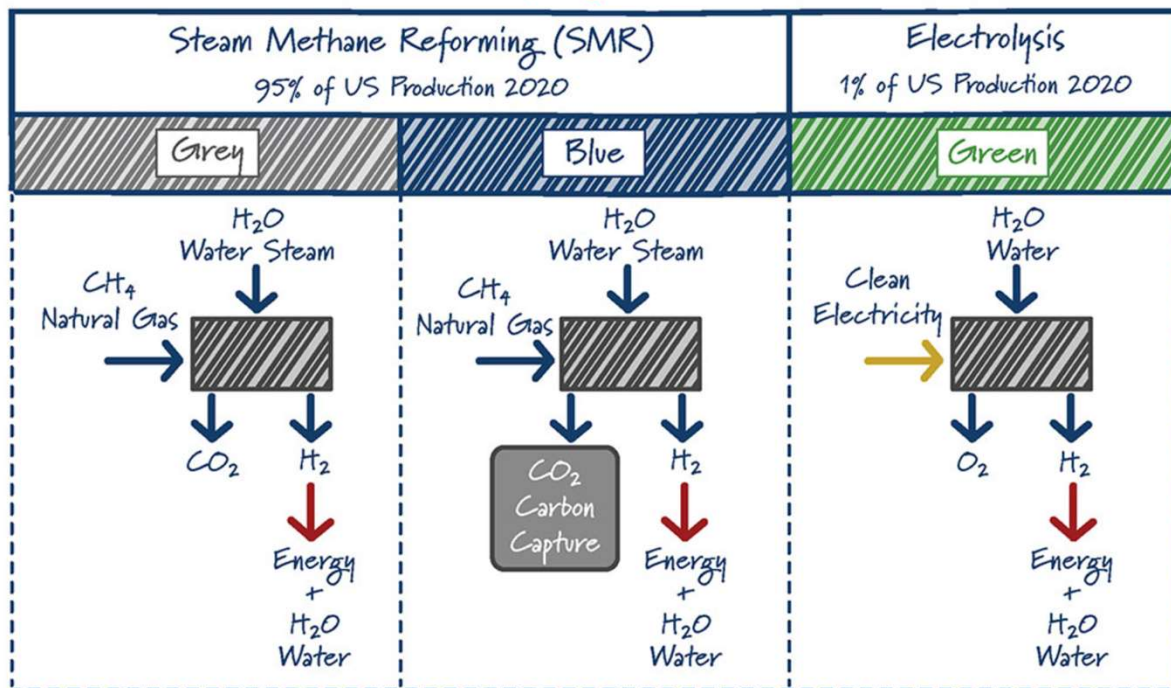
- What is hydrogen?
 - A colorless, odorless, highly flammable gas, the chemical element of atomic number 1
- Where is Hydrogen Found?
 - Water, methane, ethane, propane, coal, clay, animal fats... it's in everything!
- How has hydrogen been used today?
 - Currently, hydrogen is mostly used for fertilizer production, chemical production, and in refineries

Hydrogen For Natural Gas Dummies

- How is hydrogen measured?
 - As I always think in terms of MCF or dekatherms, the hydrogen industry thinks in terms of kilograms or metric tons
- How much heating content does hydrogen have in a cubic foot?
 - 290-340btu per cubic foot
- How many cubic feet does it take to equal one kilogram of hydrogen?
 - 423 cubic feet
- How many kilograms does it take to equal one MCF of natural gas?
 - For simplicity sake, use 7.5kg (avg btu/cf is 316 X 423=133,879btu/kg)
- At what temperature does hydrogen become liquid?
 - minus 423F (NG is minus 260F)
- How much Hydrogen is produced today in North America?
 - Every year, the United States produces around 10 million metric tons of hydrogen, which is enough to power 2.4 million transcontinental flights for a Boeing 747 or for us natural gas guys, it's the equivalent of 13 days of North America's production

Hydrogen Rainbow

The Hydrogen Rainbow

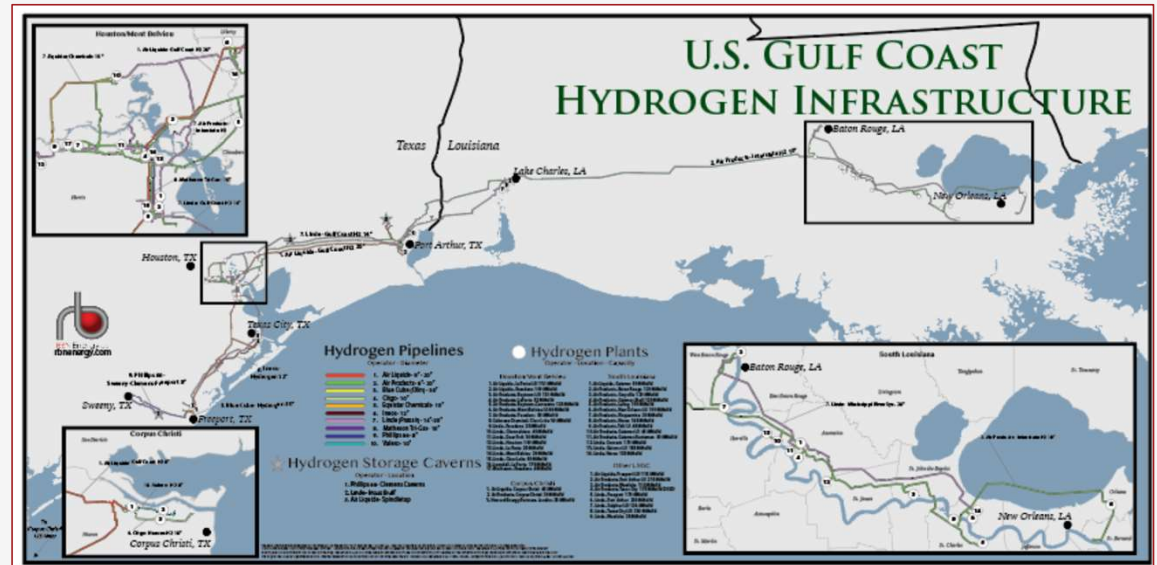


Appalachia is setup for success for Blue H₂!

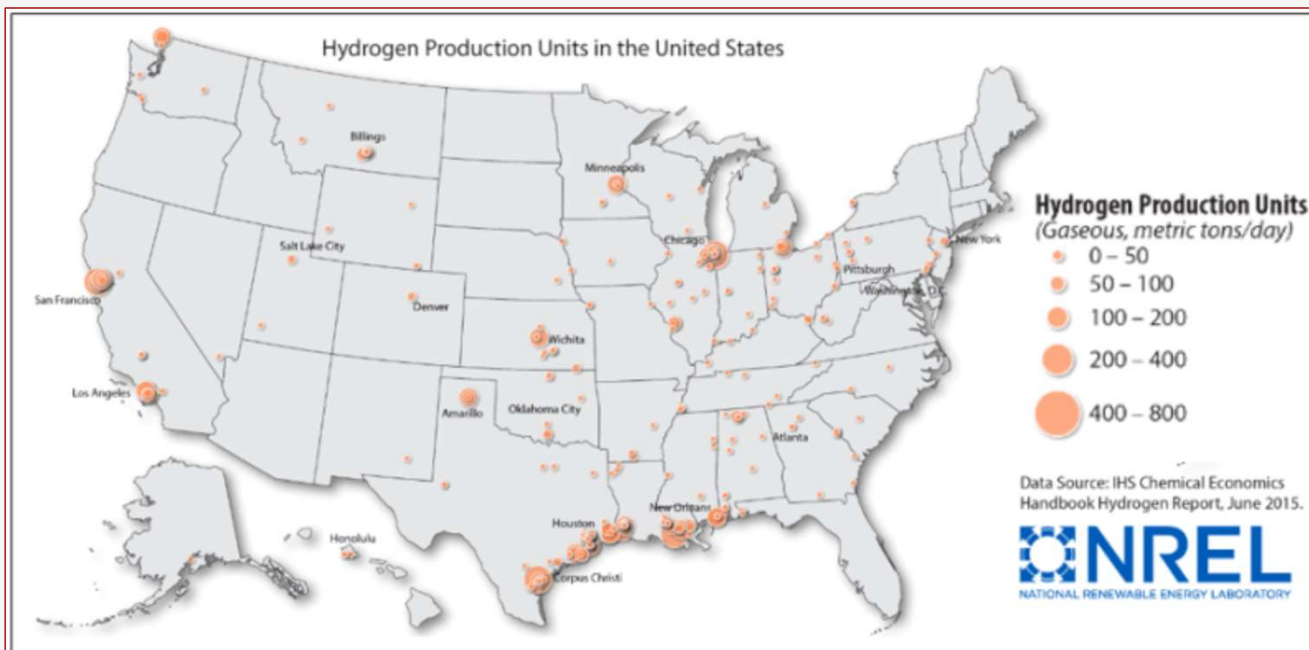
- Major pipeline networks
- Excellent industrial connectivity and demand
- Affordable power
- Energy first regulatory environments

How is Hydrogen moved today?

- Due to lack of dedicated hydrogen pipeline transmission and distribution networks, H2 is limited to truck moves only today unless you are in the gulf coasts limited pipeline network
- New gaseous hydrogen can transport 1,330 kilograms of H2 in new high-capacity trailers pressurized to 550bar
- Liquid hydrogen trailers can transport approximately 4,000 kilograms but require the product be cooled to minus 423 Fahrenheit



Hydrogen Production Sites



U.S. annual hydrogen production
10 million metric tons

Largest Users in the U.S.

Petroleum Processing

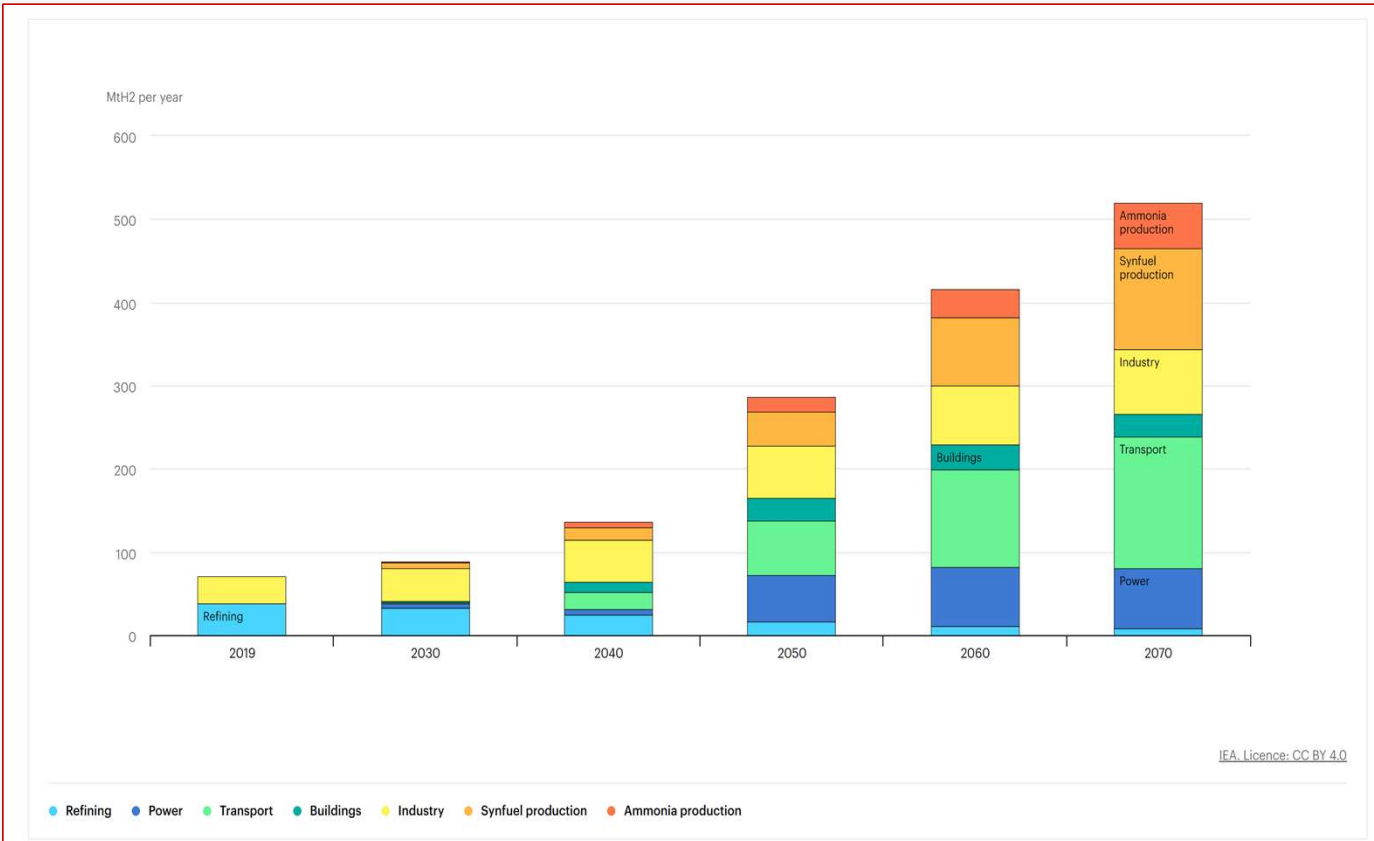
68%

Fertilizer Production

21%

- Hydrogen has predominantly been developed along the gulf coast
- Westlake Chemical in Western Kentucky is one of our larger regional producers in the state
- Marathon's Catlettsburg Refinery in Ashland is one of our largest purchasers of Hydrogen

Hydrogen Demand Growth Projections IEA



- Transportation & Power are some of the largest projected growth areas
- Industrial demand for RNG has been a massive growth sector ~ could this be a miss by the IEA?

Hydrogen Pricing Overview

FOCUS ON WHAT THE MARKET IS ACCEPTING TODAY!

Columbia Appalachia Closed on 1/23/23 at \$2.83/mcf

- **Renewable Natural Gas:** Another alternative to hydrogen is renewable natural gas. Using this as our cost “ceiling” you should assume counter parties would look to enter into long term contracts where the environmental attribute costs do not exceed \$25-35/mmbtu + physical commodity (\$3 on the curve) + pipe distribution costs
 - A. This means \$3.73-\$5.06/kg value at the plant pre distribution costs is the ceiling value the market is tolerating today based on RNG (yes there are cow manure RNG plants getting in excess of \$100/mcf)
 - B. Potential uplift over TCO is \$25-\$35/mcf
- 45V Production Tax Credit potential is \$0.60-\$3/kg or in terms of MCF uplift, \$4.5-\$22.50 on top of the commodity uplift

H2 Value Pathway Summary

	Today's Value	Conversion to NG	\$1.50 PTC Uplift	Total Value Of NG Converted to Blue H2
TCO App	\$ 3.83	\$ 3.83		\$ 3.83
RNG	\$ 28.00	\$ 28.00	\$ 11.25	\$ 39.25
Diesel	\$ 4.00	\$ 30.00	\$ 11.25	\$ 41.25
Propane	\$ 2.05	\$ 22.39	\$ 11.25	\$ 33.64

Government Incentives

- **45Q tax credit** ~ The 2022 changes to 45Q provide up to USD 85 per ton of CO2 permanently stored and USD 60 per ton of CO2 used for enhanced oil recovery (EOR) or other industrial uses of CO2, provided emissions reductions can be clearly demonstrated. Cannot be stacked on top of the 45 V production tax credit
- **ITC** ~ Broadens the existing investment tax credit (ITC) in Section 48 of the Internal Revenue Code (Code) to apply to hydrogen projects and standalone hydrogen storage technology. The four-tiered incentive in any taxable year is equal to the energy percentage of the cost basis of each specified clean hydrogen production facility placed in service during such taxable year as follows:

kgs of CO2e Produced per kg of QCH	Energy Percentage
2.5 - 4 kg of CO2e	1.2%
1.5 - 2.5 kg of CO2e	1.5%
0.45 - 1.5 kg of CO2e	2%
0 kg - 0.45 kg of CO2e	6%

In addition, such energy projects are also eligible for the 10% domestic content bonus credit amount and the 10% increase in credit rate for energy communities as set out in Section 48, resulting in potentially sizable incentives related to clean hydrogen projects.

- **LCFS** ~ The California Low Carbon Fuel Standard has approved pathways for H2 in automotive applications as well as for use in forklifts. Below is the potential uplift:

CI Score (gCO2e/MJ)	Credit Price					
	\$61	\$80	\$100	\$120	\$160	\$200
0	\$1.39	\$1.82	\$2.28	\$2.73	\$3.64	\$4.56
10	\$1.31	\$1.71	\$2.14	\$2.57	\$3.43	\$4.29
20	\$1.23	\$1.61	\$2.01	\$2.41	\$3.21	\$4.02
30	\$1.14	\$1.50	\$1.87	\$2.25	\$3.00	\$3.75
40	\$1.06	\$1.39	\$1.74	\$2.09	\$2.78	\$3.48

The Bottom Line

Hydrogen and the existing energy industry are very complimentary. Think of hydrogen as just another form of "fractionation"! There are billions of dollars being invested into this space and it is still very much in its infancy. This eco-friendly molecule will rely heavily on the decades of infrastructure, processes and knowledge that our industry has put in place. Look for ways you can use your natural gas or ethane as feedstock, your pipelines as transportation vessels and your knowledge as conduits for this transformational commodity.