



PSEG Hydrogen Projects

Association of New Jersey Environmental Commissions

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SVP & Chief Commercial Officer



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PSEG

An award-winning energy company comprised of an electric and gas utility and a nuclear generation business



PSE&G

- New Jersey's largest electric and gas utility: 2.3 Million Electric and 1.9 Million Gas Customers
- Won the 2022 Edison Award winner, the electric utility industry's most prestigious award
- Ranked first in Customer Satisfaction with both residential electric and natural gas service in the East among large utilities by J.D. Power*
- Received the 2022 ReliabilityOne® Award for the Mid-Atlantic Metropolitan Area, 21st consecutive year PSE&G has received the reward
- Built more transmission facilities in PJM and NJ than any other operating utility over the past ten years
- Making transmission upgrades to support offshore wind

PSEG Power & Other

- Operates Salem 1 & 2 and Hope Creek, USA's 3rd largest site
- Generates about 40% of NJ's electricity and 85% of its carbon-free power
- PSEG Long Island contracts
- Potential Hydrogen and RNG investments
- Potential offshore wind transmission investments

Powering a future where people use less energy, and it's cleaner, safer and delivered more reliably than ever

* PSE&G Company received the highest score in the East Large segment of the J.D. Power 2022 U.S. Electric Utility Residential Customer Satisfaction Study of customers' satisfaction with electric utility residential services and the J.D. Power 2022 U.S. Gas Utility Residential Customer Satisfaction Study of customers' satisfaction nationally among gas residential customers. Visit [jdpower.com/awards](https://www.jdpower.com/awards) for more details.

Hydrogen is:

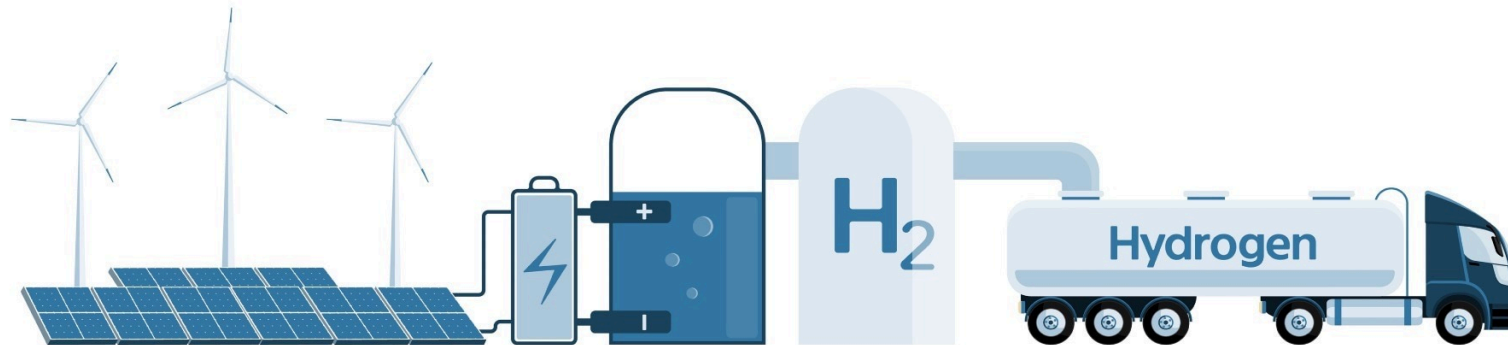
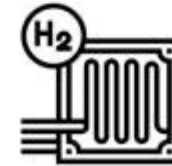
✓ the simplest,
most abundant
element in the
universe

✓ colorless,
odorless,
tasteless, and
flammable

✓ created with a
“primary”
energy source

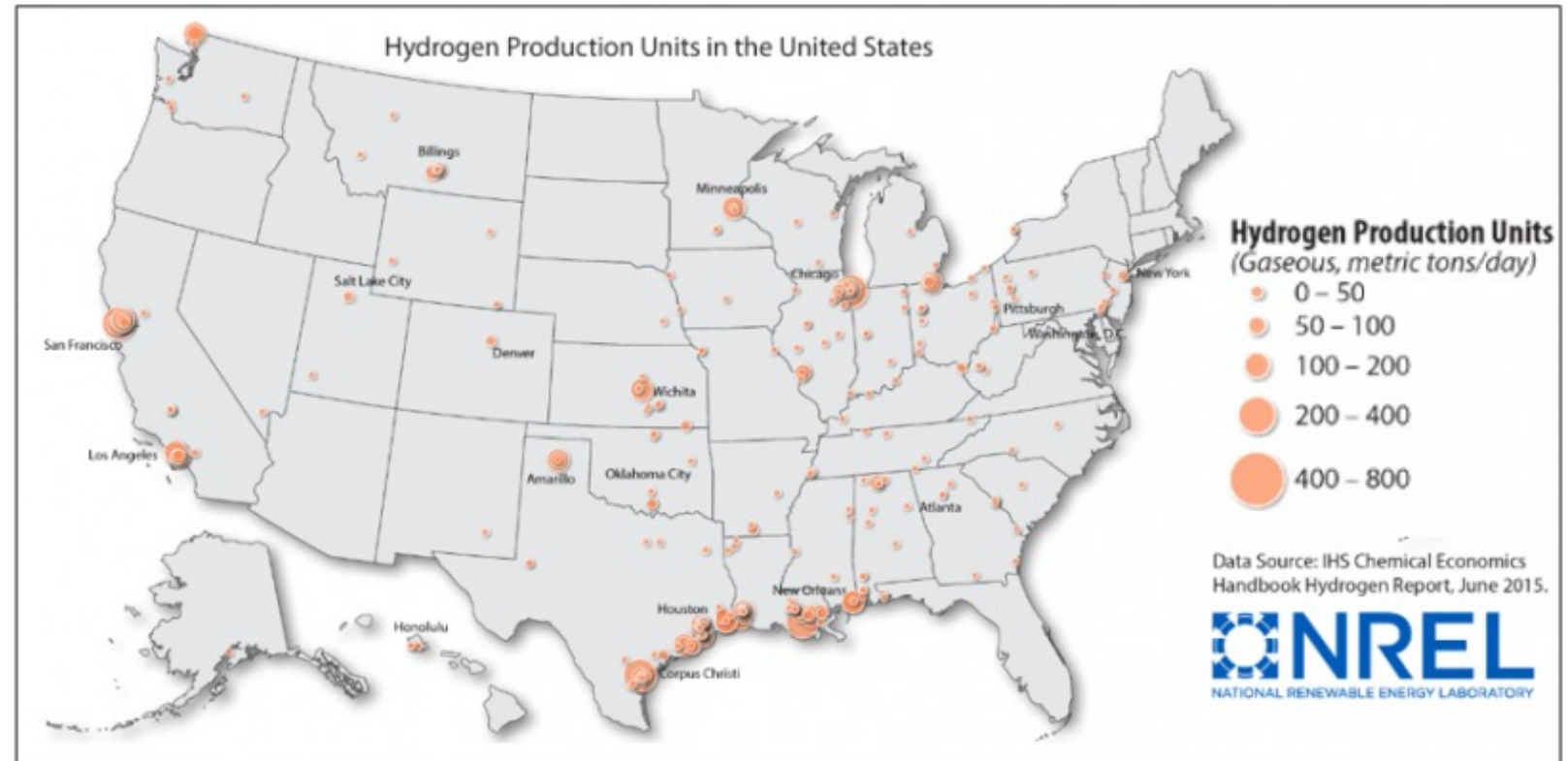
✓ a fuel that
produces only
water, heat, and
electricity

✓ extremely
safe with proper
precautions

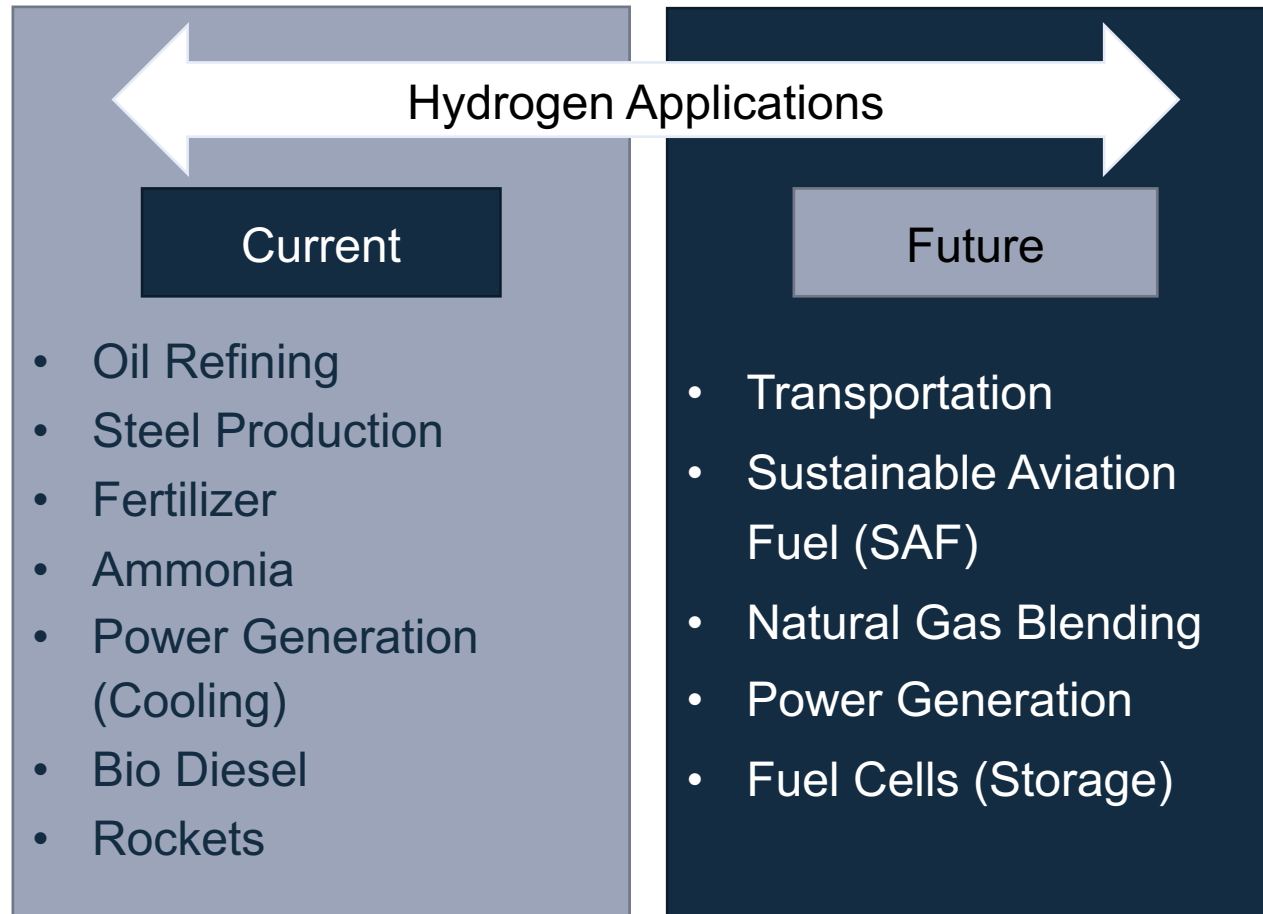


Hydrogen Production

- Approximately 10 million metric tons (MMT) of hydrogen is produced in the US each year.
- Major producers include Air Products, Linde, Air Liquide
- Hydrogen production methods include
 - Steam Methane Reformation (SMR)
 - Coal gasification
 - Waste gasification
 - Electrolysis
- 95% of the H₂ produced in the US is produced with Steam Methane Reforming
- Production is done at large central plants, as well as smaller plants at, or near, the end user.



Current and Future Uses of Hydrogen



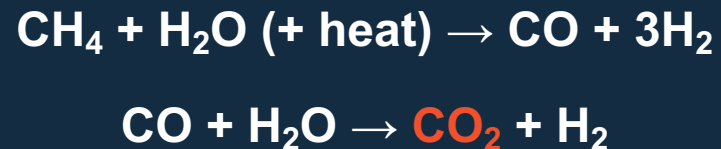
High School Chemistry Pop Quiz!



Hydrogen is produced by electrolysis, the oxygen can be captured for use or released into the air



When hydrogen is burned, it releases energy (heat) and produces only water as a byproduct

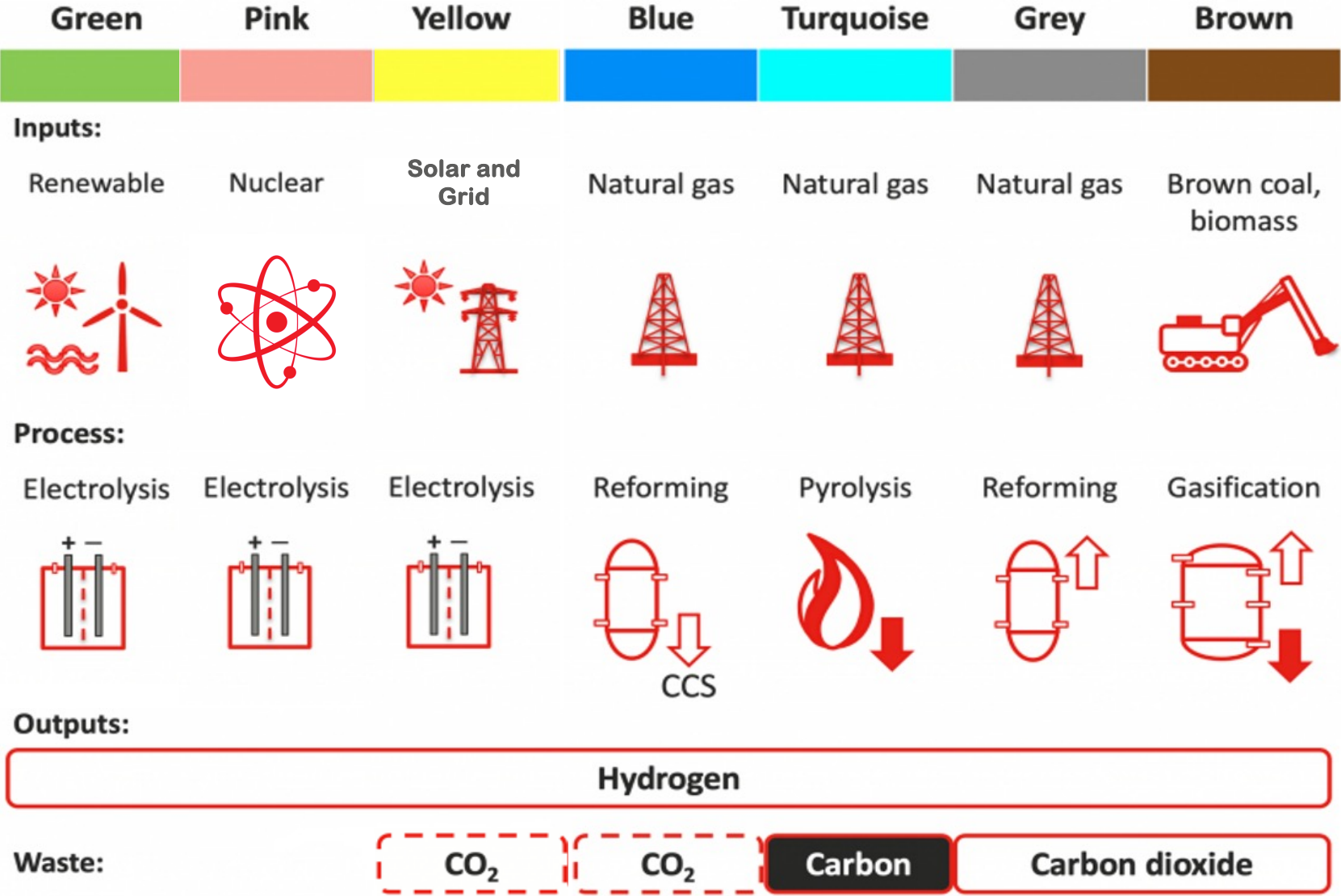


Steam methane reforming (SMR) produces CO and H₂ in primary reaction but then **carbon dioxide** as a byproduct in the water-gas shift reaction



Combustion of methane (natural gas) produces energy (heat) and water but also **carbon dioxide** when burned

The Colors of Hydrogen

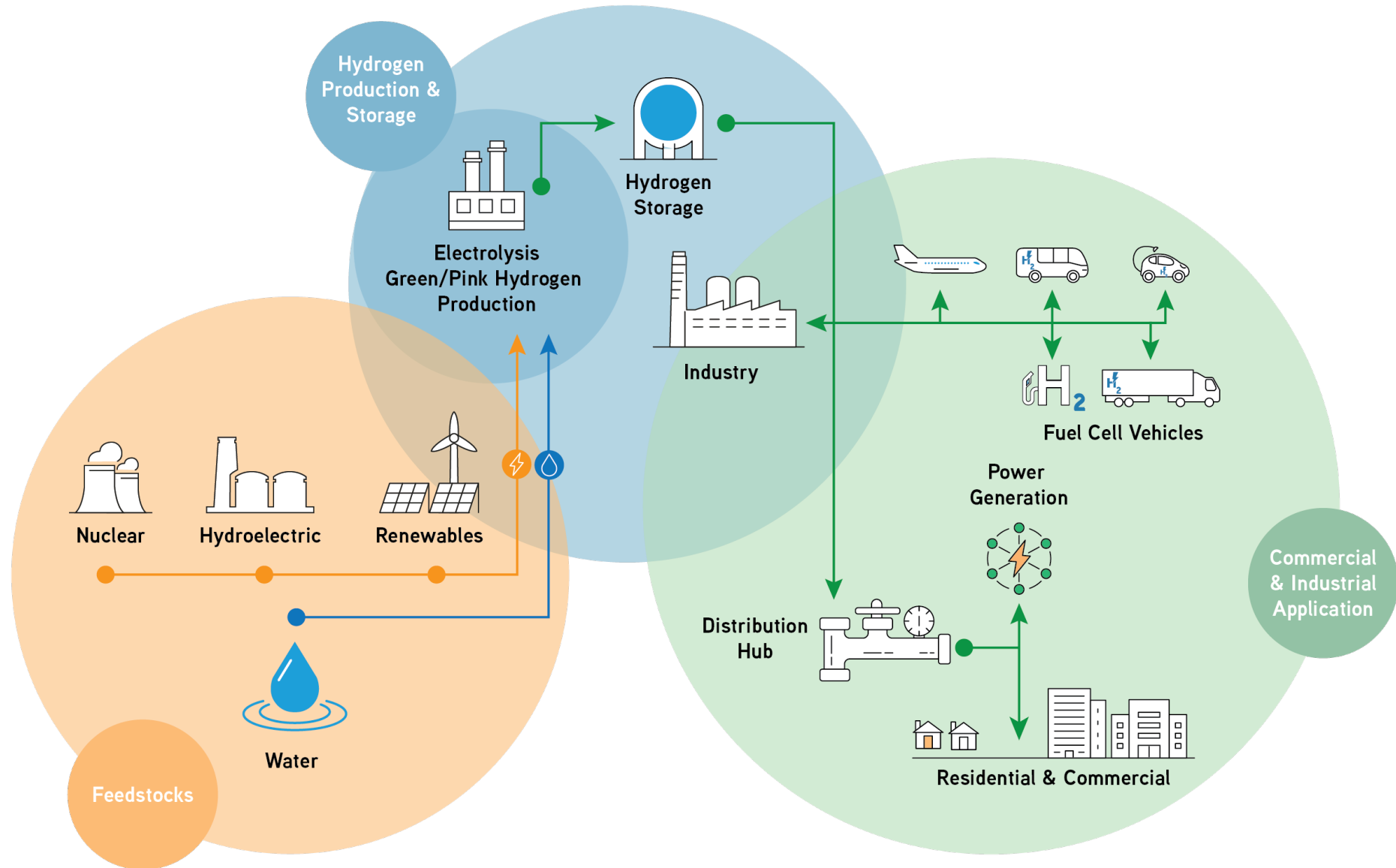


Hydrogen Safety

Hydrogen Facts

- Hydrogen is no more dangerous than other flammable fuels, including gasoline and natural gas.
- Hydrogen has a rapid diffusivity (3.8 times faster than natural gas), which means that when released, it dilutes quickly into a non-flammable concentration.
- By volume, hydrogen has 1/3 of the combustion energy of natural gas.
- Hydrogen combustion has relatively low radiant heat, because hydrogen combustion produces cooling water vapor.
- Hydrogen has a higher oxygen requirement for ignition than other fossil fuels.

What's a clean hydrogen hub?

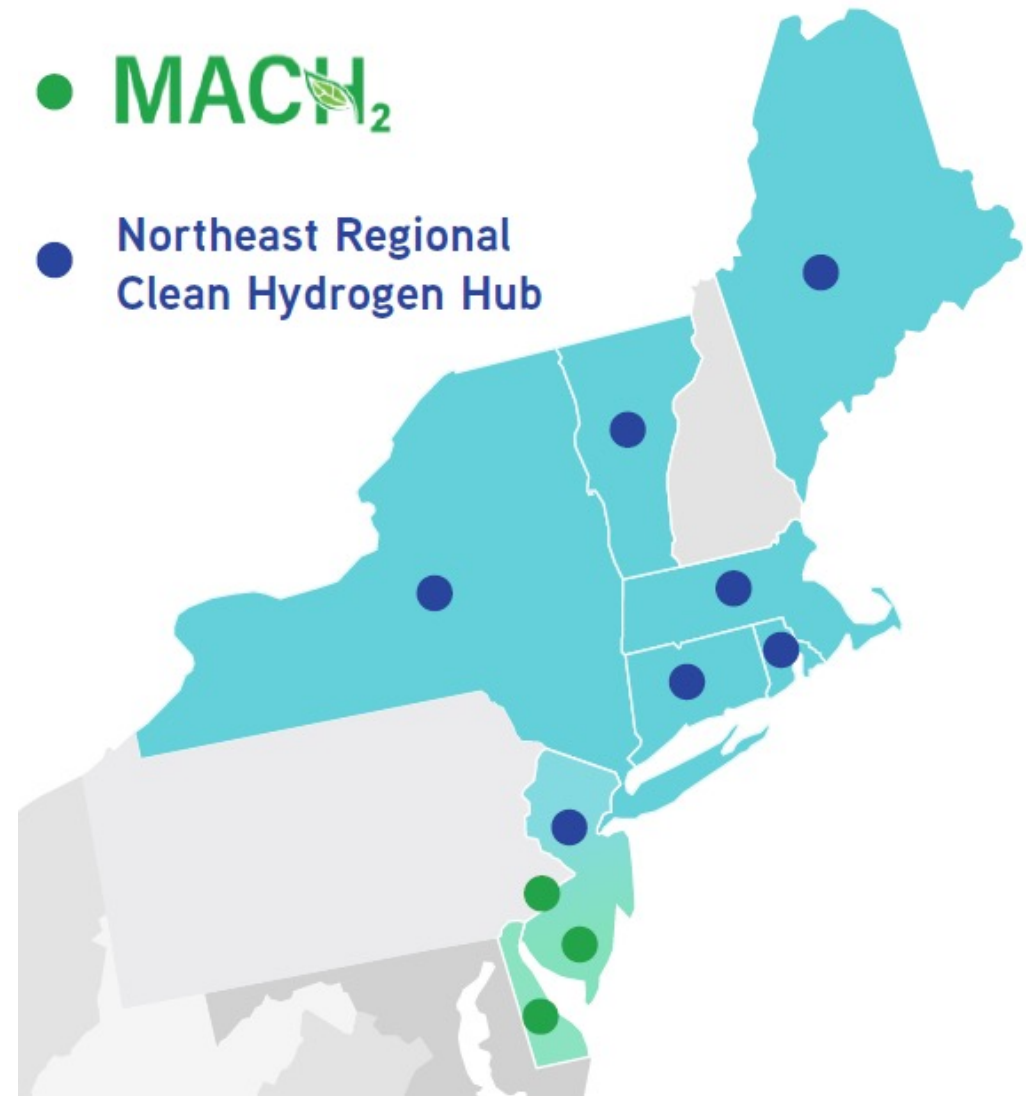


DOE Hydrogen Hubs

On October 13th, 2023, DOE announced the selection of seven (7) hydrogen hubs including MACH2. Although the Northeast Regional Clean Hydrogen Hub was not selected, PSEG continues to evaluate the feasibility of a North Jersey project.

Potential PSEG Projects

- Power Purchase Agreement with PSEG Nuclear Power assets and Hydrogen Producers
- Hydrogen Production – For refineries or other open markets
- Vehicle fueling stations – trucks at ports, large city vehicles, airport ground equipment



Hydrogen can help achieve NJ's decarbonization goals

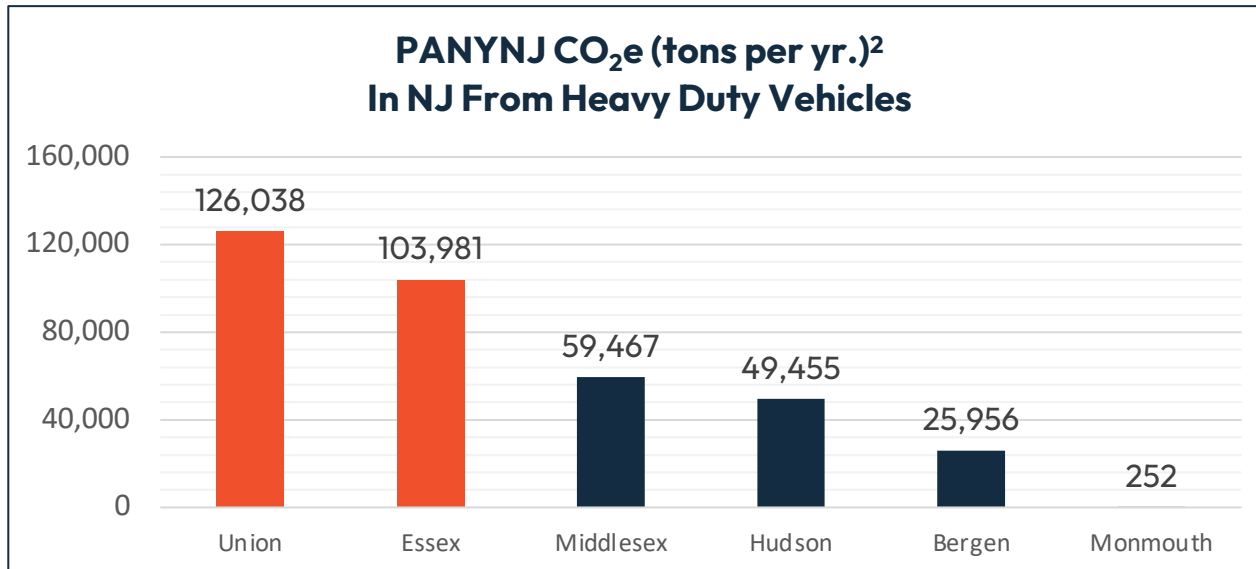
Sector	Current 2020 Inventory (MMTCO ₂)	Target 2050 Emissions (MMTCO ₂)	Reduction (%)
Transportation	34.1	5.4	84%
Buildings	23.1	2.7	88%
Electricity	18.8	0	100%
Industrial	7.2	6.7	7%
Landfills	5.7	4.9	14%

Global Warming Response Act requires the following emissions reductions by sector (based on the latest emissions inventory, published in 2022):

PSEG-North Jersey Hydrogen Project

...resulting in a meaningful reduction of CO₂ emissions in environmental justice communities...

- The Project is targeted to support over 1,000 drayage trucks and is expected to reduce CO₂ emissions from heavy duty vehicles supporting Port operations in NJ by approximately 25%
- The Project provides significant benefits to both **Essex and Union Counties**, which have high populations of overburdened communities. Over 63% of the Port Authority's total annual NJ CO₂ emissions from heavy duty vehicles are in these two counties
- Future expansion of the hydrogen production facility could lead to even greater emission reductions



¹ Assumes diesel HDV's traveling 200 miles/day, 6.5 mpg. Existing port CO₂ emissions in NJ from report below.

² Source: Report titled "Port Authority of New York and New Jersey Port Department 2021 Multi-Facility Emissions Inventory"

Hydrogen Drayage Truck Benefits

Hydrogen vs Electric drayage truck comparison

- Hydrogen refueling is 15 min compared to 8 -15 hours electric charging
- Hydrogen refueling infrastructure is not responsibilities of owners, while owners would be responsible for electric chargers
- Efficacy of a hydrogen drayage truck does not decrease as fuel is utilized, compared to electric which reduces as battery is depleted due to the added battery weight and less voltage available.

Community Impacts

- A 2020 New Jersey Environmental Justice Alliance study on Impacts of Mobile Source Emissions yielded higher rates of respiratory illness amongst local Newark communities¹
- Port of NJ recognized this impact and instituted a truck buy back program for lower emission vehicles
- Hydrogen drayage trucks would further reduce emissions on the impacted community

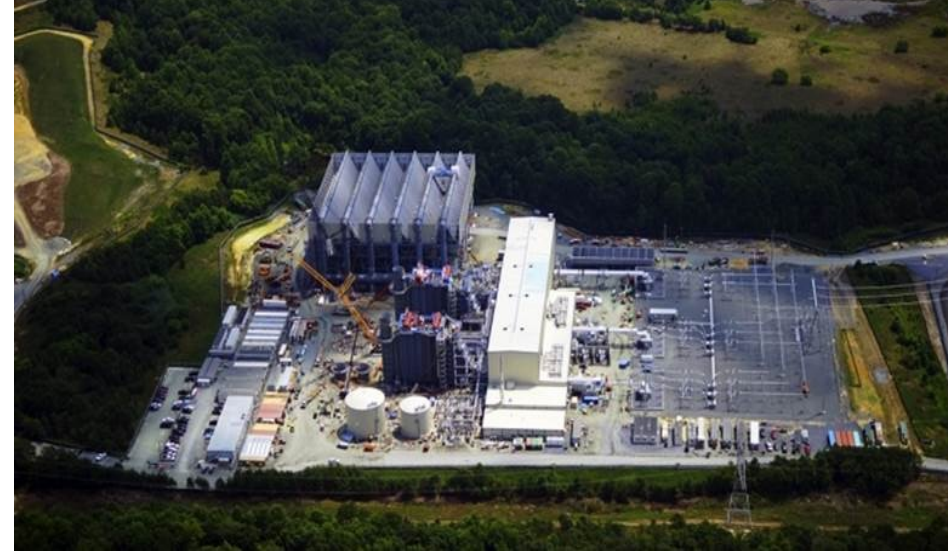
¹ https://www.njeja.org/wp-content/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf

PSEG Experience

PSEG has been working with hydrogen for more than 70 years without incident.

Hydrogen has the highest thermal conductivity of any gas and is used to cool very large turbine generators.

PSEG's hydrogen development team members designed, built, maintained and safely operated hydrogen systems at a variety of power plants.





 Thank
you