

Future of Carbon Policy
December 2019

*Power-to-Fuels:
Critical Path to Electrification and
Decarbonization*

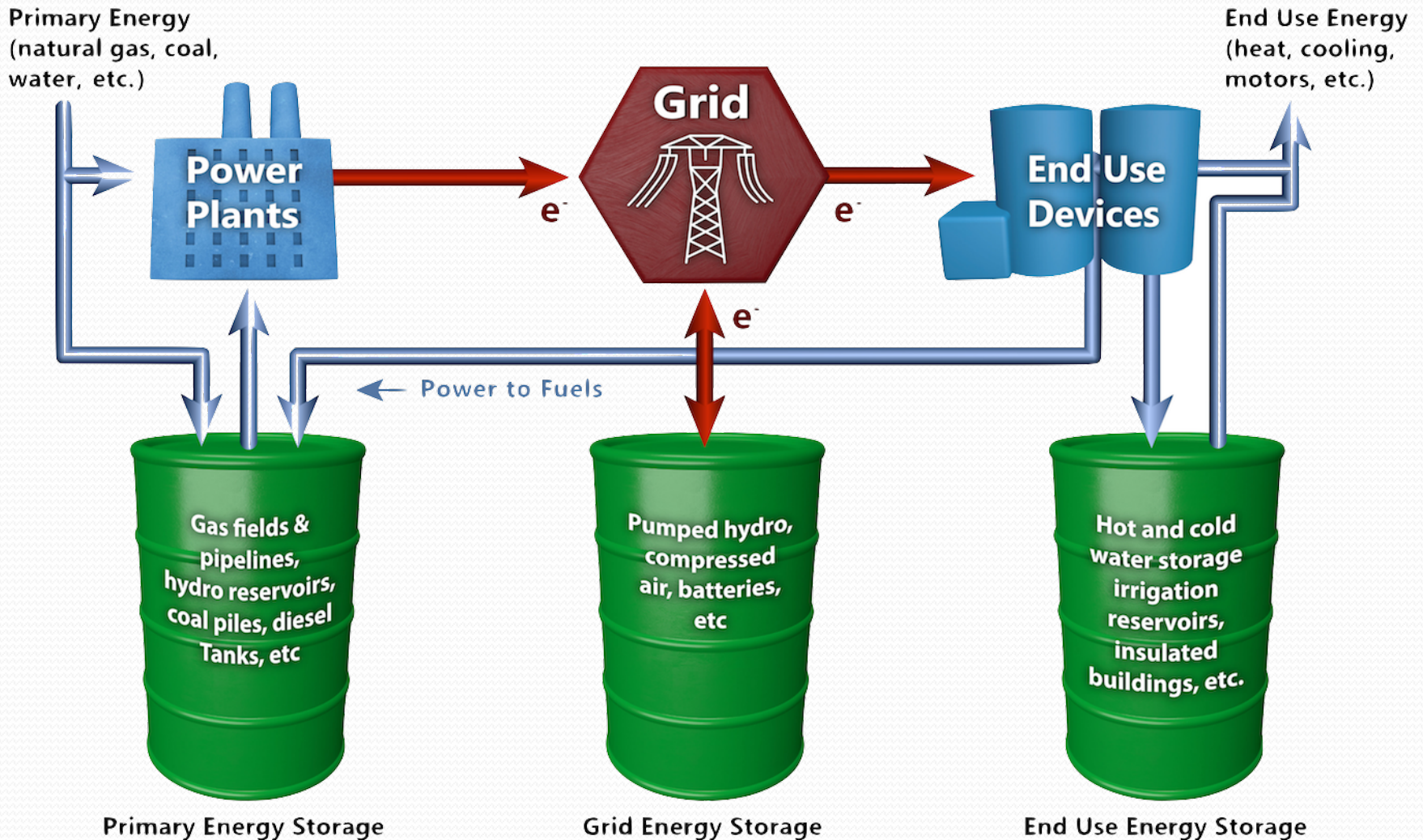
Renewable Hydrogen Alliance

Renewable Hydrogen Alliance

www.RenewableH2.org

- RHA is a trade association whose mission is to:
Promote using renewable electricity to produce climate-neutral fuels for reducing dependence on fossil fuels.
- Growing and diverse membership:
 - Electric and Gas Utilities
 - Electrolyzer Manufacturers
 - Hydrogen Transportation Manufacturers and Advocates
 - [Renewable] Energy Project Developers
 - Law Firms
 - Consultants
 - Clean Energy Advocacy Organizations

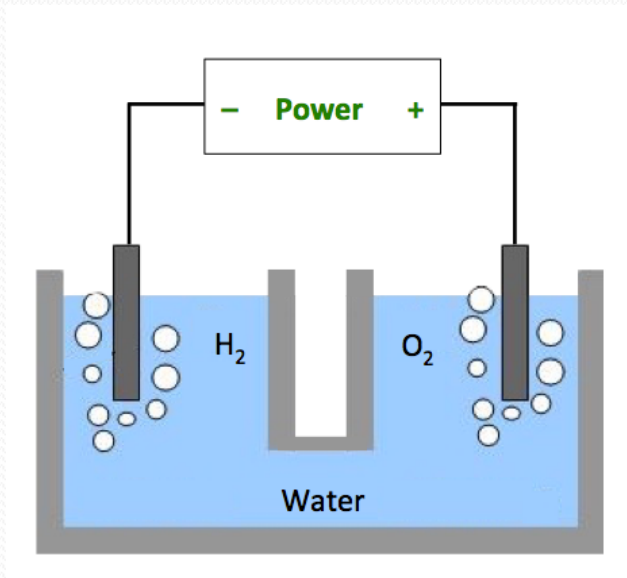
Broader View of Energy Storage



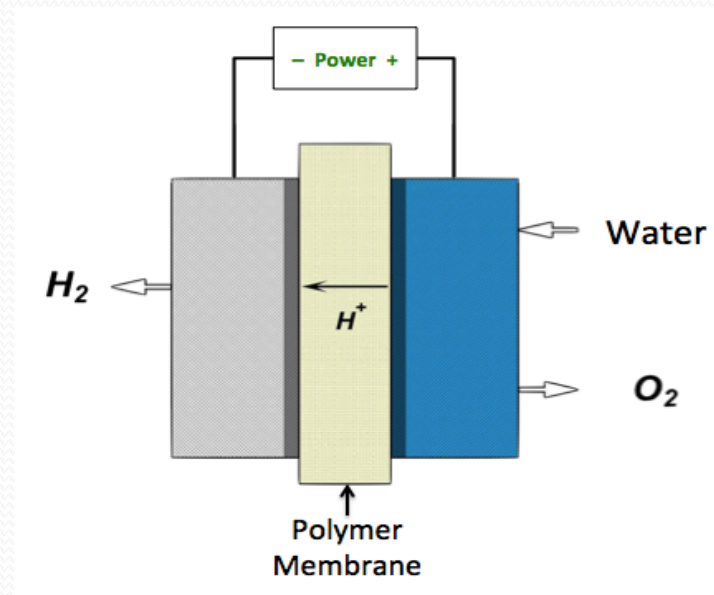
Technology Basics

- Electricity + water = hydrogen, oxygen and heat
 - Originally discovered 200 years ago!

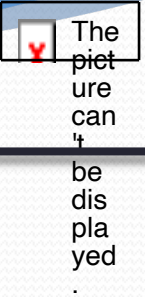
Alkaline



Proton Exchange Membrane (PEM)



Hydrogen Vehicles in the US Today



- 25,000 hydrogen forklifts in operation.
- 6,500 light duty passenger vehicles
- ~35 transit buses.
- Three heavy duty trucks by at least two manufacturers have been developed.
- San Francisco is building a hydrogen ferry.
- San Bernardino has ordered the first hydrogen locomotive.
- Zero Avia and others are developing hydrogen aircraft.

U.S. annual hydrogen production

10 million metric tons

Largest Users in the U.S.

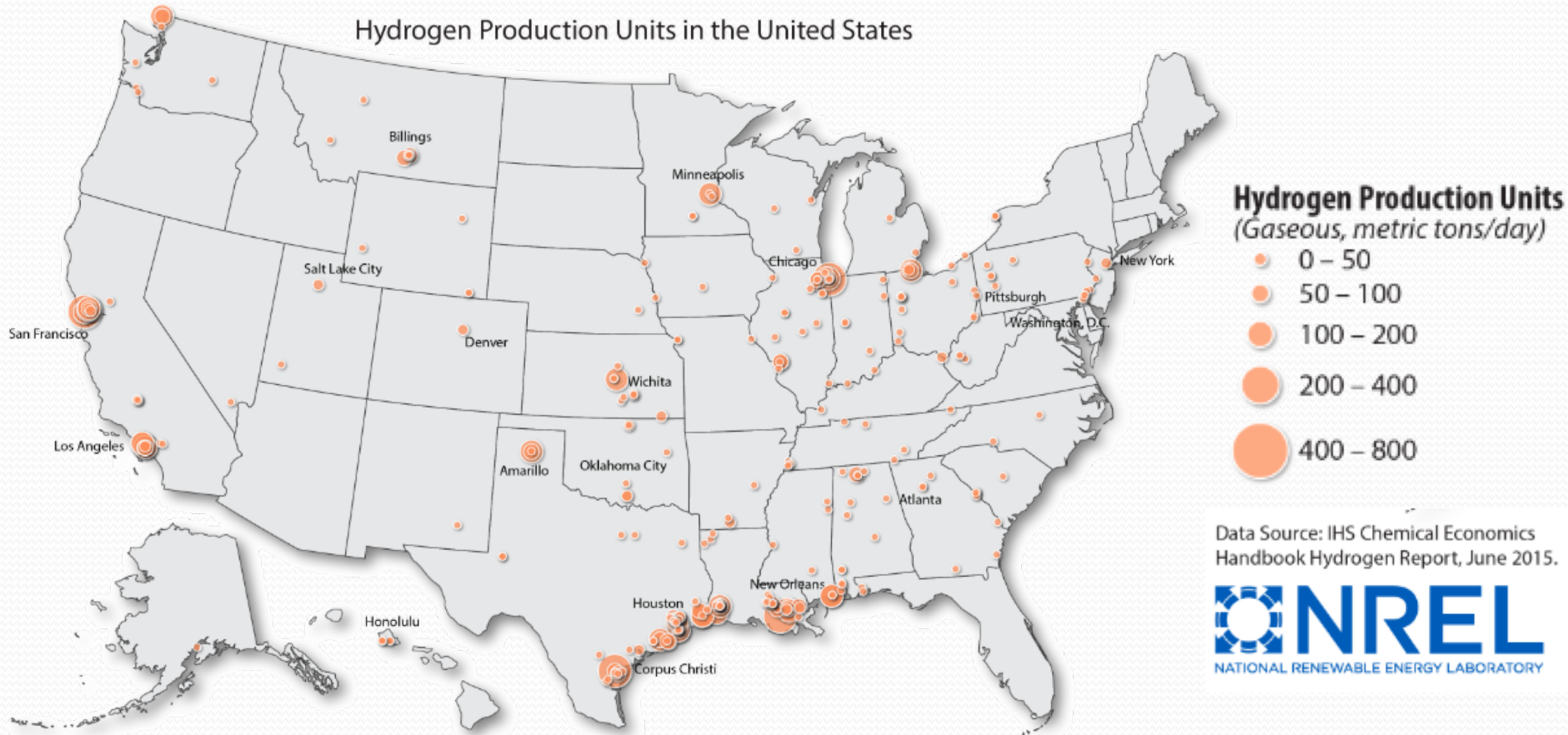
**Petroleum
Processing**

68%

**Fertilizer
Production**

21%

Hydrogen Production Units in the United States



Renewable Power to Clean Fuels Symposium 5/20/19

Some 160 attendees from at least 10 states, 2 provinces and 3 European Countries.



Thank You - Questions



Audi Car Company 6 MW e-gas plant in Germany, begun in 2013.