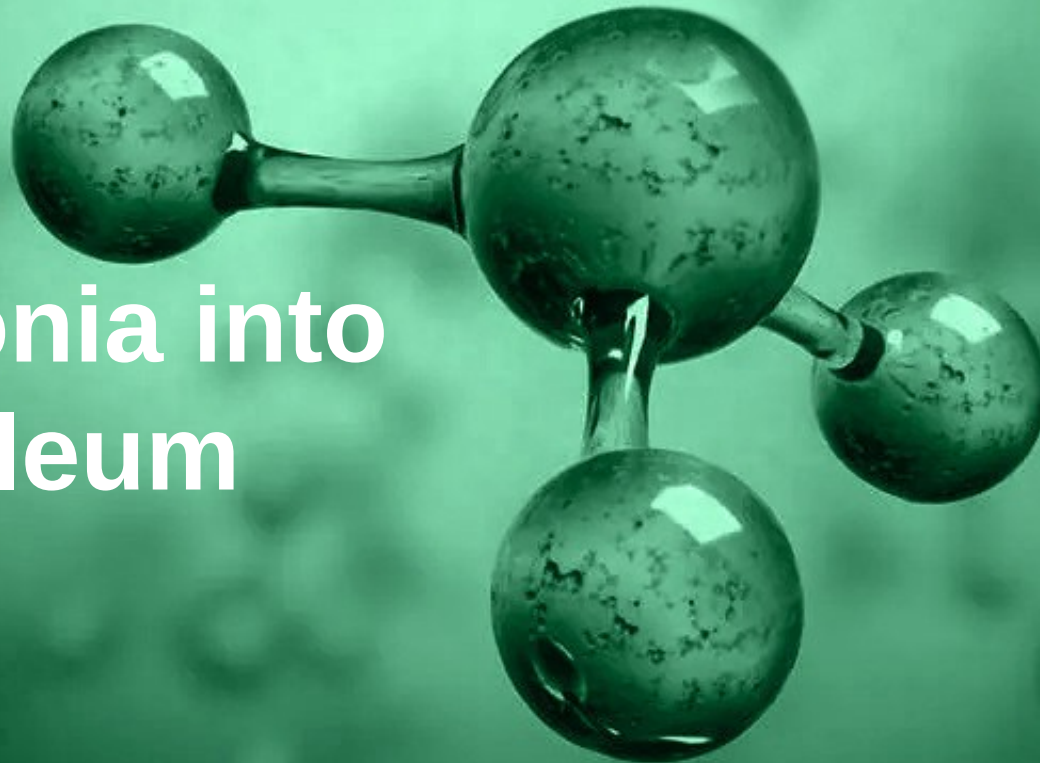




Starfire Energy

MAKING SUSTAINABLE ENERGY A REALITY

**Making ammonia into
the new petroleum**



November 2023



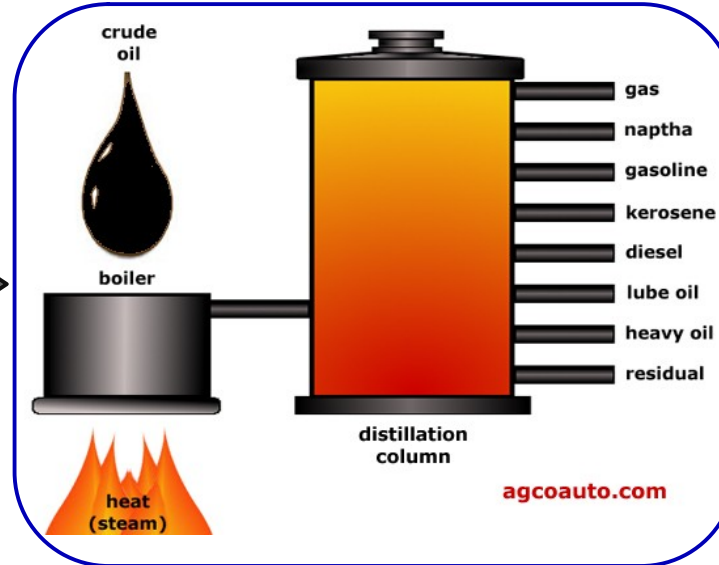
We can make ammonia into the carbon-free petroleum

Petroleum



- Easy storage
- Easy transport
- Lousy fuel

Refining



- Transform
- Blend together
- Better fuel

Gaseous fuels

Chemical feedstock

Liquid fuels



Rapid Ramp: ammonia fuel from renewable energy

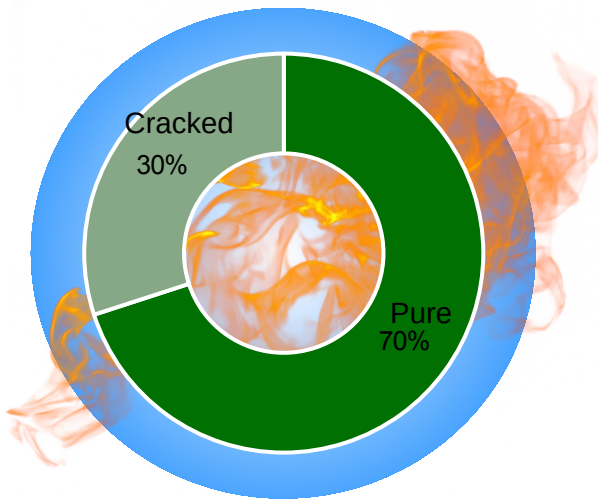
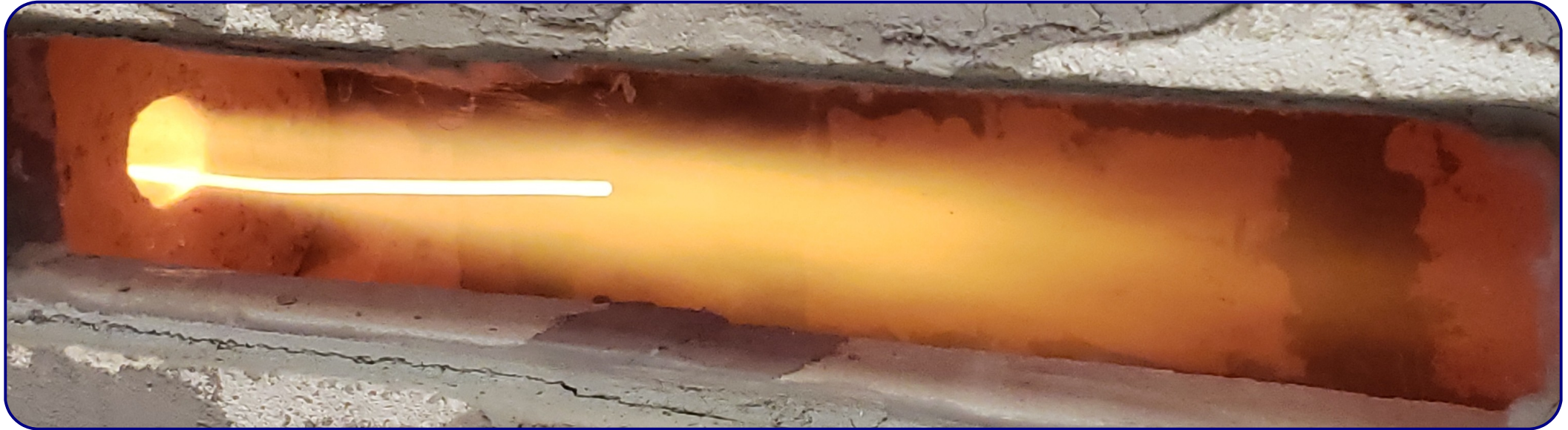


Benefits

- Thin film catalyst
- Advanced substrate
- Adsorption NH_3 harvest
- Electrolyzer pressure
- Fast 100% turndown
- Assembly line build



Prometheus Fire: burnable pure + cracked ammonia gas

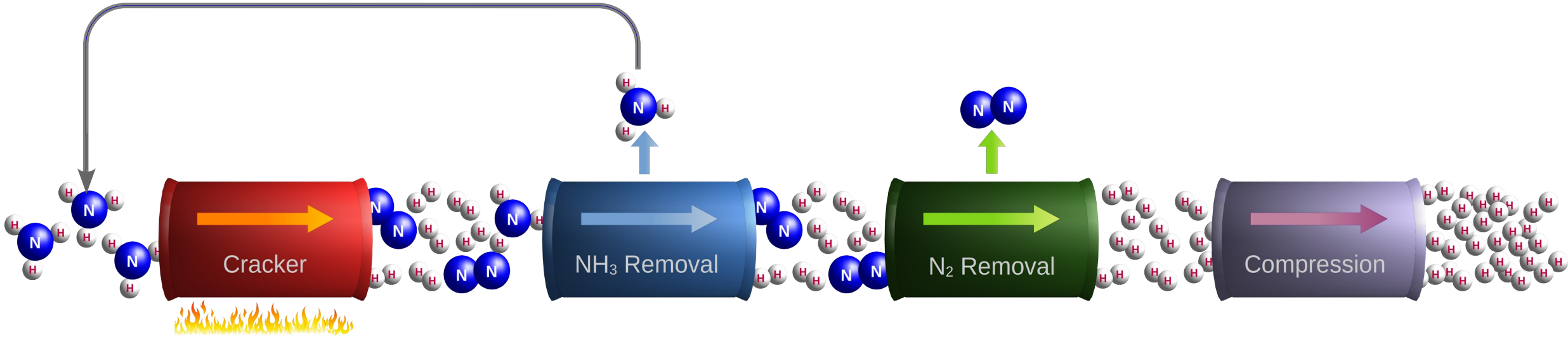


Benefits

- Carbon-free fire
- Thin film catalyst on nitride-resistant substrate
- Integrates into heat exchanger tubes
- High pressure cracking for turbines
- NO_x emissions similar to using methane



Prometheus Hydrogen: hydrogen from ammonia



Benefits

- Hydrogen delivery with ammonia's good logistics
- Thin film catalyst on nitride-resistant substrate
- Crack with either electric heat or ammonia combustion heat
- Residual ammonia removed and redirected to cracker
- No ammonia emissions to air or water



Gasoline is a highly engineered, multicomponent fuel

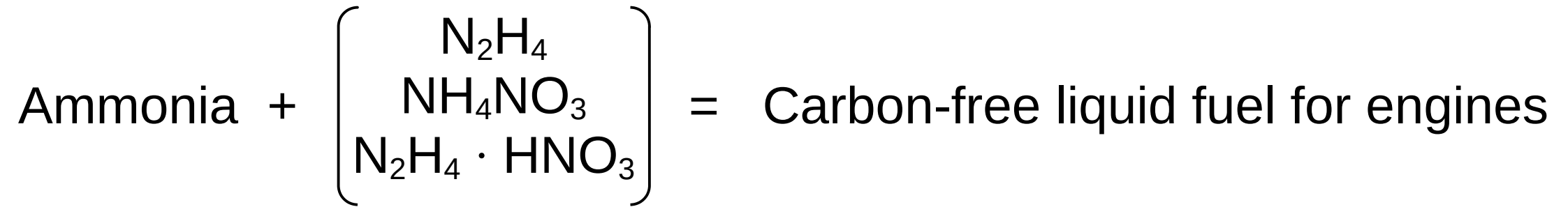


Gasoline

- 150 to 1,000 different chemicals
- Some left over from refining
- Some added to improve characteristics
- Why should carbon-free fuel be restricted to a pure single molecule?



Phoenix Fuel: an easily burned carbon-free liquid fuel



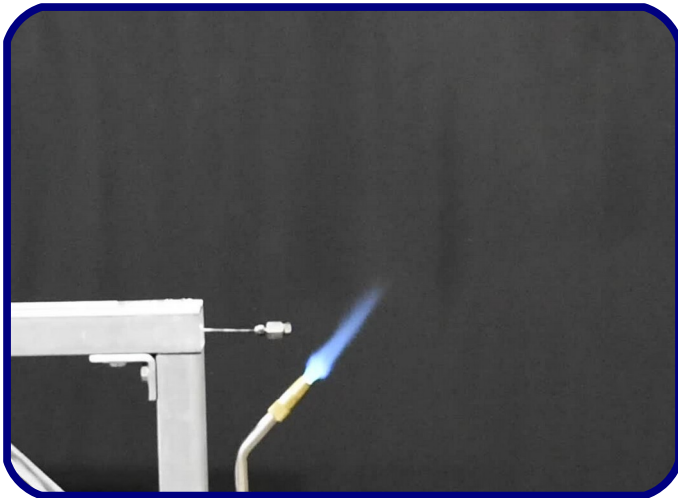
Benefits

- Carbon-free
- Liquid at direct injection pressures
- Combustion promoters ease ignition
- Oxygenators promote complete combustion



Phoenix blend lights right up in proof of concept

Test apparatus



- Pilot flame
- Fog nozzle
- Pressurized fuel supply

Ammonia



- Very little fuel ignition
- Ammonia odor

Phoenix blend



- Good fuel ignition
- No ammonia odor

Successful proof of concept!

Fire is fun



Next steps: implementation



Have this (converting now)



Want this (small turbine)

THANK YOU

I'm happy to answer questions later

