
SHEA
Southeast Hydrogen Energy Alliance

SHEA's Pursuits

Drive Innovation & Collaboration

Focus Areas:

- Connect members to opportunities by providing key connections and resources
- Create an environment conducive to startups of mature and nascent technologies
- Maximize hydrogen innovation through local, state, and federal investment dollars
- Highlight hydrogen businesses/ uses in a focused campaign for other businesses to join the region
- Make collaboration the way of business, not the exception, resulting in expansive commerce
- Creating an organization that is a tool for companies rather than an obligation to join

Increase Education & Awareness

Focus Areas:

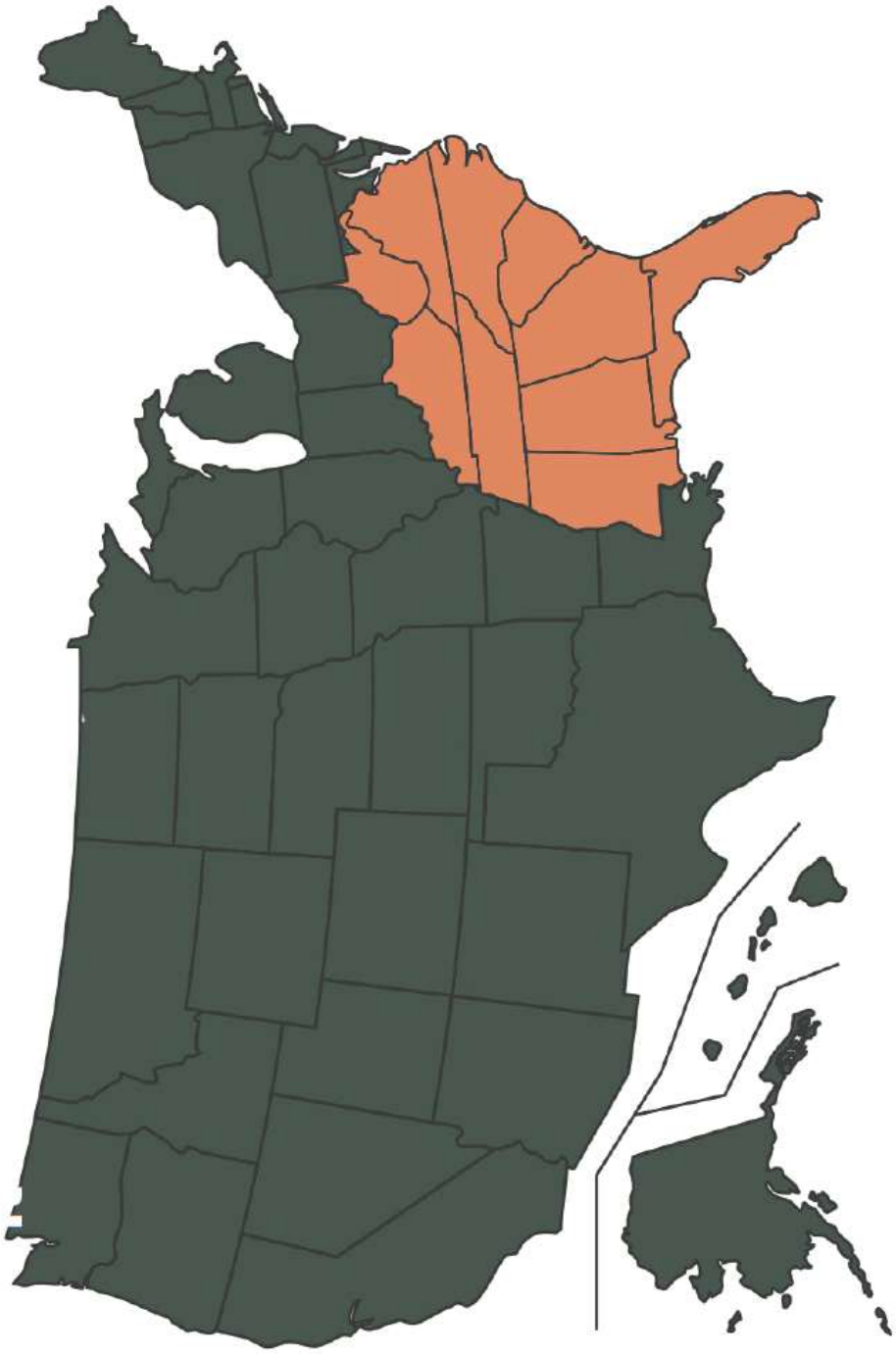
- Provide credible, trustworthy and transparent education on the hydrogen industry
- Train workforces of all sizes and backgrounds
- Partner with academia at each level of the education spectrum to create curriculum and opportunities to grow Hydrogen education
- Create partnerships with national labs
- Develop recognizable branding and marketing efforts
- Host, contribute, and attend educational webinars
- Launch educational and promotional campaigns to target specific areas and raise awareness

Enable Change & Adoption

Focus Areas:

- Partner with local and state governments to mobilize opportunities
- Establish connections with the Federal government where appropriate, including linkage to incentives and permitting opportunities
- Streamline hydrogen agenda across all 10 states and local municipalities
- Engagement directly with staff & membership
- Foster coordination across each state's key organizations, such as the Clean City Coalitions and the State Energy Offices
- Inform and uplift the Southeast communities about their key role in hydrogen development

SHEA's Geographical Footprint

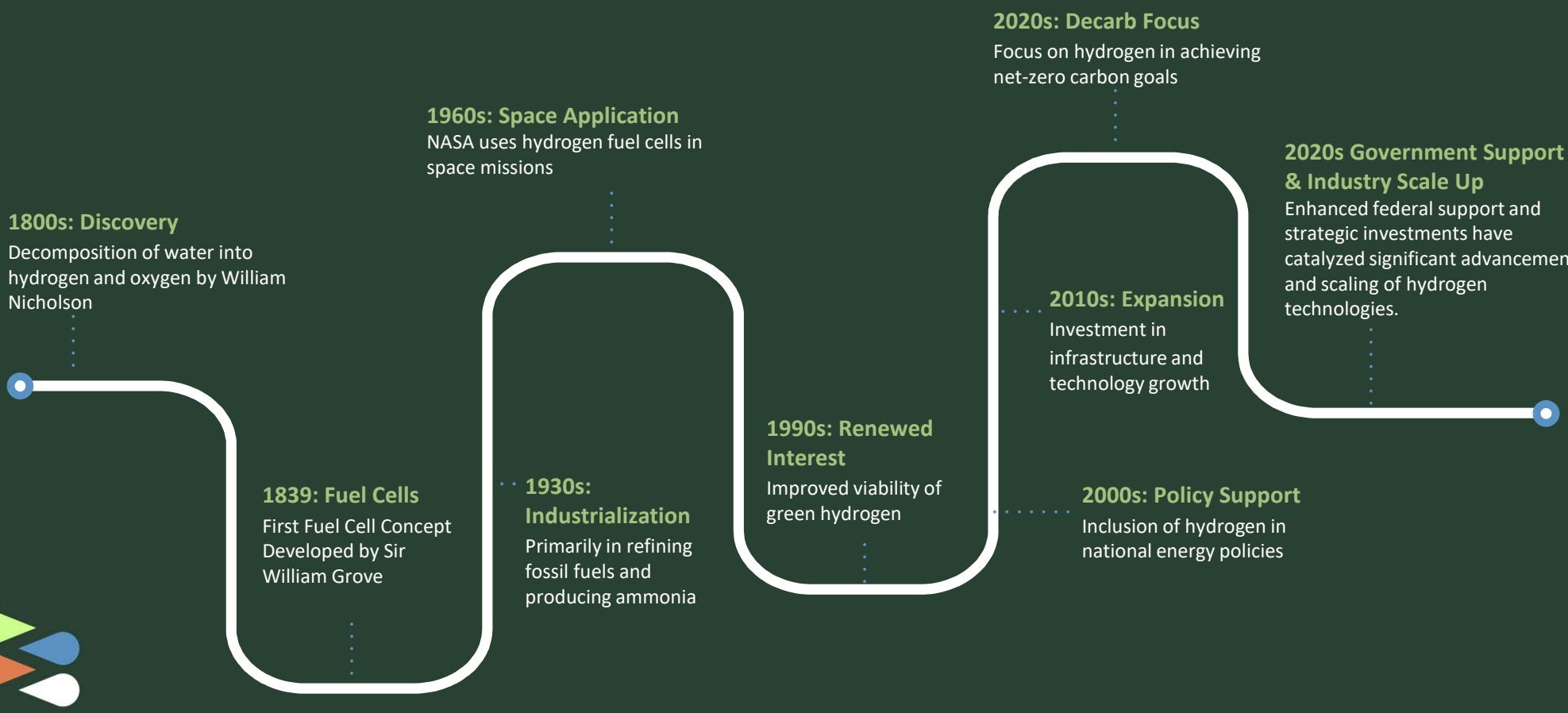


Headquartered in Nashville, TN

Hydrogen

History Basics Economics

Hydrogen: History



Hydrogen: Why Hydrogen?

Zero Emission

When utilized in fuel cells, hydrogen generates electricity, with only water vapor and heat as byproducts. This renders it a clean and environmentally friendly energy source, particularly in contrast to high carbon emitters that release greenhouse gases, contributing to environmental degradation.

Versatility

Hydrogen can be used in various sectors, including transportation, industry, and power generation. It can be used as a fuel for fuel cell vehicles, blended with natural gas for heating, or used in industrial processes such as refining and manufacturing.

Storage

Hydrogen can serve as a means of energy storage. Excess energy generated from renewable sources, such as wind or solar power, can be used to produce hydrogen through electrolysis. This hydrogen can then be stored and later used to generate electricity or power vehicles when renewable energy generation is low.

High Density

Hydrogen has a high energy density, which means it can store a large amount of energy in a small volume or mass. This makes it a potentially efficient energy carrier for applications where space and weight are critical, such as in transportation.

Minimal Output

Hydrogen provides an alternative to traditional high carbon-emitting energy sources, helping to diversify the energy mix and reduce dependence on non-renewable resources. This can contribute to energy security and mitigate the environmental impact of high carbon output from energy consumption.

Hydrogen: Basics & Production

Basics of Hydrogen

Hydrogen is the simplest and most abundant element in the universe, usually found combined with other elements in water, organic compounds, or acids. It's a colorless, odorless, non-toxic gas at standard temperature and pressure.

Hydrogen is not a primary energy source but an energy carrier. This means it can store and deliver energy in a usable form. It can be produced from various resources, including natural gas, nuclear power, biomass, and renewable power like solar and wind.

Understanding Hydrogen Safety

Hydrogen is as safe as other common fuels we use today. Like natural gas, gasoline, or propane, hydrogen has specific handling guidelines to ensure safety.

Hydrogen Properties

1. **Non-toxic Nature:**
   - Hydrogen is non-toxic, posing no health risks from poisoning, making it safer for use in populated areas compared to many conventional fuels.
2. **Rapid Dissipation:**
   - When released, hydrogen rapidly disperses into the atmosphere, reducing the risk of dangerous accumulations and facilitating safer handling and use.
3. **Lighter than Air:**
   - As the lightest gas, hydrogen rises and escapes quickly in open environments, minimizing the risk of sustained fires and explosions near the ground.

Safety Measures

1. **Advanced Detection and Control Systems:**
   - Hydrogen facilities are equipped with sophisticated sensors and automatic shutoff systems designed to quickly detect leaks and prevent accidents.
2. **Rigorous Safety Protocols:**
   - Operators follow strict safety protocols, including regular safety drills and compliance with annually reviewed and updated industry standards.
3. **Engineered Containment and Ventilation Solutions:**
   - Specialized containment measures and ventilation systems are designed to manage hydrogen safely, even in the event of a leak, ensuring that it is directed away from ignition sources.

Real-World Safety in Action

Historical Safety Record

1. Decades of use in industrial and space applications have demonstrated hydrogen's manageability and safety with proper protocols.
2. Fewer incidents on record compared to other fuels when adjusted for usage rate.

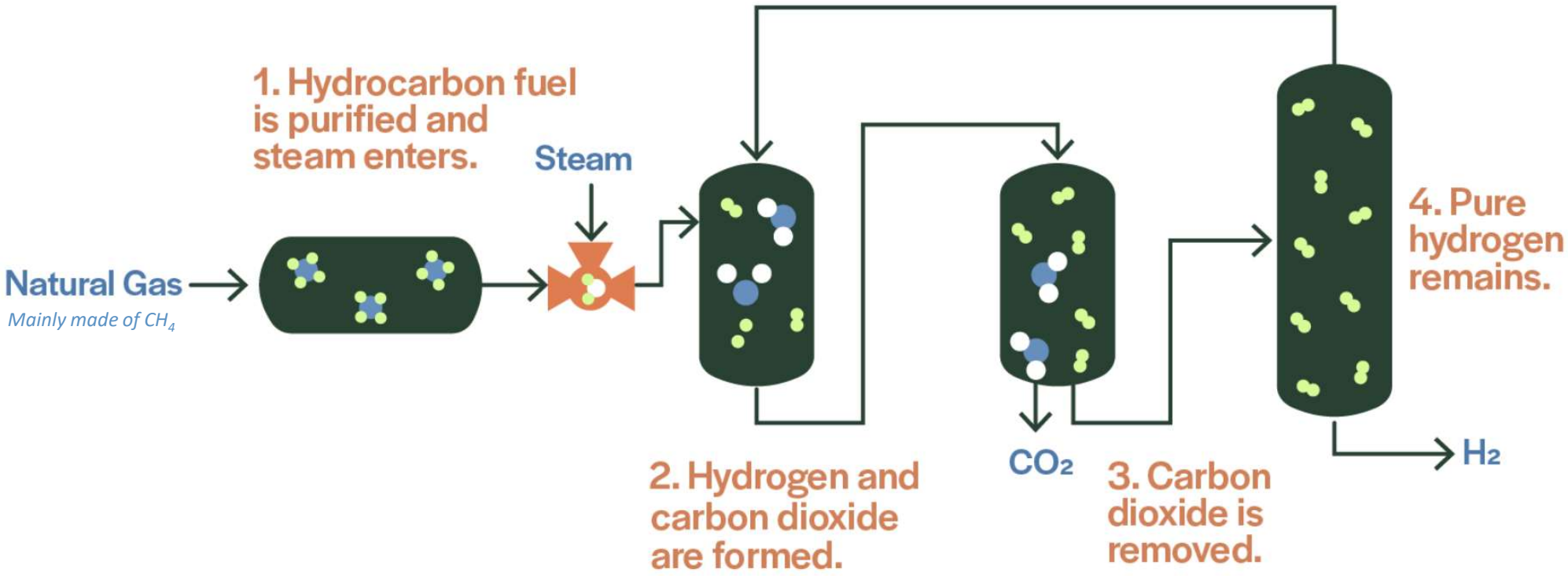
Current Applications & Safety Features

1. Today’s hydrogen buses and cars are equipped with multiple safety layers, including tank integrity sensors and automatic leak detection.
2. Emergency response teams are trained specifically for hydrogen-related incidents, ensuring community safety.

Public Confidence in Hydrogen

1. Surveys and studies show increasing public confidence in hydrogen technology, supported by ongoing safety advancements and transparent communication.

Steam Methane Reformation (SMR)



Hydrogen: Storage & Delivery Methods

Storage

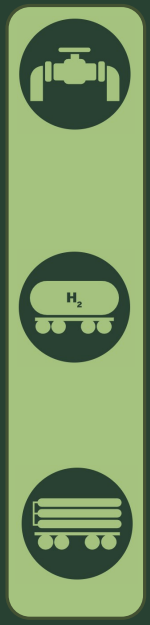
Geologically
Salt Caverns

Compressed
Stationary Tube Trailers

Liquid & Cryogenic
H2 becomes liquid at -421° F

Materially
Chemically bonded to materials that sustain dense hydrogen

Delivery Methods



Pipelines: There are approximately 1,600 miles of hydrogen pipelines across the U.S. Hydrogen can be blended into existing natural gas pipelines with modifications

Over the Road cryogenic liquid tanker trucks: These specialized vehicles are designed to transport liquefied gases at extremely low temperatures.

Over-the-road tube trailers: These mobile transportation units are equipped with high-pressure cylinders carrying compressed gases.

Hydrogen: Application

Fuel Cells: Converts chemical energy from hydrogen into electricity, powering everything from vehicles to buildings, with water as the only emission.

Industrial Processes: Used in refining, treating metals, and producing fertilizers.

Energy Storage: Acts as a buffer for renewable energy sources, storing excess energy and delivering it back when needed.

Combustion Engines: Hydrogen mixes with air and ignites like traditional fuels, producing high energy output and water vapor as the primary emission, offering a cleaner alternative to gasoline or diesel.

Data Centers: Use Hydrogen fuel cells to provide clean, reliable backup power, enhancing energy efficiency compared to traditional diesel generators.

Portable Power: Convert hydrogen into electricity for on-the-go energy solutions, emitting only water. (US Army)

Real World Application Deployments

Class 8 Fuel Cell Trucks

Class 8 fuel cell trucks are at the forefront of transforming the heavy-duty transport industry by using hydrogen to power long-haul operations with zero emissions. Companies like Nikola Motor and Hyundai are leading manufacturers in this space, developing advanced fuel cell technologies to increase the range and efficiency of these heavy trucks.

Fuel Cell Transit Buses

Fuel cell electric buses have been in operation across the United States for over a decade, demonstrating the viability and durability of hydrogen-powered public transportation. Currently, there are hundreds of these buses deployed in various cities, providing daily service and showcasing the longstanding commitment to hydrogen fuel technology in transit systems.

Fuel Cell Forklifts

Fuel cell technology is revolutionizing the material handling industry by powering forklifts, offering increased efficiency and zero emissions in warehouses and distribution centers. Companies such as Plug Power and Toyota Material Handling are leading the way in manufacturing fuel cell forklifts, enhancing operational productivity with faster refueling and longer run times compared to traditional battery-powered forklifts.

Light Duty Fuel Cell Electric Vehicle (FCEV)

Light-duty fuel cell vehicles are being developed to offer sustainable transportation solutions with zero tailpipe emissions for lighter commercial activities. Manufacturers like Toyota and Hyundai are at the forefront, producing vehicles like the Toyota Mirai and Hyundai Nexo, which combine the efficiency and quick refueling capabilities of hydrogen with the versatility needed for light-duty tasks.

Additional Applications: Hydrogen 101 - SHEA (seh2.energy)

Challenges of Energy Evolution

Progress has been made, but challenges do exist in the early stages

Development & Generation

Advancing and scaling up new technologies such as hydrogen production, energy storage, and electric vehicle infrastructure.

Construction & Improvement

Upgrading and expanding existing energy infrastructure to accommodate renewable energy sources and new technologies.

Approval & Distribution

Securing investment and funding for large-scale projects and ensuring cost competitiveness of new technologies.

Governing & Support

Developing supportive policies and regulations to encourage clean energy adoption and managing the phase-out of fossil fuels.

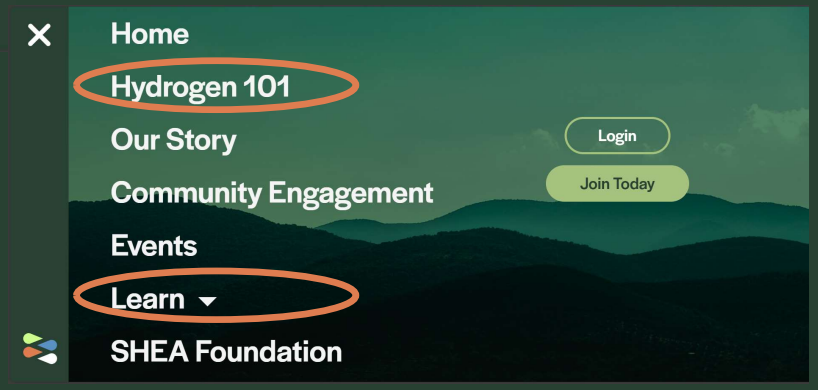
Behavior & Transformation

Gaining public support for new energy projects and managing the transition for workers from traditional energy sectors to new, sustainable industries.

Tools to Learn & Grow

Tools to Learn & Grow

www.seh2.energy



Hydrogen 101 – learning tools and printable PDFs

Learn – Resources & News: updated weekly

SHEA

Southeast Hydrogen Energy Alliance

Find out more:

www.seh2.energy

learnmore@seh2.energy

Proposed Pooler, GA Hydrogen Production & Fueling Facility

Discussion points

- Who is HydroFleet?
- Hydrogen (H2) fleets in operation today
- Proposed HydroFleet Pooler facility
- HydroFleet hydrogen production method
- Safety, environmental, & roadway overview
- Open Q&A session

Who is HydroFleet?

Specialized hydrogen leasing company

- HydroFleet provides an “All-In” lease that includes the entire hydrogen ecosystem for heavy truck and forklift fleet users. Our lease bundles the hydrogen truck fleet, hydrogen fuel, and maintenance.

Committed to clean energy transition

- Founded in 2016, HydroFleet’s mission is specifically focused on decarbonizing industrial forklift and heavy truck fleets for long-term sustainability

40+ years of hydrogen experience

- HydroFleet’s leadership team has extensive experience and knowledge in all aspects of the hydrogen industry.

HydroFleet's market approach

Fleet users want hydrogen

- HydroFleet solved a very challenging industry problem. Fleet users wanted zero emission fleets - but struggled to effectively source the entire hydrogen ecosystem at an affordable price.

Match hydrogen supply with demand

- HydroFleet produces "ready to use" high pressure gaseous hydrogen fuel either onsite, or delivered, for end-user fleets.

HydroFleet delivers H2 fuel everyday

- To date, delivered over 450,000+ kg of high-pressure, ready-to-use, gaseous hydrogen fuel to end user fleets.

Partnerships are key to our success

- HydroFleet works closely with leading hydrogen manufacturers, engineering firms, safety consultants, state and local officials to provide our entire hydrogen ecosystem to end user fleets.

Benefits for hydrogen fleets

Hydrogen fleets are quiet

- Hydrogen powered fleets (forklifts, passenger vehicles, heavy trucks) are simply electric vehicles that are powered by a hydrogen fuel cell – instead of a battery. Quiet, efficient, and low maintenance.

Quick fueling, long range

- Hydrogen powered fleets can be filled quickly, have long ranges, and they don't have locate a charger.
  - H2 heavy trucks: fill time 20-30 minutes, range 450-500 miles.
  - H2 passenger vehicles: fill time 5-7 minutes, range 400-450 miles.
  - H2 forklifts: fill time 3-5 minutes, range 8-12 hours run time.

Zero Emission Fleets

- Forklifts: 7 metric tons of CO_2 emissions removed annually by replacing one propane powered forklift with hydrogen.
- Heavy trucks: 400+ metric tons of CO_2 emissions removed annually by replacing one diesel powered Class 8 heavy truck with hydrogen.

Hydrogen fleets in operations today

H2 Forklift Fleets

Hydrogen powered forklift fleets have been deployed for years. Over 80,000 units are in operation at customer sites across the US. A few examples:

- Amazon distribution centers across North America
- Mercedes manufacturing operations (Tuscaloosa, AL)
- Volkswagen manufacturing operations (Chattanooga, TN)
- BMW manufacturing operations (Spartanburg, SC)
- Walmart distribution centers across North America
- Whirlpool (Cleveland, TN)
- General Motors (Springhill, TN)

H2 On-Road Fleets

Hydrogen fuel cell on road fleets (vehicles, buses, heavy trucks) are a growing trend across the US today

- 18,000+ hydrogen powered passenger vehicles operating in the U.S.
- 370+ hydrogen powered buses operating in the U.S.
- 200+ hydrogen powered heavy trucks operating in the U.S.
- 21+ hydrogen powered heavy trucks in greater Savannah, GA (currently refueled by mobile H2 refuelers)

Proposed HydroFleet Pooler Operations

SPLCIII (Morgan Container Facility)
500 Seabrook Parkway
Pooler, GA 31322

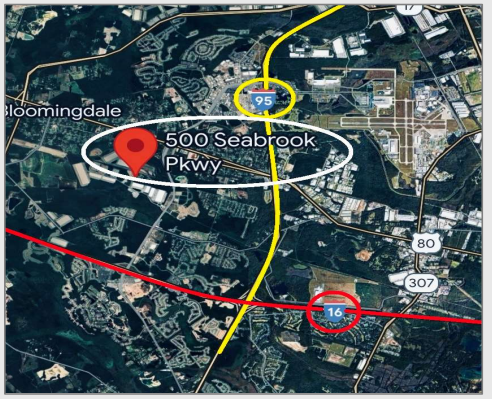
HydroFleet Pooler Overview

Ideal location for H2 production and fueling

- Proximity to I-16, I-95, and the Savannah port for current and prospective fleet users
- Ability to expand operations from 1,200 kg to 4,200 kg H2 daily fuel production

Site compatibility

- Existing PUD zoning
- Site already improved as a paved trailer yard - including existing egress/ingress, private road, and proximity to utilities with sufficient capacity



HydroFleet Pooler Overview

HydroFleet hydrogen operations

- Produce, store, and dispense H2 fuel for local hydrogen heavy truck fleets (onsite)
- Transport H2 fuel to regional hydrogen fleets for their needs (offsite)

Hydrogen production capacity/day

- Initial: H2 fuel production - 1,200kg daily
- Future: H2 fuel production - 4,200kg daily
- H2 production hours: Continuous 24/7/365

Hydrogen truck refueling capacity/day

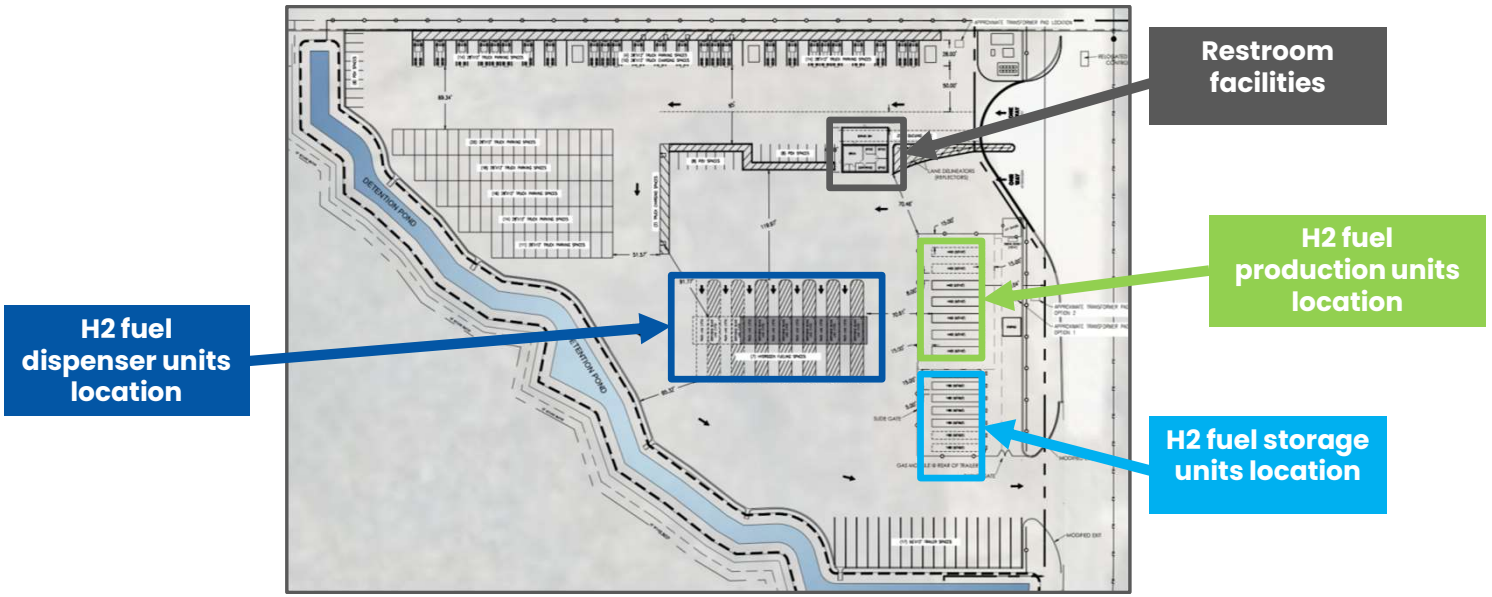
- Initial: 21 truck fleet, avg. 8-11 trucks daily (avg. 1 truck/hr)
- Future: 100 truck fleet, avg 33-50 trucks daily (avg. 3-4 trucks/hr.)
- H2 refueling hours: 7:00 AM – 7:00 PM, Mon-Sat

HydroFleet onsite H2 production & fueling station. Site rendering, not actual.

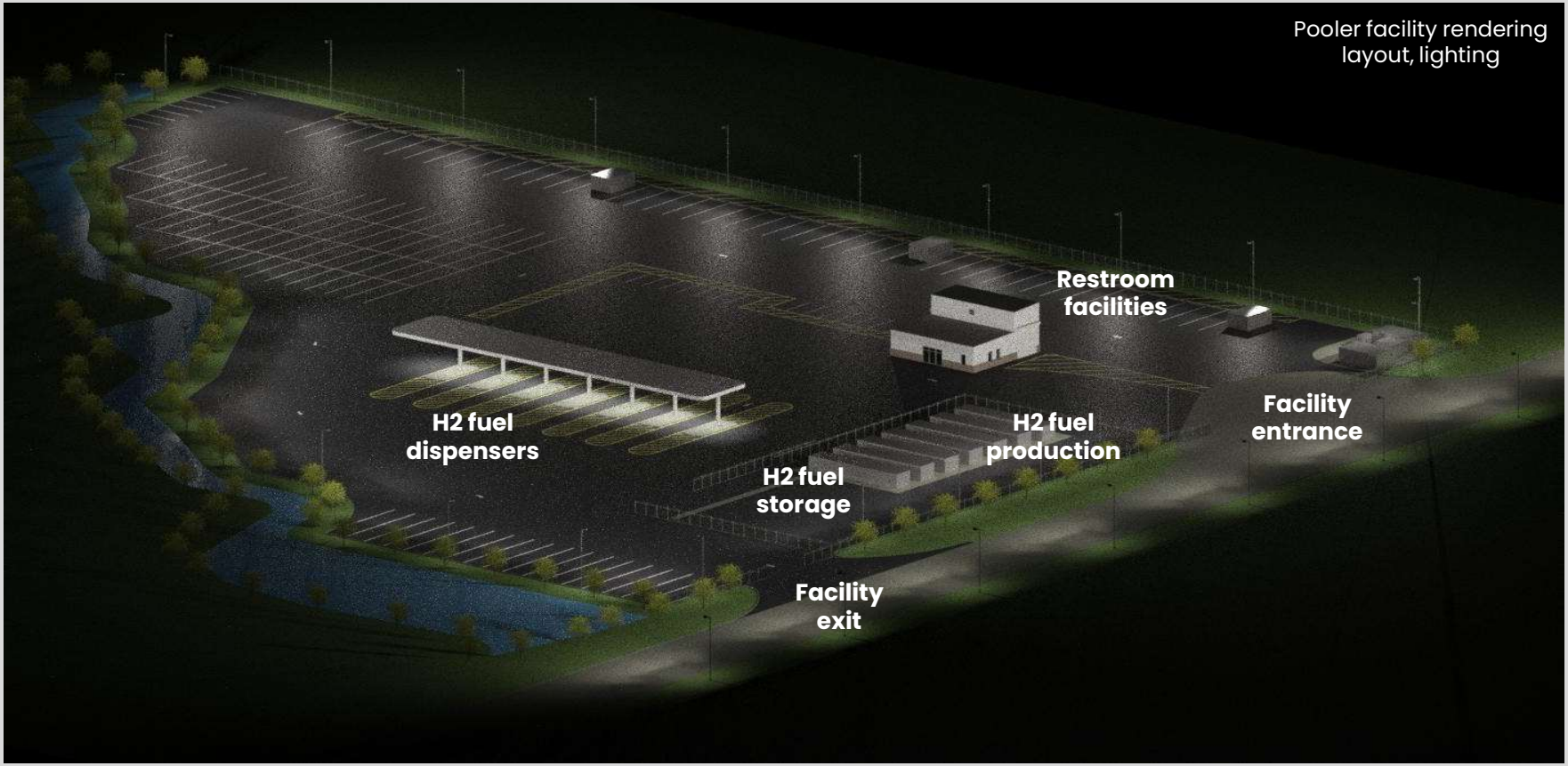
HydroFleet Pooler Overview

Hydrogen facility components / layout

- H2 fuel production units: initial (2) units, future (7) units
- H2 fuel storage units: initial (2-4) units, future (7) units
- H2 fuel dispenser units: initial (2) units, future (7) units
- Restroom facilities



HydroFleet's Pooler Facility Overview



HydroFleet H2
Production Methods

H2 Fuel Production Method

Hydrogen production technology

- HydroFleet utilizes a small scale, modular H2 fuel production system manufactured by key partner OneH2, Inc.
- Autothermal Reformation (ATR), a variation of Steam Methane Reformation (SMR), is an energy-efficient, alternative reforming process, with increased reliability
- Each production system produce 600 kg of ready-to-use, gaseous hydrogen fuel per day

Proven technology

- SMR technology has been the dominate method for hydrogen production for 70 years. Specifically, ATR technology has been in use since the late 1950s
- Proven, tried and true, is extremely safe
- Hydrogen only fuel that can be dispensed inside facilities

HydroFleet's H2 Production System

H2 Production is small scale, modular, adaptable

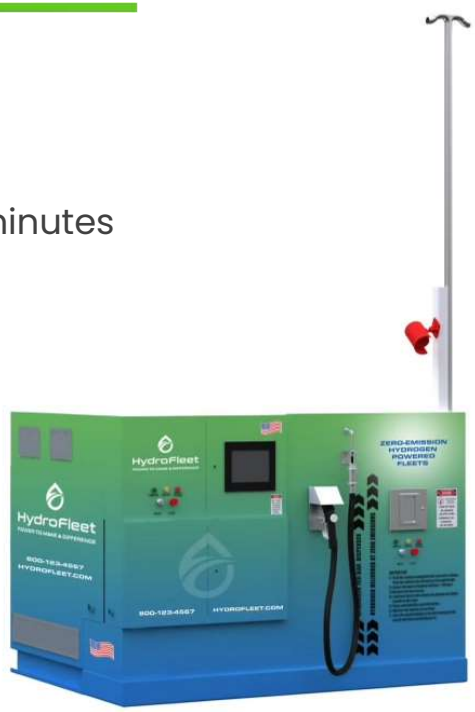
Each small scale, modular H600 H2 fuel production system is comprised of 4 modules.
One production unit is 53' x 10' (fits on the back of a flatbed truck)

C600 MODULE	P400 MODULE	R600 MODULE	W600 MODULE
Compresses gas received from 200 PSIG up to 14,500 PSIG. Interfaces with H2 storage modules.	Purifies gas received from R200 to 99.999% purity and conformance with SAE J2719 standard.	Combines purified water & and natural gas to generate low pressure impure H2 gas.	Purifies and stores water ready to generate H2 gas. Waste water is clean, deionized.

HydroFleet's H2 Storage & Dispenser

H2 storage & dispenser

Onsite H2 production fuel is transferred to mobile storage units.
H2 dispenser units then fill trucks on-demand. Fill times vary from 20-30 minutes



M400 H2 STORAGE TRAILERS
Store 400 kg gaseous H2 fuel

D700 H2 DISPENSER UNITS
Fill time 20-30 minutes

Safety, traffic, & environmental overview

H2 Production Safety Features

Safety is paramount

HydroFleet's H600 H2 production system meets all stablished state, federal, and institutional guidelines for safety-related handling issues for producing, transporting, and dispensing hydrogen.

Built-in safety mechanisms

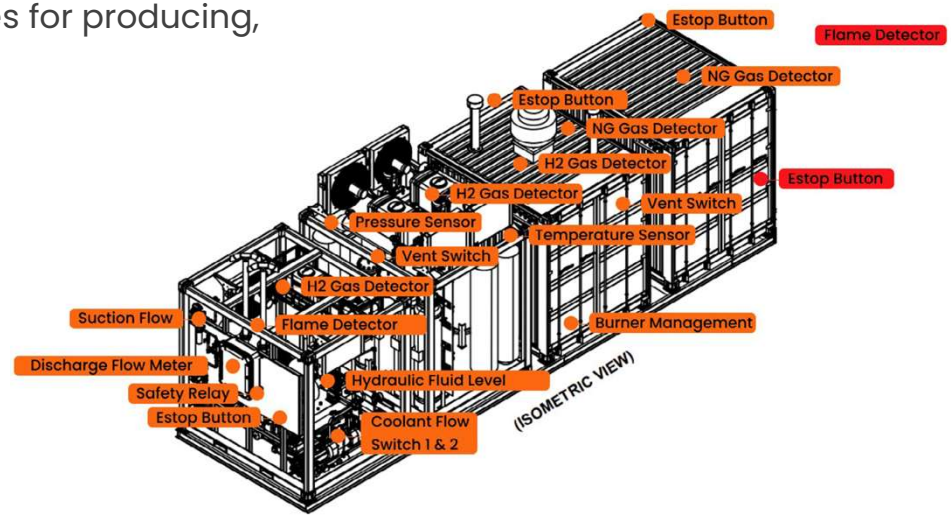
Should the H600 H2 production system experience a maintenance related failure, built in safety mechanisms include:

E-Stops

- Master and remote E-Stop for Operator intervention that directly connects to Master Electrical 480 VAC panel.
- Five (5) highly visible emergency stops per H600 System - one (1) per module and a master stop.

Safety Interlocks

- Multiple levels of safety interlock relays terminate power to the equipment and can be triggered locally or remotely.
- There are individual (local) safety relays on each module plus a master (global) safety interlock relay.



H2 Production Safety Features

Safety by design

HydroFleet works closely with engineering, safety, and local municipalities for permitting and meeting fire codes. Remote web monitoring; The H600 system is remotely monitored by OneH2, Inc. at their North Carolina operations headquarters.

Built-in safety mechanisms

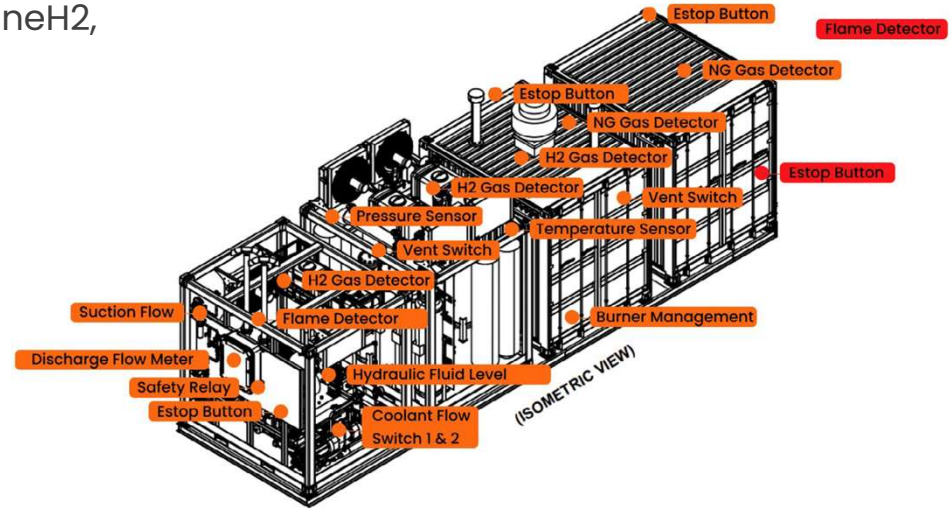
Should the H600 H2 production system experience a maintenance related failure, built in safety mechanisms include:

Sniffers/Sensors

- Sniffers, sensors, and other hardware and software monitor and manage safety, and use built-in redundancy (i.e. multiple sensors or sensors with similar/overlapping functions and detection areas).

Vents and Leak Detection

- Vent masts that release above the grade connect to pressure release devices that automatically shut down or vent.

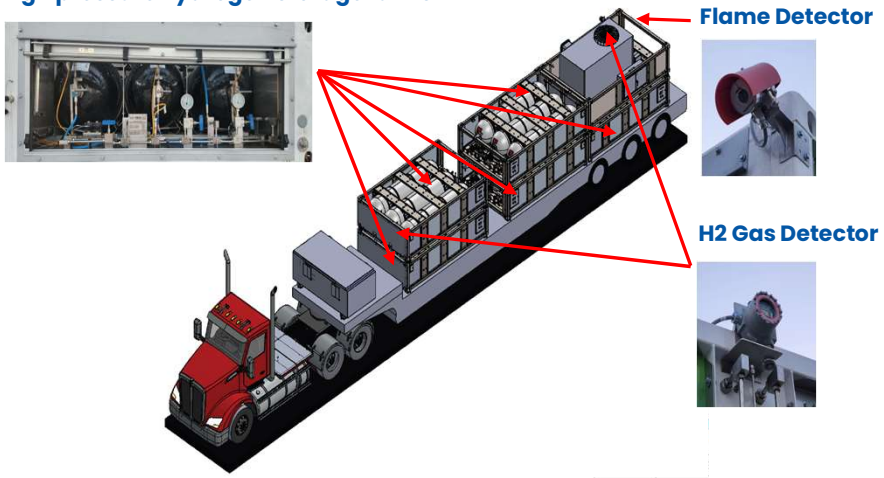


H2 Storage & Dispensing Safety

Storage

- For operational flexibility, the hydrogen storage system is a mobile (trailer mounted) solution, even when used in a fixed location.
- The storage system integrates with the global safety system and also has safety features built into the technology.

High pressure hydrogen storage tanks



Flame Detector

H2 Gas Detector

Dispensing

- Dispensing systems are configurable to 350 bar (forklifts) and 700 bar (truck and/or automotive over-the-road applications) pressure standards.
- The dispensing systems integrate with the global safety system systems and also has appropriate, individual safety features.

Gas Sensor
Alerts of hydrogen gas leak. The sensor adds an extra layer of protection for detecting odorless, colorless hydrogen.

E-Stop
Emergency stop button with secondary reset to be used in the vent of an emergency to manually activate the emergency shutdown response.

Flame Detector
Provides rapid and reliable flame detection for a hydrogen fire. The dispenser shuts down into safe mode if a flame is detected and activates an alarm

Safety Relays
Internal safety relay inside the hydrogen dispenser initiates a reliable response if an error occurs and reduces risk by halting the machines operation.

Pooler Facility's Safety Procedures

Safe Operations

HydroFleet takes numerous steps to ensure safe operation at each facility.
At the Pooler Facility, standard operating safety procedures include:

- Securing the hydrogen production and storage area
- Providing safety and operations manuals for all equipment
- Providing comprehensive training to authorized personnel, including for necessary actions to take in the event of an emergency like the operation and activation of emergency controls
- Only allowing authorized personnel to access the hydrogen production and storage area and to operate and service equipment
- Conducting regular equipment inspections and maintenance.

Emergency Response

- Prominently displaying NFPA 704 and other applicable safety signage up
- Preparing (and regularly reviewing) an emergency response plan ("ERP")
- Coordinating with the local fire department and landlord to ensure that a pre-determined action plan can be implemented should the need arise
- Providing facility and equipment overviews to fire department and emergency response personnel prior to operation as well as follow up overviews once a year for any new fire department or emergency response providers.

Pooler Facility's Environmental Impact

Natural Gas

- Primary input for H2 production is natural gas.
- It takes 11-12x more electrical energy to produce hydrogen with grid electricity than with natural gas.

Water/Sewer

- Daily water use is equivalent to about 20 average US households or about 1/3rd of an average swimming pool volume.
- Released water is clean - high enough quality that it could release into stormwater rather than sewer.
- Dilution (no negative impact to treat). Opportunities for water re-use.

Electricity

- Electricity use is low by industrial standards (equivalent to a small manufacturing facility) as it runs the control systems and not the hydrogen production process.

Noise

- Production equipment noise is 72 decibel at 20 feet which is equivalent to a loud conversation or a vacuum cleaner.
- Facility abuts the Genesee & Wyoming rail line.

Air Quality

- H600 H2 production system creates very low emission amounts.
- H600's contribute about the equivalent of a modern emissions compliant diesel tractor with after treatment.

Pooler Facility's Roadway Impact

Roadways and Traffic

- Low Volume - initially 7-14 trucks refueling/day, and future state 33-50 trucks refueling/day at capacity.
- Trailer yard scope: 1,075 containers stacked over 425 container spots + 101 trailer parking spots.

Clean Fleet Transition

- Replacing existing, local diesel truck fleets with a clean tailpipe (exhaust-free) solution as opposed to adding new truck fleets to Pooler and the greater Savannah area.
- With 21 H2 heavy trucks, 8,400+ metric tons of CO_2 emissions removed annually by this fleet replacing equivalent diesel-powered fleets. Future state, 100 H2 truck fleet will remove 40,000+ metric tons of CO_2.

Reduced Noise

- Hydrogen-powered trucks are electric, powered by hydrogen fuel cells.
- H2 trucks are nearly silent because there is no diesel engine.

Closing Comments

CAPITAL
DEVELOPMENT PARTNERS

THANK YOU!

Q&A