



 **HYDROGEN  
TECHNOLOGIES**

ADVANCING THE ENERGY TRANSITION

TSXV: JEV | OTC: JROOF | FRA:JLM

Q4 2024



## FORWARD LOOKING INFORMATION AND STATEMENTS

- Presentation and Reader Advisory

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THE PROBLEM WITH TRADITIONAL COMMERCIAL & INDUSTRIAL BOILER SYSTEMS<sup>1</sup>

25%



There is Price Volatility

Average monthly historical price volatility in natural gas prices during winter months

35%



The Process is Carbon Intensive

Percentage of Industrial Boilers still powered by coal in 2019<sup>1</sup>

>85%



They Release GHG Emissions

Percentage of Industrial Boilers that emit harmful GHG (CO<sub>2</sub> and NOx)<sup>1</sup>

40-80%



The System is Aged & Inefficient

Efficiencies across traditional boiler systems that reach 40+ years old

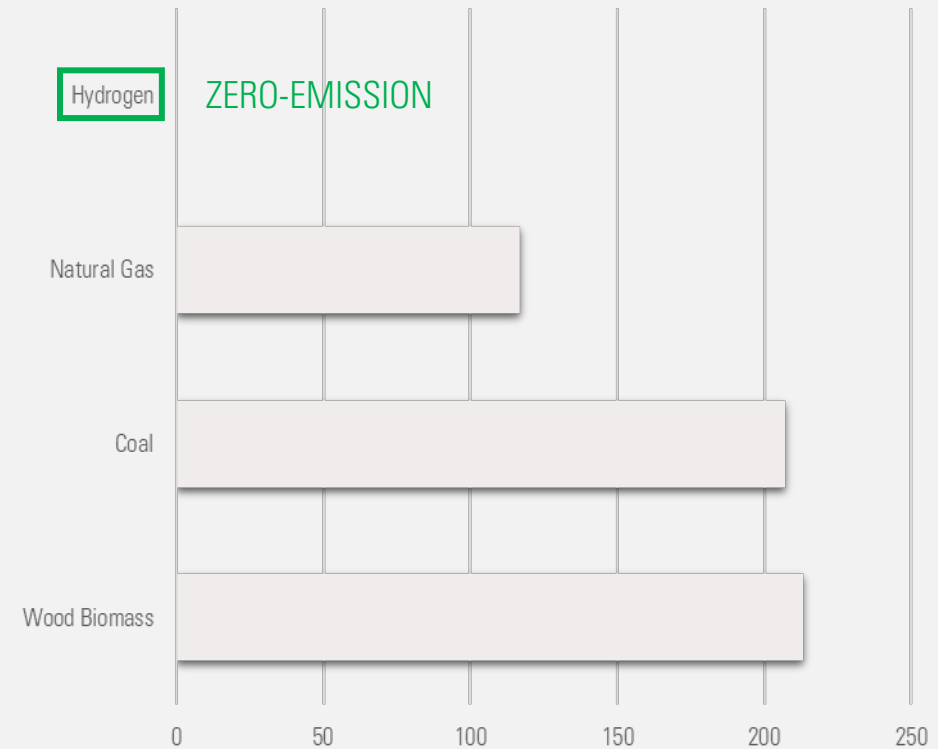
<sup>1</sup> Sources: MarketsandMarkets, "Industrial Boilers Market by Fuel, Boiler, Function, Boiler Horsepower, End-Use Industry And Region - Global Forecast to 2030," March 10, 2023 & Fortune Business Insights, "Commercial Boiler Market, 2021-2028," Feb. 11, 2022.

THE CLEANH2STEAM DCC™ BOILER IS A UNIQUE ZERO-EMISSIONS HYDROGEN BOILER – A BOLD STEP IN THE EVOLUTION OF HYDROGEN TECHNOLOGY

- The cleanH2steam DCC™ boiler is HTI's proprietary oxy -hydrogen boiler
- The cleanH2steam boiler is a fire-tube boiler using superheated steam as the tube side "hot gas"
- The superheated steam is created in the combustion chamber, through the highly exothermic reaction of hydrogen and oxygen. The combustion design is patent protected
- Atmospheric air, typically used for combustion, is not used in the cleanH2steam system. Since no carbon-based fuel or atmospheric air is used for combustion, no CO, CO<sub>2</sub>, NO<sub>x</sub> and other GHG are created.
- Since GHG and other pollutants are not created, there is no need to remove them from the system, saving energy, equipment costs and maintenance expense.

## CO2 EMISSIONS (LBS / MMBTU)

- Breakthrough high-temperature boiler that enables zero-emissions hydrogen to generate heat, steam and Combined Heat & Power (“CHP”)
  - Water is the only by-product
  - No air permit required
- 20% greater efficiency than traditional hydrocarbon boilers with 95% boiler thermal efficiency
- Eliminates all NO<sub>x</sub> and CO<sub>2</sub> emissions through a closed-loop combustion process
- Total Cost of Production (\$ / lb steam) equivalent to current industrial boiler market



# THE SIMPLIFIED PROCESS OF HOW IT WORKS



1

Renewable Energy or Grid Power

2

Electrolyser:  
Splits Water by Electric Current

3

On-Site Storage serving as on demand fuel

4

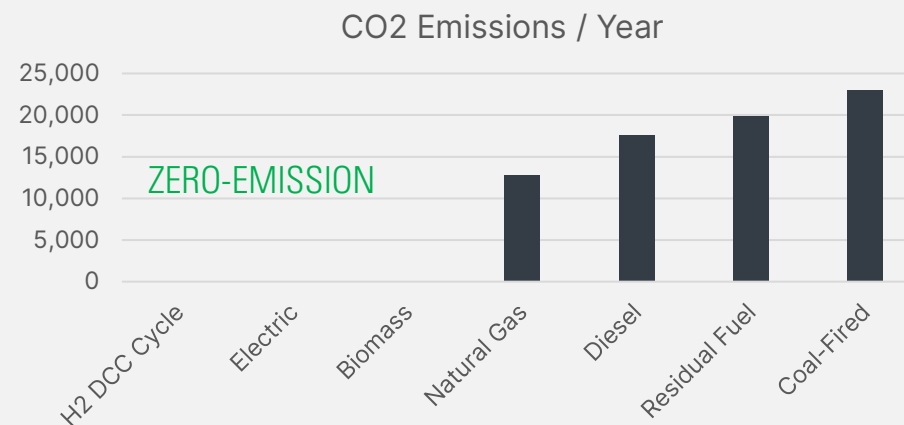
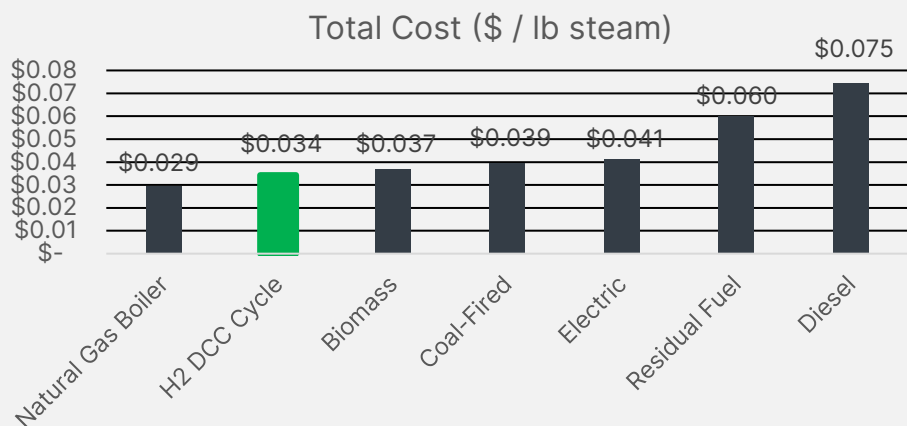
cleanH2steam DCCT™ Boiler  
Output: Zero-Emissions on-demand heat and steam

5

Heat Hot Water, Steam Irons and Presses

# PROVEN COMPETITIVE ADVANTAGES

- Total Cost Includes
  - Capital Cost, O&M Cost, Efficiency, Equipment Lifetime
- Input Pricing Assumptions
  - CO2 Emissions: \$50 / ton Electricity: \$0.06 / kWh
  - Natural gas: \$5.00 / mmbtu
  - Coal: \$80 / ton
  - Diesel: \$4.00 / gallon
  - Residual fuel: \$3.00 / gallon Wood Biomass: \$100 / ton



### COMMERCIAL NON-PRESSURE VESSEL



- Shopping malls
- Universities and institutions
- Airports and hotels
- Stadiums and venue halls
- Hospitals and government buildings

### INDUSTRIAL PRESSURE VESSEL



- Refining and petrochemical
- Pulp and paper
- Chemical and pharmaceutical
- Food Processing
- Refrigeration
- Metals and mining
- Composite and carbon fiber



- Utility Power Generation
- Energy Storage
- On-site distributed energy
- Universities and institutions
- Building HVAC
- Data Centers



CURRENT AND FUTURE BUSINESS LINES ARE MEETING CUSTOMER NEEDS

### Technology Sales

- Manufacturer and Provider of hydrogen boiler solutions
  - Sell and install cleanH2steam DCC™ hydrogen boilers to customers seeking to own and operate their infrastructure
  - Develop thermal solutions and CHP plants with global energy service companies
  - Future: Full Suite of Engineering Support during feasibility, design and installation stages
  - Future: IoT diagnostics and remote monitoring for on-going service & maintenance contracts

### Steam Sales

- Seller of Steam as a Service
  - Future: Develop, finance and own Thermal plants to sell steam to customers across our target markets
  - Future: Sale of steam based on long-term contracts, creating visible and secure cash flow

## PORTFOLIO GROWTH DRIVER AND CATALYST

### CHEMICAL REACTION SOLUTION

**+US\$19BN**  
Annually<sup>1</sup>

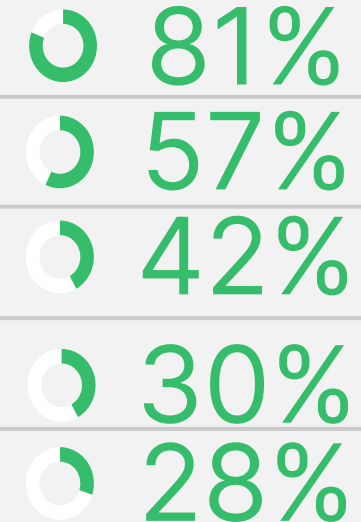
- 37% of fossil fuels burned for Industrial Utilization in the US is to produce steam
- Global heating and steam markets account for >15% of all CO2 emissions
- Macro-tailwinds driven by rising carbon pricing and policy decisions to eliminate sales of new fossil-based boilers and will increase adoption



### INDUSTRIES THAT CONSUME THE HIGHEST % OF FOSSIL FUEL TO GENERATE STEAM:

<b>Pulp and Paper</b>	<ul style="list-style-type: none"> <li>• Steam is the key component in refining and treating wood chips before they are pulped</li> <li>• High fossil fuel emissions from steam generation</li> </ul>
<b>Food and Beverage</b>	<ul style="list-style-type: none"> <li>• Steam heat used for sterilization, disinfecting, cooking, curing, and drying</li> <li>• Hot water and steam for boiling and pasteurization</li> </ul>
<b>Chemical / Petrochemical</b>	<ul style="list-style-type: none"> <li>• Steam is utilized to heat and cool reactors that operate in a cyclical fashion</li> <li>• Steam is used to produce various by-products (jet fuel, ammonia, chlorine, etc.)</li> </ul>
<b>Oil refineries and Production</b>	<ul style="list-style-type: none"> <li>• High-pressure condensate return system's conserve energy by pumping hot water directly into steam boilers</li> <li>• Utilize steam as a key component in enhanced recovery operations (i.e. SAGD)</li> </ul>
<b>Commercial Properties</b>	<ul style="list-style-type: none"> <li>• Commercial properties typically use a boiler as part of a district energy system</li> <li>• Utilize steam as the major input for space heating and hot water</li> </ul>

### % of Total Fossil Fuel Usage for Steam Generation



<sup>1</sup> Sources: MarketsandMarkets, "Industrial Boilers Market by Fuel, Boiler, Function, Boiler Horsepower, End-Use Industry And Region - Global Forecast to 2030," March 10, 2023 & Fortune Business Insights, "Commercial Boiler Market, 2021-2028," Feb. 11, 2022.

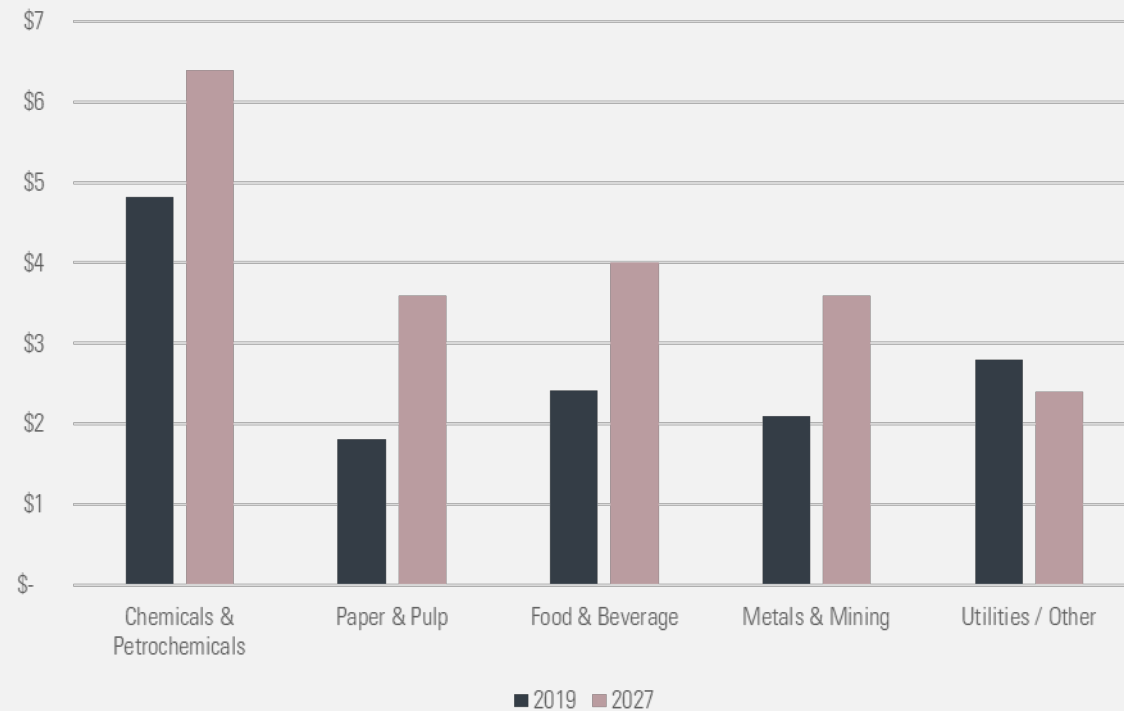
## THE OVERALL NUMBERS

# 37%

Of fossil fuels are burned in the US to produce steam<sup>1</sup>

# \$14BN

Annually and growing<sup>1</sup>

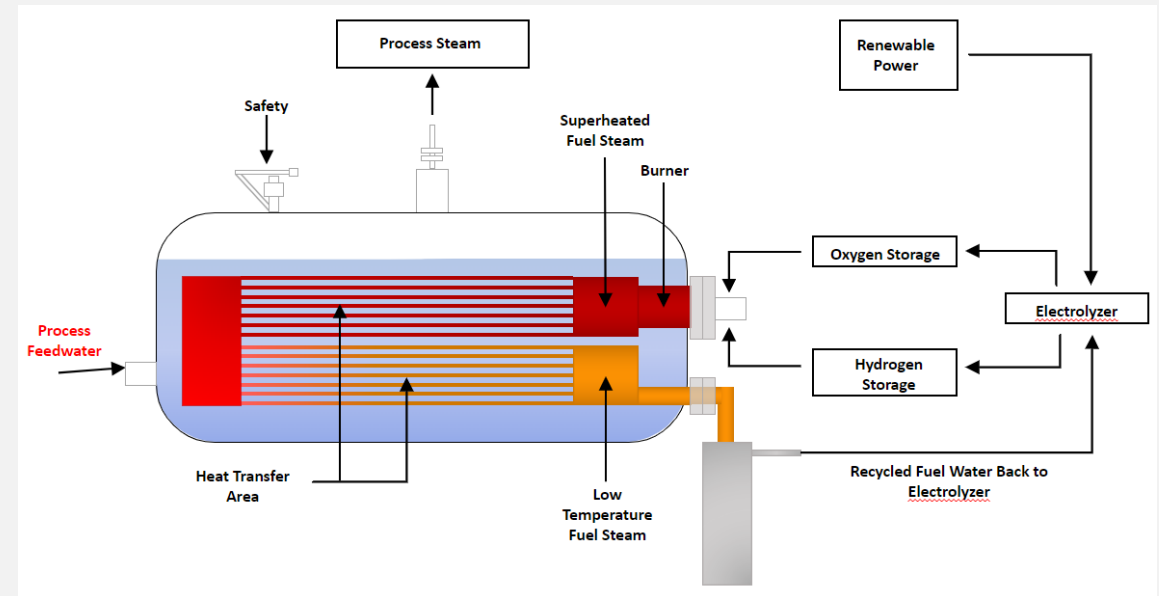


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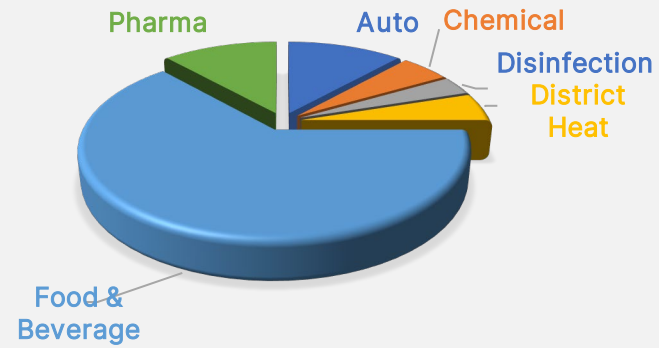


MARQUEE PATENT RELATED TO THE BROAD METHOD OF COMBUSTING PURE HYDROGEN AND PURE OXYGEN IN A VACUUM FOR THE PURPOSE OF HEATING OR POWER

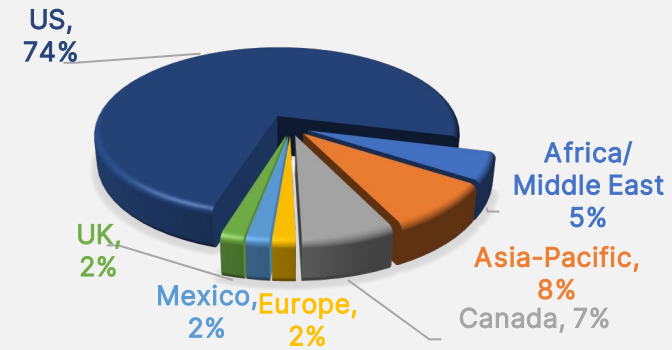
- DCC™ Combustion produces an exothermic reaction between pure hydrogen and pure oxygen (the combustion oxidizer) creating only local reaction heat and water (as hydrogen burns in the ultraviolet range)
- Water immediately flashes to superheated steam in this 5,080°F / 2,804°C environment, encountering the boiler tubes, effectively transferring heat to the boiler shell to create cycle steam for heat and power
- Conventional systems utilize the flame (burning in the infrared) and hot gases to transfer the energy to cycle steam and then exit back to the atmosphere via a smokestack, losing valuable energy and emitting CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>x</sub>
- This fundamental condensing characteristic of the DCC™ process and natural vacuum formed from steam condensation within the exchanger tubes:
  - Captures virtually all the reaction heat (accounting for >95% efficiency)
  - Acts as a natural process barrier to hydrogen and the effects of embrittlement
  - Requires no smokestack and thus no need for FD or ID fans, lowering parasitic load (increasing efficiency) and O&M costs



### INDUSTRY INTEREST



### GEOGRAPHIC DISTRIBUTION



### VARIOUS MARKETS

Food & Beverage



Pharma



Auto



Chemical



Disinfection



District Heat

