



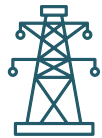
GAME-CHANGING H₂ PRODUCTION

HDF ENERGY, A GLOBAL PURE PLAYER IN HYDROGEN

H2 INFRASTRUCTURE



Development, operation & ownership of large-scale hydrogen infrastructure

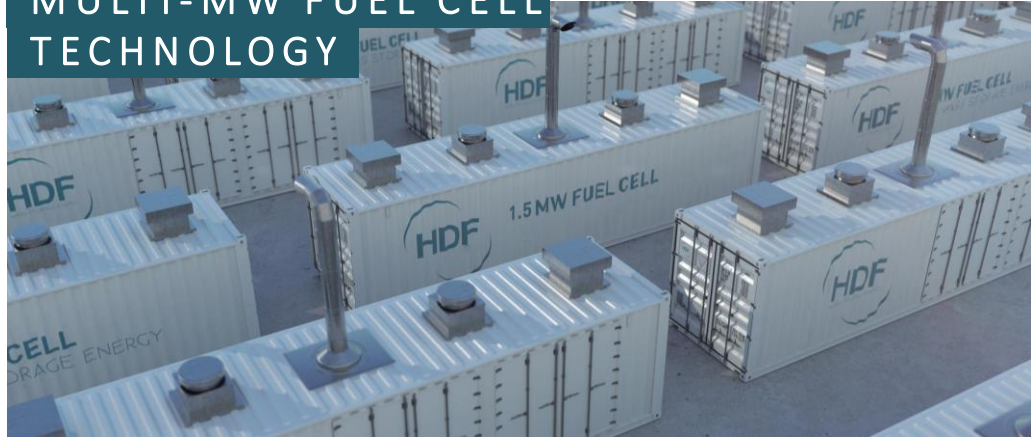


Electricity production



Green hydrogen production

MULTI-MW FUEL CELL TECHNOLOGY



Design and mass production of high-power fuel cells



Power supply

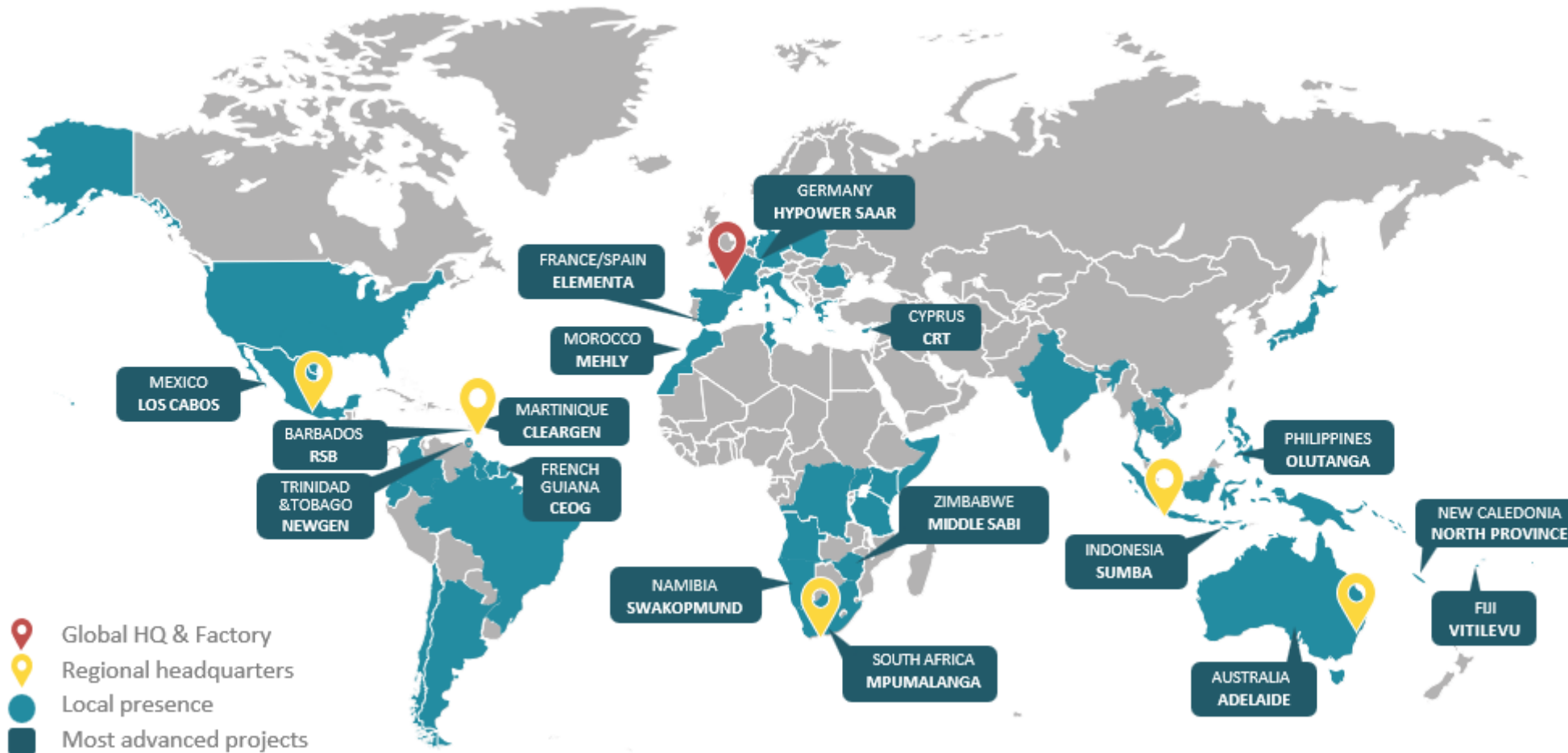


Marine



Rail

GLOBAL LEADER IN HYDROGEN INFRASTRUCTURE WITH STRONG LOCAL PRESENCE



Present in
30+ countries,
5 continents



€ 5 billion
projects under
development



30+ different
nationalities
among staff

DECARBONIZING THE POWER, HEAVY MOBILITY & INDUSTRIAL SECTORS WITH CUTTING-EDGE H₂ SOLUTIONS

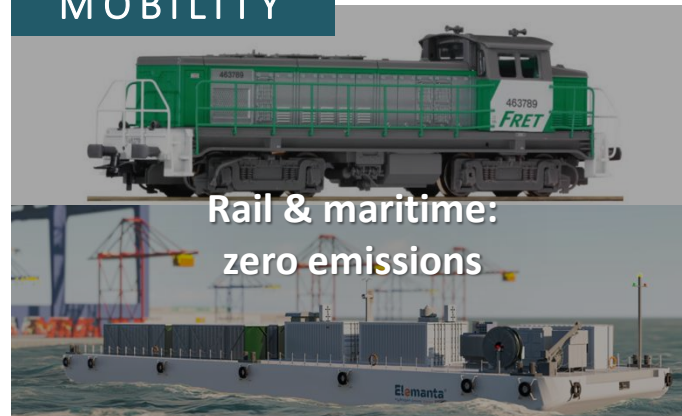


THE GREEN HYDROGEN REVOLUTION IS SPREADING
OVER MAJOR SECTORS IN TODAY'S ECONOMY

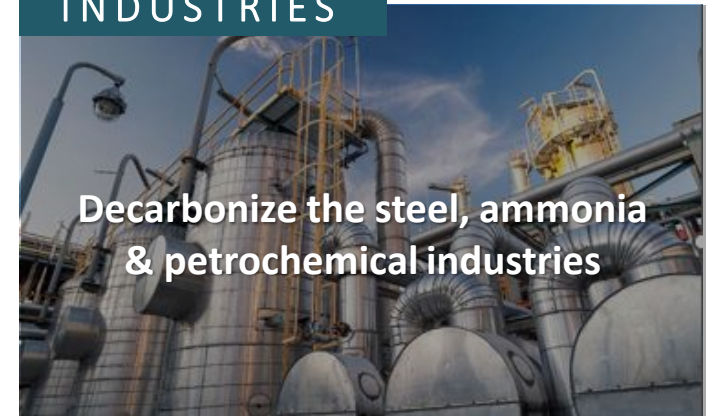
POWER



MOBILITY



INDUSTRIES



THE NEED FOR DECARBONIZATION

GLOBAL CONTEXT

- To combat climate change.
- Reduce GHG emissions.
- Protect the environment and safeguard human health.
- Reduce dependency on fossil fuels and enhance energy security and resilience.

CARIBBEAN CONTEXT

- Abundant renewable resources in solar, wind, geothermal and hydropower for production of hydrogen as a feedstock or fuel.
- Produce export commodities that meet international certification standards. (CBAM)
- Ability to produce competitively with global low emission commodities that are supported by incentives and subsidies. (IRA)

LOW EMISSION AND RENEWABLE HYDROGEN PRODUCED THROUGH ELECTROLYSIS OFFERS A PROMISING SOLUTION THAT WILL DRIVE THE ENERGY TRANSITION CREATING JOBS AND ECONOMIC GROWTH .

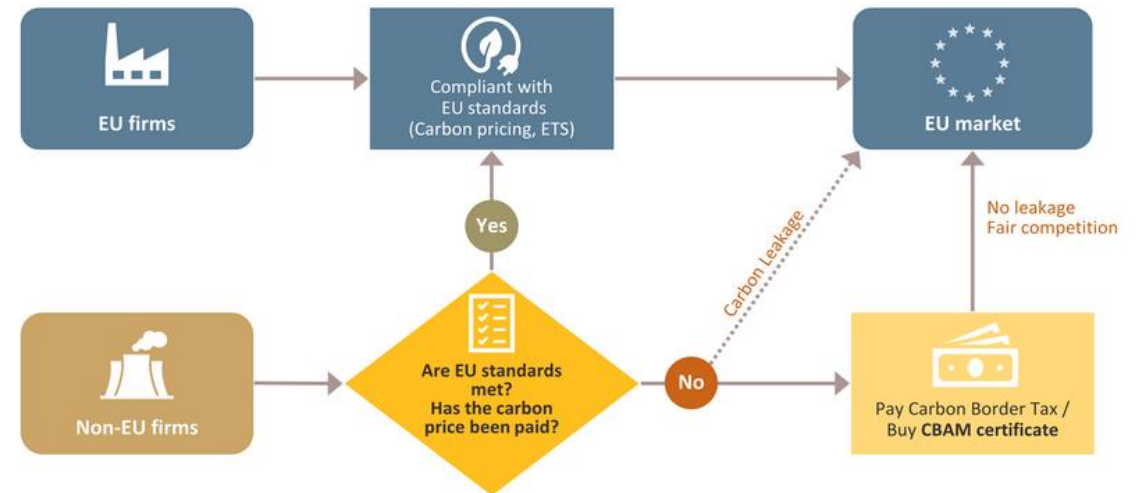
INDUSTRIAL POLICIES - CBAM

CBAM Proposals by the EU Institutions

Scope	European Commission (July 2021)	European Parliament (June 2022)	European Council (June 2022)	Final (as of May 16, 2023)
Sectoral scope 	Cement, fertilizers, iron and steel; aluminium and electricity (Review in 2025)	European Commission proposal + chemicals (including hydrogen) and Polymers (Intention to cover all sectors by 2030)	Same as European Commission	Cement, fertilizers, iron and steel, aluminium, electricity, and hydrogen
Geographic scope 	Exemption for countries with carbon market linked to EU-ETS (Iceland, Liechtenstein, Norway and Switzerland)	Same as European Commission, proposed that revenues from CBAM certificate are to be used for international climate finance in LDCs	Same as European Commission	Same as European Commission and intention to support LDCs
Emission scope 	Only direct emissions, indirect emissions to be considered later	Direct and indirect emissions	Same as European Commission	Direct emission (all) and Indirect emission (only for cement, fertilizers, and electricity)

Source: Presidential Climate Commission. (2023) and CBAM regulation in the Official Journal of the EU (May 16, 2023), Krungsri Research

How the CBAM Operates



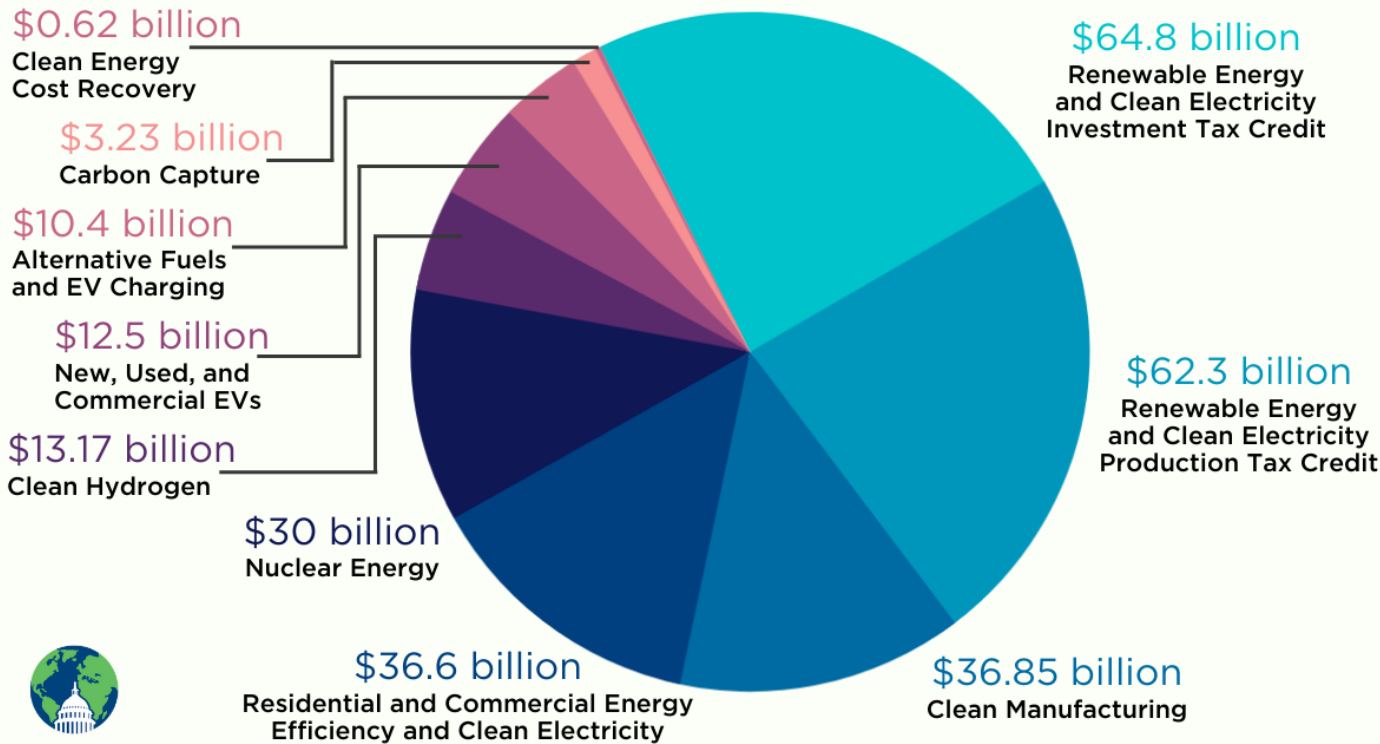
Source: BCG Analysis?, Krungsri Research

The 1998 Energy Charter Treaty, which has around 50 signatories including European Union countries, lets energy companies sue governments over policies that damage their investments – a system initially designed to support investments in the fossil fuel sector.

The EU has formally adopted the new Renewables Energy Directive raising the 2030 target for the share of renewable energy in the EU's overall energy consumption from 32% to 42.5%, the Council said Oct. 9.

INDUSTRIAL POLICIES - IRA

Carrots Over Sticks: Green Tax Credits in the Inflation Reduction Act



EESI Source: Congressional Budget Office

Graphic by: Alison Davis



U.S. Energy Dept. picks seven regional proposals, out of 79 received, to gain a share of \$7B in federal funding to build a national "clean hydrogen" production network it says could exceed 3 million tons per year.

Map: U.S. Energy Dept., Office of Clean Energy Demonstrations

Hydrogen Hubs Picked for \$7B in US Funding to Build Landmark Network Initiative could cut 25 million metric tons of carbon emissions and produce 3 million tons per year of clean H2.

INDUSTRIAL POLICIES - MARITIME

MARITIME
SECTOR
IS A KEY PLAYER
FOR HYDROGEN



ENVIRONMENTAL CHALLENGE

*Maritime transport emits around 940 million tons of CO₂ annually
= Increasing pressure to decarbonize the maritime industry*

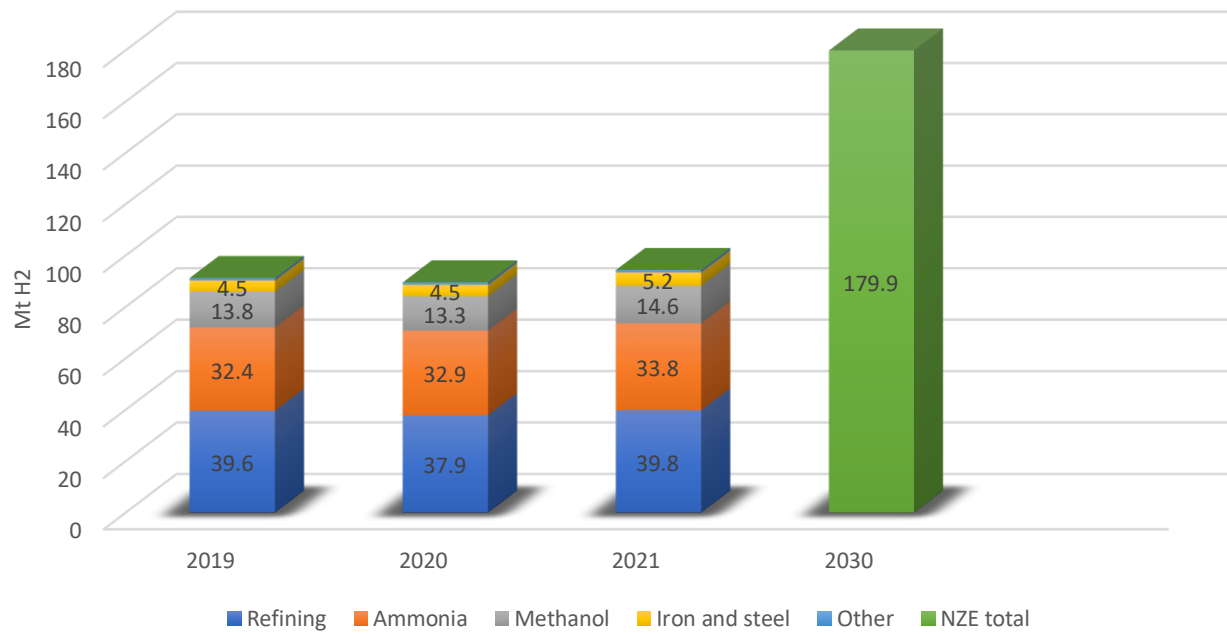
IMO (International Maritime Organization) initial greenhouse gas strategy launched in April 2018 :

- Reduce **CO₂** emissions by at least **40% by 2030**
- And pursuing efforts towards **70% by 2050**
- Reduce total annual **GHG** emissions by at least **50% by 2050** compared of level of 2008

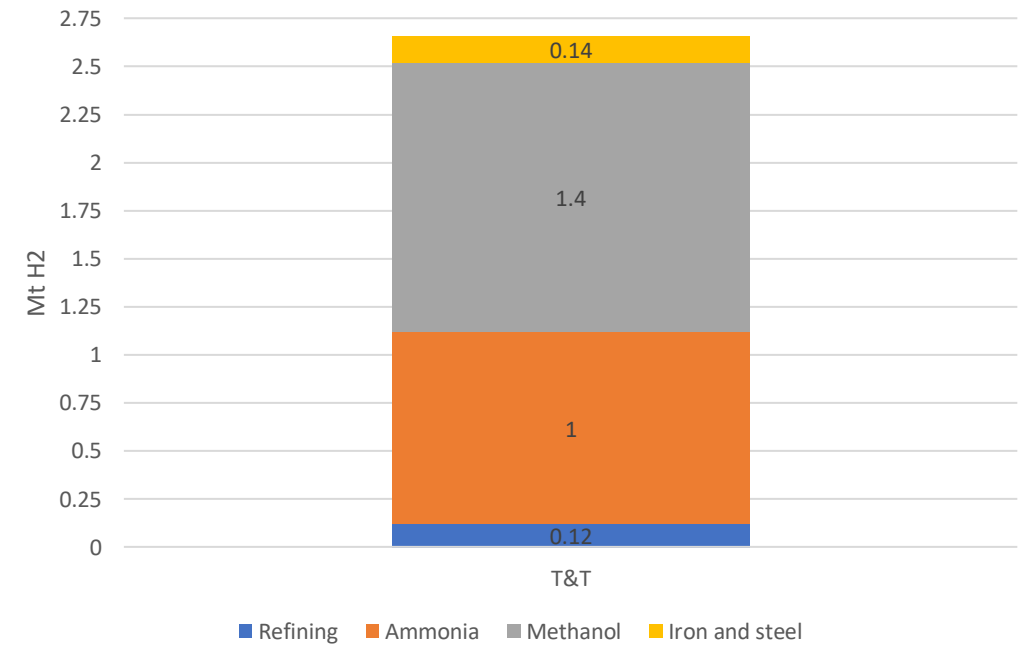
LOOKING FOR ALTERNATIVE FUEL

HYDROGEN DEMAND

IEA, Global hydrogen demand by sector in the Net Zero Scenario, 2019-2030, IEA, Paris



Trinidad and Tobago's Maximum Industrial Hydrogen Demand



1) <https://www.iea.org/data-and-statistics/charts/global-hydrogen-demand-by-sector-in-the-net-zero-scenario-2019-2030>, IEA.

2) MEEI bulletins and Energy Chamber Calculations

FUTURE CARIBBEAN HYDROGEN SUPPLY

Potential Target: Electrify and decarbonize via RE hydrogen, 20% of the petrochemical sector or 400,000 tons per year of H₂. 11.4GW of intermittent power or 3.4 GW of firm RE power required.

Intermittent RE Power Options

- 500,000 households with 75% installation of 5kw rooftop solar systems (VPP) = 1.875 GW
- Large scale onshore wind and solar installations = 1.5 GW
- Offshore wind installations = 10 GW
- **Total Intermittent Power = 13.375 GW**

- Geothermal power from the Eastern Caribbean – 4.07 GW (greater than 3.4 GW)

Geothermal Power GW	
Dominica	1.39
Grenada	1.11
St. Lucia	0.68
St. Vincent	0.89
Total	4.07

Firm RE Power Options

Erouscilla P. Joseph Seismic Research Unit University of the West Indies St. Augustine

- 3.46 GW (greater than 3.4 GW)

Guyana Energy Agency

Hydro Power GW	
Amaripa	0.107
Arisaru	0.12
Turtruba	0.32
Oko Blue	0.162
Upper Mazaruni	1.32
Sand Landing	0.65
Kaieteur	0.216
Amaila	0.103
King George V	0.112
Takwari	0.346
Total	3.46

- 200 MW to 800 MW small modular reactor (SMR)
- Requires less space
- Much simpler construction project
- Cost less
- The proponents of small nuclear plants say their technology will be necessary to meet an expected doubling of demand for electricity in the UK from consumers by 2050.

Hydropower from the South American Mainland

Firm RE Power Options - Small Scale Nuclear Power

HDF ENERGY HYDROGEN SOLUTION- INDUSTRIAL

HYDROGEN FROM CLEAN POWER SOURCES TO DECARBONIZE THE INDUSTRIES



2 **Electrolyser**
 $H_2O + E^- \Rightarrow O_2 + H_2$

1 **Clean electricity**
from PV and Energy Efficiency

3 **Low-carbon H₂**
to be used by industrial off-takers
(steel, ammonia, methanol)

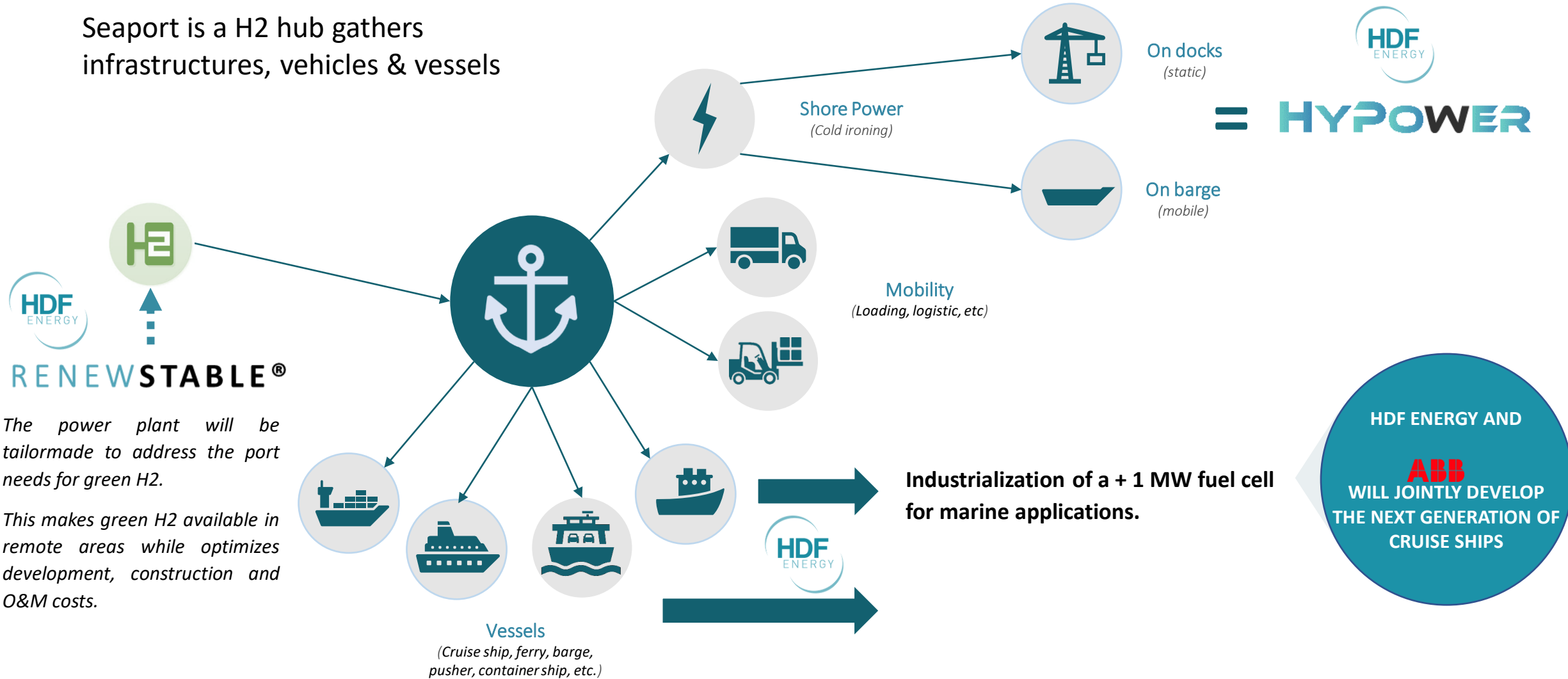
Used as feedstock for industrial activities which drastically reduce CO₂ emissions

NewGen, one of the world's largest clean hydrogen production facility



HDF ENERGY HYDROGEN SOLUTION- MARITIME

Seaport is a H2 hub gathers infrastructures, vehicles & vessels



HDF ENERGY AND
ABB
WILL JOINTLY DEVELOP
THE NEXT GENERATION OF
CRUISE SHIPS

RENEWSTABLE®

The power plant will be tailormade to address the port needs for green H2.

This makes green H2 available in remote areas while optimizes development, construction and O&M costs.

Industrialization of a + 1 MW fuel cell for marine applications.

HDF ENERGY, YOUR PARTNER OF CHOICE

Leverage HDF Energy's **strong track record** in infrastructure development & financing to ensure best execution

€ 5 billion

Projects under development

Benefit from HDF team's extensive technical & project development expertise along the complete H2 value chain

100+

Global and local talents

Collaborate with the global leader in **multi-MW PEM fuel cell technology** boasting the **world's 1st mass production factory** dedicated to addressing the **power, heavy mobility and industrial markets**

1 GW

Multi-MW fuel cells produced annually in 2030

Work with a **global leader with local presence** (5 regional offices on the 5 continents) and in-depth knowledge of each local area
Listed on Euronext Paris stock exchange

150+ M€

IPO in 2021

2nd largest IPO of a Cleantech company in the Euronext Paris

GAME-CHANGING H₂ PRODUCTION



WWW.HDF-ENERGY.COM