

# REFIRE HYDROGEN ECONOMY

BUILDING OUT THE VALUE CHAIN THROUGH GLOBAL PARTNERSHIPS

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2024.05

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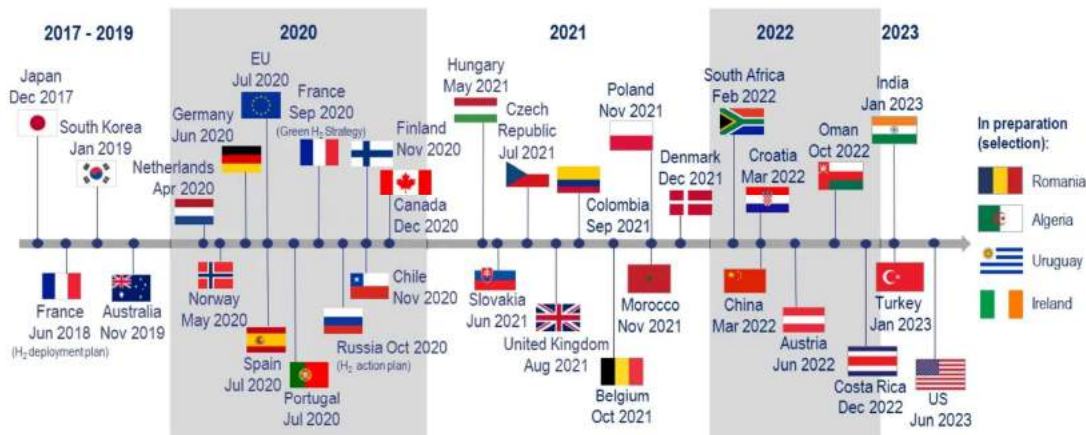
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## GROWING GLOBAL ADOPTION OF H2 ENERGY

30+ National hydrogen strategies

- 30+ countries have announced hydrogen strategies, setting ambitious targets
- Increased urgency to build and deploy fuel cell (FC) technology on a global scale
- FC tech industry 40+ years mature, with 1000's of vehicles on roads proving it
- FC roadmap is to continue to improve power output, durability, efficiency, TCO
- FC tech ready for broad end use cases, competitiveness emerging

“providing real world solutions to a clean energy mandate is essential”



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“confronted by real  
environmental  
issues.”

“what are we  
collectively doing  
about it?”

# ELECTRIFICATION

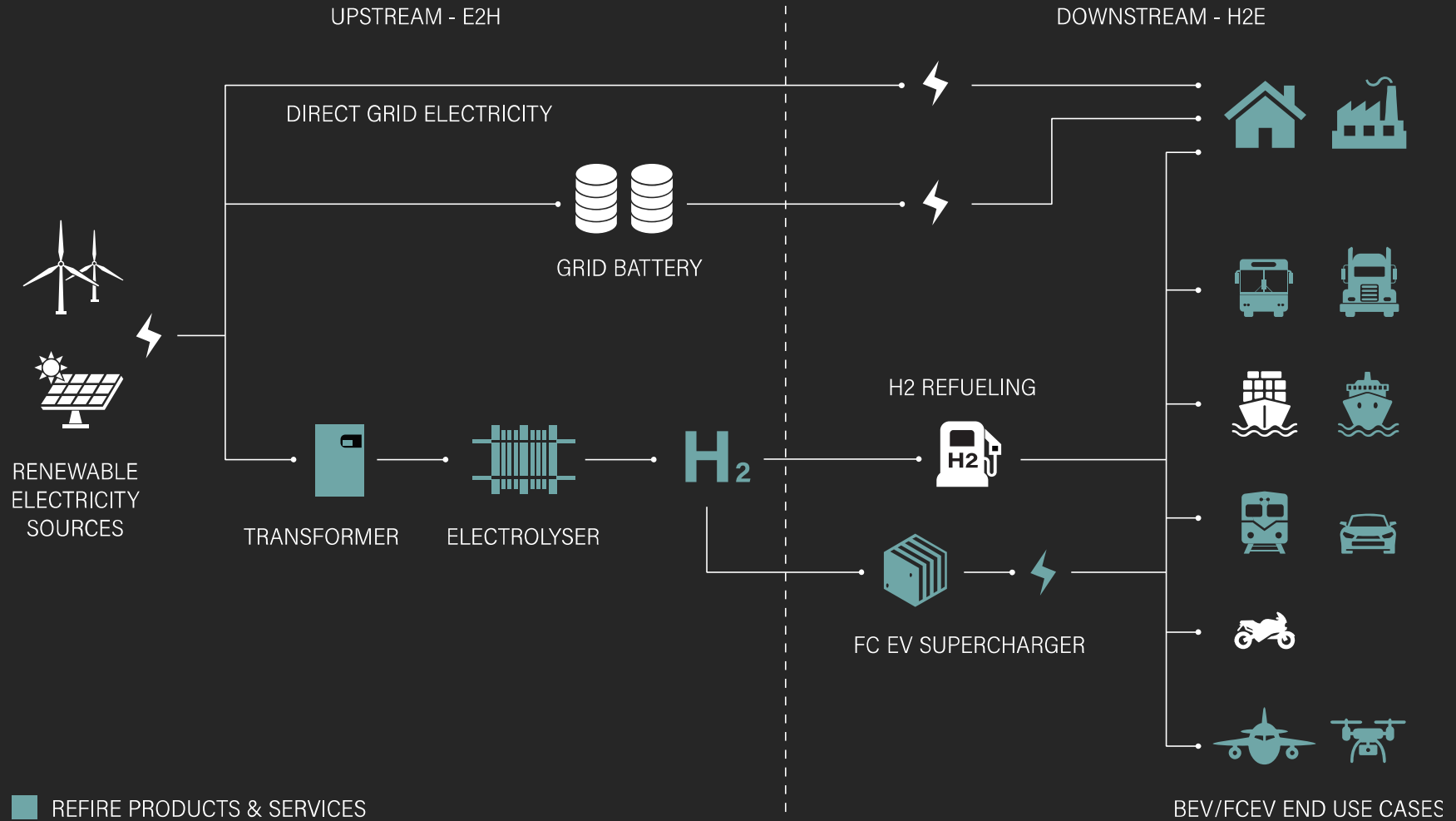
## ELECTRIFICATION

### BATTERY-ELECTRIC

### HYDROGEN-ELECTRIC

- Longer range transportation
- Heavier-duty applications
- Industry & high power requirements
- BEV charging
- Off-grid applications

# GLOBAL CONTEXT | BUILDING A HYDROGEN ECONOMY



# Our ecosystems help drive the market



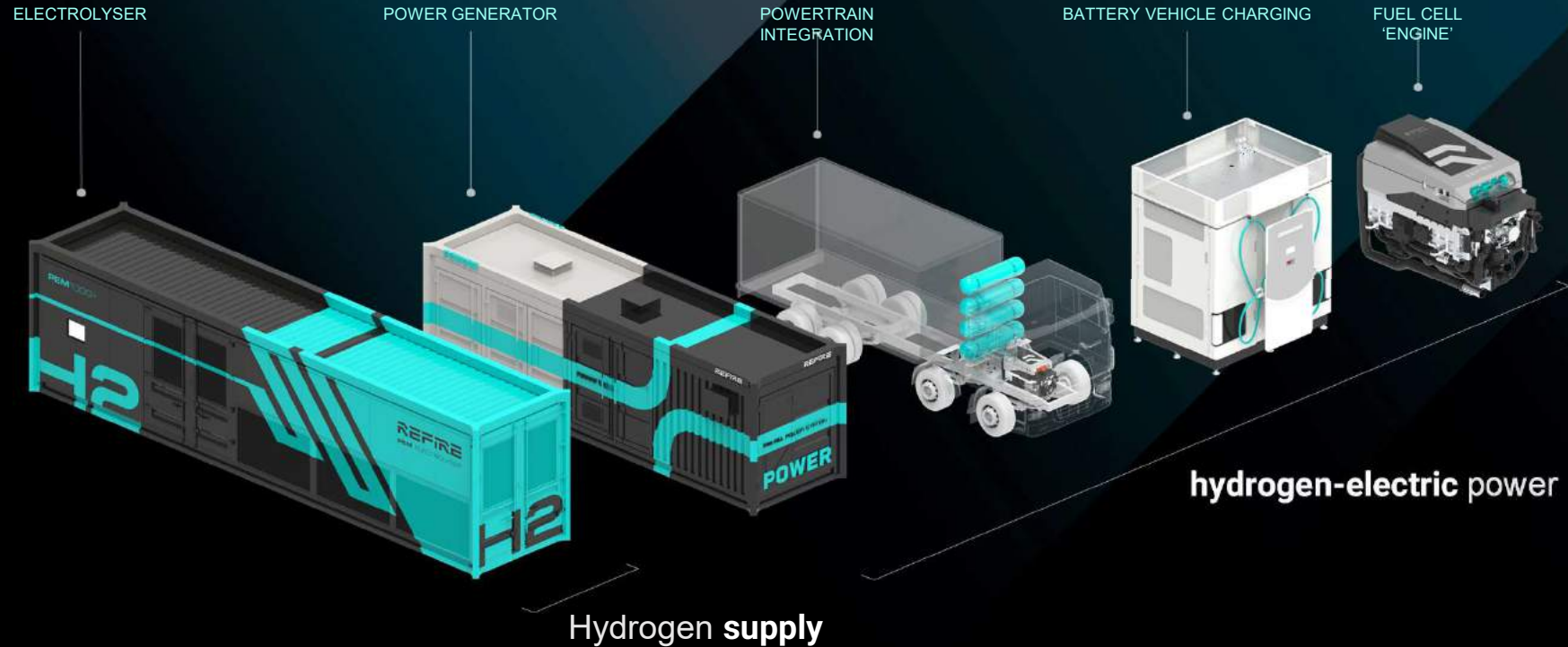


# ABOUT REFIRE GROUP

“Our vision is to commercialise world-leading hydrogen & fuel cell technology through global partnerships that deliver sustainable value”

## REFIRE GROUP

- Established 2015
- Committed to being a world-leading hydrogen technology company
- Strategising and delivering H2 production equipment & ecosystems
- Strategising and delivering Fuel Cell power products & ecosystems



We deliver the full hydrogen energy & power value chain

## #1 in heavy-duty mobility, integration, and miles

**5,500+** vehicle powertrains deployed<sup>1</sup>

**7,500+** systems delivered

**190,000,000+** kilometres driven<sup>2</sup>

**600MW+** power generated<sup>3</sup>

**100,000** tonnes CO<sub>2</sub> saved<sup>4</sup>

**170+** prototype projects built<sup>5</sup>

1. With REFIRE systems & products

2. To Dec 31, 2023

3. Estimate based on system power rating, to Dec 31, 2023

4. Roadside carbon emissions, to Dec 31, 2023

5. OEM-commissioned prototypes and production models built



# REFIRE GROUP | GLOBAL FOOTPRINT



550 staff  
160 development team

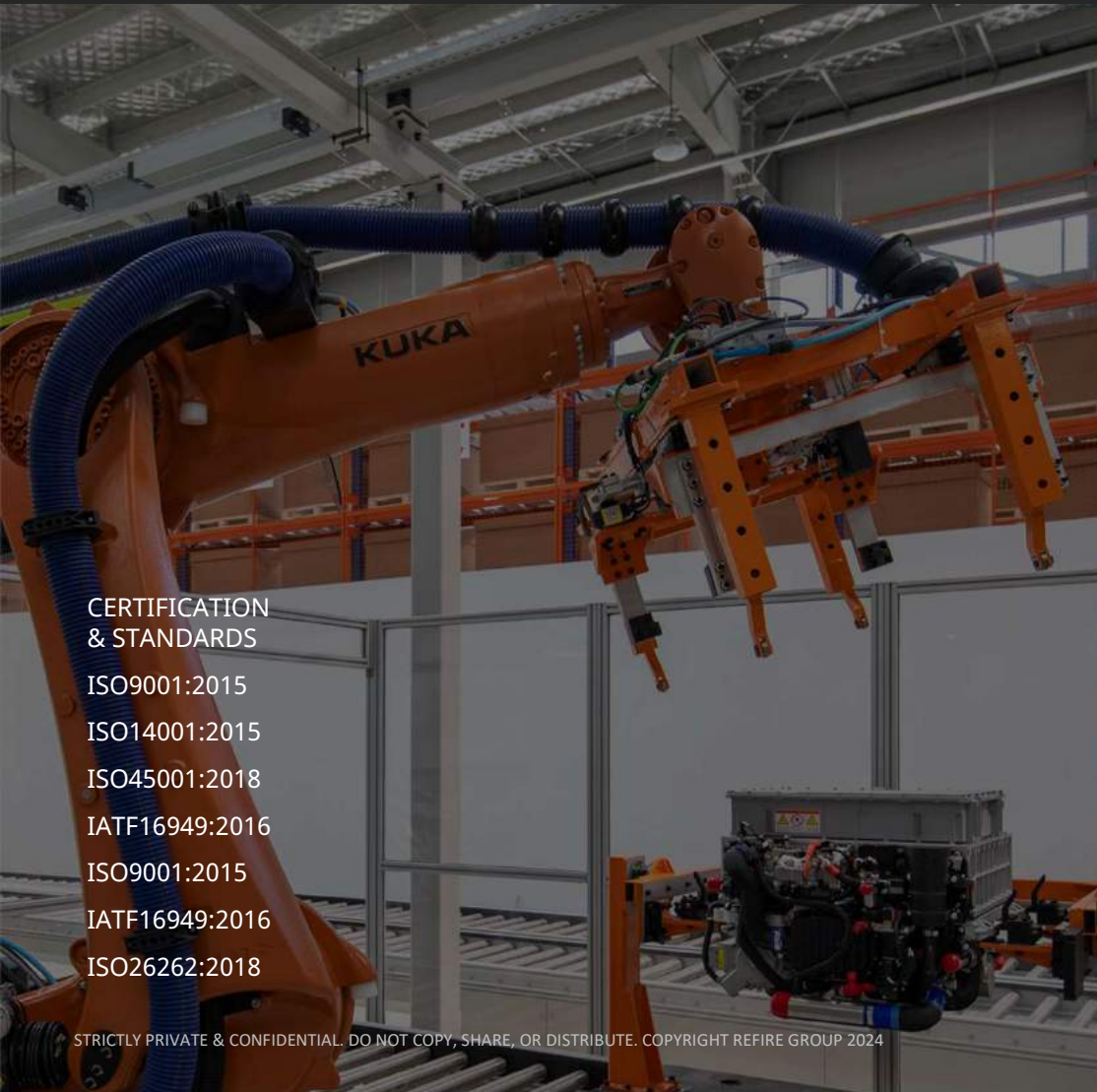
2 development Centres  
3 production sites  
6 after-sales centres





# INDUSTRIALISATION | GLOBAL PRODUCT ENGINEERING & MANUFACTURING

REFIRE



## CERTIFICATION & STANDARDS

- ISO9001:2015
- ISO14001:2015
- ISO45001:2018
- IATF16949:2016
- ISO9001:2015
- IATF16949:2016
- ISO26262:2018

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## REFIRE Group Shanghai Headquarters

25,000 sqm R&D centRE in Shanghai  
31 labs for stack, system, components R&D, testing, verification, validation



## CHANGSHU Factory

Manufacturing PRISMA FC System Series & components.  
Planned capacity: 10,000 system/year

REFIRE GROUP



UPSTREAM> E2H

DOWNSTREAM> H2E



PEM+ALK ELECTROLYSER PRODUCTS



CORE FC COMPONENTS: STACK, MEA, BPP



FUEL CELL SYSTEMS



POWER PRODUCTS



## ABOUT REFIRE GROUP | MARKET POSITIONING

REFIRE

### REAL WORLD PRODUCT INTEGRATION

REFIRE SERVES GLOBAL CUSTOMERS IN ENERGY, MOBILITY & POWER APPLICATIONS.

UPSTREAM > E2H

#### H2 PRODUCTION EQUIPMENT

- ELECTROLYSERS
- PEM
  - ALKALINE
  - TRANSFORMER

DOWNSTREAM > H2E

#### FUEL CELL POWER PRODUCTS

- CORE COMPONENTS
- CCM, MEA, GDL, BPP
  - Design, customisation, production

- SYSTEM INTEGRATION
- System configuration
  - Use case optimisation
  - Application engineering

- ENERGY & POWER
- EV supercharger
  - Megawatt microgrid
  - Scalable architecture

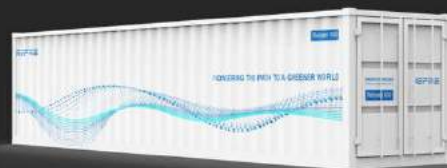
- MOBILITY & POWER MACHINES
- Bus
  - Truck
  - Utility vehicle
  - Port/Airport powered machines



# OUR PRODUCTS

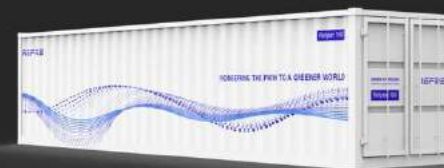
**ELECTROLYSER**

**PEM**



1MW+ MODULAR

**ALKALINE**



1MW+ MODULAR

## PEM ELECTROLYSER END USER

### HYDROGEN PRODUCTION FOR INDUSTRIAL USE CASES



1~10Nm<sup>3</sup>/h

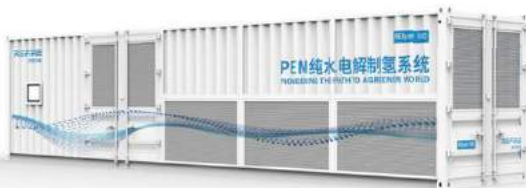


10~30Nm<sup>3</sup>/h

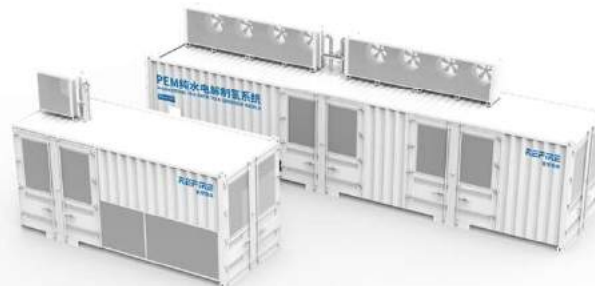


30~50Nm<sup>3</sup>/h

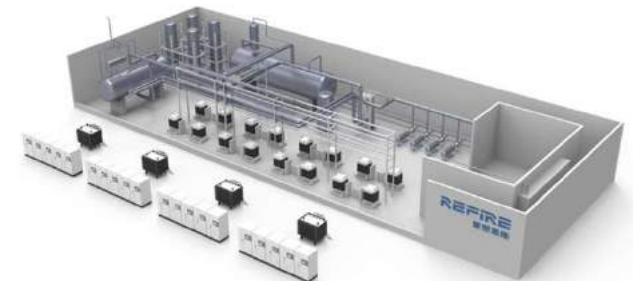
### H2 PRODUCTION FOR OFFTAKE



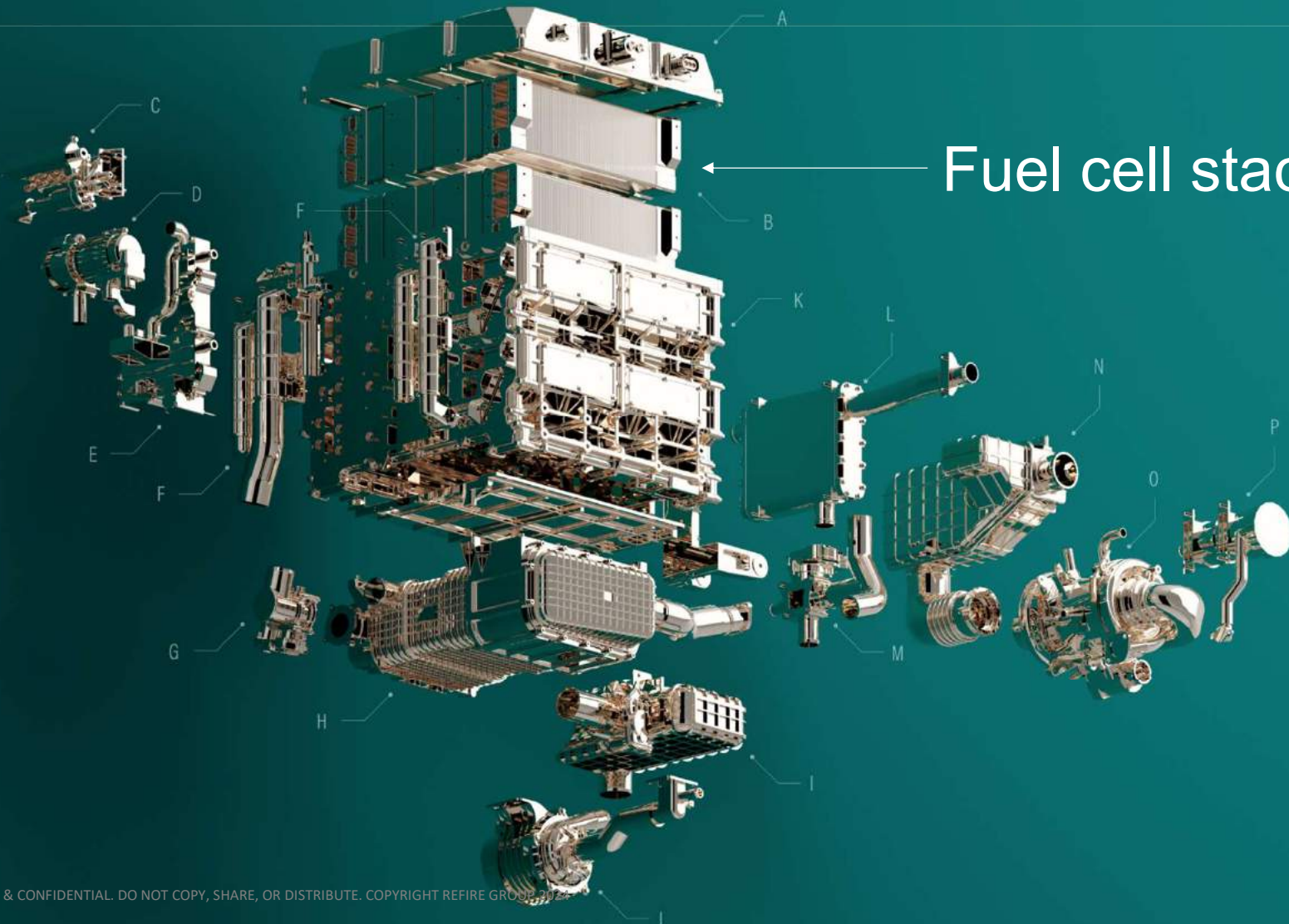
50~100Nm<sup>3</sup>/h



200~500Nm<sup>3</sup>/h



1000~5000Nm<sup>3</sup>/h



Fuel cell stacks

FUEL CELL SYSTEMS



PRISMA VI+  
60kW – 80kW




PRISMA XII+  
120kW – 130kW



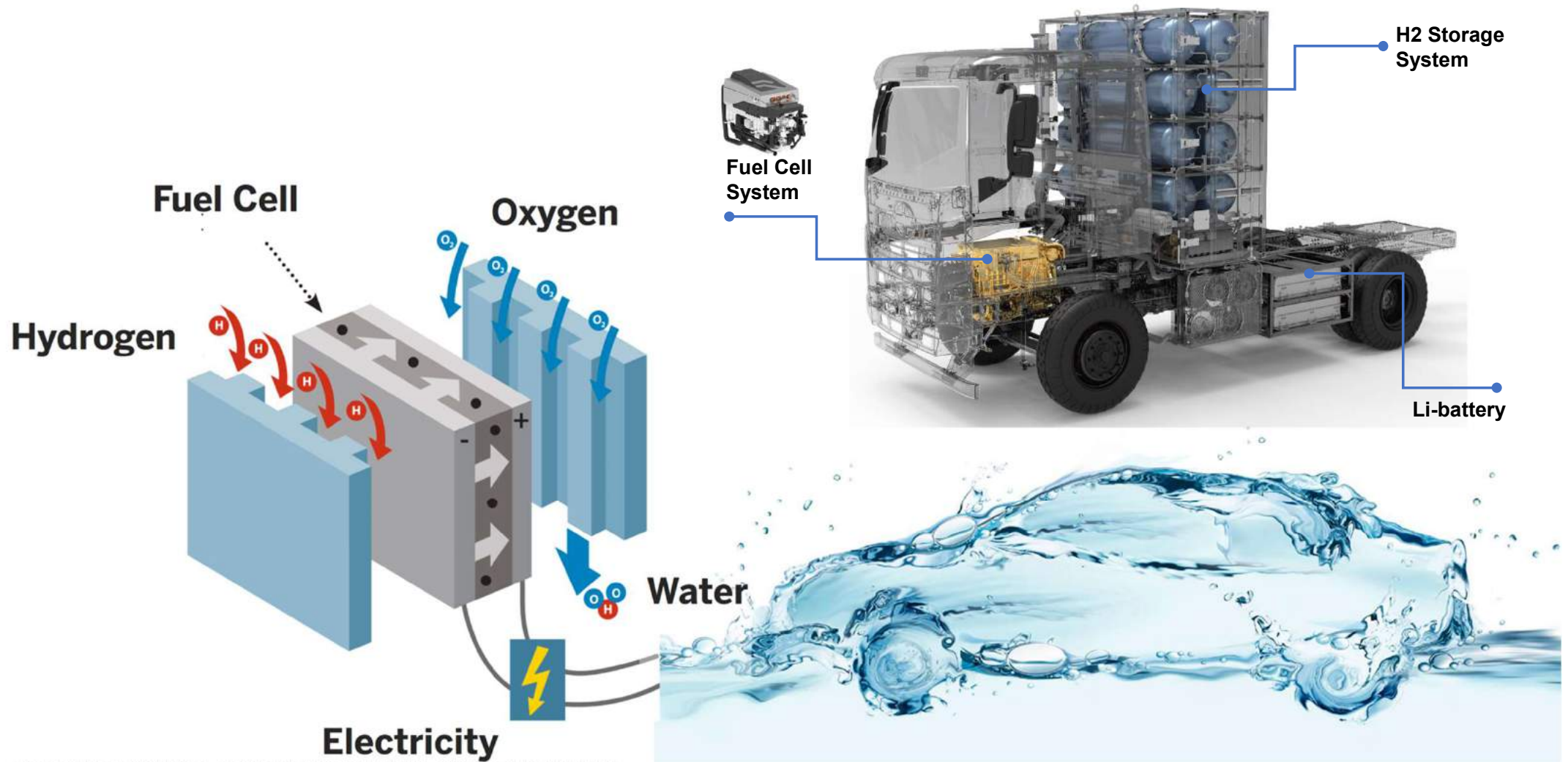
PRISMA XXII  
180kW – 220kW

REFIRE



FUEL CELL  
INTEGRATION:  
MOBILITY &  
MACHINES





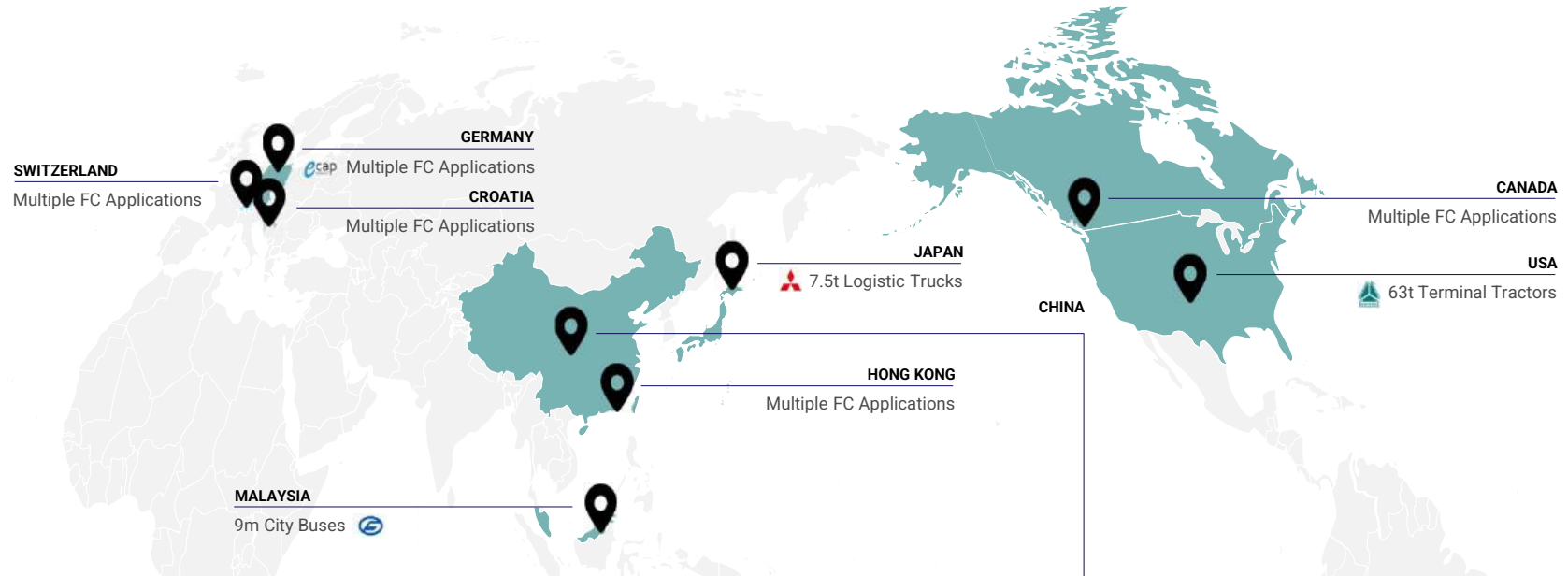
**POWERED BY REFIRE PRODUCTS**

**Buses & trucks** of all classes





# DOWNSTREAM H2E | FC POWER INTEGRATION | PROJECT MAP



Erdos - 8.9m City Buses	Baoding - 49t Semitrailer Tractors	Foshan - 7.5t Logistics Trucks	Beijing - 42t Semitrailer Tractors	Liaocheng - 49t Semitrailer Tractors
Linfen - 49t Tractor	Changshu - 9t Logistics Trucks	Foshan - 8.5m/11m City Buses	Beijing - 4.5t Logistics Trucks	Liaocheng - 18t Logistics Trucks
Baicheng - 10m City Buses	Changshu - 10.5m City Buses	Foshan - 9t Logistics Trucks	Beijing - 49t Semitrailer Tractors	Liaocheng - 9m City Buses
Jinan - 10.5m City Buses	Shanghai - 7.5t Logistics Trucks	Foshan - 8.5m City Buses	Beijing - 31t Dump Trucks	Tianjin - 49t Semitrailer Tractors
Jinan - 9.5m City Buses	Shanghai - 9t Insulated Trucks	Guangzhou - 7.5t Logistics Trucks	Yinchuan - 12m City Buses	Zibo - 49t Semitrailer Tractors
Qingdao - 9t Refrigerated Trucks	Jiaxing - 10.5m City Buses	Guangzhou - 18t Sprinkler	Zhangye - 7m City Buses	Dongguan - 31t Cement Mixers
Zhengzhou - 12m City Buses	Wuhan - 6.9m City Buses	Guangzhou - 8t Garbage Trucks	Zhangye - 12m City Buses	Hebi - 49t Semitrailer Tractors
Zhangjiagang - 9t Logistics Trucks	Shiyan - 7.5t Logistics Trucks	Shenzhen - 7.5t Logistics Trucks	Kashi - 9t Insulated Trucks	Liupanshui - 10.5m City Buses
Zhangjiagang - 10m City Buses	Xiangyang - 10.5m City Buses	Shenzhen - 9t Logistics Trucks	Jining - 10.5m City Buses	Xining - 9m City Buses
Weinan - 49t Semitrailer Tractors	Xi'an - 31t Dump Garbage Trucks	Yancheng - 7.5t Logistics Trucks	Yueyang - 31t Cement Mixers	Changsha - 31t Cement Mixers

READY TO ACT

PROTOTYPE PROJECTS

- 58 BUSES
- 28 LIGHT-DUTY COMMERCIAL TRUCKS
- 75 HEAVY-DUTY COMMERCIAL TRUCKS
- 7 PASSENGER VEHICLES
- 11 NON-VEHICULAR

\* With REFIRE systems & products  
\* To Dec 31, 2023



58 BUSES



28 LIGHT-DUTY COMMERCIAL TRUCKS



11 OFF ROAD APPLICATIONS



& NON-VEHICULAR

7 PASSENGER CARS





# DOWNSTREAM H2E | FC POWER INTEGRATION | PROTOTYPES

REFIRE

## 75 HEAVY-DUTY COMMERCIAL TRUCKS





# DOWNSTREAM H2E | FC POWER INTEGRATION | COLLABORATIONS



FUSO – Mitsubishi Fuso’s first 7.5t FC truck co-developed with REFIRE and showcased at the 46 Tokyo motor show in 2019



SCHAEFFLER – Schaeffler and REFIRE collaboration on 3.5t FC delivery van prototype



Clean Logistics - repowered 40t fuel cell truck and 12m fuel cell buses



FC buses in Malaysia – REFIRE offers local aftersales support & training



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Sinotruck – 63t Yard truck





# STATIONARY FUEL CELL POWER PRODUCTS

# FUEL CELL POWER STATION APPLICATION SCENARIO

REFIRE



Biotech & Biopharma



Data Centres



Healthcare



Mining & Construction



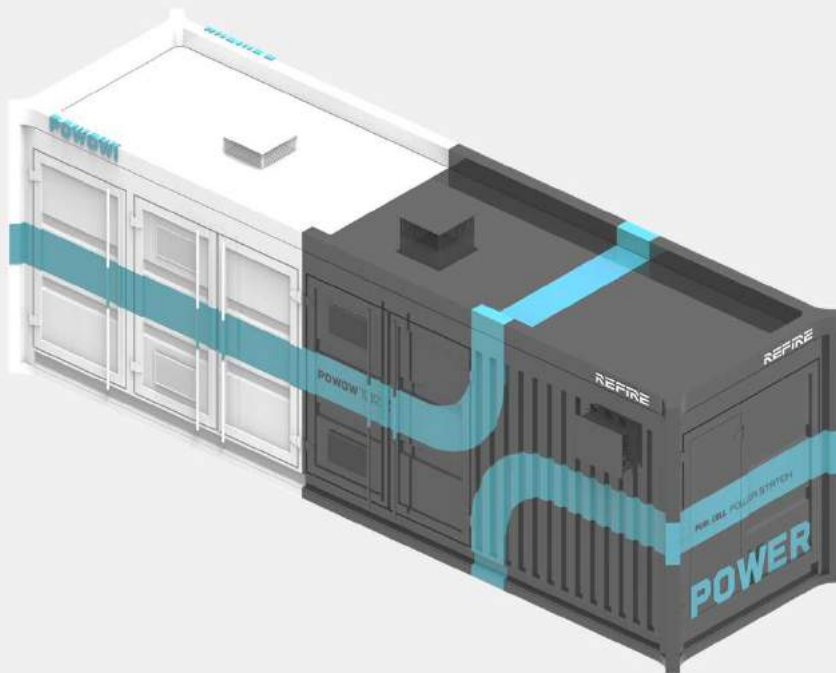
Telecom.



Retail



Manufacturing



## STABILITY

Distributed power supply offers flexibility, and eliminates grid outage risk

Maximize availability and uptime according to demand



## SIMPLICITY

Turnkey modular power unit

REFIRE and EPC partners to handle project management, installation and after market service



## SUSTAINABILITY

Accelerating the path to decarbonization and cleaner air

A viable solution contributing to the clean energy transition



## 200KW GRID-CONNECTED AND OFF-GRID POWER STATION | CASE REFERENCE

REFIRE

- Case Study shown Commissioned in July, 2022
- Achieved continuous stable 200kW full load operation





## 1-2 MW FUEL CELL CONTINUOUS ON-SITE POWER GENERATION | CASE REFERENCE

REFIRE

- Case Study shown Commissioned in April, 2022
- Achieved continuous stable full load 2MW operation, with outstanding performance in many key indicators



# 1.5MW FUEL CELL MOBILE POWER STATION | CASE REFERENCE





## EV OFF-GRID CHARGING & ENERGY

### H2 Piped, bottled, or by energy module

- On-site zero carbon emission power
- Rapid installation/removal on demand
- Flexible relocation, no site construction
- Modular, plug & play storage
- Up to 750V/400A power supply
- 24/7 service plans
- Complies with CQM safety standards
- No substation required
- Grid-neutral product



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## DELIVERING POWER TO BEV VEHICLES



# DOWNSTREAM H2E | POWER PRODUCTS | MW POWER LAUNCH PROJECTS



Paul Scherrer Institute in Switzerland - Cogeneration Units



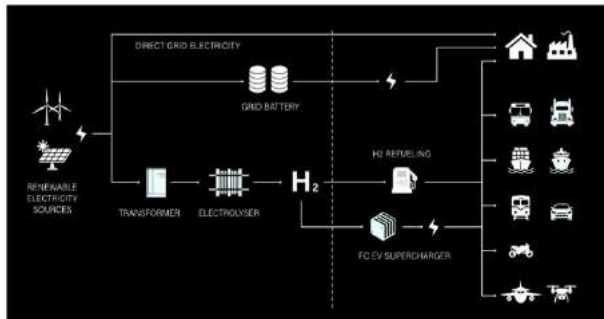
Cogeneration Unit

No.	Selected Completed Projects	Location	Power
1	Research Projects at Tongji University	Shanghai, China	100KW
2	Nanchang University Research Project	Jiangxi, China	100KW
3	Green Hydrogen Power Generation Project	Xinjiang, China	100KW
4	Port area Cogeneration System Project	Zhejiang, China	100KW
5	Aerospace Hydrogen Power Generation Project	Shanghai, China	400KW
6	Megawatt Level Power Generation Project	Zhejiang, China	1MW
7	Combined heat and power generation units	Bremen, Germany	60kW
8	Combined heat and power generation units	Zurich, Switzerland	60kW
9	1.5MW mobile power station	China	1.5MW
10	Stationary Power for BEV charging	Shanghai, China	60kW





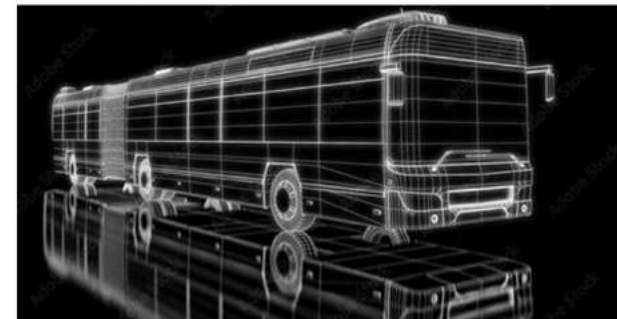




Complete H2 ecosystems



Distributed power for the built environment



Commercial vehicles

- THANK YOU -

For considering REFIRE in building the Hydrogen Value Chain with you.

[www.refire.com](http://www.refire.com)



Contact: [sales@refire.com](mailto:sales@refire.com)