

A hydrogen commercial vehicle powered by a REFIRE fuel cell undertakes emissions-free deliveries in Shanghai. Picture credit: REFIRE



Headquartered in Shanghai, China, REFIRE is a leading global provider of hydrogen fuel cell technologies.

The company specialises in the design, testing, prototyping, application engineering and production of integrated fuel cell systems for buses, trucks, specialised vehicles and marine applications.

What is the central technology used by REFIRE?

At the heart of REFIRE hydrogen fuel cell systems is platinum-based proton exchange membrane (PEM) stack technology.

REFIRE's fuel cell systems are characterised by industry-leading product reliability, durability, freeze-start performance and fuel efficiency for light- to heavy-duty commercial vehicle applications.

Our aggregated mileage of over 75 million kilometres (as of mid-August 2021) is testament to this and has been accrued by over 2,700 fuel cell vehicles in daily operation.

This represents a saving of over 39,000 tonnes of kerbside carbon emissions –equivalent to approximately 100 round-trip flights between Shanghai and New York.

SPOTLIGHT ON REFIRE

Audrey Ma, REFIRE's Vice President, Marketing, Branding and International Business, on its growing hydrogen fuel cell business

How critical is platinum to fuel cell products?

Platinum is a key component of fuel cell stacks as it catalyses the electro-chemical processes required to produce electricity. Without platinum and other catalytic compounds, the efficiency of PEM fuel cells would be greatly diminished.

Fuel cell stacks that do not use platinum-based PEM technology need to be much bigger to achieve similar power outputs. This makes platinum essential to the efficiency of end-user applications and, in particular, its use ensures that the fuel cells are compact enough for use in FCEVs.

REFIRE is constantly striving to improve the area power density of its fuel cells to maximise the power achieved per gram of platinum. This optimum is achieved by balancing the fuel cell system design with the stack and Membrane Electrode Assembly (MEA).

What is the potential for the fuel cell electric vehicle market in China?

REFIRE sees strong potential for FCEV growth, especially with the further expansion of the

new energy vehicle (NEV) industry under China's 2060 carbon neutral directive.

According to China Association of Automobile Manufacturers (CAAM) statistics, from January to July 2021, China's domestic new vehicle sales were 14.756 million units, of which 1,478,000 were NEVs, an increase of over 190 per cent year-on-year.

Recent plans (NEV Industry Development Plan & Energy Saving and New Energy Vehicle Technology Roadmap 2.0) will also help to stimulate the market for FCEVs.

By 2035, the market share of NEVs in China is expected to exceed 50 per cent, with the number of FCEVs reaching around one million.

To what extent is the heavy-duty sector driving FCEV growth?

According to CAAM's 2019 statistics, commercial vehicles accounted for only about 12 per cent of China's car ownership but produced 56 per cent of road traffic carbon emissions; of this portion, trucks in particular are major polluters.

In 2019, China was home to approximately seven million heavy-duty trucks – or one third of the world's 20 million heavy-duty trucks. Based on Bloomberg NEF predictions, by 2040, 50 per cent of the world's heavy-duty trucks will be powered by new, clean energy.

Fuel cell technologies provide an attractive and viable zero-emissions mobility solution in the long term and their advantages, such as longer range and quick refuelling, combined with greater load capacity, make them a uniquely attractive option for trucks as this sector works towards decarbonisation.

Specifically, what are China's central government and local governments doing to encourage FCEV deployment?

The central government continues to announce new policies supporting further development of the industry's supply chain and home-grown technologies.

As an example, in September 2020, the Ministry of Finance, together with four other ministries, issued a notice on the demonstration and application of FCEVs, which is expected to further drive technological breakthroughs, cost reduction and end-use application of fuel cell power in various areas.

At the local level, more than 20 regions have so far issued phased plans for the promotion of FCEV deployment.

Shanghai, for example, has recently proposed a 2023 target of '100 hydrogen refuelling stations, 100 billion yuan of industry output, 10,000 FCEVs deployed'.

Is the China domestic carbon trading scheme likely to have an impact?

Coupled with the collaborative efforts of policy and industry, China's nascent carbon trading schemes may further incentivise a shift towards green hydrogen which is produced from fully sustainable sources such as wind and solar power.

As the domestic carbon trading and credit systems take hold, further market demand will arise from the need by corporations to offset their own carbon footprint.

Thus, for companies operating vehicle fleets, for example, it will be attractive to opt for zero carbon solutions such as fuel cell power.

Producers of FCEVs will likely see an increasing uptrend in demand as more corporations participate in the scheme, and as the carbon pricing mechanism begins to weigh in on overall corporate ESG directives.

REFIRE is orientated towards the heavy-duty commercial vehicle sector. Where does it see fuel cells in the light-duty vehicle sector?

Routes and duty cycles of mass transit and logistics vehicles of all sizes are generally well understood, meaning that even with limited refuelling and servicing locations, they can all play an early and significant role in the decarbonisation of urban and extra-urban traffic.

Urban movement of goods has exploded in recent years in China due to economic improvements, e-commerce and the growth in home-delivery culture. These trends are expected to continue which will ensure greater demand for clean power including fuel cells.

Importantly, mid- and light-duty FCEV deployment will help facilitate a broader spectrum transition to hydrogen energy by accelerating the roll-out of critical infrastructure such as refuelling networks and by driving technological breakthroughs.

REFIRE has focused on light- and mid-duty sectors for several years already, with mass transit and commercial logistics fleets remaining a priority.

For example, earlier this year, Geely Commercial Vehicle Group announced a new generation of light-duty truck prototype that will be developed into three types of NEV including battery electric vehicles, range extended electric vehicles and FCEVs.

The company has said that 5,500 trucks will be deployed, of which 1,200 will be FCEVs powered by REFIRE's PRISMA fuel cell system.

How important are collaboration and strategic partnerships?

Since the hydrogen value chain is long and complex, local and global partnerships are essential to achieving industry competitiveness, leading to breakthroughs.

We are seeing more robust global partnerships with market participants from government, the Oil & Gas sector and automotive OEMs across the supply chain. Such partnerships are supported by actionable steps towards producing cleaner hydrogen and fuel cell products at scale and with decreasing bottlenecks in order to meet the green mandate.

What strategic partnerships has REFIRE set up within the hydrogen economy value chain?

Since its inception in 2015, REFIRE has been creating strategic partnerships with upstream and downstream industry partners, academic and research institutions, as well as with industry associations and standards bodies, to accelerate the shared vision of mass-adoption of clean fuel cell technologies. This will only be achieved by building affordable and truly great products at scale.

For example, since 2020, REFIRE has been working with Sinopec Shanghai to build a strategic hydrogen energy cooperation ecosystem, effectively promoting the large-scale application of FCEVs and rapid development of infrastructure such as hydrogen refueling stations in Shanghai.

Other industry partners include Toyota Tsusho, Mitsubishi Fuso, Dupont, TÜV Nord, TÜV Rheinland, Garrett, Continental AG, Johnson Matthey, Schaeffler and many others.

How important is green hydrogen production to REFIRE's vision?

Grey and blue hydrogen are valuable interim contributors to the transition to fully green hydrogen because they do allow for zero emissions at the point of use.

However, upstream considerations such as Carbon Capture and Sequestration (CCS) and other methods of reducing the carbon footprint during hydrogen production are ultimately less sustainable.

REFIRE's vision is to accelerate the mass-adoption of zero emissions hydrogen fuel cell technology so that the world can breathe easy.

Therefore, it is essential to strive for a greater proportion of fully renewable sources of hydrogen to achieve net zero carbon.



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