

**BALLARD™**



CASE STUDY

# Fuel Cell Zero-Emission Trucks in Shanghai

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## Situation

Shanghai is one of the largest cities in China. It is an important global financial center and transport hub, and is a pioneer of advanced technologies. An example of advanced technologies is Shanghai’s provision of 100 hydrogen fuel cell sightseeing vehicles and 4 fuel cell buses for the 2010 Shanghai World Expo. The 2017 Shanghai Fuel Cell Vehicles Development Plan illustrated the city’s determination to integrate supply chain and achieve fuel cell vehicle commercialization at scale. Near-term target (2017-2020) ambitions show 3,000 fuel cell vehicles on road. Shanghai strives to achieve scaled-up production and commercialization of fuel cell vehicles to address air pollution.



## Solution

In 2017, Ballard supplied FCvelocity®-9SSL fuel cell stacks to Shanghai Re-Fire Technology Co., Ltd. to power 500 fuel cell Dongfeng trucks. Re-Fire is the system integrator to offer the fuel cell powertrain solution for the 500 trucks. These trucks are 6.41 meters in length, with a cargo volume of 15.7 m3 and a payload capacity of 3.2 tons. The fuel cell system increases the vehicle operating range up to 350 km. With the integration work completed in late-2017, all 500 commercial trucks have received their green license plates for new energy vehicles.

STNE is one of the largest commercial operation platforms for hydrogen fuel cell vehicles in China. The 500 trucks were leased by STNE to provide logistic services for several well-known e-commerce and express delivery services, mainly in the Shanghai region. Jingdong has become one of the first e-commerce companies in China to use hydrogen-powered vehicles to deliver zero emission self-service logistics services.

In the past two years, more restrictions have been imposed on diesel vehicles entering into urban areas, which makes it difficult to meet the surging demand for express delivery services. The battery electric light vans solve the problem of urban traffic restrictions, but it is still limited by relatively small cargo loading, operating range and charging infrastructure, especially in summer when the burden on the local electrical grid limits the capacity to charge many vehicles at once. The fuel cell electric trucks can be refueled in as little as 10 minutes, providing better range and heavier payload, and avoiding long charging time and grid infrastructure limitations.

Site	Shanghai, China
Application	500 zero-emission hydrogen fuel cell logistics trucks
System	Re-Fire Caven 3 with Ballard FCvelocity®-9SSL stack
Fuel	Refueling service at Jingyuan HRS
Objectives	To support Shanghai’s goal of carbon reduction to realize a low carbon economy

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## Refueling

So far, Shanghai has a total of 3 hydrogen refueling stations (HRS) in operation. Jingyuan HRS is the main HRS providing refueling service for the 500 trucks. Jingyuan HRS, covering an area of 1590 square meters, is located at Re-Fire's new R&D Center and is developed through a joint investment of 12 million yuan from Re-Fire, FuruHP and Zhongjiao New Energy Automobile Operation (Shenzhen) Co., Ltd.

Jingyun HRS has a geographic advantage as it is located on the routes from logistic distribution centers in the west of Shanghai to the urban areas. Hydrogen trucks refuel on their way from the distribution centers prior to their delivery service in the urban areas. The maximum daily hydrogen supply capacity of the HRS exceeds 1300 kg with maximum refueling event of 173 times in a single day, and the current accumulative hydrogen supply has already surpassed 163,000 kg.

## Result

Fuel cell electric commercial trucks offer an attractive value proposition, particularly where user requirements favor long range, heavy payloads and fast refueling. As of November 2018, 21 well known e-commerce logistics and distribution enterprises have adopted zero-emission commercial trucks.

These 500 fuel cell vehicles have reduced carbon dioxide emissions by more than 60 tons, with a cumulative commercial mileage of more than 5 million kilometers. The longest travelled distance of a single truck reached 110,000 kilometers. The daily average mileage of hydrogen fuel cell trucks running in Shanghai is more than 150 km. The maximum single-day mileage of a single truck exceeded 400 km during the service period of Double 11 (on November 11, 2019), the most important shopping day in China.

The 500 fuel cell truck fleet, the world's largest deployment of fuel cell commercial trucks, marks the beginning of an era for fuel cell vehicles in the logistics industry and it highlights progress in the adoption of Ballard fuel cell technology by the China transportation sector. This project highlights the benefits of fuel cell technology offering zero emission efficient delivery vehicles with no compromise in performance and operability while maximizing asset utilization for the fleet operators. This successful deployment proves that with our leading technology and strong partnerships, we can achieve fuel cell vehicle commercialization and improve air quality in China.



Distance Travelled	> 5 million kilometers
Refueling events	28,700
Refueling time	10 minutes
Range	>350 km

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