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Meanwhile, Germany's Daimler signed a deal with Chinese battery maker BYD last week to form a joint venture to build an electric car for the China market based on an investment of 600 million yuan. BYD already has two such vehicles on the market, a plug-in hybrid called the F3DM and its E6 electric car. But neither have yet come close to cashing in the electric gold rush the China market could harvest, with foreign carmakers predicting it will take at least another decade before the battery technology gets to a point where mainstream use would be realistic.

Experts say greenhouse gas emissions could be trimmed by at least

20 percent if gas-powered vehicles were replaced with electric cars. Urban smog would not totally disappear, due largely to China's heavy reliance on coal to feed its people's energy needs, but it would dissipate.

The burnt hydrogen from fuel-cell "stacks" is relatively clean and emission-free, but building an infrastructure that facilitates their widespread use is the main stumbling block

for economies looking to adopt this new technology.

"The biggest problem in terms of commercializing this technology is building operable and practical refueling stations," Yu said during a tour of the Clean Energy Demonstration Base for the World Expo in Shanghai's Jiading district.

At the demonstration base, a team of experts tracks the movements of each Expo buggy in real time on computer screens while scanning for bugs, kinks and ways of saving costs en route to carving a new business niche.

The base, in Anting town, Jiading, produced its first fuel-cell vehicle in 2002. Called "Start 1", the car now sits in the showroom like a prop at Universal Studios' Back to the Future ride. Anting has been dubbed an international automotive town as it hosts scores of manufacturing and development bases for industry giants like Honda.

Shanghai Volkswagen Automotive Co Ltd and Chinese manufacturers Chery and Chang'an are among those involved in China's latest fuel-cell project, which has been

overseen by the Ministry of Science and Technology since 2001.

The ongoing Expo experiment, which sees visitors charged 10 yuan for a short ride in a fuel-cell buggy from the China Pavilion to the USA Pavilion, is the most advanced project of its kind in China, they said. Other companies are developing prototypes but they are not getting the same level of feedback, experience or government support.

"There are still problems of cost and the reliability of components, but we've already learnt a lot in just one month, such as about the quality of the battery and the controller over long-term repeat use," said Zhang.

Each of the Expo buggies cost 1.5 million yuan (\$220,000) to

build, or the same as a Ferrari 458 Italia sports car, he said. If the cost of the technology were factored in, the price tag would be higher.

Despite this, Zhang said the fuel-cell buggies have the potential to be both economical and environmentally friendly. They currently run at about one-third the cost of petrol by squeezing 400 kilometer out of their two tanks.

Professor Ma Jianxing, one of the men who built the portable hydrogen refueling station in Jiading, said Shanghai has a huge advantage in terms of obtaining hydrogen because of its sizable steel and coke industry.

Another problem is convincing people it is safe to compress dangerous chemical elements under high pressure in a way that leaves no margin for hydrogen leaks or explosions during a collision. Critics point to previous air disasters involving hydrogen leaks, such as the midair fire that engulfed the Hindenburg Zeppelin over New Jersey in 1937.

"According to our experience that has never happened," said Dr Ning Guobao, another member of the Tongji team, referring to the hydrogen tanks exploding during controlled crashes. "Remember there is also a risk of electric cars electrocuting people but that doesn't happen either."

The team is so confident it is now looking at ways of doubling the tank's pressure level from 350 bars to 700 bars so drivers can travel

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TONG ZHANG
GENERAL MANAGER OF
SHANGHAI FCV POWER-
TRAIN CO, LTD



GAO ERQIANG AND YONG KAI / CHINA DAILY PHOTOS

There are 196 fuel-cell vehicles being used at the Expo, including this one in front of the China Pavilion.



Some of the sight-seeing fuel-cell buggies in the Expo Garden.

twice as far on a single tank.

But the threat of something going horribly wrong is always lurking over the horizon. Voicing concern about the possible side effects of radio waves, Ma urged reporters to switch off their cell phones last week as they thronged around the portable refueling station, which itself looks like a cross between a SCUD missile launcher and a giant scuba tank.

Some of the statistics used to promote fuel-cell vehicles can be misleading and need to be put in perspective. Many vehicles have a basic fuel stack but also rely on auxiliary power systems to compensate for their shortfalls, such as by installing small battery packs to make up for slow reaction times during operations such as gunning the ignition.



US Secretary of Transportation Ray LaHood (left) tests and inspects the EN-V from General Motors inside the SAIC-GM Pavilion.