

# Hydrogen & Fuel Cell Connection

## March/April 2020



Four billion years ago  
Our lonely Earth  
Set sail on cosmic seas  
Guided by an unseen hand  
Of nature, God or chance

ONE PLANET  
ONE FUTURE

The **Hydrogen & Fuel Cell Connection** is a bi-monthly newsletter published by IHFCA that highlights the latest industry news & business opportunities for global H<sub>2</sub> fuel cell research, demonstration and commercialization.



### IN THIS ISSUE

- I. The Association (IHFCA) News
- II. Hydrogen Fuel Cell News
- III. Hydrogen Momentum in China
- IV. IHFCA Member Introduction

#### I. THE ASSOCIATION NEWS

Commissioned by the Government of Fangshan, IHFCA is developing an *Integrated Hydrogen and Fuel Cell Implementation Plan* for Fangshan District, Southwest Beijing. A part of the plan is to develop a business strategy to attract foreign investment in the hydrogen value chain. Home to Sinopec Yanshan, Fangshan is known for its petrochemical industry and related hydrogen infrastructure.

Commissioned by the National Manufacturing Strategy Advisory Committee (NMSAC) and MIIT, China SAE & IHFCA are comprehensively updating China's *FCV Technology Roadmap (2020-35)* that will be released in Q4 2020. China released the first edition of its FCV Roadmap in 2016.

#### II. HYDROGEN FUEL CELL NEWS

Science is the great giver – and we're just at the beginning of what it can give. Bill Gates wrote in his notes that from penicillin to pasteurization [and from William R. Grove to Geoffrey Ballard], the world owes an ongoing debt to scientists' discoveries. Today, science and government policy are interacting to solve various complex challenges, using the most abundant element in the Universe.

The European Commission unveiled the *European Industrial Strategy*, a broad plan to advance the European industrial sector toward digitization and climate neutrality by 2050. The plan includes creating the European Clean Hydrogen Alliance, an EU-wide consortium to collectively promote renewable hydrogen and fuel cell technologies.

Hydrogen Europe released the 2x40 GW Green Hydrogen Initiative, aiming to promote a massive increase of electrolyser production within the EU to support green H<sub>2</sub> production. It represents an investment of €20B over the next 5-10 years.

The Environment Minister of Portugal announced an ambitious plan to build a green hydrogen plant near the port of Sines, which will start in 2020 and could attract up to €5B in private investment. The western-most European country is pioneering the exploration of the "Hydrogen World."

The Dutch Government presented its views on future hydrogen and policy intentions to improve the business climate for green hydrogen in the Netherlands. To become the Silicon Valley of the hydrogen economy, the Northern Netherlands is taking on pioneering work to build the Hydrogen Valley – an innovation hub to attract talents from science, industry and politics who are committed to an intelligent energy transition.

In Central Europe, Austria closed its last coal-fired power plant, ending the era of coal-based electricity generation in the landlocked country. Looking for the hydrogen future, Austria is taking another step toward phasing out fossil fuels, with the target of 100% renewable electricity by 2030.

Daimler and Volvo, two of the world's largest commercial vehicle makers, unveiled plans to jointly commercialize hydrogen fuel cell trucks. The former has intensively pursued hydrogen for two decades, and the latter has focused more on electric trucks but also has long experience with hydrogen.

In Scandinavia, Nel and Kvaerner established a partnership to standardize large scale hydrogen production plants and green hydrogen projects. Their initiatives include the standardization of a 20 MW P2G system that could be scaled up to several hundred megawatts.

Funded by NEDO, the world's first international hydrogen supply chain realised between Brunei and Japan via 4,000 km of marine shipment. The pilot project will run till the end of 2020, exploring the potential of a global LOHC H2 supply chain.

Anglo American, BHP, Fortescue & Hatch formed a Green Hydrogen Consortium to look at ways of using low-cost renewable hydrogen to accelerate decarbonisation in the mining sector. Connecting people with natural resources, Anglo American is re-imagining mining to improve our lives with the most precious element in the universe.

### III. HYDROGEN MOMENTUM IN CHINA

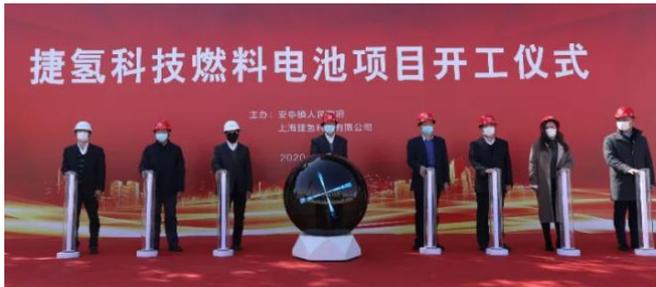
China's Ministry of Finance announced that it will extend NEV subsidies to the end of 2022. The Ministry also outlined a *new* strategy to accelerate China's FCV development. Instead of providing subsidies to OEMs as it did for EVs in 2009, the Ministry will allocate its subsidies directly to the governments of selected H2 demonstration cities and provinces, enabling these cities and provinces to create synergies and develop China's complete FCV supply chain within four years. Details will be provided in the next newsletter.

China's NDRC and Ministry of Justice released a guideline to establish China's national regulatory framework for green production and consumption. One of the 27 main tasks is to complete China's hydrogen market regulation development in two years by NEA, NDRC, MOST, MIIT, MNR & SAMR. China is striving to develop a national regulatory framework for the production and transport of hydrogen fuel, as well as regulations for the development and operations of H2 stations.

MIIT released *The 2020 Main Tasks to Accelerate the Standardization of New Energy Vehicles*. Below are key tasks for FCEVs.

- *H2 Stations*: Accelerate standard development for dispensers and nozzles; Launch projects for developing FCEV-HRS communication protocols;
- *FCEVs*: Accelerate FCEV standards and testing on vehicle collision, cold start, driving range, fuel efficiencies, and power performance; Launch projects for FCEV sub-systems including engines, air compressors & onboard H2 storage;
- *Global collaboration*: Actively participate in tech standard formulation under *the Framework of FCEV Tasks*; encourage domestic enterprises to initiate and actively participate in international standard development.

For more information about China's FCV standards, please email: [ryanca@163.com](mailto:ryanca@163.com).



Shanghai Hydrogen Propulsion Technology (SHPT), a spinoff of SAIC, started the construction of its fuel cell R&D and manufacturing center. With an investment of RMB 500M (\$70M), the center will open in summer 2021 with an annual capacity of 12,000 fuel cell stacks.



Weichai, the world's largest diesel engine maker, launched the production of fuel cell engines at its new plant. With an annual capacity of 20,000 units, the plant is the world's largest fuel cell engine manufacturing center.



With an investment of RMB 8.5B (\$1.2B), Toyota and FAW started the construction of a joint plant in Tianjin, China. Designed exclusively for the production of new energy vehicles, the 342,000 sq.m plant will open in summer 2022 with a designed annual capacity of 200,000 units of FCVs, BEVs, and PHEVs.

Also in Tianjin, China Automotive Technology and Research Center (CATARC) announced an investment of \$280M to build a NEV testing center, serving mainly in three areas: fuel cells, power batteries, and electric drives. The center will build China's largest testing facility for FCV R&D and standard development.



SAIC Motor and Shanghai Airport Group signed a strategic partnership framework on hydrogen shuttle buses and ground transport. The two sides will also explore the potential to develop hydrogen refueling stations. In Nov. 2019, SAIC inked a similar collaboration with China Post.



The School of Vehicle & Mobility (SVM) at Tsinghua University presented its FCV research frontiers at a celebration event. In partnership with SinoHytec & Foton, Tsinghua has developed FCBs featuring cold start at -30°C, higher fuel efficiency and integrated thermal management. Foton FCBs now account for 46.8% of China's total FCB mileages. After the serial production of its 3rd generation fuel cell engine (30-100 kW) with self-developed stacks, Tsinghua is developing 200 kW engines to power FCBs, as well as LH2 heavy-duty trucks with a designed onboard storage capacity of 60-100 kg LH2 for a minimum range of 800 km.



Vancouver-based Loop Energy received a \$15M fuel cell range extender order from a major bus manufacturer in China to support the retrofitting of a fleet of 7,000 electric transit buses in Nanjing. Loop received this order after the receipt of its 50 kW serial product certification by CATARC, a national auto testing and certification organization.

In the H2 storage sector, Hexagon Composites signed a term sheet for strategic cooperation and joint venture agreement with CIMC ENRIC – a leading energy equipment manufacturer in Asia. Listed on the Hong Kong Stock Exchange, CIMC ENRIC is a subsidiary of China International Marine Containers Group (CIMC).

#### IV. IHFCA MEMBER INTRODUCTION

“No law of nature, however general, has been established all at once; its recognition has always been preceded by many presentiments.”

– Dmitri Mendeleev

In 1869, Dmitri Mendeleev presented the first Periodic Table of Chemical Elements. The Table, as the organizing principle for the chemical behavior of all known and yet-to-be-known elements in the Universe, is also a cultural icon: a testimony to the endeavor of science as an international human adventure to explore new territories.

Going from zero to one, SHPT and SinoHytec have played a key role in China’s fuel cell and FCV development. Today, the fuel cell engines built by these two companies represent China’s highest technical standards.



**捷氢科技** Shanghai Hydrogen Propulsion Technology (SHPT), a spinoff of

SAIC Motor, was established in 2018. Its main products include fuel cell engines, H2 storage solutions, and FCV engineering services.

SAIC, China’s largest automaker, has engaged in the FCV development since 2001. In 2010, its 174 fuel cell sedans and sightseeing vehicles were successfully demonstrated at the Shanghai Expo. At the 2014 Michelin Challenge Bibendum, SAIC achieved the highest score in fuel cell cars. Its early successes laid a solid foundation for SHPT and China’s FCV industry. Today, SHPT engines (30-100 kW) are equipped on a wide range of fuel cell cars, buses, and trucks.



**Photo:** LU Bingbing, SHPT General Manager, introduced FC engines to WANG Xi, Deputy Minister of MOST, in his visit to SHPT on May 9, 2020.



**亿华通** SinoHytec, a spinoff of Tsinghua Univ., was established in 2004.

Specialized in safe, efficient fuel cell systems and FCB sub-components, SinoHytec offers a full range of fuel cell engines.

Building a better world, SinoHytec is also at the forefront of renewable hydrogen, P2G, and CGH2 stations. In 2007, it built China’s first HRS serving the 2008 Summer Olympics.

In 2013, SinoHytec achieved China’s first serial production of fuel cell engines. It has made in-house development of graphite bipolar plates and is collaborating with Foton and Toyota in metal plate-based FCB development. With either carbon or metal-plates, SinoHytec engines (30-100 kW) have developed a unique competitive advantage.

SinoHytec has established cooperation with over 30 major Chinese OEMs, including Yutong, Foton, Zhongtong, Sunlong, Higer Bus, Ankai, Zhongzhi, Dongfeng, Sinotruk, Shaanxi Auto, Beiqi, GAC and Changan, to develop a wide range of fuel cell cars, buses, and logistics trucks. Nearly 20 percent of all recommended FCV models listed by MIIT in 2018 and 2019 are equipped with SinoHytec engines.

On Apr. 30, the Shanghai Stock Exchange approved SinoHytec’s IPO application. The Tsinghua spinoff is to become China’s first public-listed hydrogen fuel cell company, with an estimated P/E ratio of 63.

SinoHytec’s upcoming IPO is expected to further foster China’s domestic fuel cell ecosystem. The table below lists SinoHytec’s top five suppliers in 2018 vs. 2019 (source: XCH-Club).

	2018		2019	
1	Ballard	13.91%	ZCJSD	10.03%
2	Hydrogenics	13.36%	WUT Energy	8.48%
3	Johnson Matthey	9.62%	Zhejiang Nuvera	8.23%
4	CubeEnergy	8.67%	Johnson Matthey	7.51%
5	Zhejiang Nuvera	4.53%	Toyota Tsusho	5.62%
	<b>Total</b>	<b>50.09%</b>		<b>39.87%</b>