



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update October 2016: China

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1. New Policy Initiatives on Hydrogen and Fuel Cell

- On June 1st 2016, the National Development and Reform Commission and China's National Energy Administration released the Energy Technology Revolution Innovation Action Plan (2016- 2030), and at the same time released the Energy Technology Revolution Innovation Roadmap for action. Hydrogen and fuel cell technology innovation is one of the 15 Key Tasks listed in the Action Plan. The target for hydrogen and fuel cell technology in the roadmap is "By 2020, the rated output power of PEMFC 50 ~ 100 KW power, system greater than 300 Wh/kg, stack greater than 3000 W/L, service life greater than 5000 hr; By 2030, to realize the large-scale application of fuel cell and hydrogen; By 2050, to realize the popularization of hydrogen energy and fuel cells."
- On July 28th, the State Council issued "Thirteen-Five" National Science and Technology Innovation Plan (2016-2020). Hydrogen and Fuel Cell technology was listed in the disruptive technologies for leading industry innovation.
- Energy - saving and New Energy Vehicle Technology Roadmap is being prepared by SAE-China, and will be released soon. The final review meeting was held in Beijing on Aug 30th. The Fuel Cell Vehicle Technology Roadmap is an important part of this file.
- Meanwhile, the National Standardization Technical Committee for Hydrogen Energy (SAC TC309) is developing a Blue Book on China's Hydrogen Infrastructure, which will be released soon.

2. Hydrogen and Fuel Cell R&D Update

- The first 70MPa Hydrogen Refuelling Station (HRS) in China was built in Dalian City. Research and development of the 70MPa hydrogen dispenser, 87.5MPa hydrogen storage cylinder, and 90MPa hydrogen diaphragm compressor was undertaken with the support of the national 863 project. The solar and wind power generation coupled with a hydrogen electrolysis production unit were also installed in this station.



The first 70MPa HRS in China



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3. Demonstration and Deployments Update

Transportation:

- On Sept. 28, 2016, an initial 12 fuel cell buses were deployed in the District of Sanshui, in the City of Foshan, in the Province of Guangdong, China. This is the first step of the planned deployment of 300 fuel cell-powered buses in Foshan/Yunfu City. Mr. Xu Guo, Vice Mayor of the City of Foshan/Yunfu said, “We are moving the Cities of Foshan and Yunfu into the future by adopting zero-emission fuel cell buses that have long range, fast refuelling and outstanding passenger comfort. We expect additional routes to be commissioned in the coming months.” There are three HRSs under construction and two more in planning in Foshan and Yunfu.



A portion of the new Foshan fuel cell bus fleet



The FCB launching ceremony

- On July 18, 2016, Ballard signed a definitive agreement in Foshan, China, with Guangdong Nation Synergy Hydrogen Power Technology Co. Ltd. (“Synergy”) for the establishment of an FCvelocity®-9SSL fuel cell stack production operation in the City of Yunfu, in Guangdong Province. The fuel cell stacks will be packaged into locally-assembled fuel cell engines and integrated into zero-emission buses and commercial vehicles in China. Expected in late-2016, a joint venture will be created to undertake the stack manufacturing operations and will be owned 90% by Synergy, and 10% by Ballard.
- On Sept. 1, 2016, Zhongshan Broad-Ocean Motor Co., Ltd., headquartered in the City of Zhongshan in Guangdong Province, China, signed an MOU with Ballard having a goal of producing fuel cell modules for use in buses and commercial vehicles in select cities and regions in China. On August 18, 2016, Broad-Ocean also made a \$28.3 million strategic equity investment in Ballard, through which Broad-Ocean acquired a 9.9% ownership position in Ballard, making it the company’s largest shareholder.
- On Aug. 31, the UNDP-GEF-MOST FCV Project Phase-III (2016-2020) was launched in Beijing. The objective of this project is the facilitation of the commercial production and application of fuel cell vehicles in China. With the support of this project, more than 100



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FCVs will be demonstrated in five cities, including Beijing, Shanghai, Zhengzhou, Foshan and Yancheng.

- In May 2016, Beiqi Foton Motor Co., the truck subsidiary of BAIC Motor Group Co., received an order for 100 fuel cell buses from Shouqiev Co., an alternative energy vehicle leasing company in Beijing. Foton will deliver the first 60 buses to the buyer in late 2016 and 40 buses toward the end of 2017. Shouqiev is a subsidiary of Shou Qi Group Co., a public bus and taxi operator owned by the Beijing city government. The buses were developed by Foton, Tsinghua University, and Beijing Sinohytec Co., a fuel cell vehicle developer backed by private equity firms. In April 2016, Beijing Sinohytec Co. also signed a letter of intent to cooperate on 100 fuel cell bus with Zhengzhou Yutong Bus Co., the biggest bus manufacture in China.

Other Application:

- Many companies in China are designing fuel cell power systems specifically for UAV application with Troowin Power System Technology Co. one of the most famous developers. In March 2016, Troowin's UAV demonstrated its endurance by operating 4 hours 33 minutes in the field using a multi-rotor UAV powered by HyLite® fuel cell power system. Troowin's fuel cell powered UAV is being used by Wuhan city public security bureau, as reported by CCTV (China Central Television) in July 2016.



CCTV report the using of FC powered UAV

- On Aug. 27, 2016, the UNDP-China Hydrogen Economy Pilots project was launched in Rugao (2016-2020). Rugao is a city in Jiangsu Province, China. The project's objective is to demonstrate the application of hydrogen production and technology in the field of manufacturing and consumer goods, and, build the first "Hydrogen City" to demonstrate the hydrogen economy, with the goal of promoting the sustainable development of China and mitigating the adverse impacts of climate change. (For more information, please contact Mr. Zhang Weidong at weidong.zhang@undp.org)



The Opening Ceremony of UNDP-China Hydrogen Economy Pilots in Rugao



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4. Events and Solicitations

- China Machinery Industry Federation (CMIF) and the National Standardization Technical Committee for Hydrogen Energy (SAC TC309) will hold the "2016 China International Hydrogen and Fuel Cell Conference and Exhibition" (CHFCE 2016) in Beijing China National Convention Center on November 28-30, 2016. The organizer contacts: yanganping@vip.163.com; Website: www.chfce.com, www.energy-tech.com.cn
- To promote fuel cell technology implementation through international cooperation, SAE-China will hold the first International Fuel Cell Vehicle Congress (FCVC) on November 7 – 8 2016, in conjunction with the 53rd Executive Committee and its Annex meetings of Technology Collaboration Programme on Advanced Fuel Cells affiliated to the International Energy Agency (IEA AFCTCP). The organizer **contacts:** Ms. Ge Yingying / Gao Cuicui SAE-China Email: geyy@sae-china.org/gaocc@sae-china.org; Website: <http://fcvc.sae-china.org>

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

- Ministry of Science and Technology (MOST) launched the "New energy vehicles" pilot projects of the National Key R&D Program in July 2016, in which there were two projects on fuel cell R&D. The government funding is 175 million RMB.



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Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
Fuel Cell Vehicles ¹	No national target	Approx. 60	FCV technology roadmap is in progress	• Subsidy for purchase, 200K RMB
FCBus	No national target, Foshan City plans for 300 FCBs by 2017	Approx. 40		• Subsidy for purchase, 500K RMB
Fuel Cell Trucks ²	No national target	Approx. 10		Subsidy for purchase, 300K RMB
Forklifts	No national target			• No support policy
H ₂ Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
70 MPa On-Site Production	No target	1		• Subsidy for installation of a new hydrogen refuelling station with 200kg H ₂ capacity , 4M RMB
70 MPa Delivered	No target	0		• Subsidy for installation of a new hydrogen refuelling station with 200kg H ₂ capacity , 4M RMB
35 MPa On-Site Production	No target	1		• Subsidy for installation of a new hydrogen refuelling station with

¹ Includes Fuel Cell Electric Vehicles with Range Extenders

²As above



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				200kg H2 capacity , 4M RMB
35 MPa Delivered	No target	2	Many cities have plans for building HRS, such as Foshan, Rugao, Yancheng, Wuhan, Beijing, Shanghai, etc.	Subsidy for installation of a new hydrogen refuelling station with 200kg H2 capacity , 4M RMB
Stationary	Target Number³	Current Status	Partnerships, Strategic Approach	Policy Support
Small ⁴	No target			
Medium ⁵	No target			
Large ⁶	No target	One project under construction		
District Grid ⁷	No target			
Regional Grid ⁸	No target			
Telecom backup	No target	Approx. 50 units		
H₂ Production	Target⁹	Current Status	Partnerships, Strategic Approach	Policy Support
Fossil Fuels ¹⁰	No target			

³ Targets can be units installed and/or total installed capacity in the size range indicated

⁴ <5 kW (e.g., Residential Use)

⁵ 5kW – 400 kW (e.g., Distributed Residential Use)

⁶ 0.3MW – 10 MW (e.g., Industrial Use)

⁷ 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)

⁸ 30MW plus (e.g., Grid Storage and Systems Management)

⁹ Target can be by quantity (Nm³, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target



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Water Electrolysis ¹¹ (PEM, Alkaline, SOEC)	No target			
By-product H ₂	No target			
Energy Storage from Renewables	Target¹²	Current Status	Partnership, Strategic Approach	Policy Support
Power to Power ¹³ Capacity	No target			
Power to Gas ¹⁴ Capacity	No target	Two pilot projects are under construction		

¹⁰Hydrogen produced by reforming processes

¹¹ Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)

¹² Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

¹³ Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

¹⁴ Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)