



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update December 2018: China

Name	ZHANG Cunman / XUE Mingzhe
Contact Information	zhancunman@tongji.edu.cn 86-21-69583793 mzxue@tongji.edu.cn 86-21-69583895
Covered Period	May 2018 – November 2018

1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

1.1 National level

On July 10th, China's Ministry of Finance (MOF), State Administration of Taxation, Ministry of Industry and Information Technology (MIIT) and Ministry of Transport (MOT) released "Notification on preferential policies for energy saving and new energy vehicles and vessels to enjoy the vehicle and vessel tax". New energy vehicles including fuel cell passenger vehicles and fuel cell commercial vehicles were exempted from the vehicle and vessel tax. (http://www.gov.cn/xinwen/2018-08/04/content_5311722.htm)

1.2 Local level

On June 6th, the Guangdong Provincial Government released "Opinions on Accelerating the Innovation and Development of New Energy Automobile Industry". It proposed to vigorously promote the industrialization of hydrogen fuel cell vehicles, plan the layout of hydrogenation infrastructure construction, and increase the promotion and application of hydrogen fuel cell vehicles. (http://zwgk.gd.gov.cn/006939748/201806/t20180613_769686.html)

On August 23rd, the Hainan Provincial Government released "Hainan Clean Energy Vehicle Development Plan". It confirmed fuel cell vehicle as an important product technology for future development and proposed deployment of fuel cell vehicle comprehensive application ecological construction and special project for promoting hydrogen energy application demonstration. (http://xxgk.hainan.gov.cn/hi/HI0105/201808/t20180823_2735203.htm)

On September 21st, the Shandong Provincial Government released "Shandong New Energy Industry Development Plan (2018-2028)". In the field of hydrogen energy and fuel cell industry, the Plan pointed out that it was necessary to enlarge and strengthen key industries of new energy vehicles, accelerate the layout of hydrogen energy frontier industries, cultivate and strengthen hydrogen energy characteristic industrial clusters, and organize hydrogen implementation. By 2028, the province's hydrogen energy industry output value will strive to exceed 50 billion yuan (US\$ 7.22 billion). (http://www.shandong.gov.cn/art/2018/9/21/art_2259_28611.html?rsv_upd=1&from=singlemessage)

On October 22nd, the Tianjin Municipal Government released "Tianjin New Energy Industry Development Three-Year Action Plan". It proposes to improve the hydrogen fuel cell industry supply-chain and to help build a leading national fuel cell vehicle industry zone. The total industrial output value of emerging fields such as hydrogen energy and hydrogen fuel cells was expected to reach 8 billion yuan (US\$ 1.15 billion) by 2020. (http://gk.tj.gov.cn/gkml/000125022/201810/t20181030_80623.shtml)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

On November 6th, the Foshan Municipal Government released “Foshan Hydrogen Energy Industry Development Plan”. It proposed the following target:

Year	Hydrogen refueling stations	Output value of hydrogen energy related industries
2020	28	20 billion yuan (US\$ 2.89 billion)
2025	43	50 billion yuan (US\$ 7.22 billion)
2030	57	100 billion yuan (US\$ 14.43 billion)

(http://www.foshan.gov.cn/zwgk/zwtdt/jryw/201811/t20181107_7360016.html)

Some cities and provinces released subsidy policies for fuel cell vehicles. Key points are as follows:

Date	City	Province	Subsidy from central government : local government
May 21st	Shanghai		1 : 0.5 or 1 (depend on the rated power)
May 29th	Xian		1 : 0.5 (public use) or 0.3 (private use)
June 1st		Hainan	1 : 0.5
June 5th		Henan	1 : 0.3
June 21st	Chongqing		1 : 0.4
August 28th	Foshan		1 : 1 (only for public transportation bus)
August 30th	Shenzhen		1 : (0.8-1) (depend on the rated power)

For hydrogen refuelling stations, Foshan City and Zhongshan City, both located in Guangdong Province, released subsidy policies. Key criteria and subsidies are as follows:

Date	City	Station type	Hydrogen refuelling capacity (day)	Subsidy (million RMB)
August 28th	Foshan	Stationary	350-500 kg	300
			≥500kg	500
		Skid-mounted	≥200kg	150
September 27th	Zhongshan		≥200kg	100

2. Hydrogen and Fuel Cell R&D Update

2.1 Fundamental Research

In August 2018, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences reported a metal-free nitrogen-doped hydrogen-substituted graphdiyne (N-HsGDY) catalyst that showed much better electro-catalytic performance for the oxygen reduction reaction than that of the commercial platinum-based catalyst in alkaline media and comparable activity in acidic media. This study will open a different avenue for developing pyridinic N selectively doped carbon materials for fuel cells and other energy storage device. The results were published in the article “Selectively nitrogen-doped carbon materials as superior metal-free catalysts for oxygen reduction” in “Nature Communications” (DOI: 10.1038/s41467-018-05878-y).



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

3. Demonstration, Deployments, and Workforce Developments Update

3.1 Demonstration

From October 12-15th, “2018 Hydrogen Fuel Cell Vehicle Itinerant Exhibition & Roadshow in the Yangtze River Delta” was held in Rugao, Nantong, and Shanghai (Fig. 1). During the activities, more than 10 fuel cell vehicles, trucks and buses from Chinese and international automobile manufacturers were driven from Rugao to Shanghai (c.a. 170 km). Students from local universities, senior, junior and elementary schools were involved. WWW.CCTV.COM, the internet platform of “China Central Television” broadcasted the activities.



Fig. 1 FCVs in the roadshow

3.2 Deployments

From May to October 2018, several cities started demonstration operations of fuel cell public transportation buses. Key points of information are as follows:

Date	City	Province	Number	Bus Line
June 11st	Rugao	Jiangsu	3	Xingxing Line
June 28th	Chengdu	Sichuan	10	Pidu P09 Line
July 25th	Zhangjiakou	Hebei	49	23 Line, 33 Line
August 16th	Zhengzhou	Henan	2	727 Line
September 27th	Shanghai		6	Jiading 114 Line
September 29th	Zhangjiakou	Hebei	25	1 Line
October 27th	Beijing		5	384 Line

4. Events and Solicitations

On October 11th, the “2018 China Hydrogen Energy and Fuel Cell Industry Forum” was held in Haikou, Hainan Province, China. This Forum was organized by the National Alliance of Hydrogen and Fuel Cell (China). On the forum, Mr. Saehoon KIM from HYDROGEN COUNCIL gave a brief introduction of HYDROGEN COUNCIL while Mr. Eiji OHIRA introduced Japan’s current policy, market status and R&D activity.

On October 23-25th, the “3rd International Hydrogen Fuel Cell Vehicle Congress” was held in Rugao, Jiangsu Province, China. This congress was jointly organized by International Hydrogen Fuel Cell Association (IHFA) and the Society of Automotive Engineers of China (SAE-China). Dr. Sunita SATYAPAL from U.S. Department of Energy, U.S., Dr. Klaus BONHOFF from NOW GMBH, Germany, Mr. Eiji OHIRA from NEDO, Japan, Mr. Jeahang SHIN from H2KOREA, South Korea, and Mr. Enrique GIRON from FCH JU, European Union (E.U), were invited to give presentation on the congress.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

On October 25-27th, Japan's Prime Minister Shinzo ABE visited China. During his visit, China and Japan agreed to cooperate in the field of hydrogen energy. Japan's JXTG Energy Group and China's Sinopec Group will jointly build hydrogen-refuelling stations in third-party markets.

On November 2-8, the "2nd Hydrogen Energy Week Series Activities" was held in Foshan, Guangdong Province, China. These activities included:

- (1) the 3rd Hydrogen Energy and Fuel Cell Industry Development Exchange Conference; and,
- (2) the 2nd International Hydrogen Energy & Fuel Cell Technology and Product Expo Foshan-China.

International speakers from E.U., U.K., Germany, Japan, Canada, and U.S. were invited to give presentations. Companies from U.K., Germany, and Japan exhibited their products and technologies.

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

In May and August, 2018, Ministry of Science and Technology (MOST) approved 6 projects for the National Key Research and Development Plan "New energy vehicles" Key Special Projects. Total subsidies from central finance is 485.69 million RMB (US\$ 70.09 million). Major information was listed as follow.

No.	Project name	Lead agency	Funding (million RMB) (US\$ million)	Duration (year)
1	Full-power fuel cell passenger car power system platform and vehicle development	Dongfeng Motor Corporation	52.36 (7.56)	3
2	Extended-program fuel cell car power system platform and vehicle integration	BAIC Motor	51.24 (7.39)	3
3	Fuel cell bus electric-electric deep hybrid system platform	Zhengzhou Yutong Bus Co., Ltd	52.82 (7.62)	3
4	High-environment adaptive road bus fuel cell power system	Tsinghua University	55.54 (8.01)	3
5	Research on Demonstration Operation of Multiple Fuel Cell Vehicles in Typical Areas	China Automotive Technology and Research Center Co., Ltd. (CATARC)	47.05 (6.79)	3
6	Fuel cell engine and commercial vehicle industrialization technology and application	Weichai Power Co., Ltd.	226.68 (32.71)	3

In September 2018, Ministry of Science and Technology (MOST) launched the application of National Key Research and Development Plan "Renewable energy and hydrogen energy technology" Key Special Projects. Projects related to the following topics will be supported:

- 1) Hydrogen energy
 - (1) Basic research on solar photo-catalysis, photo-electro-catalysis and thermal decomposition of water to produce hydrogen (Basic research)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- (2) Basic research on high-density hydrogen storage based on hydrogen storage materials (Basic research)
 - (3) Research on degradation mechanism and life extension strategy of high efficient solid oxide fuel cells (Basic research)
 - (4) New fuel cell research based on low-cost material systems (Basic research)
 - (5) MW-class solid polymer electrolyte water electrolysis hydrogen production technology (Common key technology)
 - (6) Proton exchange membrane fuel cell long-life stack engineering preparation technology (Common key technology)
 - (7) Solid oxide fuel cell stack engineering development (Common key technology)
 - (8) Fuel cell stack and auxiliary system component testing Technology (Common key technology)
- 2) Renewable energy coupling and system integration
- (1) Research and demonstration of key technologies for large-scale Wind/Light Complementary Hydrogen Production (Application demonstration)

6. Regulations, Codes & Standards, and Safety Update

In June and July, the State Administration for Market Regulation and the Standardization Administration of the People's Republic of China (SAC) released information listed as follows:

Released date	Implementation date	Regulation	Name
June 7th 2018	January 1st 2019	GB/T 36288-2018	Fuel cell electric vehicles – Safety requirement of fuel cell stack
July 13th 2018	February 1st 2019	GB/T 36544-2018	Proton exchange membrane fuel cell power supply system for substation



Summary Country Update December 2018: China

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles ¹	10,000 by 2020	Approx. 760	FCV Technology Roadmap is released	
Fuel Cell Cars ²		Approx. 60		Subsidy for purchase 0.2 million RMB (US\$32,000)
Fuel Cell Buses		Approx. 200		Subsidy for purchase 0.3-0.5 million RMB (US\$48,000-79,000)
Fuel Cell Trucks ³		Approx. 500		Subsidy for purchase 0.3-0.5 million RMB (US\$48,000-79,000)
Forklifts	No national target	2		No support policy
H ₂ Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
70 MPa On-Site Production	No national target	1		Subsidy for installation of a new hydrogen refueling station with 200kg H ₂ capacity, 4 million RMB (US\$0.63 million)

¹ Includes Fuel Cell Cars, Buses, and Trucks

² Includes Fuel Cell Electric Cars with Range Extenders

³ As above



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

70 MPa Delivered	No national target	1		Same to above
35 MPa On-Site Production	No national target	1		Same to above
35 MPa Delivered	No national target	8	Many cities proposed plans for building HRS (mainly 35 MPa HRSs), such as Beijing, Shanghai, Wuhan, Foshan, Suzhou, Rugao, Yancheng, etc.	Same to above
Stationary	Target Number⁴	Current Status	Partnerships, Strategic Approach	Support Mechanism
Small ⁵	No target			
Medium ⁶	No target			
Large ⁷	No target	1		
District Grid ⁸	No target			
Regional Grid ⁹	No target			
Telecom backup	No target	Approx. 50 units		

⁴ Targets can be units installed and/or total installed capacity in the size range indicated

⁵ <5 kW (e.g., Residential Use)

⁶ 5kW – 400 kW (e.g., Distributed Residential Use)

⁷ 0.3MW – 10 MW (e.g., Industrial Use)

⁸ 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)

⁹ 30MW plus (e.g., Grid Storage and Systems Management)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

H ₂ Production	Target ¹⁰	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fossil Fuels ¹¹	No target			
Water Electrolysis ¹² (PEM, Alkaline, SOEC)	No target			
By-product H ₂	No target			
Energy Storage from Renewables	Target ¹³	Current Status	Partnership, Strategic Approach	Support Mechanism
Power to Power ¹⁴ Capacity	No target			
Power to Gas ¹⁵ Capacity	No target	1 (100kW)		

¹⁰ Target can be by quantity (Nm³, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target

¹¹ Hydrogen produced by reforming processes

¹² Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)

¹³ Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

¹⁴ Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

¹⁵ 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)