INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update March 2017: China

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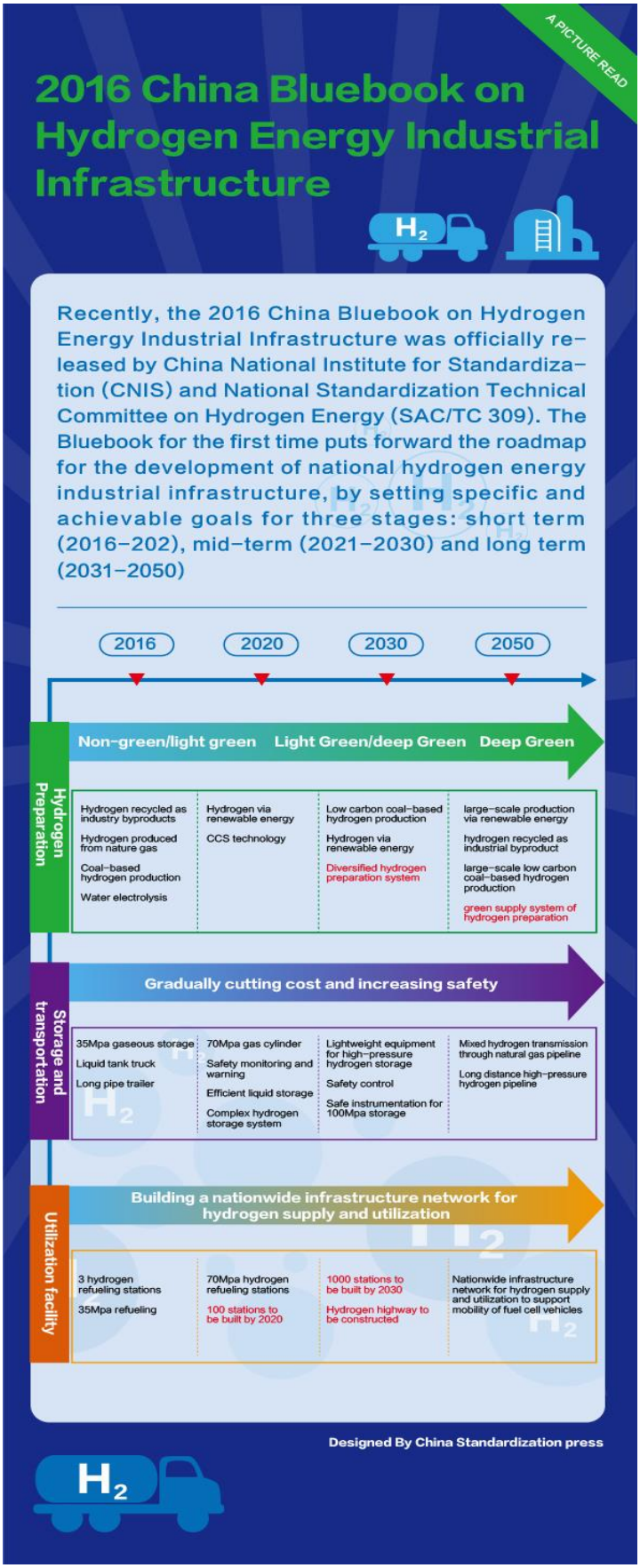
1. New Policy Initiatives on Hydrogen and Fuel Cell

- The Chinese Society of Automotive Engineers (SAE China) released a "Technology Roadmap for Energy-Saving and New Energy Vehicles" for China in October 2016, including the Fuel Cell Vehicle Technology Roadmap. This technology roadmap is the newest comprehensive guideline for energy-saving vehicles and NEVs and takes into account China's "Made in China 2025" initiative.

FCV Technology Roadmap

		2020	2025	2030
Overall Target		Small-scale demonstration of FCVs in public transportation in particular area. 5,000 units scale	Large-scale application in public and private transportation. 50,000 units scale	Large-scale application of commercial and passenger fuel cell vehicles. Million units scale
		Fuel cell system production capacity greater than 1,000 sets per enterprise	Fuel cell system production capacity greater than 10,000 sets per enterprise	Fuel cell system production capacity greater than 100,000 sets per enterprise
Fuel Cell Vehicles	Performance requirements	Cold start -30℃, costs at the same level as pure electric vehicles	Cold start -40℃, costs at the same level as hybrid vehicles	Performance is same as traditional vehicle, have competitive advantage
	Commercial vehicle	Durability 400,000 km cost≤1,500,000 yuan RMB	Durability 800,000 km cost≤1,000,000 yuan RMB	Durability 1,000,000 km cost≤600,000 yuan RMB
	Passenger vehicle	Lifetime 200,000 km cost≤300,000 yuan RMB	Lifetime 250,000 km cost≤200,000 yuan RMB	Lifetime 300,000 km cost≤180,000 yuan RMB
Key components technologies		High speed oil free compressor, hydrogen circulation system, 70MPa hydrogen storage system satisfy the vehicle requirements		System cost lower than 200 yuan / kW
Hydrogen infra-structure	H2 production	Distributed renewable hydrogen production and by-product hydrogen with high efficient purification technology		Distributed renewable hydrogen production
	H2 transportation	High pressure compressed H2 storage and transportation	Low temperature liquid H2 storage and transportation	Organic liquid hydrogen storage and transportation
	Hydrogen refuelling station	≥100 stations	≥300 stations	≥1000 stations

- On Oct 28, 2016, the 2016 China Bluebook on Hydrogen Energy Industrial Infrastructure was officially released by China National Institute for Standardization (CNIS) and National Standardization Technical Committee on Hydrogen Energy (SAC/TC 309).


A PICTURE READ
2016 China Bluebook on Hydrogen Energy Industrial Infrastructure
Recently, the 2016 China Bluebook on Hydrogen Energy Industrial Infrastructure was officially released by China National Institute for Standardization (CNIS) and National Standardization Technical Committee on Hydrogen Energy (SAC/TC 309). The Bluebook for the first time puts forward the roadmap for the development of national hydrogen energy industrial infrastructure, by setting specific and achievable goals for three stages: short term (2016–202), mid-term (2021–2030) and long term (2031–2050)
2016
2020
2030
2050
Hydrogen Preparation
Non-green/light green
Light Green/deep Green
Deep Green
Hydrogen recycled as industry byproducts
Hydrogen produced from nature gas
Coal-based hydrogen production
Water electrolysis
Hydrogen via renewable energy
CCS technology
Low carbon coal-based hydrogen production
Hydrogen via renewable energy
Diversified hydrogen preparation system
large-scale production via renewable energy
hydrogen recycled as industrial byproduct
large-scale low carbon coal-based hydrogen production
green supply system of hydrogen preparation
Storage and transportation
Gradually cutting cost and increasing safety
35Mpa gaseous storage
Liquid tank truck
Long pipe trailer
70Mpa gas cylinder
Safety monitoring and warning
Efficient liquid storage
Complex hydrogen storage system
Lightweight equipment for high-pressure hydrogen storage
Safety control
Safe instrumentation for 100Mpa storage
Mixed hydrogen transmission through natural gas pipeline
Long distance high-pressure hydrogen pipeline
Utilization facility
Building a nationwide infrastructure network for hydrogen supply and utilization
3 hydrogen refueling stations
35Mpa refueling
70Mpa hydrogen refueling stations
100 stations to be built by 2020
1000 stations to be built by 2030
Hydrogen highway to be constructed
Nationwide infrastructure network for hydrogen supply and utilization to support mobility of fuel cell vehicles
Designed By China Standardization press

- On Dec 29, 2016, the central authorities renewed the standards of new energy vehicle subsidies for 2017. Except fuel cell vehicle, central and local subsidy standards and limits for various models in 2017 and 2018 fall 20% on the basis of existing standards. The revision also raises technological standards, including battery capacity and pure electric drive range. For fuel cell vehicles, the subsidy standards are defined as follows:

	Vehicle type	Pure electric drive range R (km)	Fuel cell system power rating P (kW)	Subsidy standard (10k RMB)	Technical requirement
Fuel cell vehicle	Passenger vehicle	R≧300	30>P>10	0.6/kW, upper limit 20	Fuel cell system power rating is not less than 30% of the drive motor power rating
	Passenger vehicle	R≧300	P≥30	20/unit	
	Light bus, truck			30/unit	
	Large and medium-sized bus, medium and heavy duty truck			50/unit	

2. Hydrogen and Fuel Cell R&D Update

- Peking University and Chinese Academy of Sciences cooperated on research on low - temperature hydrogen production from water and methanol, developed a new platinum - molybdenum carbide bifunctional catalyst, and on the high production efficiency of hydrogen at low temperature (150-190 ℃). The results of the study "Low - temperature hydrogen production from water and methanol using Pt/alpha MoC catalysts" is published in Nature on March 23, 2017.

3. Demonstration and Deployments Update

Transportation:

- January 2017, a 35MPa hydrogen refuelling station opened in Yunfu City in South China's Guangdong Province. This is the first hydrogen refuelling station in Guangdong Province, one of the most promising area for fuel cell vehicles in China. More than 10 HRSs are in planning or under construction in Guangdong Province.
- More and more automobile manufactures began to pay attention on fuel cell vehicles, some of which had developed fuel cell vehicles, such as SAIC, Yutong, Foton, DFM, and so on. A few new fuel cell bus models were included in the national recommended directory of 2017. It was reported that Foton would deploy 60 fuel cell buses in Beijing in May 2017, and 500 Foton fuel cell buses would be deployed around the country in 2017.
- CRRC Qingdao Sifang announced on March 9， 2017 that it has signed a contract to produce eight hydrogen-powered trams. The trams are expected to run on a 17.4 km track with 20 stations in Foshan city, Guangdong province. The first phase of the project officially started construction on February 27th, and is expected to be completed by the end of 2018.

Other Application:

- On October 14th, 2016, the world's first 2MW PEM fuel cell power plant was installed on site at Ynnovate Sanzheng (Yingkou) Fine Chemicals Co. Ltd in Yingkou, Liaoning province, China. This fuel cell power plant was delivered by AkzoNobel, MTSA, and

Nedstack with support from the European Union's Fuel Cells and Hydrogen Joint Undertaking (FCH JU).

- Chinese drone manufacturer MMC introduces the next generation of its hydrogen drone at the International Defense Exhibition and Conference (IDEX 2017). HyDrone 1800's hydrogen fuel cell technology provides a flight endurance of 4 hours.

4. Events and Solicitations

- The "2017 China International Hydrogen and Fuel Cell Conference and Exhibition" will be held in the China International Exhibition Center on October 17-19, 2017. Further information will be provided later.

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

None

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Summary Country Update March 2017: China

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
Fuel Cell Vehicles[1]	5000 by 2020 (see FCV Technology Roadmap)	Approx. 60	FCV Technology Roadmap is released	• Subsidy for purchase, 200K RMB
FCBus	No national target, Fosan City plans for 300 FCBs by 2017	Approx. 50		• Subsidy for purchase, 300K~500K RMB
Fuel Cell Trucks[2]	No national target	Approx. 10		Subsidy for purchase, 300K~500K 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 H2 capacity , 4M RMB
70 MPa Delivered	No target	0		• Subsidy for installation of a new hydrogen refuelling station with 200kg H2 capacity , 4M RMB

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

[2] As above

35 MPa On-Site Production	No target	1		• Subsidy for installation of a new hydrogen refuelling station with 200kg H2 capacity , 4M RMB
35 MPa Delivered	No target	3	Many cities have plans for building HRS, such as Fosan, Rugao, Yancheng, Wuhan, Beijing, Shanghia, etc.	Subsidy for installation of a new hydrogen refuelling station with 200kg H2 capacity , 4M RMB
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Small[4]	No target			
Medium[5]	No target			
Large[6]	No target	1		
District Grid[7]	No target			
Regional Grid[8]	No target			
Telecom backup	No target	Approx. 50 units		
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**

[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 (Nm^3, kg, t) and by percentage of total production;also, reference to efficiency capabilitiescan be a target

Fossil Fuels[10]	No target			
Water Electrolysis[11] (PEM, Alkaline, SOEC)	No target			
By-productH_2	No target			
Energy Storage from Renewables	**Target[12]**	**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		

[10]Hydrogen produced by reforming processes
[11] Please indicate if targets relate to a specific technology (PEM, Alkiline, 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 fortransportation, heating, electricity)