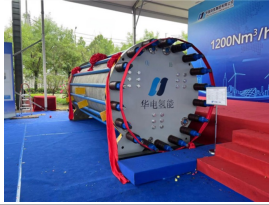


# What's on with China's „hydrogen consortium<sup>1</sup>“ and Japan's „hydrogen society<sup>2</sup>“ ?

Rolf Schmid and Xin Xiong, Bio4Business, Stuttgart

## Focus

- Energy production
- Transportation sector
- Chemical, coal and steel industry



2021	Shell JV with Zhangjiakou Beijing Winter Olympics	20 MW electrolyzer powered by wind turbines provides 4000 Nm <sup>3</sup> /h H <sub>2</sub>
2021	Baofeng Energy Group	150 MW electrolyzer and 200 MW PV plant for H <sub>2</sub> captive use
2022	Sinopec Kuche plant	electrolyzers and 300 MW PV plant, scalable to 700 MW, for H <sub>2</sub> captive use



The hydrogen will go to a cracker in a 1 Mt ethylene plant

## China National Energy Administration Hydrogen Industry Development Plan to 2025 March 23, 2022.



- Manufacture about 50,000 FCV
- Install a large number of hydrogen refueling stations
- Master core technologies and manufacturing processes (production, processing, transport, refueling, fuel cells and system integration)
- Core competencies: manufacture and scale up AEL and PEM electrolyzers, improve efficiency of hydrogen conversion from renewable energy sources
- Produce hydrogen from non-fossil sources at 100,000-200,000 t/y
- Provide demonstration projects for FCVs such as cabs and busses
- Involve more than 300 industrial companies in the hydrogen value chain in three preferred regions: (1) the Yangtze River Delta (Shanghai - Jiangsu - Zhejiang), (2) Beijing-Tianjin-Hebei, and (3) Guangdong and the Greater Bay Area.
- strengthen hydrogen energy production and trade along the belt-and-road initiative BRI, and develop infrastructure and projects

	2021	2025	2030	2060
Fuel cell vehicles	„145“ plan period	7.000	50.000	50.000
Gasoline stations	270	1.000	900	
Electrolyzer capacity			100 GW	
Hydrogen production (tons)		up to 200.000	35 million	60 million
Hydrogen cost			1.60 €/Nm <sup>3</sup>	



Changan C385/SL03: China's first serial fuel cell car. 160 kW power, 13 kWh/100 km Sales prize: 699,900 CN¥ (~ 103,000 US\$)

## China's share in global installed capacity BP, 2022

- 40% of wind turbines
- 36% of photovoltaics
- 30% of hydropower

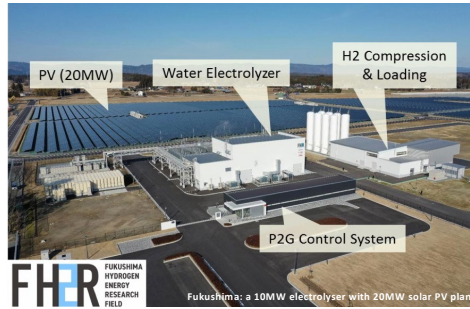
## Hydrogen-related patent applications

2011-2020  
CN: 21,235 JP: 34,624



<sup>1</sup>China's hydrogen consortium has 87 members, mostly from industries. It was founded 2019 by the MIIT

<sup>2</sup>Japan's concept of a „hydrogen society“ was introduced in 2016 by Meti.



- 78.000 m<sup>2</sup> AIST Renewable Energy Institute with photovoltaic demonstrators, wind turbine, geothermal and ammonia demonstrators
- Sumitomo Rubber pilot plant for the production of tyres with renewable energy
- Fukushima Advanced Laminated Wood Manufacturing Center for production of laminated wood with renewable energy
- Fukushima Robot Testfield for drones

## Focus

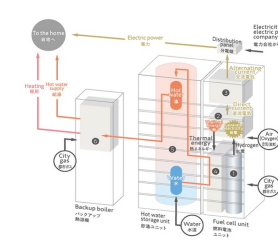
- Mobility
- Industry
- Households

	2020	2025	2030	2050 („net zero emission“)
Fuel cell vehicles	40.000	200.000	800.000	
Hydrogen fuel stations	100	320	900	
Urban SOFCs	300.000*		5.300.000	
Hydrogen demand			3 mill. tons	20 mill. tons
Hydrogen cost			1.60 €/Nm <sup>3</sup>	

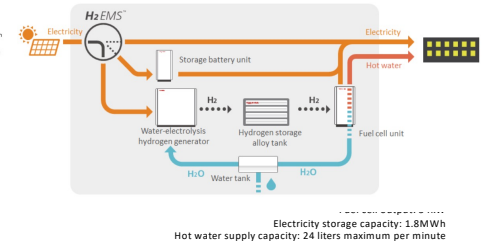
- FC trucks and busses
- Zero-carbon steel
- Cheaper fuel cells
- Scale up of electrolyzers (PEM & AEM)
- Innovative R&D



## Residential Fuel Cell ENE-FARM Tokyo Gas Co., Ltd.



## Toshiba H2One system



## 14 research and technological development projects to expand the use of hydrogen

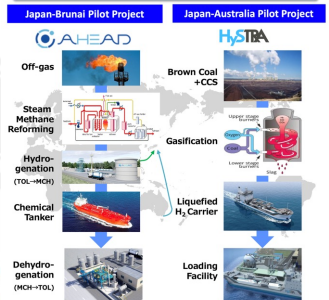
[https://www.nedo.go.jp/news/press/AA5\\_101462.html](https://www.nedo.go.jp/news/press/AA5_101462.html)

- Kobe Port Island (households)
- Kansai Airport (energy, bus, forklift)
- Nagoya region (car manufacturers)
- Yokohama/Kawasaki (households, port)
- Expo '25 in Osaka
- Fukushima
- Sendai Region (MCH)
- Hokkaido (wind energy, composting), and more

## Private public partnerships

- Ammonia supply chain [https://www.nedo.go.jp/news/press/AA5\\_101502.html](https://www.nedo.go.jp/news/press/AA5_101502.html)
- Zero-carbon steel [https://www.nedo.go.jp/news/press/AA5\\_101503.html](https://www.nedo.go.jp/news/press/AA5_101503.html)

## International hydrogen supply chain



„Offshore wind turbines in a single Chinese province could supply all of Japan's hydrogen needs“

<https://www.nature.com/articles/s41467-021-27214-7>