Hydrogen Fuel Cell Vehicles in China

10 April 2024

Contents

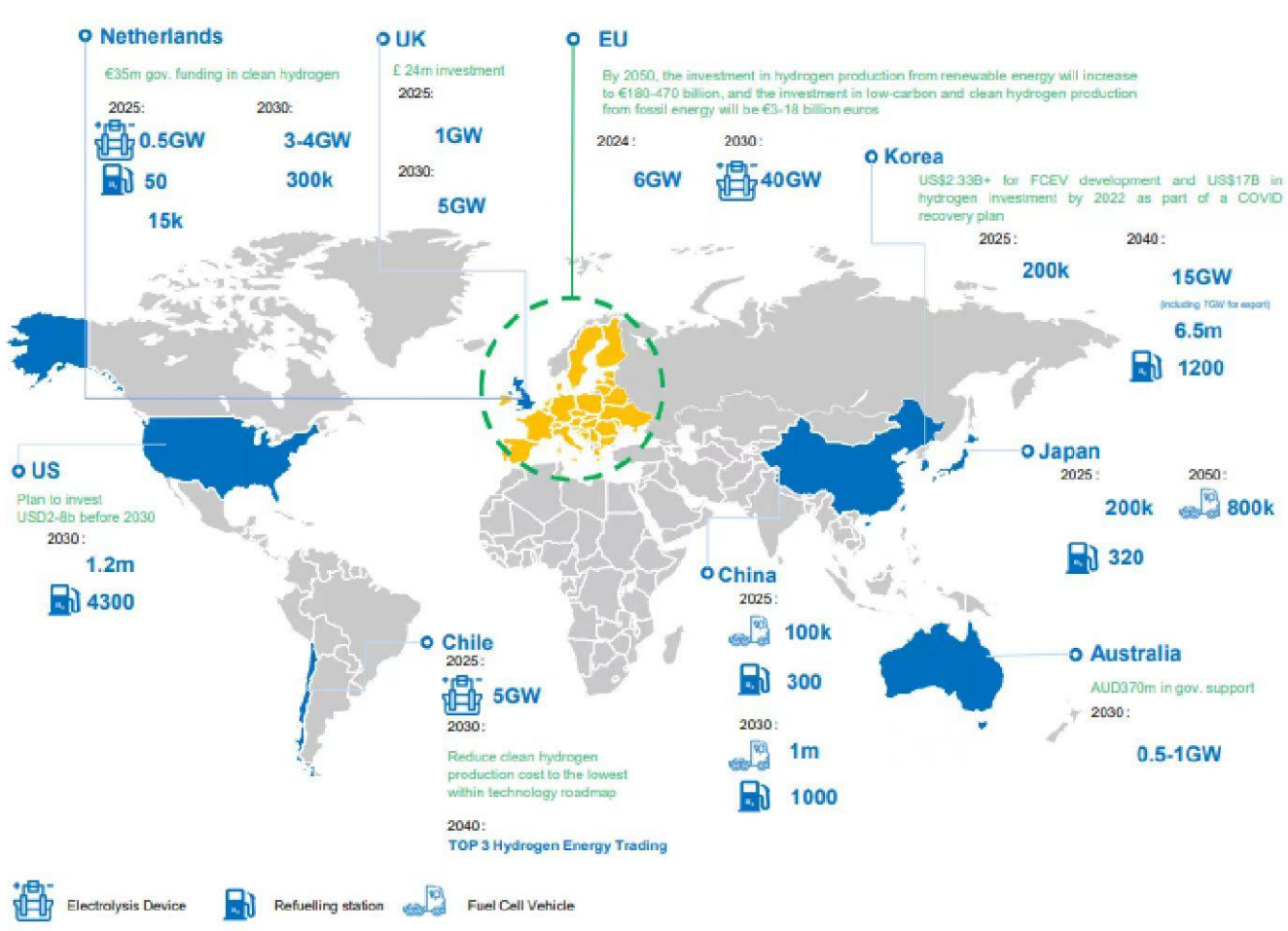
SINOSYNERGY

Hydrogen Development in the World and China

Hydrogen Strategy and Applications Globally

1,000+ projects

announced hydrogen projects in published by the Hydrogen Council



Chinese Government
"Medium and Long-Term Plan for the Development of Hydrogen Energy Industry (2021-2035)", 2022

Fuel Cell & Hydrogen Energy Association
"Road Map to a US Hydrogen Economy", 2019

European Commission
"A hydrogen strategy for a climate-neutral Europe", 2020

German Government
"The National Hydrogen Strategy", 2020

HM Government
"UK Hydrogen Strategy", 2021

Hydrogen Mobility Ireland
"A Hydrogen Roadmap for Irish Transport 2020-2030", 2019

Portuguese Government
"EN-H2: The National Strategy", 2020

Dutch Government
"Government Strategy on Hydrogen", 2020

Russian Government
"Russia's Hydrogen Energy Strategy", 2020

South Korean Government
"Korea Hydrogen Economy Roadmap 2040", 2019

Japanese Government
"Basic Hydrogen Strategy", 2017

Council of Australian Governments
"Australia's National Hydrogen Strategy", 2019

Source: Public information at the end of 2023, Management analysis and estimates.

Hydrogen Development in China

The Chinese government laid out a medium- and long-term development plan for hydrogen, for the period 2021-2035. China targets to bring 50,000 hydrogen fuel-cell vehicles on the road by 2025 and to build a number of hydrogen refuelling stations. The plan targets green hydrogen production using renewable feedstock resources to reach 100,000-200,000 tonnes per year by 2025. Besides transport, the plan envisages the use of clean hydrogen in other sectors: energy storage, electricity generation and industry. Currently, China is already the world largest producer and consumer of hydrogen.

Inner Mongolia: Focus on developing and expanding green hydrogen, green ammonia, green alcohol and other industries

Shaanxi: Create new growth points such as hydrogen energy

Xinjiang: Accelerate the construction of four hydrogen energy industry demonstration zones in Urumqi, Yixing, Karamay, and Hami

Ningxia: Build Ningdong "Green Chlorine Industry Demonstration Base"

Liaoning: Accelerate the promotion of technology productization and product commercialization in hydrogen energy storage and other aspects, and develop and expand hydrogen energy industry clusters

Hunan: Closely follow the development trend of hydrogen energy and strive to gain new advantages on the new track

Beijing: Promote the construction of fuel cell vehicle demonstration city clusters

Qinghai: Promote green hydrogen application demonstration pilot

Shanxi: Support the development of the entire industrial chain of hydrogen energy production, storage, transportation and utilization

Henan: Expand hydrogen energy storage and other fields and actively open up new tracks

Anhui: Implement a three-year action plan for high-quality development of the hydrogen energy industry

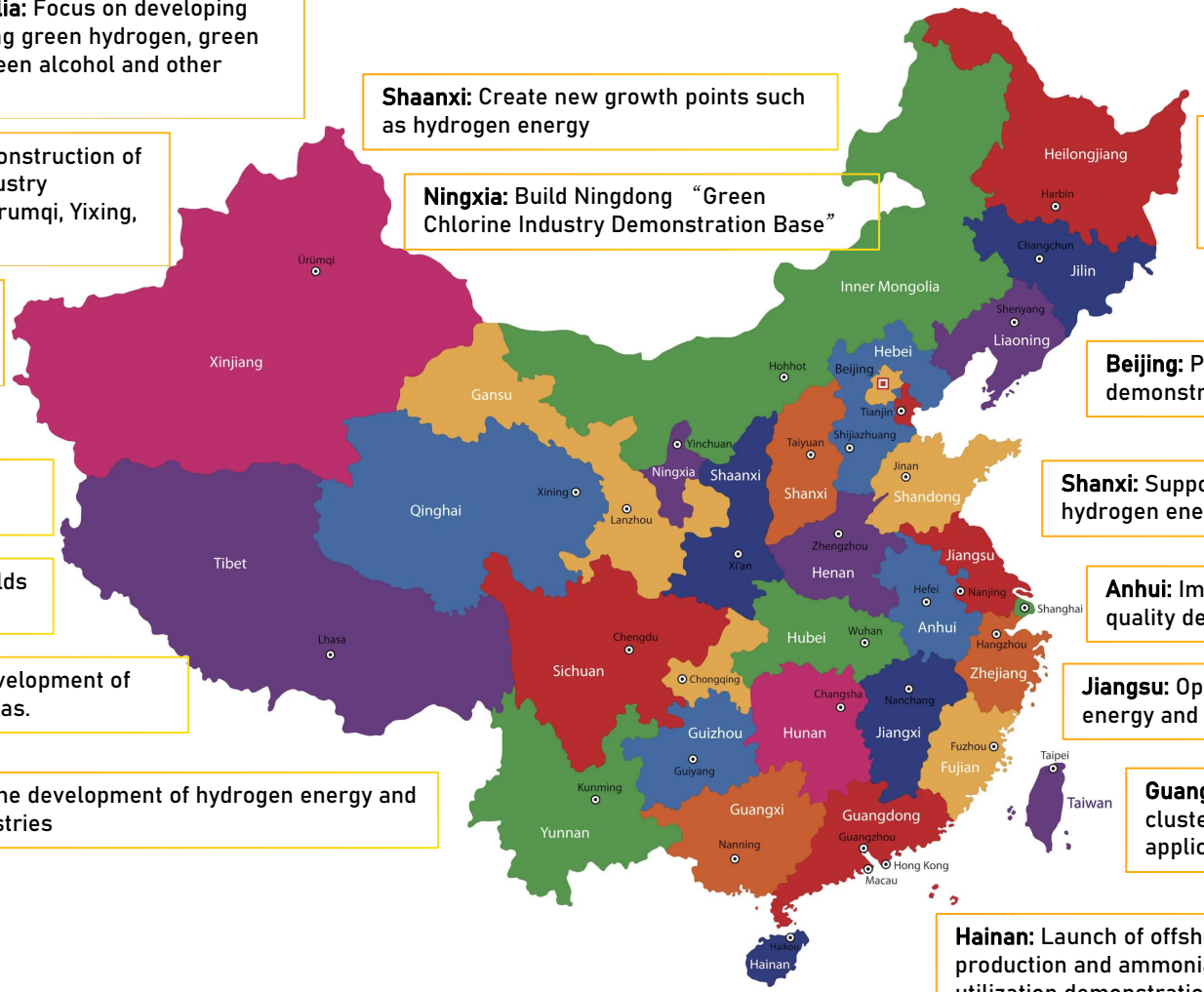
Sichuan: Promote the complementary development of water, wind, light, hydrogen and natural gas.

Jiangsu: Open up new tracks for hydrogen energy and other industries

Yunnan: Lay out the development of hydrogen energy and other future industries

Guangdong: Promote the construction of urban clusters for fuel cell vehicle demonstration applications

Hainan: Launch of offshore wind power argon production and ammonia energy comprehensive utilization demonstration project



Source: Public information at the end of 2023

Field-proven in China & Expansion Overseas

- In China, the annual carbon dioxide emissions of **heavy-duty trucks** account for about **54%** of all vehicle models with only about **4%** of the total number of road vehicles, making them the key vehicle type in reducing carbon emissions from all vehicles.

49T heavy duty truck
15% lower than average industry level

Mobile Applications


Bus & Coach


Logistics Truck


Sanitation Truck


Forklift


Heavy-duty Truck


Dump Truck


Concrete Mixer


Rail Transit

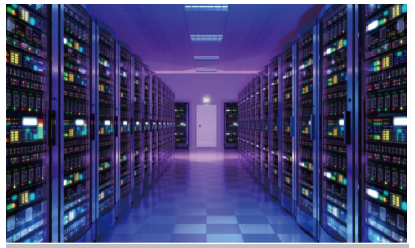

Marine & Ship

Stationary Applications


Stationary Power Generation


Base Station


Hydrogen Energy Storage


Data Center

Source: Company information.

Field-proven in China & Expansion Overseas

- **Successful applications on trucks and buses at home and installed on the 1st Chinese-made exported HFC bus**

For HFC Trucks

HFC heavy truck

- 49T heavy truck with Sinosynergy SynRoad G110 has delivered to Beijing-Tianjin-Hebei region and the Yangtze River Delta for demonstration
- **100 trucks has been delivered to XCMG** officially in 2022 and 1,000 trucks will be promoted on or before 2025

HFC Truck Fleet Operated by JD.com

- **Largest HFC truck fleet** around the globe, with **2,000+** logistic trucks with Sinosynergy's products onboard as of 2019
- Commenced operation in mid-2018, served as an integral part to JD.com's logistics network nationwide during the "Double 11" and "Double 12" shopping festivals
- Cumulative mileage has reached **over 20mn kilometers as of 2019**

For HFC Buses

Foshan / Yunfu Demonstration HFC Bus Routes

- 28 11m HFC buses deployed since 2016
- 150,000km mileage to date with minimal performance degradation
- **World's largest HFC bus fleet** deployed at the time

Export to Sarawak, Malaysia

- **1st Chinese-made HFC bus model** ever exported, with Sinosynergy's fuel cells installed
- Initial batch delivered in 2019

Foshan HFC Bus Deployment

- **900+** 8.5m HFC buses deployed in Foshan since December 2018

Hydrogen-powered Forklift

- **In 2022**, Sinosynergy and **Jungheinrich** launched **hydrogen-powered forklifts** in Shanghai

Source: Company information.

Field-proven in China & Expansion Overseas (cont'd)

- **Additionally focus on various other attractive downstream verticals in parallel to main CV business, paving avenues to incremental market opportunities**

HFC Tram in Collaboration with CRRC

- Extensive collaboration with CRRC in industry stan-dards drafting, system R&D, and trials
- 1st commercially viable HFC tram model commenced operation in 2017
- In 2021, the world's first hydrogen-powered Digital-rail Rapid Transit Tram was launched in Shanghai

HFC Marine Engine & Ship

- R&D agreements with vessel OEMs and operators

Source: Company information.

Field-proven in China & Expansion Overseas (cont'd)

- **Increasing project development in stationary power generation systems**

HFC Mobile Emergency Power Supply Unit

- On-the-go units equipped with power stored in HFC systems catering to ad-hoc electricity demand
- Suitable for even-driven capacity back-up and natural disaster relief amid disrupted grid supply
- China Tower backup power station has been in stable operation since 2016

The world's first practical and scaled zero-carbon distributed energy center demonstration project

世界首个！榆林科创新城零碳分布式智慧能源中心示范项目建成投用

澎湃 政务：榆林发布 2022-08-02 10:19

8月1日，世界首个实用化和规模化零碳智慧能源中心——榆林科创新城零碳分布式智慧能源中心示范项目建成投用。该项目在世界上首次实现了含氢能的零碳多能源供需系统的实用化和规模化示范应用，为实现碳达峰、碳中和目标提供了新的技术路径。

- Through photovoltaic panels, Yulin's abundant solar energy resources can be converted into electricity.
- A hydrogen electrolyzer extracts hydrogen from water using surplus electricity. During the electro-chemical reaction between hydrogen and oxygen, fuel cells generate electricity and heat.
- In Henan, a similar project has been implemented as well.

The First Pilot Project of Hydrogen Power Generation in Hong Kong

國鴻氫能
打造香港首個氫能發電示範項目
爲建築業注動力

項目將坐落北部都會區 示範意義突出

發

Source: Company information.

Field-proven in China & Expansion Overseas (cont'd)

- **Sinosynergy has been working closely with global partners to promote the development of hydrogen energy and jointly build a cleaner and greener future.**

Exported HFC Buses to Malaysia in 2019

In March 2019, a batch of hydrogen fuel cell buses has been exported to Maylasia to provide more convenient and low-carbon transportation method to local residents.

The First HFC Coach in Europe Presented by Sinosynergy at IAA, Handover in 2022

Sinosynergy has been invited to attend FII 2022 in Saudi Arabia

Sinosynergy has been invited to attend Busworld Europe 2023

NEWS

The world's first hydrogen-powered smart tram equipped with fuel cell systems of Sinosynergy has started on-road testing in Malaysia on 6th September 2023!

Source: Company information.

World's Largest Capacity Enabling High Quality Mass Production

- **World's largest HFC stack and system production capacity, simultaneously supplying key HFC components**
- **Highly automated flow with locally patented equipment, providing a high degree of reliability and customization**

30,000

Annual Hydrogen Fuel Cell Stack Production Capacity of One of the Largest Production Line

10,000

Annual Hydrogen Fuel Cell System Production Capacity of One of the Largest Production Line

#1 Globally

HFC Stack & System Production Capacity

Quality Excellence

Strict Compliance with Ballard Standards with even Higher Product Conformity

- ✓ Production capability of flexible graphite bipolar plate with annual capacity of **5mn units**
- ✓ High level of vertical integration for **effective cost control** and **extra degree of customization**
- ✓ Exceptional performance consistency across different batches, verified **useful life of 30,000 hrs**
- ✓ Fully locally-patented equipment and localized production

Source: Company information.

World's Largest Capacity Enabling High Quality Mass Production

- **Sinosynergy has one of the world's largest fuel cell stack production lines and continues to expand its production capacity.**

Source: Company information.

Industry Outlook

Optimal Clean Energy Solution for the Global Auto Industry

- **Governments worldwide are targeting the phase out sales of new internal combustion engine ("ICE") vehicles starting from 2025, paving ways for rapid roll-out of HFC vehicles as an attractive alternative**

Core Advantages of HFC Vehicles

Life-long Environmental-friendliness

Strong Environmental Adaptability

Fast Refueling of Hydrogen

High Energy Conversion Efficiency

Robust Mileage & Range Performance

Compatible with Prevailing Driver Habits

Side-by-side Comparison between Vehicle Types

	ICE Vehicles	HFC Vehicles	Battery EVs
Energy Efficiency	24 – 30%	50 – 60%	—
Emission & Recycling	Emitting CO_2 and other greenhouse gasses, NO_x, SO_2 and particulates	Water as the only emission. Environmental-friendly throughout lifecycle	Potential pollutions during production and recycling
Mileage	500 – 600km	500 – 600km	100 – 200km
Refueling Time	Within minutes	Within minutes	Several Hours
Operating Temperature	-30 – 45 ˚C	-30 – 45 ˚C	-10 – 45 ˚C

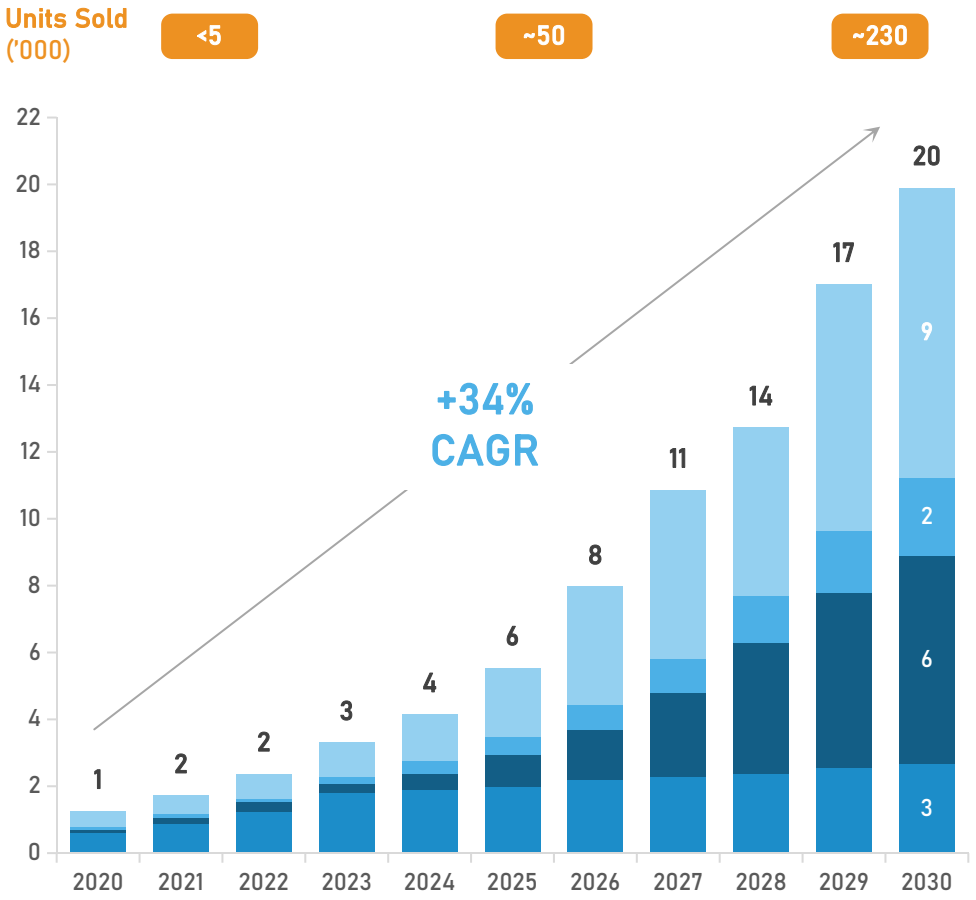
Source: Public information, Management analysis and estimates.

Large Addressable Market at an Inflection Point

- **Global commercial fuel cell vehicle market is projected to grow at 34% CAGR to US$20bn in 2030, driven by policy tailwinds, rapidly falling costs, and governments' strategic planning worldwide**

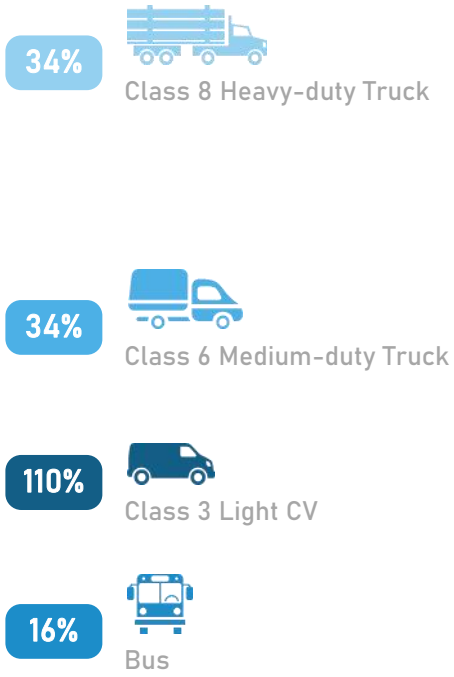
Evolution of Commercial Fuel Cell Vehicle Market

(US$bn)



CAGR by Vehicle Class

2020 – 2030



Key Drivers

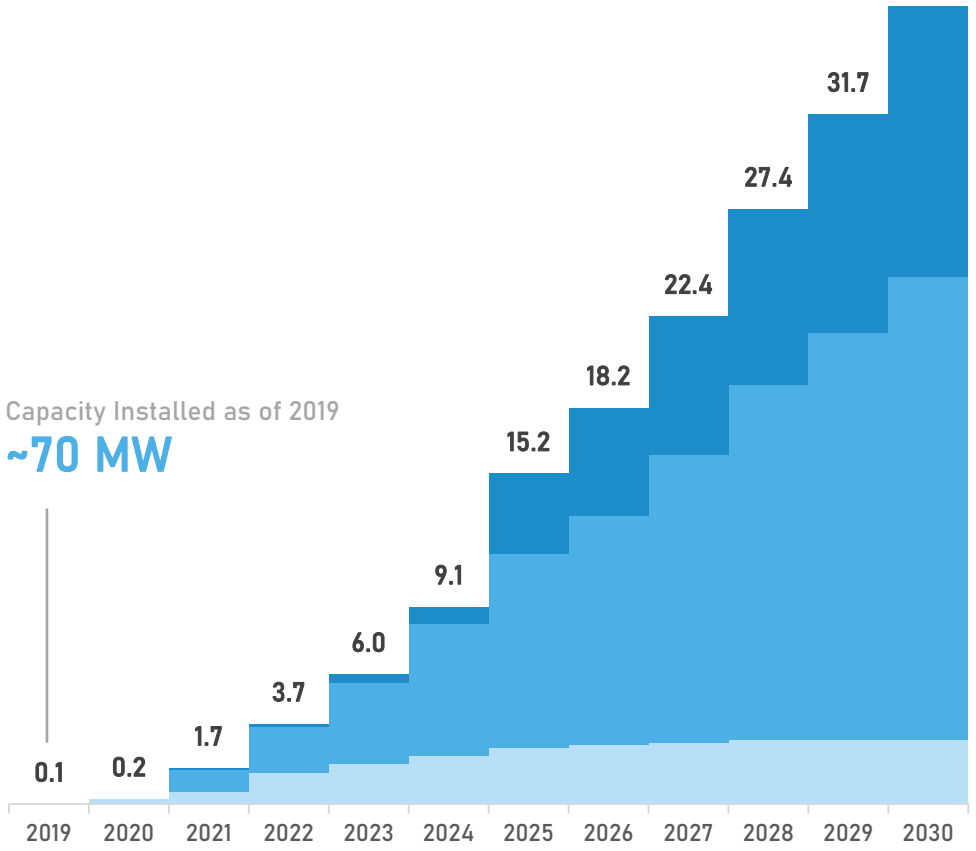
- Global policy tailwinds advocating for clean energy transition and reducing carbon emission
- **60+** countries committing to zero net emission by 2050, incl. China
- **Falling cost** of hydrogen technologies and products from **economies of scale**
- Roadmaps set forth in national strategies worldwide, committing to a cumulative roll-out in 2030 of **10mn HFC vehicles**

Source: McKinsey Center for Future Mobility, Management analysis and estimates.

Supported by Expanding Global Upstream Capacity…

- **Rapid scale-up of hydrogen production capacity of 360x growth to 2030 globally, with mid-term commitments for 2030 rose tenfold in c. 24 months**

Electrolyzer Project Capacity Announced Worldwide
(GW)



Capacity Announced until 2030
(at Different Point in Time)

October 2020
Planned capacity of projects announced further increased to
~36.7 GW by 2030

March 2020
Rapid uptick of planned capacity to
~24.2 GW by 2030

June 2019
Capacity expected to stand at
~2.9 GW by 2030

10x

In commitments of announced projects in past c. 24 months

50%+

Growth headroom to global govts' target of 75GW by 2030

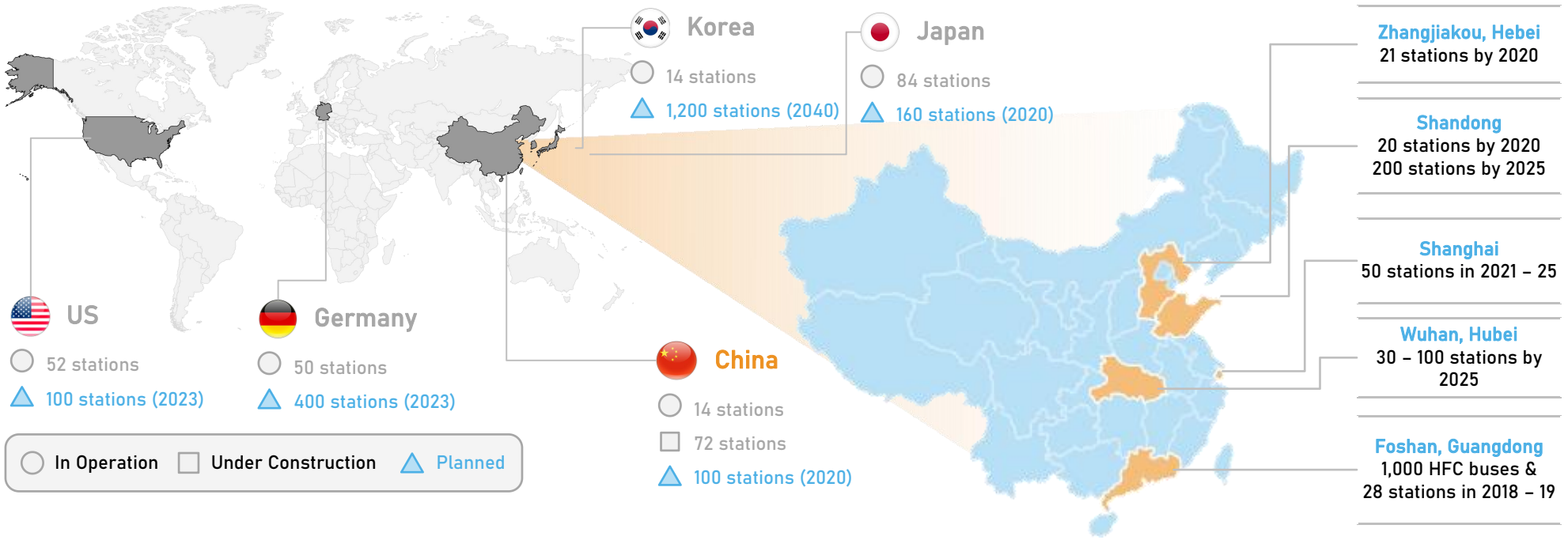
65%+

Potential for CapEx decline (to US$350 – 400/kW) due to economies of scale

Source: Public hydrogen project announcement, Management analysis and estimates.

… and Ambitious Plans for Refueling Infrastructure Worldwide

- **Governments around the globe have been endeavoring to accelerate the development of hydrogen refueling networks over the next decades, forming a solid foundation for HFC vehicle deployment**



Refueling Station of Foshan Motor Transport Group

Mobile Refueling Truck by Toyota

Refueling Station at Berlin Airport, Germany

Riverside Refueling Station by the Seine in Paris, France

Source: Public information, Management analysis and estimates.

Appendix

COMPANY PROFILE

SINOSYNERGY

Headquarter of Oversea Business

Hong Kong

Global Business Distribution

Canada France Germany Italy Malaysia Turkey

Established in June 2015, Sinosynergy is a high-tech enterprise, committed to provide state of the art hydrogen fuel cell products and robust system solutions.

In 2017, the Company built a world-leading hydrogen fuel cell stack production base, and passed the ISO9001:2015, IATF16949:2016 and ISO/TS22163:2017 quality system certification. Thanks to the strong independent R&D and innovation capabilities, high-quality and reliable products, and excellent service infrastructure, the accumulated market share of the company's stack products have taken a leading position in China's market over the past seven years.

#1

2017-2023 HFC stack market share in China

China's first mass production of low-cost flexible graphite bipolar plates company

30,000

Annual HFC stack production capacity of one of the largest production line

ISO9001

Passed the ISO9001:2015, IATF16949:2016 and ISO/TS22163:2017 quality system certification

5,000+

Over 5,000 vehicles powered by Sinosynergy

200

Patents application

250,000,000+

The cumulative mileage of vehicles exceeds 250 million km

Differentiated Proprietary & Co-developed Model Line-up

- **Sinosynergy has a product portfolio spanning the HFC value chain, from stacks and modules to integrated systems and equipment for various end applications, and key ancillary components**

	HFC Stacks	HFC Modules / Systems	HFC Back-up Power Supply	HFC Air Filter
Proprietary Products	 SynStack (鸿芯) GI  SynStack (鸿芯) GIII	SynRoad (鸿途) / SynRail (鸿锐) / SynSwift（鸿迈）Series  H240  G110  G80  B60  E10  A110	SynPower (鸿源) Series  S160  S640 / S1050	SynFilter (鸿程) Series ACG:  T150  T090  T045  T020 MOF:  T090
Co-developed	 BALLARD 9SSL+ Series	with Ballard BALLARD  MD30  HD60  HD85 with REFIRE REFIRE  MP30	ElectraGen™ Series with Ballard BALLARD  5kW  1.7kW  ME	

Source: Company information.

Differentiated Proprietary & Co-developed Model Line-up (cont'd)

- **Sinosynergy's line-up is on the road in HFC buses, trucks and forklift with field-proven operation footprints**

7m Minibus | 8 ton Urban Logistics Truck | 8.6m Light Passenger Bus

11m Passenger Bus | 12m Passenger Bus | 12m Passenger Bus

4.5 ton Urban Logistics Truck | 12 ton Urban Logistics Truck | 18 ton Urban Logistics Truck | 31 ton Dump Truck | 49 ton HD Truck Tractor

3 ton HFC Forklift

Source: Company information.

Differentiated Proprietary & Co-developed Model Line-up (cont'd)

- **Successfully passed the start-up test under -38.5℃**

Leading Market Position & Diversified Client Base

- **Sinosynergy is the #1 HFC stack manufacturer in China by market share**
- **Supported by a number of blue-chip clients from diversified downstream verticals**

5,000+
CVs with Sinosynergy Products on the Road

#1
2017-2023 (half year) Market Share in China

~50%
of HFC Vehicles in MIIT's Recommended Catalog[1] in 2018 Adopt Sinosynergy's Products

85%
of HFC Vehicles in MIIT's Subsidies Catalog[2] in 2017 Adopt Sinosynergy's Products

Multitude of Major-league Clients from Various Sectors

HFC Vehicle OEMs
飞驰科技 FEICHI TECHNOLOGY
中通客车 ZHONG TONG BUS
宇通客车 YUTONG
XCMG
FOTON 福田汽车
中国中车 CRRC
KING LONG
DFM
安凯客车
奥新新能源 AOXIN NEW ENERGY
Skywell 开沃汽车
ZEV 中植汽车
泰歌氢能汽车
长安汽车 CHANGAN AUTO

HFC Value Chain
德燃动力 D.R. Power
富瑞特装 FURUISE
氢雄 HydraV
氢途科技
比洛德传动
海亿新能 HYVITECH
上海电气 SHANGHAI ELECTRIC
大洋电机 BROAD-OCEAN
上海电驱动 EDRIVE
REFIRE
雄韬股份 VISION GROUP
兴邦能源
WEICHAI 潍柴
CETC 中国电科

Energy / Utilities
美锦能源 Meijin Energy
(000723-CN)
Shareholder of Sinosynergy
Sinopec
中国南方电网 CHINA SOUTHERN POWER GRID

Other Corporates
中国移动 China Mobile
China unicom 中国联通
中国电信 CHINA TELECOM
CHINA TOWER 中国铁塔
JD.COM
中国建筑 CHINA STATE CONSTRUCTION
TEMPLEWATER 普水资本
IKEA
科陆

Source: Company information, Management analysis and estimates.
Note: 1. Means the "Catalog of Recommended Models for the Promotion and Application of New Energy Automobile (新能源汽车推广应用推荐车型目录)" published by MIIT in 2018; 2. Means the "Announcement on Review and Audit of Subsidies for Promotion and Application of New Energy Automobile in 2017 (关于2017年度新能源汽车推广应用补助资金清算审核情况的公示)" published by MIIT in 2019.

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