

Commercial supply chain and hydrogen strategy roadmap for Asia Pacific - China & India

Part-13 (Global demand clusters, international trade and development hydrogen strategy roadmaps for different geographies)

The Chinese government at various levels is actively promoting hydrogen energy development

CHINA

Hydrogen is gaining increasing attention from industries and policymakers in China. However, most of the current demonstration projects in the country have relied on conventional sources, including industrial by-product hydrogen and grey hydrogen produced from fossil fuels. The Chinese government at various levels has actively promoted hydrogen energy development. As of 2019, out of 34 Chinese provincial administrative regions, 17 (plus at least 22 municipal administrations) have published policies to develop hydrogen energy-related industries and infrastructure; this is complemented by more than 10 policy documents issued by the central government of China.

China launched a new FCEV pilot cities programme in 2020 to enlarge FCEV industry supply chains. In contrast with

vehicle purchase subsidies, the scheme rewards clusters of cities based on a series of parameters. To be eligible for financial rewards, city clusters must deploy more than 1 000 FCEVs that meet certain technical standards; achieve a delivered hydrogen price at a maximum of (Chinese Yuan) CNY 35.00/kg (~USD 5.00/kg); and provide at least 15 operational hydrogen refuelling stations (HRSs). Based on the plan and how well objectives are met, a maximum of CNY 1.5 billion (~USD 220 million) will be transferred to each selected city cluster between 2020 and 2023.

The Asia-Pacific region currently accounts for half of global industrial hydrogen demand, with China alone taking a major portion (17 Mt H₂) for ammonia and methanol production. With growth across all sectors, China accounts for almost two-thirds of Announced Pledges Scenario hydrogen demand.

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- IEA

Hydrogen strategy roadmap and targets for China – A landscape view till 2030

Hydrogen Utilization Objective

A. Mobility



Passenger Cars –
40,000 FCVs in service by 2025
800,000 in service by 2030



Buses/Trucks –



10,000 buses/trucks by 2025
200,000 buses/trucks by 2030



Refuelling Stations –
>300 stations by 2025
>1000 stations (>50% of H2 production from renewable sources)

B. Commercial



Cost of commercial vehicle –
≥ RMB 1.0 Million
≥ RMB 600,000



Cost of passenger car –
≥ RMB 200,000
≥ RMB 180,000

\$ 220 Million

Anticipated government investment in China for hydrogen development till 2023 to each selected city cluster

Hydrogen Infrastructure

A. Hydrogen Supply

Objective



Decentralized hydrogen production from renewable sources , industrial by-products such as coke-oven gas till 2025

Decentralised H2 production from renewable sources till 2030

B. Hydrogen Delivery

Objective



Cryogenic liquid hydrogen delivery by 2025

High density organic liquid hydrogen storage and delivery at normal pressure by 2030

Landscape of Hydrogen in China as on 2021

Currently China has

~2000 Cars

~3000 Buses/trucks

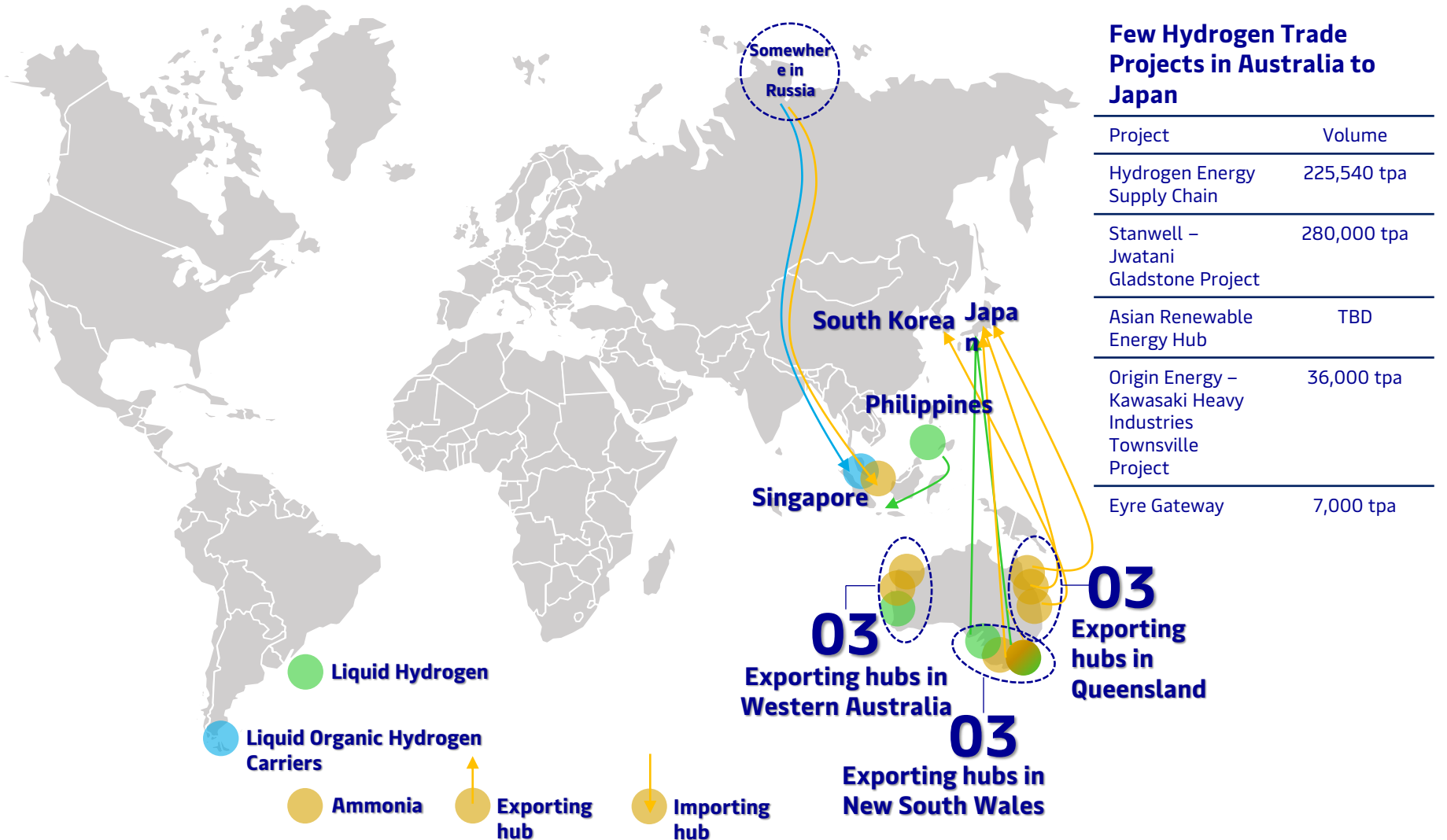
Buses/trucks

~100 Refuelling hydrogen STs

Key Demand Centers



Most hydrogen trade projects under development are in Asia –Pacific



India and Italy have agreed to explore development of green hydrogen , setting up renewable energy corridors and joint projects in the natural gas sector

INDIA

On 15th August 2021 Honourable Prime Minister of India – Mr. Narendra Modi flagged the launch of **National Hydrogen Mission** and announced to transform India into a global hub for green hydrogen production and export. Further, the country is also focusing upon having international tie-ups for developing green hydrogen. The mission envisages commercial production of green hydrogen production in India from financial year 2025-26 onwards. The draft proposes to undertake hydrogen production projects through a competitive bidding mode which would be open to participation from both public and private entities. Further, the mission includes frameworks for indigenous manufacturing and research & development aimed at improving the efficiency of electrolyzers – systems that use electricity to break water into hydrogen and oxygen in a process called electrolysis.

Among other provisions, the mission includes a framework for demand creation of green hydrogen through mandates in identified sectors. As for current capacity in the nation, **a green hydrogen project with a production capacity of one tonne per day has been established at Bikaner, Rajasthan, under the private sector.** Further, under a Research and Development project supported by the Ministry of New and Renewable Energy, **a 5 Nm³/h (normal cubic meter per hour) green hydrogen production plant based on solar energy-powered electrolysis has been established at the National Institute of Solar Energy.**

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Hydrogen demand in India was close to 6 million tonne per annum in 2020 with most of the demand coming from ammonia production and refineries.

-TERI

Hydrogen Development in the India – Market Landscape till 2021



Under development hydrogen projects for mobility in India supported by government of India



06

Fuel cell buses by Tata Motors Ltd.

50

Hydrogen enriched CNG buses in Delhi, (By Indian Oil in collaboration with Govt of NCT of Delhi)

02

Hydrogen fuelled internal combustion engine buses (by IIT Delhi, in collaboration with Mahindra & Mahindra)



15

Hydrogen fuelled three wheelers in Delhi, (by IIT Delhi, in collaboration with Mahindra & Mahindra)



02

Hydrogen diesel dual fuel cars (by Mahindra & Mahindra)

01

CSIR – Central Electrochemical laboratory and CSIR – National Physical Laboratory

₹ 21 Crores

Cumulative fund released from 2019-20 to 2020-21 for developing hydrogen and fuel cells



Key Industry partnerships with global players

Partnership		Country of Origin	Area of Development
Indian Player	International Player		
		Australia	For hydrogen usage in steel making and mobility
	FUSION-FUEL™	Ireland	To develop a demonstrator plant for cost competitiveness
		Norway	To accelerate hydrogen technology development
	Stiesdal	Denmark	To manufacture & set up electrolyzers unit of capacity 2.5 GW
		Italy	Will explore development of industrial projects producing chemicals , ammonia& hydrogen

Hydrogen Development in the India – Market Landscape till 2021 (Contd.)



Key Industry partnerships with global players

Partnership	Country of Origin	Area of Development
Indian Player Greenko International Player John Cockerill	Belgium	To jointly develop market initiatives for green hydrogen electrolyzers in India
Indian Player HERO FUTURE ENERGIES planet positive power International Player ohmium	USA	To set up 1 GW green hydrogen facilities



Key Industry partnerships of domestic players

Partnership	Area of Development
LARSEN & TOUBRO ReNew POWER	To develop, own and operate green hydrogen projects in India
IISc Indian Oil Corporation Limited	To develop and demonstrate biomass gasification based hydrogen generation technology for producing fuel cell grade hydrogen at an affordable price



Key partnerships of India with other countries for developing hydrogen

India-EU
EU to partner with India through investments in green hydrogen

India-Japan
India to seek collaborations with Japan for innovations on hydrogen based technologies

India-US Hydrogen Task Force
It aims to serve as a forum to achieve affordable hydrogen solutions. The key vision is to enhance energy security and resilience by scaling up low or zero-carbon hydrogen technologies and deployment

India- US-Japan-Australia Establish a clean hydrogen partnership
It aims to strengthen and reduce costs across all elements of the clean hydrogen value chain , leveraging existing bilateral and multilateral hydrogen initiatives in other fora

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