

Advancing the Net-Zero Agenda through Regional Cooperation in Green Hydrogen in Asia

Hydrogen development in China

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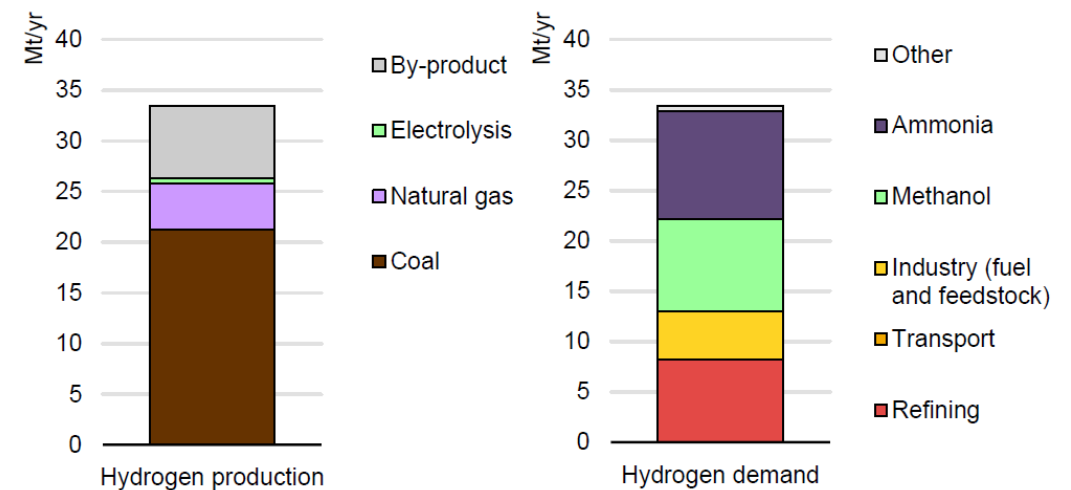


China leads the world in hydrogen production and use



- China produces approx. 33 Mt of hydrogen in 2020, around 30% of the world total. Over two-thirds of China's dedicated hydrogen production currently comes from coal and almost all the remainder from natural gas
- China dominates global hydrogen demand, as it has roughly 30% of the world's combined capacity for producing ammonia, methanol and high-value chemicals

Hydrogen production and demand in China, 2020



IEA. CC BY 4.0.

Notes: By-product hydrogen includes hydrogen produced from coal-coking in steelmaking; chlor-alkali electrolysis in chlorine and caustic soda production; dehydrogenation; cracking of light oil fractions; and naphtha catalytic reforming. Dedicated hydrogen production and by-product hydrogen from catalytic naphtha reforming (which is generally the basis of IEA estimates) amount to around 26 Mt.

Source: CHA (2020a), *China Hydrogen Energy and Fuel Cell Industry Development Report*.

National hydrogen strategy

— *Medium and Long-Term Plan for the Development of Hydrogen Energy Industry (2021-2035)*

- China aims to peak carbon emissions by 2030 and achieve carbon neutrality by 2060 (aka. dual carbon targets)
- First national strategy for hydrogen released on 2022 March

Development Goals

2025

- A **relatively complete set of policies** for the hydrogen development shall be ready
- FCEVs reaches 50 thousand. Green hydrogen production reaches 100-200 thousand ton/year.

2030

- A **relatively complete technology innovation system** of hydrogen industry shall be established in supporting peaking carbon emissions
- Wide applications for renewable energy based green hydrogen

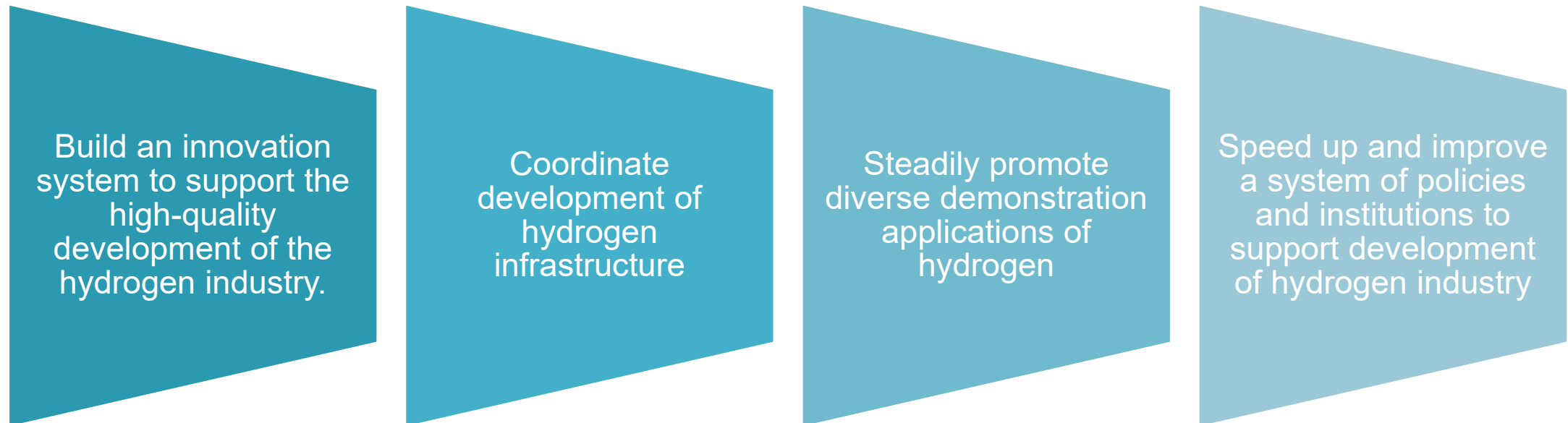
2035

- A **comprehensive** hydrogen industry supporting the energy transition
- Build a diversified hydrogen energy application ecology covering transportation, energy storage, and industry

National hydrogen strategy

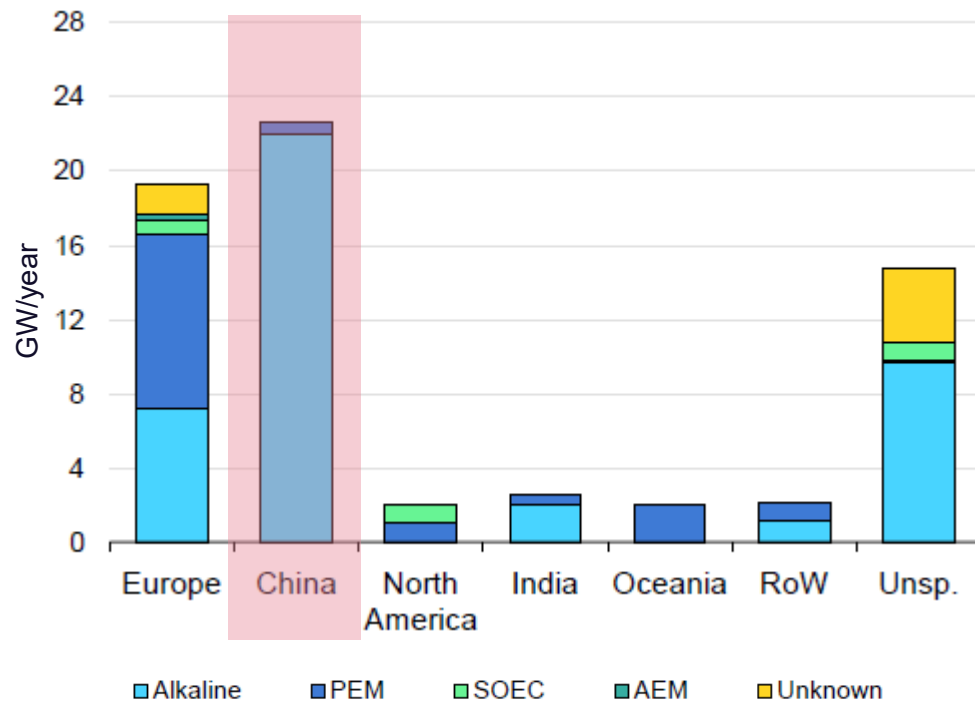
— *Medium and Long-Term Plan for the Development of Hydrogen Energy Industry (2021-2035)*

- ▶ The plan proposed four specific tasks for the development of hydrogen industry in China



China will play a major role in future hydrogen market

Electrolyser manufacturing capacity to 2030

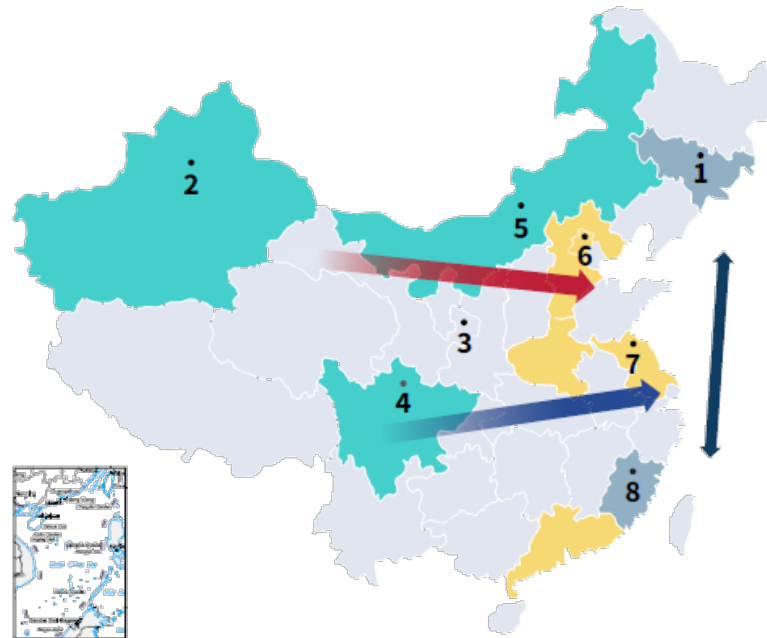


Source: IEA 2022

- ▶ The annual demand for hydrogen in China is expected to rise to approx. 31~37 Mt by 2030 and 90~130 Mt by 2060. *Source: IEA APS and China Hydrogen Alliance (CHA)*
- ▶ Despite different analysis by IEA and CHA, both foresee that around 60% of the growth in hydrogen demand is in transport (including for ammonia and green fuels for shipping and aviation). Around 30% in industrial processes, which use hydrogen as a feedstock, reducing agent and fuel, including iron and steel production.
- ▶ China and Europe will lead the way of global electrolyser manufacturing capacity (*Source: IEA, 2022*). China has the potential to achieve at least 100 GW of accumulated renewable hydrogen capacity installed by 2030 (*Source: CHA, 2022*).

In-country analysis on green hydrogen potential

— *Examples of existing and potential green hydrogen mega bases*



- Fuel cell vehicle demonstration city cluster
- Yangtze River Transport supply chain
- Coastal transport and maritime trade supply chain
- Northern rail and pipeline supply chain

1		Northeast base: wind power, biomass hydrogen production + pipeline hydrogen mixing
2		Xinjiang base: wind and solar based hydrogen production + new electric power demonstration area
3		Ningdong base: photovoltaic hydrogen + green chemical industry
4		Sichuan base: hydroelectricity hydrogen production + green ammonia synthesis + green shipping
5		Inner Mongolia base: wind and solar based hydrogen + green chemical industry
6		North China base: wind power hydrogen + green transportation + green steel
7		East China base: hydrogen production from offshore wind power + green transportation + international trade
8		South China base: hydrogen production from offshore wind power + green transportation + international trade

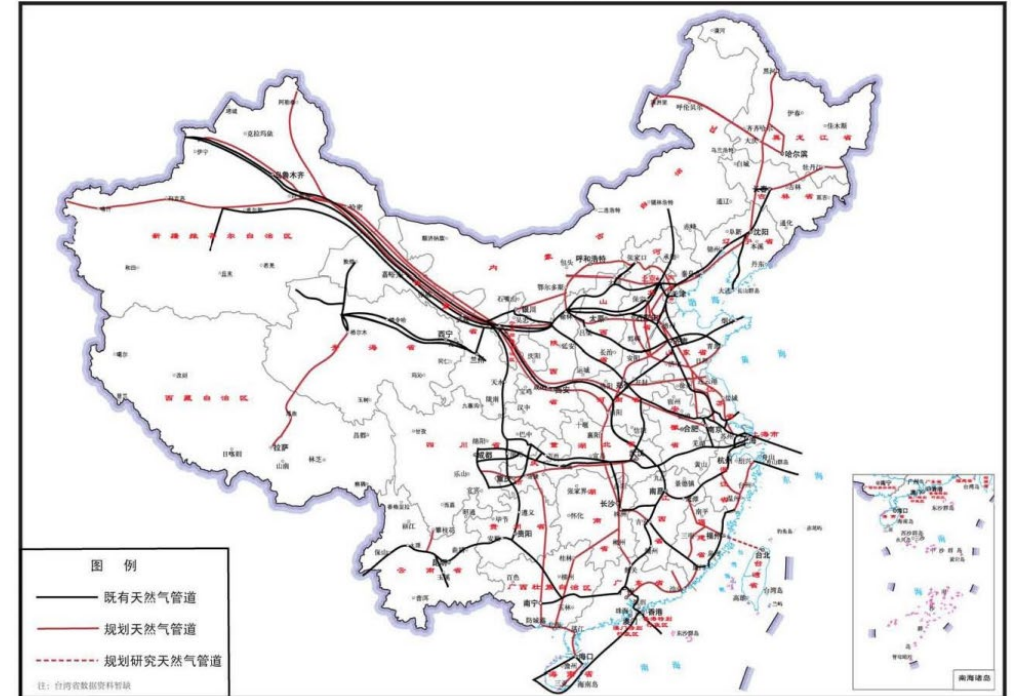
Green hydrogen projects for industrial purposes

Hydrogen is one of the limited options for decarbonizing some industries. Particularly for those that require chemical transformations that may not be able to be decarbonized by other clean energy sources.

Country	Industry	Hydrogen type/Year/Status	Projects
China	Chemical production	Green/2020/Ongoing	Lanzhou "Solar Methanol" Demonstration Project is the first demonstration project of solar fuel production in China, with a total investment of 141 million Yuan. Water electrolysis uses solar-generated electricity (20 MW) to generate hydrogen, and then carbon dioxide hydrogenation to product synthesize methanol (1,440 tons/yr).
		Green/2021/Ongoing	Ningxia Baofeng Energy Group produces green hydrogen through solar power generation, and the green hydrogen produced is used to produce high-end materials such as methanol and olefins.
	Iron and steel production	Green/2021/Planned	Angang Group signed an agreement to realize the process of wind power+PV-hydrogen production by electrolysis of water -hydrogen metallurgy.
		Green/2022/Under construction	Baosteel Group subsidiary Baosteel Zhanjiang Iron and Steel is constructing China's first self-integrated shaft furnace, and the world's first shaft furnace that directly adds hydrogen for the reduction process (1 Mt). The plant to be installed will adopt the local wind and solar power-based green hydrogen.

Development of hydrogen infrastructure

- ▶ Currently, only three hydrogen pipelines running in China, which span less than 100 km.
- ▶ China is working on developing both new pure hydrogen pipelines and blending into existing gas pipelines. The target is to achieve a 20% blending of hydrogen throughout its entire 185,000 km gas network.
- ▶ In 2023, Sinopec announced building the first “West to East” green hydrogen transmission line in China, which is 400km from Inner Mongolia to Beijing.
- ▶ In 2023, CNPC has transported hydrogen by blending it into a gas pipeline in Ningxia. The proportion of hydrogen in this natural gas pipeline has gradually reached 24%.



Natural gas pipeline network in China
* *black lines: existing, red lines: planned*

Thanks for attention

Any further questions, please reach out



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