#WhyESGMatters

The rise of ‘green’ hydrogen

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The rise of 'green' hydrogen

Hydrogen is set to play a more significant role as efforts to combat climate change becomes more urgent. It is abundant as an element and has great potential as a zero-emission fuel. In particular, 'green' hydrogen, a pure form of hydrogen produced via renewable energy sources, emits no carbon dioxide when converted into electricity.

In this issue of #WhyESGMatters, we look at how increased demand for hydrogen use across sectors, declining renewable energy costs, and favourable government policies are all providing support for the growth prospects of 'green' hydrogen. We explore how these advancements are elevating the profile of hydrogen in consumers' everyday life.

Did you know?

11,200
Passenger cars globally powered by hydrogen fuel cells in 2018

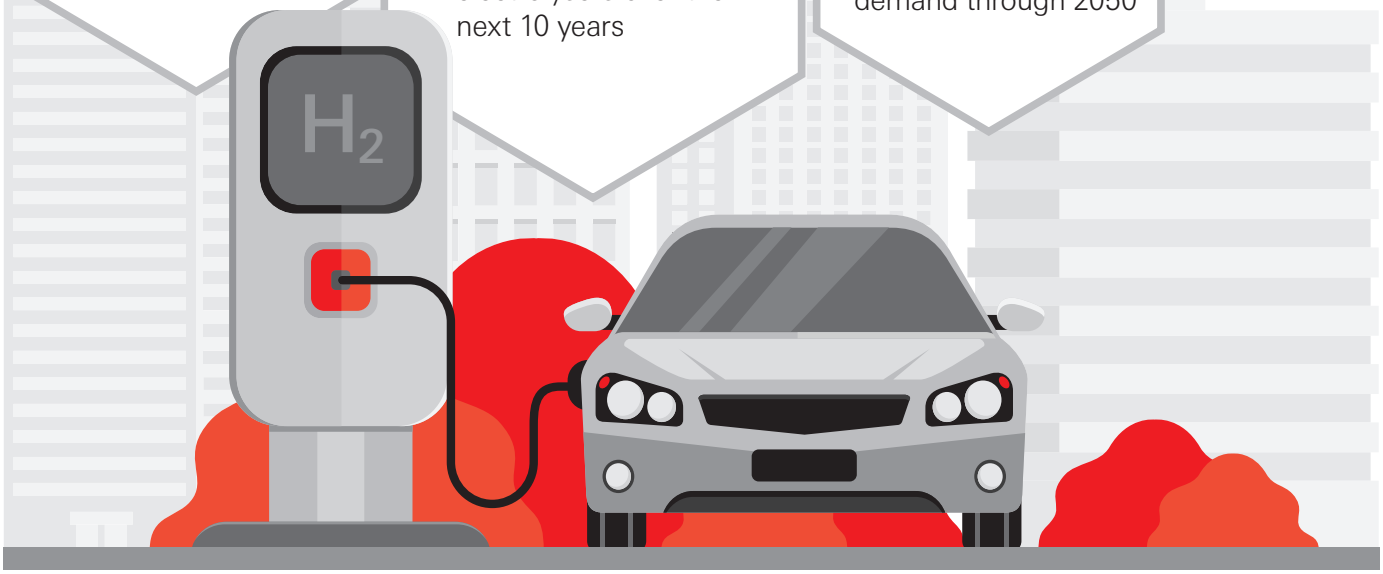
20%
New car sales expected in China from electric, plug-in hybrid and hydrogen-powered vehicles (up from 5% now)

18%
World energy demand forecast to come from hydrogen by 2050

98%
Hydrogen produced globally by carbon-intensive methods

EUR 24-42bn
Planned spend in the EU to install hydrogen electrolysers over the next 10 years

6.4%
Annual growth forecast for hydrogen demand through 2050

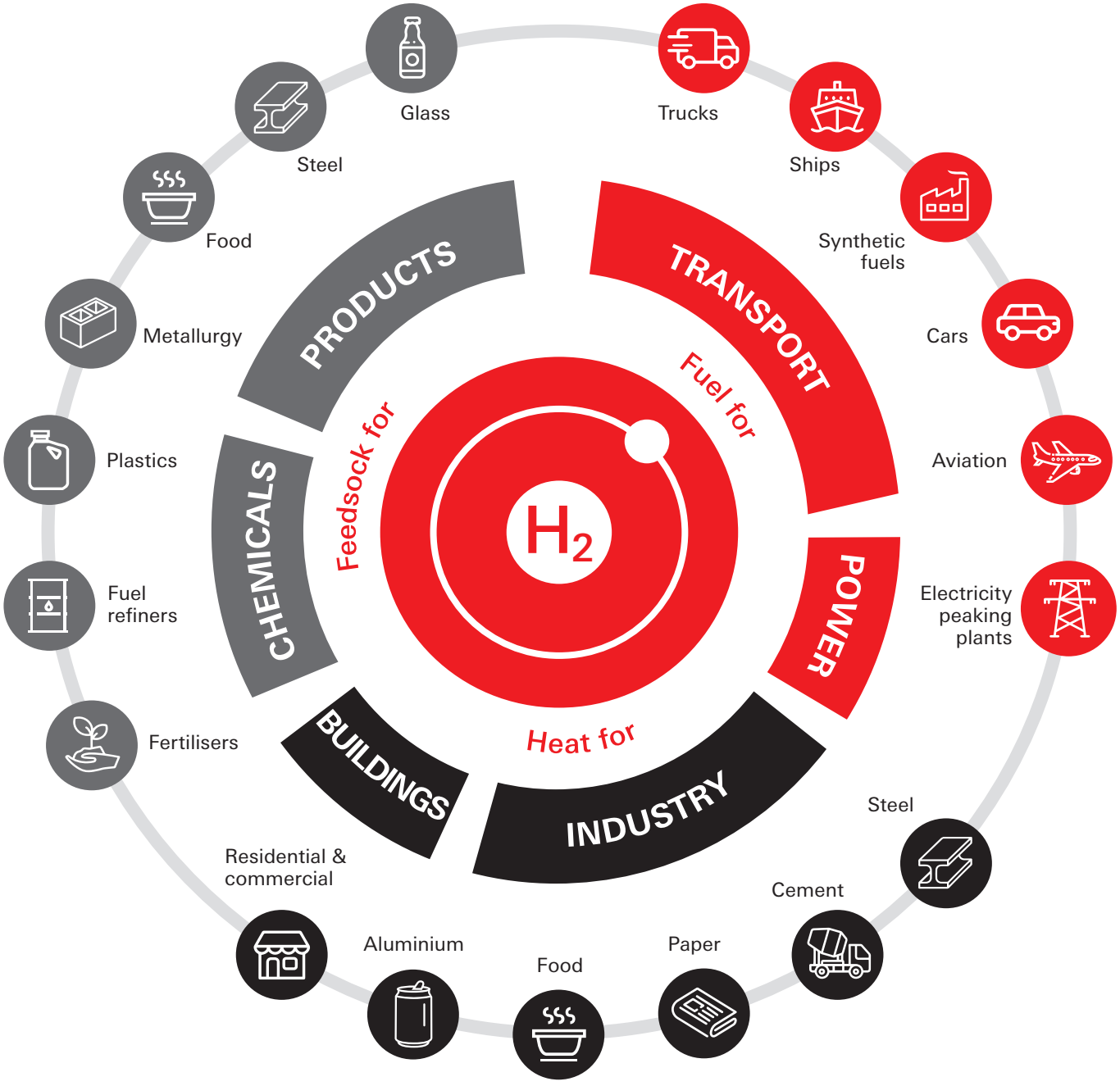


Source: EU Hydrogen Strategy, Hydrogen Council, The State Council of the PRC, HSBC estimates

1. Hydrogen's role in energy transition

Hydrogen is a versatile, non-toxic and lightweight gas that can be stored, transported and converted in clean power. More importantly, it has the potential to decarbonise a wide range of sectors. We believe the key to hydrogen's success will most likely be tied to its adoption beyond the power sector in feedstock for chemicals and end products, fuel for transport, and heat for buildings and heavy industries (see Chart 1).

Chart 1: A clean-green economy: Hydrogen can feed into a range of applications if produced on a large scale



Source: BNEF, Element Energy, HSBC

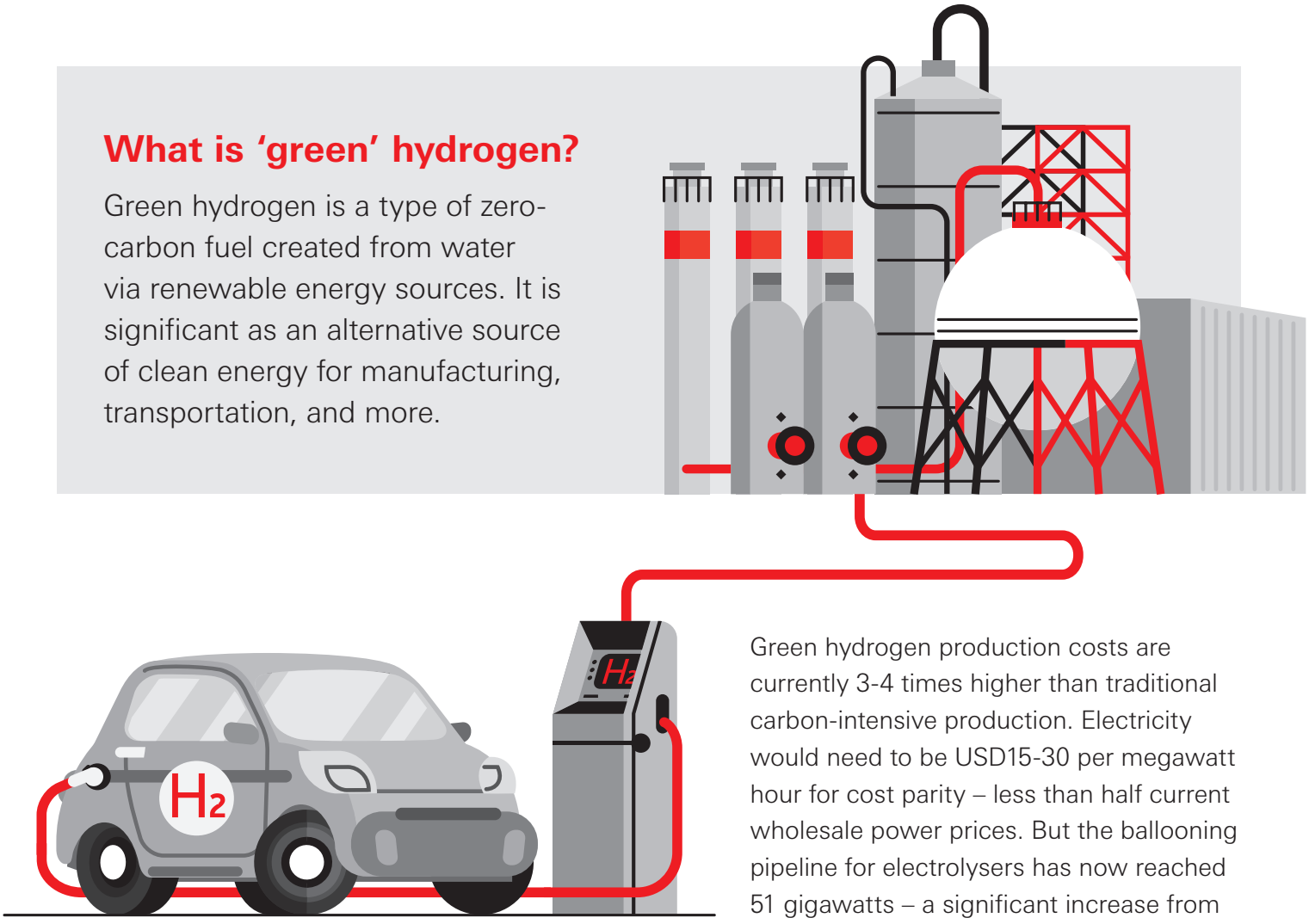
Hydrogen: from grey to green

Hydrogen's potential can only be realised if its production first becomes carbon-free. Approximately 98% of pure hydrogen produced globally today is generated via carbon-intensive methods, using a natural gas or coal feedstock (so called 'grey' hydrogen).

The remaining 2% of global hydrogen is produced via electrolysis, a chemical reaction that cracks water into its constituent parts: hydrogen and oxygen. If the electric current is powered by a renewable energy source, e.g. solar or wind, the end result is clean or 'green' hydrogen.

What is 'green' hydrogen?

Green hydrogen is a type of zero-carbon fuel created from water via renewable energy sources. It is significant as an alternative source of clean energy for manufacturing, transportation, and more.



Green hydrogen production costs are currently 3-4 times higher than traditional carbon-intensive production. Electricity would need to be USD15-30 per megawatt hour for cost parity – less than half current wholesale power prices. But the ballooning pipeline for electrolysers has now reached 51 gigawatts – a significant increase from 3 gigawatts in January 2020. This builds confidence that system sizes can be scaled up and manufacturing costs can fall by ~50% from current levels to close the cost gap with grey hydrogen.

2. The rising demand for hydrogen

The Hydrogen Council, a global advisory body to foster long-term clean energy transition, expects global hydrogen demand to reach 546 million tonnes by 2050. This is up from 70 million tonnes today with a 6.4% annual growth rate. We expect incremental demand for green hydrogen to stem from a variety of sectors, which could pose investment potential.

Industrials

Hydrogen can be applied as a raw material for industrial usage. Around 52% of demand comes from the oil refining sector where it is used for desulphurisation, or the removal of harmful sulfur compounds that could be released into the environment. This reinforces hydrogen's role as a critical component of 'clean fuels'. Another 42% of demand is for the production of ammonia, a basic agricultural fertiliser, and other chemicals. Hydrogen use in the chemicals sector should expand while steelmakers and other industries are set to become new users.

Utilities

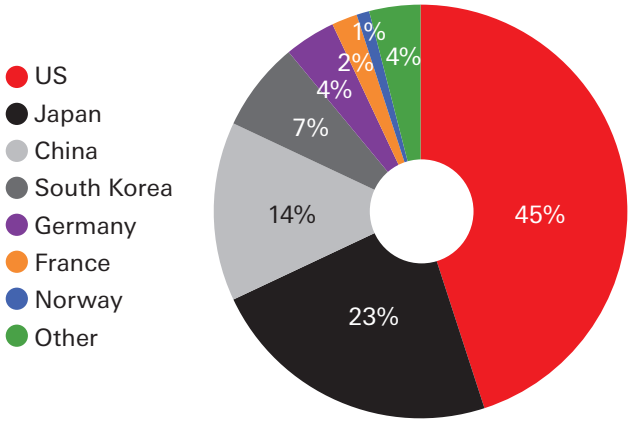
Utility companies are considering green hydrogen as a clean alternative for natural gas as coal usage falls. Hydrogen can be blended into the existing grid so households don't need to upgrade appliances, which avoids the potential for any major structural transformation. It can also be injected into existing gas distribution to dilute the overall carbon footprint by up to 15%, with limited infrastructure investment needs.

Transport

Passenger cars

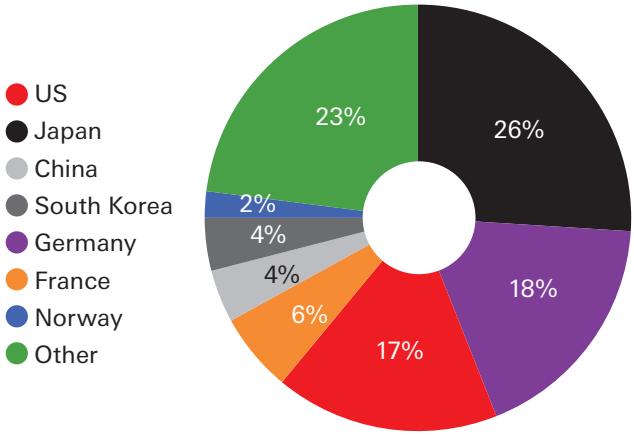
Hydrogen offers an alternative to battery-powered electric vehicles. A fuel cell and an on-board compressed hydrogen tank provide the power. But, to date, most electric-car makers have chosen battery power, with hydrogen part of a longer-term strategy. Only Toyota, Hyundai and Honda have commercial hydrogen-powered fuel cell electric vehicles in the passenger vehicle market, although Mercedes-Benz recently began leasing plug-in hybrid electric cars with a fuel cell. At the end of 2018 there were only 11,200 fuel cell passenger cars, compared to 5.1 million battery electric vehicles. Refer to geographical breakdowns in Charts 2 and 3.

Chart 2: Fuel cell passenger car stock breakdown by country, 2018



Source: IEA, HSBC

Chart 3: Hydrogen refuelling infrastructure breakdown by country, 2018

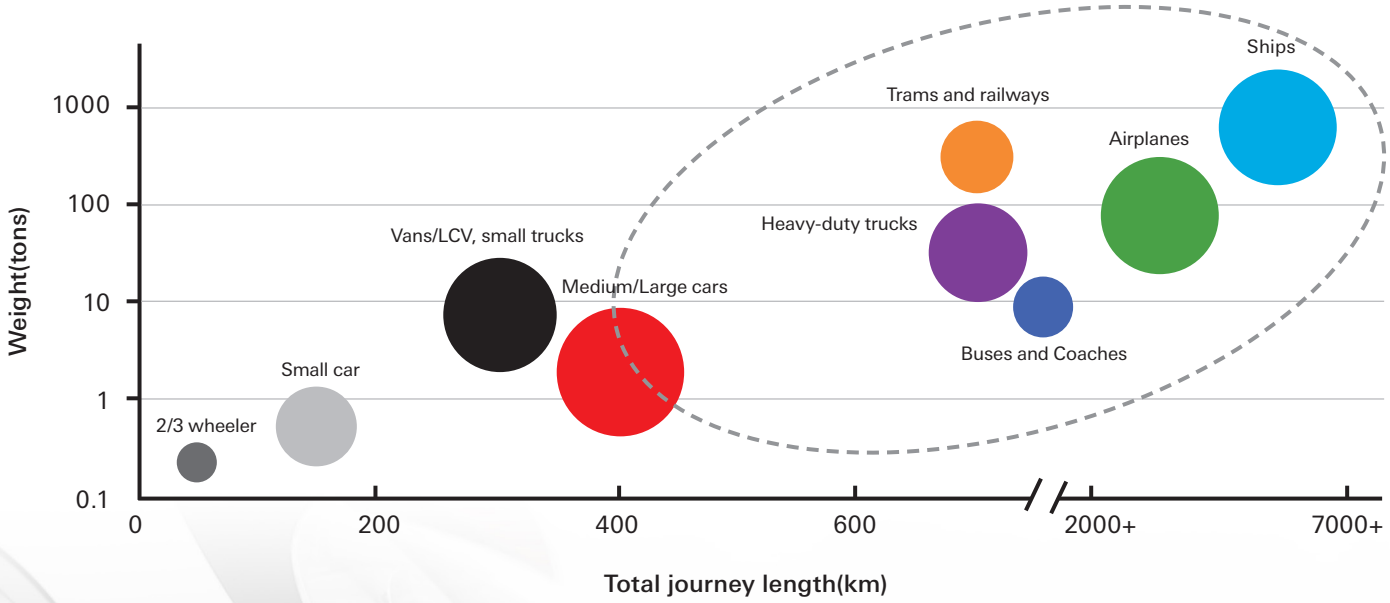


Source: IEA, HSBC

Heavy-duty vehicles

The promise of hydrogen in heavy-duty transport segments is rapidly developing. Its high energy density and shorter refueling times make it more attractive than batteries for long-distance transport (see Chart 4). In April 2020, Daimler and Volvo announced a EUR1.2bn joint venture to develop and produce fuel cell systems for trucks, buses and coaches, which we believe is the most significant development thus far towards commercialising hydrogen for heavy-duty commercial vehicles. Hydrogen buses and trucks are also gaining traction in China – where they account for over 95% of hydrogen vehicles.

Chart 4: Hydrogen fuel cells more suitable for heavy transport applications (trucks / trains / ships / airplanes etc.)



Source: FCH hydrogen roadmap Europe

3. Policy support for green hydrogen

We believe policy support is essential to driving investments in green hydrogen. Support has historically been strong in Asian markets such as Japan and South Korea, with rising momentum in other parts of the world. We look at recent policy developments in within regions that have continued to support the development of hydrogen.

Europe

The European Union regards hydrogen as a key driver for their post COVID-19 recovery. A formal hydrogen strategy was enforced in July last year and includes firm targets for green hydrogen production by 2024 and 2030. A number of EU member countries have since adopted national strategies to promote and develop hydrogen in their respective economies, driving further granularity on targets.

UK

The UK Department of Business, Energy and Industrial Strategy announced a plan to invest EUR22m in the national rollout of hydrogen to cut emissions. Local bus authorities are also demanding more action on clean air, and cutting particulates which are harmful to human health, linked to higher levels of cardiovascular and respiratory problems.

US

In July 2020, the Democratic presidential campaign unveiled their Plan for Climate Change and Environmental Justice. This includes commitment to electrolysing technologies for cost-effective green hydrogen production with fossil fuels by 2030. The US has also set a target of USD1m Fuel Cell Electric Vehicles (FCEVs) and 1,000 refueling stations by 2030. To help achieve this, the California government has announced consumer rebates ranging from USD4,500-7,000 on FCEVs.

China

In November 2020, the State Council of China forecasted that national sales of electric, plug-in hybrid and hydrogen-powered vehicles would rise to 20% of overall new car sales by 2025 (vs 5% from today). The State Council also advocates for technological improvements, construction of more efficient electric vehicle charging networks and greener vehicles in support of the world's largest automobile market.

4. Conclusion

Investors can expect the demand for green hydrogen across sectors and geographical regions to take off in the 2020s as global projects leveraging on the element increase in scale. Facing pressure to decarbonise, the most significant opportunities will come from oil and gas companies, which are also uniquely positioned to support green hydrogen production at a more cost efficient scale.

A strong pipeline for electrolyser projects could also provide the scale to substantially reduce production costs. But government support is still necessary and policy makers in Europe, Asia and other regions are aligning supportive policies for climate ambition. We expect hydrogen to become fully industrialised by 2030.

Disclosure appendix

1. This report is dated as at 09 February 2021.
2. All market data included in this report are dated as at close 09 February 2021, unless a different date and/or a specific time of day is indicated in the report.
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