HSBC Global Research

Energy Transition
Equity Research Report
China | Thematic research

March 2022
www.research.hsbc.com

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SPOTLIGHT

China Green Hydrogen

Ready for prime time

Green hydrogen is taking off in China, which is set to lead the world in its adoption, driven by tighter emission standards and falling costs

We show why chemical and steel producers are set to be the biggest commercial users of this clean fuel over the next five years…

…and highlight other major implications such as a brighter outlook for renewable power and re-rating opportunities along the supply chain

Why read this report?

- Green hydrogen is taking off in China, which is set to lead the world in its adoption, driven by tighter emission standards and falling costs
- We show why chemical and steel producers are set to be the biggest commercial users of this clean fuel over the next five years…
- …and highlight other major implications such as a brighter outlook for renewable power and re-rating opportunities along the supply chain

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Prime time for green hydrogen

Green hydrogen is on the cusp of becoming far more widely adopted in China as the costs come tumbling down. It's an energy source that is crucial to achieving net zero emissions – it is produced using renewable energy and produces no carbon emissions when consumed – but up to now has been prohibitively expensive. That is changing as since 2021, China's oil majors and leading chemical companies have started using this fuel source to power their plants, leading to cost reductions for this emerging energy source.

In this report, we look at applications which are most commercially viable in the next five years, namely green hydrogen being used by chemical and steel producers as they can make it on site, so there is no need for transportation. But we also look at the wider development of green hydrogen in China and detail a number of major implications to investors:

- The cost of green hydrogen is set to decrease by 38% in 2022-25e, driven by the falling costs of electrolysers, the equipment which splits water to make hydrogen, and solar energy.
- We detail the beneficiaries all along the green hydrogen supply chain. While revenue may not be significant in the next two years, we see re-rating opportunities ahead.
- Green hydrogen also improves the outlook for renewable power like solar and wind, as for the first time, we see a commercially-viable solution to power grid instability as storing energy in the form of hydrogen is 5-15x cheaper than lithium batteries.
- We expect average annual electrolyser system installation to be 20GW over the next five years in China, compared to only 1-1.5GW in 2022e, and equivalent to RMB79bn of annual equipment spending. We believe exponential growth to happen in 2024-25e.
- We see China playing a key role in global green hydrogen development. Two-thirds of electrolysers in 2022 are set to be installed in China, per BNEF estimates.
- We explain why we prefer green hydrogen to carbon capture, utilisation and storage (CCUS), a technology that is both complementary and competing with green hydrogen.

Contents

Facts and figures

c69%

of global electrolysers, used to produce hydrogen, are set to be installed in China in 2022e

RMB79bn

average annual spending on electrolysers in 2022-27e

The reduction in the levelised cost of energy (LCOE) for producing green hydrogen will be driven by a decline in solar and electrolyser system costs

38%

How much green hydrogen production costs (LCOE) in China will decline by in 2021-25e

20%

Steelmaking and petrochemical sector's share in China total carbon emission in 2020

14%

Green hydrogen's share of China's peak-shaving capability by 2027e

1.2%

How much green hydrogen could reduce China's total carbon emissions by in 2027e

5-15x

Storing electricity in the form of hydrogen (without regeneration) is 5-15x cheaper than lithium battery

We expect green hydrogen with storage capacities can help reduce solar and wind curtailment (aka wasted energy)

6-9x

How much China's carbon trading price (Jan 2022) is lower than its CCUS cost

7%

Green hydrogen's share of China's total hydrogen supply in 2027e

Source: BNEF, HSBC Global Research, HSBC Qianhai Securities estimates

Related research

Recommended reading...

- *Global Hydrogen - Why the journey from grey to green is taking off*, **30 January 2020**
- *Global Hydrogen - 2020s are the roaring decade of hydrogen*, **13 January 2021**
- *Asia Energy & Resources: ESG Integrated -On the front line of the energy transition*, **1 November 2021**
- *Carbon Capture & Sequestration - Back in the debate, but no silver bullet*, **23 March 2021**
- *A-share Infrastructure Renewables - How to play the energy storage investment upcycle?*, **2 November 2021**
- *China Easing - Time for a RMB2trn tech and green stimulus package* , **17 November 2021**
- *CIMC Enric Holdings (3899 HK) - Pending better entry point* , **14 February 2022**

Executive summary

- China is joining the march towards wider use of green hydrogen
- We expect costs to rapidly fall and the sector to be re-rated, like what has happened to EVs and solar
- Green hydrogen could be an ideal candidate for the ultimate clean energy solution as it perfectly matches up with solar and wind use

Green hydrogen is entering the 'real application' stage

Why now?

Hydrogen promises to be a new type of fuel that can burn without emitting any greenhouse gases. But up to now its production hasn't always been as clean. While green hydrogen – which makes hydrogen by "cracking" water using renewable energy and thus creating zero carbon emissions – has been around for decades it has not been massively adopted due to its high costs. However, since 2019, the rising emphasis on decarbonisation has driven renewed interest in carbon-free 'green' hydrogen produced using electricity from renewables. By January 2021, there were over 51GW of electrolysers - which enable the production of this clean type of hydrogen - in the global pipeline, based on announced projects (please see *Global Hydrogen - 2020s are the roaring decade of hydrogen*, 13 January 2021).

The reason we focus on green hydrogen now is that China is entering the 'real application' phase, as more leading Chinese chemical producers (e.g. Sinopec group, Petro China and Baofeng) started to invest more in new electrolyser capacity last year. In addition, we believe the launch of the China Emissions Trading Scheme in July 2021 accelerates the application of green hydrogen given the higher carbon emission expenses of coal-made hydrogen, a competing alternative.

We see the potential for green hydrogen to be used widely in the petro chemical and steel production industry, which together accounted for 20% of carbon dioxide emissions in 2020 in China, much higher than 7% from gasoline and diesel vehicles (Exhibit 1). We also expect potential support from the RMB2trn stimulus package for green projects (see *China Easing: Time for a RMB2trn tech and green stimulus package*, 17 November 2021). On 23 March 2022, the National Development and Reform Commission (NDRC) released *Hydrogen development plan 2021-35* on its website. Hydrogen is declared to be a key component of the country's future national energy system. We believe the potential for more policies to be rolled out in the form of tax breaks or subsidies could further accelerate the green hydrogen industry.

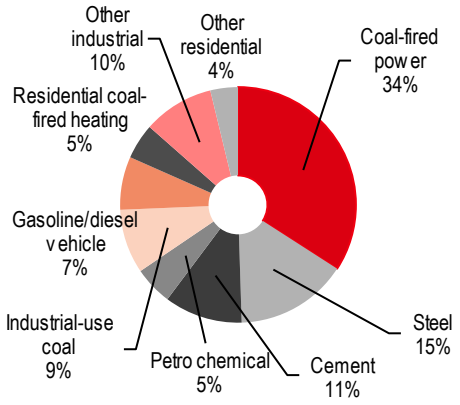
Another story of Chinese manufacturing reducing costs

Solar equipment market leaders such as Longi and Sungrow power, are foraying into the green hydrogen equipment market by starting to make electrolysers for green hydrogen projects. We believe this should also bring about cost reductions in equipment as the industry is on the cusp of mass manufacturing electrolysers. We hence believe we're firmly on the cost reduction road for green hydrogen, and the speed is likely to accelerate when the virtuous cycle starts: more

production volume leads to lower costs, and lower costs in turn facilitate more industry applications. This is similar to the solar sector in 2010-21 when installation costs declined 83% and global installation increased by a 24% CAGR from 2010 to 2021. Given c69% of global electrolysers will be installed in China in 2022 (BNEF estimates), we expect Chinese manufactures to play a key role in supplying the domestic market and facilitating global electrolyser development.

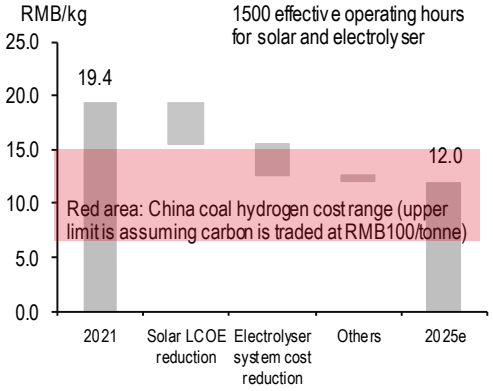
We expect the levelised cost of energy (LCOE) — a measure that removes the impact of direct subsidies and includes the costs of construction, operations and financing for a new plant — of green hydrogen to decline by 38% from cRMB24/kg (1200 operating hours) in 2021 to RMB15/kg (1200 operating hours) in 2025e, or USD2.5/kg. This will allow green hydrogen to be cheaper than blue hydrogen (made from natural gas or coal while capturing the carbon dioxide emitted) in regions that have good sunlight conditions for the solar panels needed for renewable energy (e.g. RMB12/kg cost for green hydrogen when there are 1,500 effective annual operating hours for solar). This will not be the final destination for costs as BloombergNEF (BNEF) estimates that renewable hydrogen costs may fall to as low as USD1.4/kg by 2030e. We believe that robust green hydrogen demand could translate into average annual equipment spending on electrolyser systems of RMB79bn in 2022-27e in China.

Exhibit 1. China carbon dioxide emissions breakdown by source (2020)



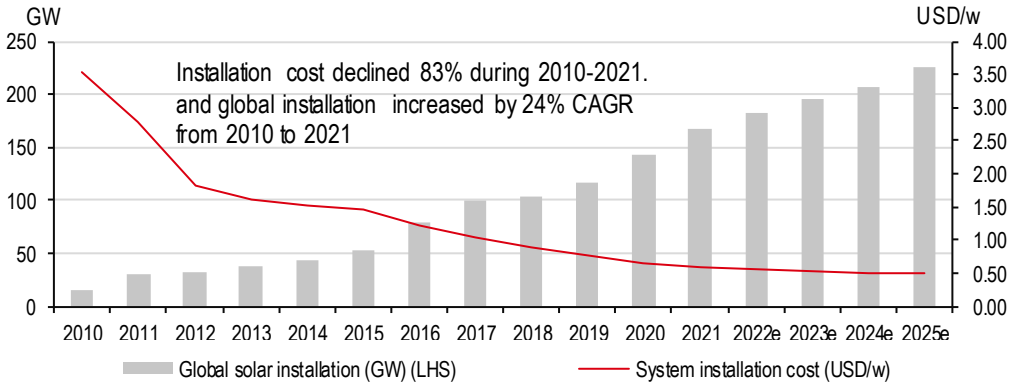
Source: Wind, HSBC Qianhai Securities

Exhibit 2. China green hydrogen LCOE to decline 38% by 2025e, and to be cheaper than coal hydrogen by 2025e



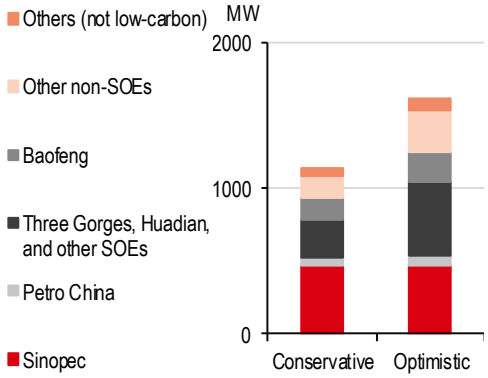
Source: China PV Industry Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 3. The virtuous cycle seen in solar is a path electrolysers could copy



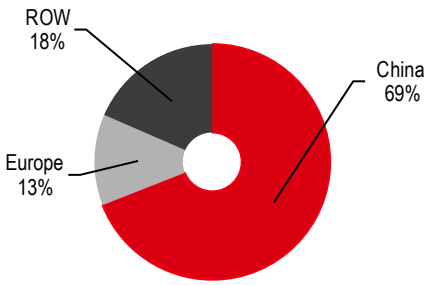
Source: China PV Industry Association, BNEF, HSBC estimates, HSBC Qianhai Securities estimates

Exhibit 4. Forecast for the China electrolyser market in 2022, by developer



Source: Company data, BNEF estimates, HSBC Qianhai Securities

Exhibit 5. Breakdown of global electrolyser market in 2022, by region



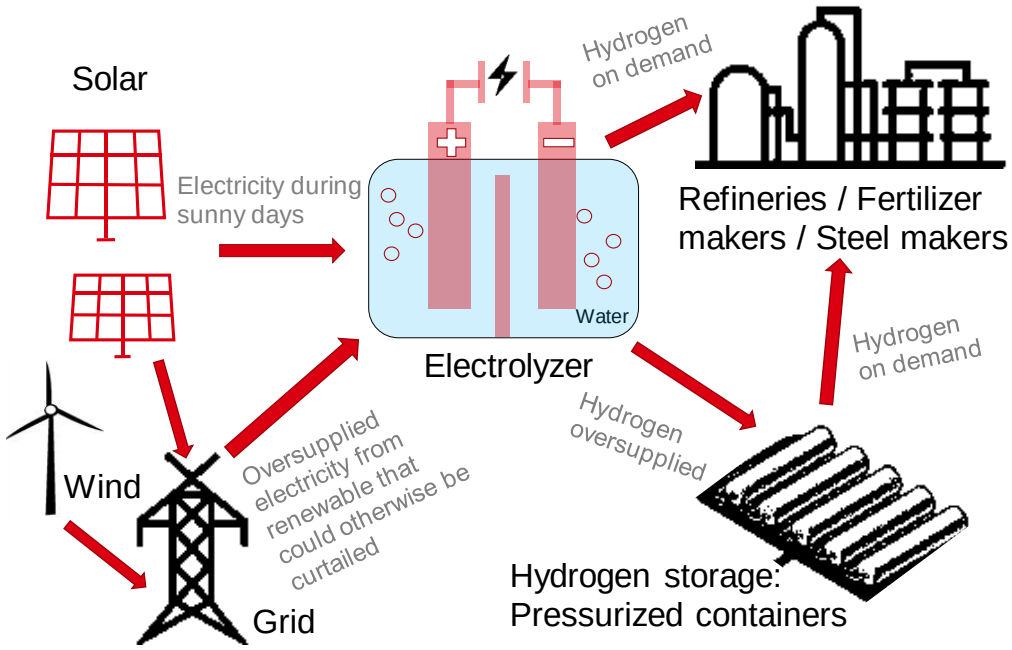
Source: BNEF estimates, HSBC Qianhai Securities

The most viable solution to the ultimate clean energy solution

In this report, we focus on green hydrogen applications that are the most commercially viable in the next five years - chemical and steel production – with no transportation as green hydrogen is made on site. However, if we look at the even bigger picture, green hydrogen could also find mass application in transportation (e.g. trucks and buses that are powered by fuel cells, which generate electric-power with hydrogen), heat generation (hydrogen can be mixed in with natural gas pipelines and used to heat buildings or water for residential use) and almost all aspects of industry activities that have been supported by fossil fuels. The lack of infrastructure and high costs have restricted hydrogen's use beyond oil and gas, chemical and the steel making industries, but the economics for broader applications could work out in the longer term.

A more important role that green hydrogen could play is in energy storage. Storing energy in the form of hydrogen is significantly cheaper than chemical-based lithium batteries. The flexible nature of electrolysis and low cost of hydrogen storage could accommodate the intermittency and volatility from renewable energy power like solar and wind. At the same time, this could dramatically reduce the unit costs of hydrogen production. Therefore, we see a brighter outlook for renewable power like solar and wind. We believe that a build-up of an excess supply of renewable power over the next decade – leading to curtailment where renewable power generated cannot be accepted by the power grid – can help accelerate the application of green hydrogen with storage facilities.

Exhibit 6. Green hydrogen storage could help avoid curtailment of solar and wind



Source: HSBC Qianhai Securities

Exponential growth is likely to happen in 2024-25e

We expect average annual electrolyser system installation to be 20GW in 2022-27e (compared to only 1-1.5GW in 2022e) in China. We believe exponential growth in electrolyser installation is likely to happen in 2024-25e, as the next batch of mass green hydrogen projects will likely be completed in 2024e. This is after Sinopec's first green hydrogen project is completed in mid-2023e, at which point the true operating costs can be assessed by the oil majors, who could then decide on new projects. That is also likely to be a time when electrolyser makers scale up their capacity to over 10GW and electrolyser costs significantly decline. The next generation of solar cell technology like hetero-junction solar cells (HJT) will likely drive down solar costs by 2024e as well. Therefore, in view of these pending changes, we believe 2024-25 is likely to be the turning point for the green hydrogen industry.

Small revenue exposure but a good re-rating opportunity in 2022-24e

Admittedly, none of our covered companies will have significant revenue exposure to green hydrogen in the next two years. Part of the reason is that our covered companies have an established mature business with leading market shares, and that green hydrogen is an emerging sector with little contribution as of now. In addition, companies with purer exposure are not listed.

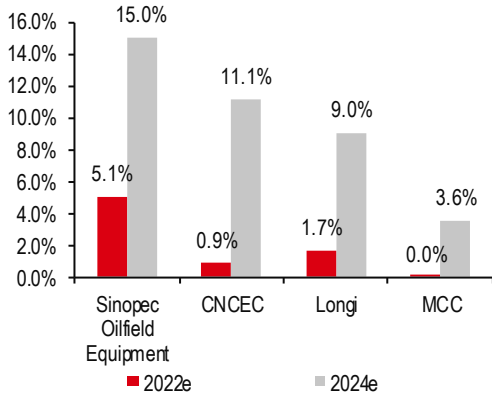
Despite this, we believe most companies along the green hydrogen supply chain will enjoy re-rating opportunities when the industry approaches mass application in 2023-27e. Take the electric vehicle (EV) industry as an example. The P/E multiple for major listed companies rose from c20x to c50x in 2015-19, ahead of the surge in EV sales. Similarly, we believe companies with green hydrogen exposure deserve higher valuations because of the increasingly visible prospects for green hydrogen.

We identify the following types of companies with a re-rating potential:

1) Players that make electrolysers, or components for electrolysers, that have larger market potential and higher entry barriers (see Exhibit 14 and Exhibits 44-47 for details).

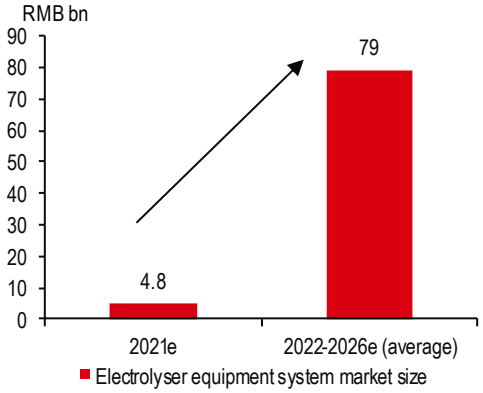
2) Players with resources transferable to these businesses are likely to have an edge (See Exhibit 14 for details).

Exhibit 7. Revenue exposure to hydrogen for our covered companies



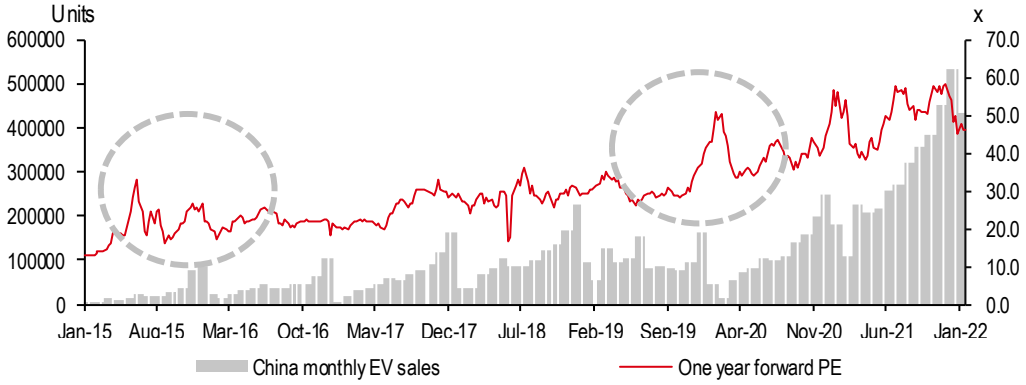
Source: Company data, HSBC Qianhai Securities estimates

Exhibit 8. China electrolyser equipment system annual spending



Source: BNEF, HSBC Qianhai Securities estimates

Exhibit 9. China A-share EV sector companies re-rated 1 year before significant sales growth



Note: Our EV sector multiple is based on 10 major EV supply chain companies
Source: Company, Wind, HSBC Qianhai Securities

Stocks

CNCEC (601117 CH, RMB9.33, Buy, TP RMB15.60): We estimate green hydrogen and carbon capture, utilisation and storage (CCUS) to directly contribute to 14% of CNCEC's revenue by 2024e. In addition, we expect CNCEC's strong footing in CO2 reduction technology to give it an advantage in winning new chemical projects given rising emission requirements by the government. Up to 40% of CNCEC's new orders are related to CO2 reduction in 2021. Our new target price of RMB15.60 (previously RMB15.20) implies c67.2% upside from the current share price. We maintain our Buy rating on the stock, given improving earnings stability and less cyclicality from its engineering, procurement and construction (EPC) business, smoothed by hydrogen, CCUS and other carbon reduction solutions. We also expect more sustainable self-operating business such as adiponitrile production could also help reduce CNCEC's earning cyclicality. The stock is trading at a 1.1x 2022e PB, lower than the c2.0x level during a period of high earnings growth in 2010-12 (36% CAGR) and the bull market in 2015.

Longi (601012 CH, RMB80.50, Hold, TP RMB72.60): Longi is both the largest wafer supplier and module supplier globally, in terms of 2021 sales volume. We also see potential upside from better-than-expected contribution from its green hydrogen equipment business. As of October 2021, Longi had 500MW in manufacturing capacity in electrolysers and plans to expand this to 5-10GW in five years. Our target price is RMB72.60 (unchanged). With 9.8% downside from current levels, we maintain our Hold rating on the stock, as we see great potential in its green hydrogen equipment business.

MCC (601618 CH, RMB3.83, Buy, TP RMB7.20): China Metallurgical Group Corporation (MCC) is the largest metallurgical engineering and construction (E&C) contractor in China (c90% market share) and globally (c60% market share). Most of its metallurgical projects are for steel production, which we believe will start to use hydrogen (we assume 5% of the steel in China will use hydrogen instead of carbon monoxide by 2027e). We believe MCC will benefit from hydrogen's application in the steel industry. We keep our target price unchanged at RMB7.20. Our TP implies 88% upside from current levels, and we maintain our Buy rating on the stock.

Sinopec Oilfield Equipment (000852 CH, RMB6.40, Hold, TP RMB6.40): We believe Sinopec Oilfield Equipment could benefit from the aggressive carbon reduction endeavours by its largest customer and controlling shareholder, Sinopec. However, as its share price has risen by 47% in the past year, outperforming the Oilfield Services Index which rose 10.5% during the same period (comprising 11 A-share listed oilfield services providers), we believe the improving prospects for the hydrogen business have been priced in. Meanwhile, we remain cautious on Sinopec Oilfield Equipment's growth prospects, as it has yet to prove its competitiveness in either oilfield equipment or hydrogen products. We raise our target price to RMB6.40 from RMB5.60. With 0.0% upside, we maintain our Hold rating.

Exhibit 10. Ratings and estimates

			Current	TP		Rating		Upside/	12/2021e EPS (RMB)		12/2022e EPS (RMB)		12/2023e EPS (RMB)	
Company	Ticker	Currency	price	Old	New	Old	New	downside	Old	New	Old	New	Old	New
China National Chemical	601117 CH	RMB	9.33	15.20	15.60	Buy	Buy	67.2%	0.78	0.66	1.01	0.95	1.21	1.21
Sinopec Oilfield Equipment	000852 CH	RMB	6.40	5.60	6.40	Hold	Hold	0.0%	0.046	0.046	0.045	0.051	0.048	0.053
MCC	601618 CH	RMB	3.83	7.20	7.20	Buy	Buy	88.0%	0.42	0.42	0.51	0.51	0.60	0.60
Longi	601012 CH	RMB	80.50	72.60	72.60	Hold	Hold	-9.8%	1.86	1.86	2.07	2.07	2.11	2.11

Note: Priced at close of 22 March 2022

Source: Company data, HSBC Qianhai Securities estimates

Sector catalysts and downside risks

Potential catalysts: 1) Rising carbon trading volumes and prices; 2) major green hydrogen project announcements; 3) lower solar and electrolyser costs; 4) rising coal and natural gas prices, and 5) more supportive policies are rolled out.

Key downside risks: 1) Lower-than-expected cost reductions in electrolysers; 2) lower-than-expected cost reductions in solar; 3) lower-than-expected carbon tariff hikes, and 4) incidents related to hydrogen safety failures.

Company-specific catalysts

CNCEC: Ramp-up of adiponitrile capacity (main raw material required for the production of nylon 66), new self-operating chemical project launches, SOE reform-led industry consolidation, and major hydrogen-related project wins.

Longi: Delivery of electrolysers, announcement of new capex plans for electrolysers, major electrolyser orders, and announcement of technology breakthroughs in electrolysers.

MCC: Major new contracts in steel-hydrogen projects, and breakthroughs in the steel-hydrogen technology.

Sinopec Oilfield: Oil price surge, major hydrogen-related orders, major capex plans by parent company Sinopec, and major CCUS related orders.

Our estimates vs. consensus

China National Chemical: Our 2021 earnings estimates are in line with consensus, but our 2022-23e earnings estimates are 6-10% above consensus, mainly because of our higher expectations on green hydrogen, CCUS, and other carbon-reduction projects.

Sinopec Oilfield Equipment: Our 2021-23e earnings estimates are in line with market consensus.

Longi: Our 2021-23e earnings estimates are 6-23% below consensus as we see pressure on the company's wafer margins given industry overcapacity, but we believe this is mostly priced in.

MCC: Our 2021-23 earnings estimates are 10-18% above consensus given our more bullish new contract forecasts.

Exhibit 11. HSBC Qianhai estimates vs consensus

		HSBC Qianhai estimates			Consensus			Variance		
Company	RMBm	2021e	2022e	2023e	2021e	2022e	2023e	2021e	2022e	2023e
China National Chemical	Revenue	137,696	165,657	196,412	128,770	149,085	169,447	7%	11%	16%
	Net profit	4,233	6,079	7,742	4,229	5,716	7,067	0%	6%	10%
Sinopec Oil Equipment	Revenue	6,388	7,070	7,399	6,579	7,013	7,015	-3%	1%	5%
	Net profit	36	40	42	37	39	41	-3%	2%	1%
Longi	Revenue	111,820	119,120	107,578	88,070	116,821	135,216	27%	2%	-20%
	Net profit	10,068	11,383	11,611	10,756	13,245	14,993	-6%	-14%	-23%
MCC	Revenue	535,130	626,705	711,580	455,008	554,045	600,215	18%	13%	19%
	Net profit	8,641	10,493	12,404	7,865	9,377	10,506	10%	12%	18%

Source: Company data, Wind, HSBC Qianhai Securities estimates

ESG Integration

Quantifying the positives of green hydrogen

Under our assumptions, by 2027e:

- 52.65m tons of steel (5% of steel production in China in 2020) will be produced with green hydrogen. This can reduce carbon dioxide emissions by 96.35mn (assuming 1.83 ton CO_2/steel production), which is 0.9% of China's total carbon emissions in 2020.
- 1.25m tons of green hydrogen will replace grey hydrogen (hydrogen produced with coal) in chemical production. This can reduce carbon dioxide emissions by 28.75m tons, which is 0.3% of China's total carbon emissions in 2020.

In sum, our estimates for green hydrogen by 2027e could reduce carbon emissions by 125.1m, which is about 1.2% of China's carbon emissions in 2020.

Integrating ESG into our financials and valuations

In addition to the industry impact, we identify three key ESG factors that are critical to the sector – renewable exposure, corporate governance, and social activity – and apply the impact from these factors to our financials and valuations.

Our analysis of China National Chemical's ESG efforts results in a modest increase to our valuation premium. Our target multiple of 1.8x PB has enjoyed a premium to its historical PB level of 1.4x since 2010.

For Sinopec Oilfield, we raise the target multiple to 20% below its historical average (compared to 30% previously), not only because of the higher ROE projection (2022e ROE of 2.1% versus 2022e ROE 1.9% previously), but also because of its improving ESG profile on the higher revenue share expected from renewables.

Exhibit 12. We integrate our ESG factors into our models

	Into financials	Into valuations	China National Chemical (601117 CH)	Sinopec Oilfield Equipment (000852 CH)
Environment				
Revenue exposure to renewables	√	√	40% new contract share in 2021	10% revenue share in 2023e
Social				
Investment/donations to social goods			Donated RMB12mn for poverty alleviation in 1H21	N/A
Governance				
Board independence			Three of the seven board directors are independent	Three of the eight board directors are independent

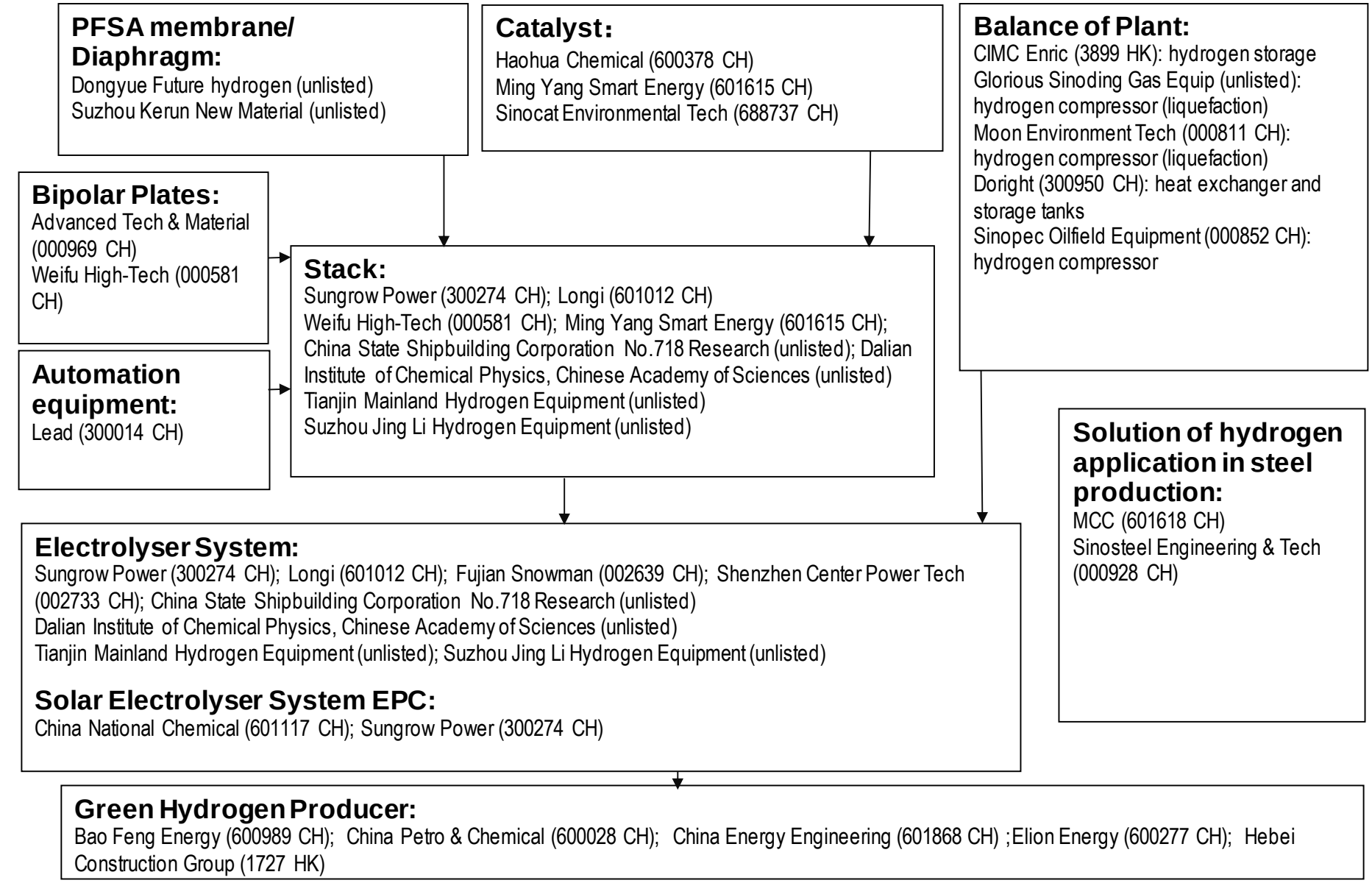
Source: Company data, HSBC Qianhai Securities estimates

Exhibit 13. Hydrogen related comps

Company name	Stock Code	Ccy	Rating	TP	Closing 2022/3/22	Market cap. USDbn	3M ADTV USDm	PE (x) 2021e	PE (x) 2022e	PB (x) 2021e	PB (x) 2022e	ROE 2021e	ROE 2022e	EPS CAGR 2021-23e
Electrolyser maker/EPC														
Longi	601012 CH	RMB	Hold	72.60	80.49	68.44	832	43.3	38.9	8.9	6.7	24%	20%	29%
Sungrow Power	300274 CH	RMB			113.41	26.46	416	63.8	42.1	13.1	9.7	21%	24%	42%
Ming Yang Smart Energy	601615 CH	RMB			23.89	7.90	255	12.4	15.3	1.7	1.6	15%	11%	-27%
China National Chemical	601117 CH	RMB	Buy	15.60	9.33	8.95	111	14.1	9.8	1.2	1.1	10%	11%	23%
Shenzhen Center Power Tech	002733 CH	RMB			16.03	0.97	48	23.7	16.6	5.2	3.5	24%	26%	23%
Hydrogen storage and CCUS related														
Sinopec Oilfield Equipment	000852 CH	RMB	Hold	6.40	6.40	0.78	28	139.0	124.8	2.7	2.6	2%	2%	6%
Moon Environment Tech	000811 CH	RMB			12.39	1.45	54	42.2	37.9	8.7	6.5	24%	20%	7%
CIMC Enric	3899 HK	HKD			8.87	2.30	9	17.3	14.0	1.8	1.7	11%	13%	21%
Solution of hydrogen application in steel production														
MCC	601618 CH	RMB	Buy	7.20	3.83	11.55	124	9.2	7.6	0.8	0.7	9%	10%	17%
Sinosteel Engineering & Tech	000928 CH	RMB			6.93	1.39	39	16.4	11.2	1.4	1.3	10%	11%	29%
Global names exposed to Hydrogen														
ITM Power	ITM LN	GBp			349.40	2.84	16	NA	NA	4.9	5.6	-9%	-4%	8%
NEL	NEL NO	NOK			17.57	2.92	14	NA	NA	5.7	5.8	-11%	-8%	-60%
Siemens Energy	ENR GY	EUR			21.40	17.14	78	55.9	19.9	1.0	1.0	2%	5%	100%

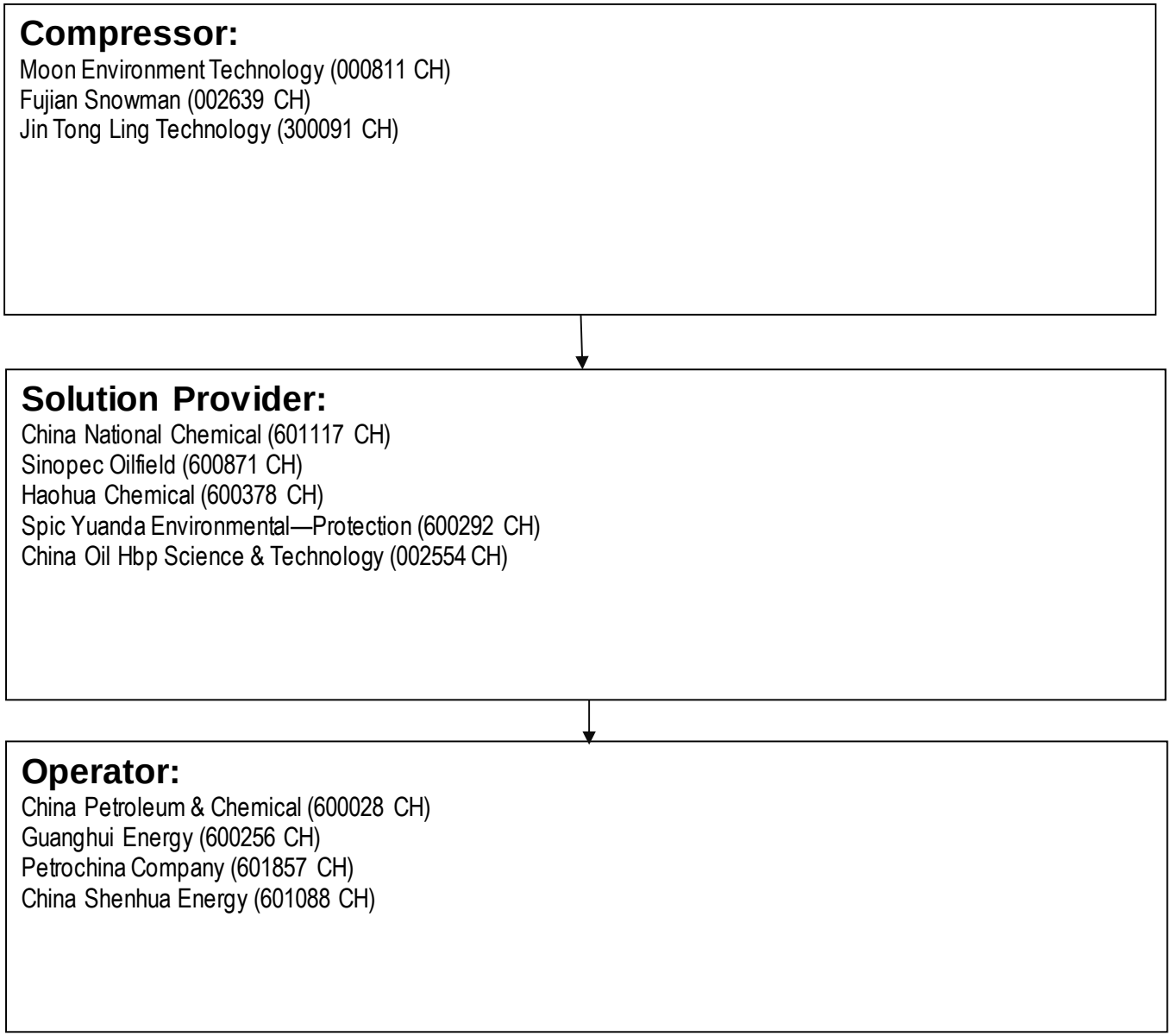
Source: Bloomberg, Company data, HSBC Qianhai Securities estimates (for rated stocks)

Exhibit 14. China green hydrogen supply chain



Source: Company, HSBC Qianhai Securities

Exhibit 15. China CCUS supply chain



Source: Company data, HSBC Qianhai Securities

Valuation and risks

		Valuation	Risks
China National Chemical 601117 CH **Buy**	Current price: **RMB9.33** Target price: **RMB15.60** Up/downside: **67.2%**	We continue to use a PB multiple to value the stock, and roll over our valuation base year. Our target price is based on a 1.8x one-year forward PB (1 SD above its historical average, unchanged) and our 2022e BVPS estimates of RMB8.67 (previously an average of RMB8.43 in 2021-22e). We believe the stock deserves a premium to its historical PB level 1.4x since 2010, considering its improving ROE outlook (2021-23e ROE of 9.6-13.2%, above its historical average of 10.8% since 2010). The stock is trading at a 1.1x 2022e PB. Our target price of RMB15.60 (previously RMB15.20) implies c67.2% upside from the current share price. We maintain our Buy rating on the stock, given improving earnings stability and potential upside from the hydrogen business. **Dun Wang* [S1700519060002]** | dun.wang@hsbcqh.com.cn | +86 21 6081 3827	**Key downside risks:** ◆ Fluctuations in crude oil prices. ◆ Chemical industry capex cuts ◆ Foreign exchange risks ◆ Lower-than-expected adiponitrile capacity ramp-up ◆ Lower-than-expected development in hydrogen and CCUS business
Longi 601012 CH **Hold**	Current price: **RMB80.50** Target price: **RMB72.60** Up/downside: **-9.8%**	We base our target price of RMB72.60 (unchanged) on a DCF valuation model. Key assumptions are: (1) Cost of equity of 9.0% (unchanged), based on a risk-free rate of 2.0%, a market risk premium of 6.0%, and a beta of 1.16. (2) After-tax COD of 4.3% (unchanged). (3) Debt-to-capital ratio of 12% (unchanged). (4) Operating cash flow (before changes in working capital) CAGR of 12% (unchanged) in 2020-29e. (5) Capex of RMB15.8bn in 2021e, RMB7.4bn in 2022e, and RMB7.3bn in 2023e, and RMB2-5bn per year over 2024-29e (unchanged). (6) Terminal growth rate of 2% (unchanged). With 9.8% downside from current levels, we maintain our Hold rating on the stock, as we see great potential in its green hydrogen equipment business. **Corey Chan* [S1700518100001]** | corey.chan@hsbcqh.com.cn | +86 21 6081 3801	**Key upside risks:** ◆ Higher-than-expected cost reductions in non-Si wafers ◆ Faster-than-expected wafer capacity expansion ◆ Better-than-expected wafer demand **Key downside risks:** ◆ Weaker-than-expected PV demand ◆ Risk of equity dilution from fundraising exercise ◆ Greater-than-expected cuts to wafer ASPs
MCC 601618 CH **Buy**	Current price: **RMB3.83** Target price: **RMB7.20** Up/downside: **88%**	Our TP is based on a sum-of-the-parts approach. **Engineering & construction:** We value this division by applying a 2023e PE multiple of 10x (unchanged), which is close to the historical average of global E&C peers. **Property development:** We value this division by applying a 2023e PE multiple of 7x (unchanged), which is close to the historical average of industry peers. **Resources development:** We value this division using DCF. Our WACC assumption is 7.9% (unchanged). **Equipment manufacturing:** We value this division by applying a 2023e EV/EBITDA multiple of 6x (unchanged), which is close to the historical average of industry peers. We maintain our target price unchanged at RMB7.20. Our TP implies 88% upside from current levels, and we maintain our Buy rating on the stock. **Corey Chan* [S1700518100001]** | corey.chan@hsbcqh.com.cn | +86 21 6081 3801	**Key downside risks:** ◆ Slowdown in metallurgical investment ◆ Weaker-than-expected margins on intensified competition ◆ Higher-than-expected capex in mining ◆ Project delays or cancellations ◆ Profit volatility from non-recurring items
Sinopec Oilfield Equipment 000852 CH **Hold**	Current price: **RMB6.40** Target price: **RMB6.40** Up/downside: **0.0%**	We raise our target price to RMB6.40 from RMB5.60, mainly to reflect our higher earnings estimates in 2022-23e. We apply a 12-month forward multiple of 2.65x (previously 2.32x) to our average 2021-22e BVPS estimate of RMB2.40 (unchanged). Our target multiple is 20% below (previously 30%) the stock's historical average of 3.31x between 2015 and August 2020. We raise the target multiple to 20% below its historical average (30% below previously), given the higher ROE projection (2022e ROE of 2.1% vs 1.9% previously). Our new target price of RMB6.40 implies c0.0% upside from the current share price. We maintain our Hold rating on the stock. **Dun Wang* [S1700519060002]** | dun.wang@hsbcqh.com.cn | +86 21 6081 3827	**Key upside risks:** ◆ Stronger-than-expected shale gas development in China ◆ Faster-than-expected overseas expansion ◆ A higher-than-expected crude oil price ◆ Larger-than-expected upstream capex of China oil majors ◆ Stronger-than-expected development of hydrogen business **Key downside risks:** ◆ Slowdown in shale gas and oil field equipment ◆ Intense competition ◆ Working capital management risks ◆ Weaker-than-expected development of hydrogen business

Note: Priced at close of 22 March 2022

* Employed by a non-US affiliate of HSBC Securities (USA) Inc, and is not registered/ qualified pursuant to FINRA regulations

Source: HSBC Qianhai Securities estimates

Virtuous cycle starts

- Green hydrogen and CCUS projects are accelerating in China
- We expect mass application in green hydrogen as costs decline
- Prefer players with resources transferable to this emerging market

Green hydrogen

Huge market potential

The use of hydrogen is already relatively mature in the chemical and refining industry. And green hydrogen is replacing coal-made or natural-gas-made hydrogen as the cost of green hydrogen declines. In the chemical industry, hydrogen is primarily used for the production of ammonia, a basic fertiliser, while in the refining sector, hydrogen is used for desulphurisation.

For the steel making industry, there is still room for technology to improve and costs to fall to justify replacing carbon monoxide and natural gas with hydrogen. Mixing hydrogen with natural gas and coke-oven gas in steel production can reduce carbon emissions by 10-80% (compared to pure coke-oven gas or natural gas), depending on the share of hydrogen in the gas mix or technology route (a blast furnace or a gas shaft furnace), according to our estimates, based on data from China Iron and Steel Association. Meanwhile, using hydrogen to replace coal and coke in the gas mix will increase steel costs by RMB50-750/ton (assuming RMB24/kg hydrogen price), accounting for 5-75% of current steel processing cost (total cost excluding iron ore), or 1-15% of the average steel price in China in 2022 (according Wind). We note that the economics of hydrogen-produced steel improves if we consider the carbon cost: on average, steel processing produces 1.5 tons of carbon emissions per ton of steel using the traditional method and, if the carbon cost is above RMB300/ton, using hydrogen can reduce carbon costs by RMB45-450/ton of steel. We also note that reducing hydrogen costs to RMB12/kg-RMB15/kg by 2025e could effectively render the use hydrogen in steel making economic in some cases.

Exhibit 16. Uses of hydrogen in the refining, chemicals and steel making sector

Application	Description
Refining	1) Hydro-cracking; 2) hydro-treating (e.g. fuel desulphurisation); and 3) bio refinery
Ammonia	Production of ammonia (for urea and other fertilisers)
Methanol	Production of methanol and other derivatives (for plastics, paints, car parts and construction materials, or car fuels)
Other chemicals	e.g. Polymers, polyurethanes and fatty acids
Steel making	Used as a reducing agent in the manufacture of iron pellets and the carbon purification process

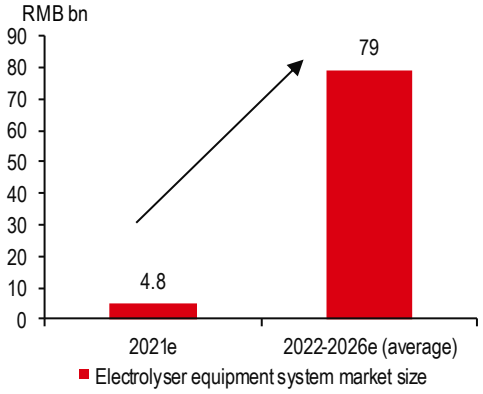
Source: Hydrogen Roadmap Europe by FCH JU, HSBC, HSBC Qianhai Securities

While costly in the near term, we believe chemical producers and steelmakers are incentivised to invest in green hydrogen projects, as they try to expand their capacity. Local governments have emission reduction targets, and they are more likely to grant new capacity permits to those operators that have minimum new emission additions or emission reduction agendas that can justify the investment in heavy emission projects. On 23 March 2022, the NDRC released *Hydrogen Development Plan 2021-35* on its website, proposing to strictly limit new capacity that uses fossil fuel to produce hydrogen, and encourage development of green hydrogen.

Our market sizing indicates 2.55m tons of annual green hydrogen production, equivalent to 120GW of dedicated solar-to-hydrogen projects (assuming all solar-powered) in China by 2027e. This will account for 7% of China's total hydrogen supply by 2027e. If we assume a RMB3.3/w average electrolyser system cost during 2022-2027e, total electrolyser system equipment demand could be RMB396bn by 2027e, and average annual equipment spending to be RMB79bn in 2022-27e. Our market sizing and key assumptions are as follows:

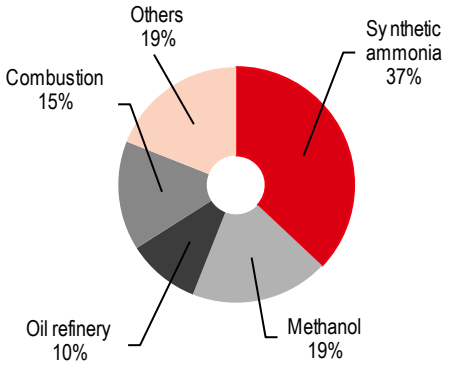
- If we assume 5% of the steel (1053mn tons in 2020) is produced with hydrogen by 2027e in China, at an average 25kg hydrogen per ton of steel, the total demand for hydrogen could be 1.3m tons, or 62GW of solar installation (assuming all solar-powered). Since 36% of China's steelmaking capacity is located in northern and northwestern China with effective annual solar operating hours of over 1,500 in 2020 (according to ASKCI Research), we believe it is more economical for capacity in these places to use hydrogen produced from renewables.
- If we assume that, by 2027e, green hydrogen will replace 5% of the hydrogen demand market that was 25m in 2020 (China Coal Processing & Utilization Association), China needs to produce 1.25m tons of green hydrogen, or 58GW of solar installation (assuming it is all solar-powered). We believe this forecast is in line with the government's plan: Inner Mongolia's energy administration alone aims to build over 0.48m tons of green hydrogen capacity by 2025e, as disclosed in its 14th Five-year Plan published on 28 February 2022. Inner Mongolia's green hydrogen production target is much higher than NDRC's national target of 0.1-0.2m tons by 2025e (released on 23 March 2022). We believe the NDRC does not want to set a tone that encourages a race on mass project construction without commercialisation. Note that our estimate for the total hydrogen demand market did not include steel production, which is negligible to the current total hydrogen market and we estimate it separately.
- We assume most of the green hydrogen projects are located near user bases (chemical plants or steel plants) and do not need to bear transportation and refueling costs. Also, we do not factor in hydrogen for vehicle use in the market sizing of green hydrogen, as hydrogen for vehicles usually involves transportation and refueling costs and therefore is less likely to become economically viable as fast as in the chemical and steel industry.
- A more detailed calculation: 2.55m tons of annual green hydrogen needs 142800GWh of electricity (at a 56 kwh/kg hydrogen conversion rate), which translates into 119GW of dedicated solar capacity at 1,200 effective annual operating hours, or 119GW from an electrolyser system (assuming it is all solar-powered). Assuming a RMB3.33/w average electrolyser system cost, total electrolyser system equipment demand could be RMB396bn.
- If we assume green hydrogen projects purchase 50% electricity from outside, instead of 100% reliance on solar power, our projection for electrolyser installation will be 60GW by 2027e (compared to 119GW previously), but 2.55m tons of hydrogen can still be produced annually; Accordingly, total electrolyser system equipment demand could be RMB198bn in 2022-27e. In this case, the utilisation of electrolyser improves from 1,200-1,500 hours to around 3,000 hours annually and LCOH could be lowered by c20% on average (Exhibits 29-30), but the project is not 100% 'green', as external electricity could be produced with coal. In reality, projects like Baofeng and Sinopec's are not dedicated solar-to-hydrogen projects, and are purchasing electricity externally.

Exhibit 17. China electrolyser equipment system annual spending



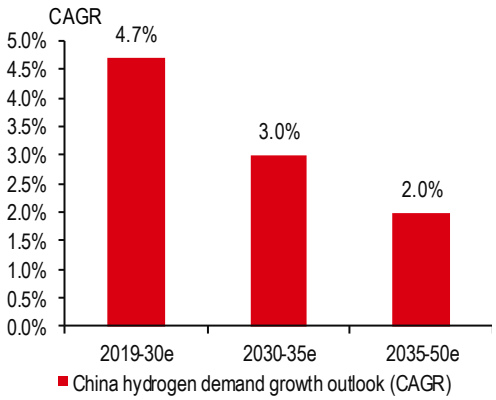
Source: BNEF, HSBC Qianhai Securities estimates

Exhibit 18. China hydrogen consumption breakdown by downstream (2020)



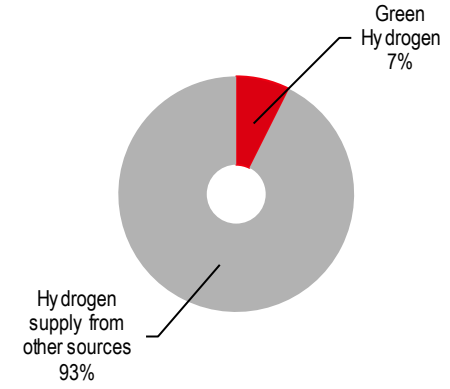
Source: China Coal Processing & Utilization Association, HSBC Qianhai Securities

Exhibit 19. China hydrogen demand CAGR outlook



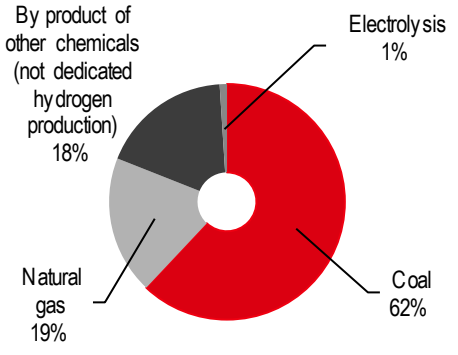
Source: China Coal Processing & Utilization Association, China Hydrogen Alliance, HSBC Qianhai Securities; e= China Hydrogen Alliance estimates

Exhibit 20. Green hydrogen to account for 7% of total China hydrogen supply in 2027e



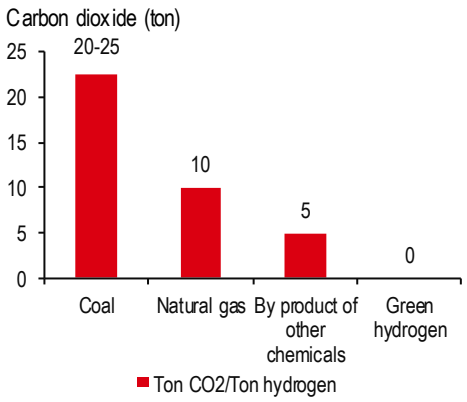
Source: China Coal Processing & Utilization Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 21. Hydrogen production in China by source (2020)



Source: China Coal Processing & Utilization Association, HSBC Qianhai Securities

Exhibit 22. Carbon emission comparison of different hydrogen production



Source: Planning Institute of Chemical Industry, HSBC Qianhai Securities

Green hydrogen case study: accelerating

Various pilot projects started in 2021, and some have shown potential for mass application:

- In March 2021, Baofeng started operations at its solar-hydrogen project, the world's largest, in 2021. The project can produce 160m cm of hydrogen annually, which is used in methanol production (raw material for polyethylene and polypropylene). As disclosed by the company on 26 April 2021, the levelised cost of hydrogen (LCOH) is as low as RMB1.34/cm, or RMB15/kg. The lower-than-average LCOH is mostly because of the higher utilisation of electrolysers which we will discuss in the cost reduction section.
- According to the South China Morning Post (7 December 2021), Sinopec group, China's largest oil refiner, started building a green hydrogen plant which is entirely powered by solar energy, in Kuqa, the far western region of Xinjiang. Production is expected to start in June 2023, with a 20k ton hydrogen capacity supported by a 300MW solar installation. The RMB3bn investment will produce green hydrogen used in local oil refining production, replacing the natural gas supply.
- The application of hydrogen in the steel industry is at an early stage but the growth potential is significant since carbon emissions from the steel industry accounted for 15% of China's carbon emissions in 2020. Some leading steel makers such as China Baowu Group have laid out their carbon reduction plans as well, and the steel-hydrogen route is unanimously their ultimate plan, especially after 2030e.

Exhibit 23. Projects: application of hydrogen in the steel industry

Project owner	Construction start date	Production date	Investment (RMB m)	Steel Capacity (m tons)	Other info
Inner Mongolia Saisipu	December 2020	April 21st 2021	1090	0.3	
Xinjiang Ba Yi	October 2019	July 2020	NA	1.2	
Xinjiang Ba Yi	December 2021	June 2022	NA	1.2	Upgrade on existing projects
China Baowu	September 2021	September 2023e	NA	1	In Zhanjiang
Hbis Group	May 2021	2023e	NA	1.2	

Source: Company, HSBC Qianhai Securities

Green hydrogen: the cost reduction path is visible

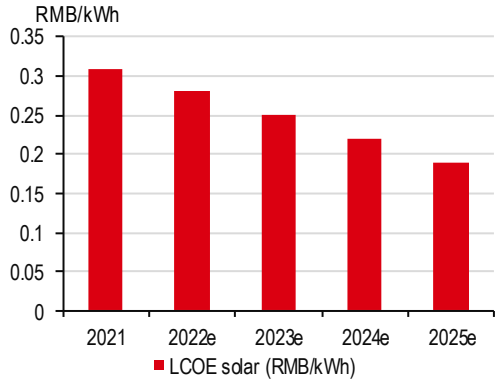
We expect the green hydrogen production LCOE to decline by 38% from 2021e to 2025e, with 54% of the cost reduction coming from the solar LCOE decline (39% decrease) and 38% coming from the electrolyser system cost reduction (on average a 30% decrease). This will enable green hydrogen to be cheaper than blue hydrogen (a byproduct from natural gas or coal using captured carbon dioxide) in regions that have good sunlight conditions (c1,500 effective annual operating hours). We believe the cost reduction path is visible because:

- The solar LCOE will decrease mainly due to new cell technology applications (such as Topcon technology in 2022e and HJT technology in 2023e) and improving upstream capacity like polysilicon in 2023e.
- Electrolyser system costs will fall on improving economies of scale, learning curves and technology upgrades. According to IRENA, the electrolyser system cost (proton exchange membrane, or PEM) could decline by 45% if annual production volume increases from 10MW/year to 1,000MW/year (for example as electrolyser production lines are automated). manual line could become automated). Similarly, alkaline electrolysers (another technology route to PEM) system costs could also decline from economies of scale. Technology upgrades can also help with cost reductions, such as by the invention of cheaper membranes, replacing titanium with cheaper materials, and exerting higher operating pressure.

We have also made the following assumptions in arriving at our estimates:

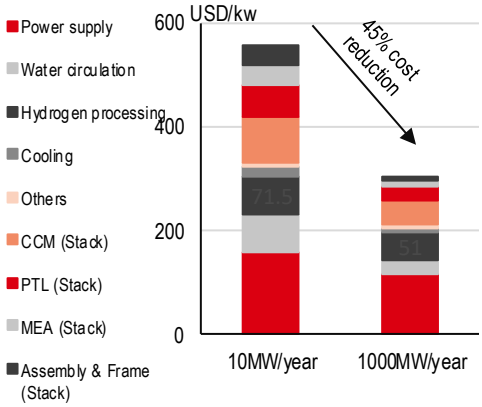
- Our assumption is based on dedicated solar-to-hydrogen projects with a lower electrolyser utilisation (20-25%). The LCOH could go lower if the electrolyser enjoys higher utilisation hours (>50%), powered by a mix of grid-connected electricity and dedicated renewables (solar and wind). In other words, taking advantage of cheaper renewable power at peak production hours of the grid (could be as low as RMB0.10/kwh) and enhancing the electrolyser utilisation rate could help reduce costs. Baofeng's hydrogen cost is as low as RMB1.34/cm (or RMB15/kg), mainly because of the high utilisation of its electrolyser (close to 3,000 hours annually, based on our estimates) and low solar LCOE (RMB0.22/kwh, our estimates are based on 1,700 effective operating hours in the local area); high utilisation is thanks to the fact that the company purchases electricity externally (though it is expensive at over RMB0.30/kwh) when solar isn't working during the night or on cloudy days.
- Our estimates do not include hydrogen storage, transportation, or refueling costs, which together more than doubles the current hydrogen manufacturing cost, and hinders the mass application of hydrogen. That is why we believe green hydrogen will first achieve mass application in areas with good sunlight conditions and where hydrogen production facilities are close to steel and chemical plants so there is no extra cost from long-distance transportation, liquefaction and refueling of hydrogen.
- We estimate that the carbon emission allowance prices (carbon dioxide) in China will rise from RMB57/ton at the end of 2021, to over RMB100/ton in 2025e. This will increase the cost of grey hydrogen (coal-made + carbon price) or blue hydrogen (coal-made + CCUS) from cRMB13/kg in 2021 to cRMB15/kg (coal-made hydrogen on average produces 22.5kg carbon/kg hydrogen) in 2025e. This will make green hydrogen look more economic in comparison. We believe carbon emission allowance prices in China are likely to rise and become close to the CCUS cost, because the China Emissions Trading Scheme was just launched in July 2021 and the platform has not required chemical and industrial companies to pay emission tariff yet (only 2,000+ power plants are included as of now). China's emissions allowance price is significantly below that of Europe as well as the average China CCUS cost. Our global research team also expects future prices of CO2 to rise significantly in the decades ahead (*Asia Energy & Resources: ESG Integrated: On the front line of the energy transition*, 1 November 2021).
- Our assumption is conservative because: 1) we do not include the possibility that the natural gas and coal price could rise and lead to higher grey and blue hydrogen prices; 2) we do not include the revenue of selling oxygen, a by-product of electrolysis. Assuming a RMB0.5/cm oxygen price (according to Wind), oxygen sold at the market price could reduce the green hydrogen cost by c10%, on our estimates.

Exhibit 24. China solar LCOE to decline (1,200 effective operating hours)



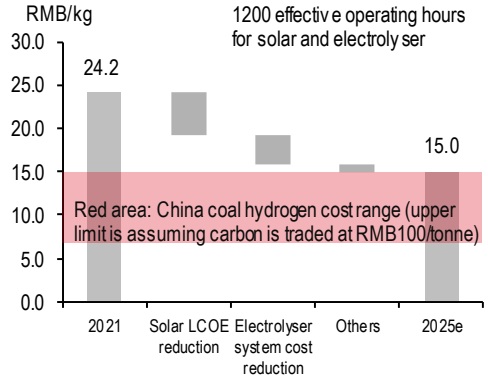
Source: China PV Industry Association, HSBC Qianhai Securities estimates

Exhibit 25. We expect the electrolyser system cost (PEM) to decline by 45% from 2021 to 2025e



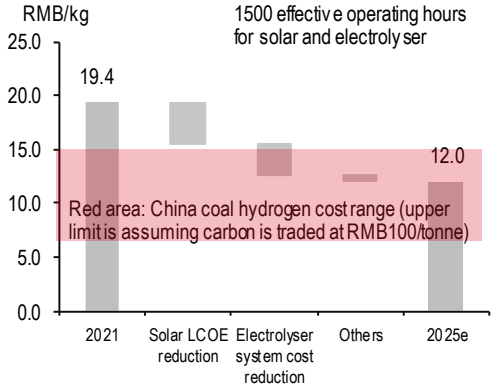
Source: IRENA, HSBC Qianhai Securities estimates

Exhibit 26. China green hydrogen LCOE to decline 38% by 2025e, and…



Source: China PV Industry Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 27. …in selective areas this implies green hydrogen LCOE to be cheaper than coal hydrogen by 2025e



Source: China PV Industry Association, China Hydrogen Alliance ,HSBC Qianhai Securities estimates

Exhibit 28. China LCOH (RMB/kg) at different solar LCOE and electrolyser capex (1200 operating hours)

		Electrolyser system cost (RMB/w)								
		4.00	3.80	3.61	3.43	3.26	3.10	2.94	2.79	2.65
Solar LCOE (RMB/kwh)	0.30	23.5	23.0	22.4	21.9	21.4	20.9	20.5	20.1	19.7
	0.29	22.9	22.4	21.8	21.3	20.8	20.3	19.9	19.5	19.1
	0.27	22.4	21.8	21.2	20.7	20.2	19.8	19.3	18.9	18.5
	0.26	21.8	21.2	20.7	20.2	19.7	19.2	18.8	18.4	18.0
	0.25	21.3	20.7	20.2	19.7	19.2	18.7	18.3	17.8	17.4
	0.23	20.8	20.2	19.7	19.2	18.7	18.2	17.8	17.3	16.9
	0.22	20.3	19.8	19.2	18.7	18.2	17.7	17.3	16.9	16.5
	0.21	19.9	19.3	18.8	18.3	17.8	17.3	16.9	16.4	16.0
	0.20	19.5	18.9	18.3	17.8	17.3	16.9	16.4	16.0	15.6

Source: China PV Industry Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 29. China LCOH (RMB/kg) at different solar LCOE and electrolyser capex (1500 operating hours)

		Electrolyser system cost (RMB/w)								
		4.00	3.80	3.61	3.43	3.26	3.10	2.94	2.79	2.65
Solar LCOE (RMB/kwh)	0.25	18.8	18.4	17.9	17.5	17.1	16.8	16.4	16.1	15.7
	0.23	18.3	17.9	17.5	17.0	16.6	16.3	15.9	15.6	15.3
	0.22	17.9	17.4	17.0	16.6	16.2	15.8	15.5	15.1	14.8
	0.21	17.4	17.0	16.6	16.1	15.7	15.4	15.0	14.7	14.4
	0.20	17.0	16.6	16.1	15.7	15.3	15.0	14.6	14.3	14.0
	0.19	16.6	16.2	15.7	15.3	14.9	14.6	14.2	13.9	13.6
	0.18	16.3	15.8	15.4	15.0	14.6	14.2	13.8	13.5	13.2
	0.17	15.9	15.4	15.0	14.6	14.2	13.8	13.5	13.1	12.8
	0.16	15.6	15.1	14.7	14.3	13.9	13.5	13.1	12.8	12.5
	0.16	15.2	14.8	14.4	13.9	13.6	13.2	12.8	12.5	12.2
	0.15	14.9	14.5	14.1	13.6	13.2	12.9	12.5	12.2	11.9

Source: China PV Industry Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 30. China LCOH (RMB/kg) at different solar LCOE and electrolyser capex (1500 solar operating hours + 3000 operating hours of electrolyser with external electricity purchased at RMB0.25/kwh)

		Electrolyser system cost (RMB/w)								
		4.00	3.80	3.61	3.43	3.26	3.10	2.94	2.79	2.65
Solar LCOE (RMB/kwh)	0.25	14.44	14.20	13.98	13.77	13.57	13.37	13.19	13.02	12.86
	0.23	14.19	13.95	13.73	13.52	13.32	13.13	12.94	12.77	12.61
	0.22	13.95	13.72	13.49	13.28	13.08	12.89	12.71	12.54	12.37
	0.21	13.73	13.49	13.27	13.06	12.86	12.67	12.48	12.31	12.15
	0.20	13.52	13.28	13.06	12.85	12.64	12.45	12.27	12.10	11.93
	0.19	13.31	13.08	12.85	12.64	12.44	12.25	12.07	11.90	11.73
	0.18	13.12	12.89	12.66	12.45	12.25	12.06	11.88	11.70	11.54
	0.17	12.94	12.70	12.48	12.27	12.07	11.87	11.69	11.52	11.36
	0.16	12.76	12.53	12.31	12.09	11.89	11.70	11.52	11.35	11.18
	0.16	12.60	12.36	12.14	11.93	11.73	11.54	11.35	11.18	11.02
	0.15	12.44	12.21	11.98	11.77	11.57	11.38	11.20	11.03	10.86

Source: China PV Industry Association, China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 31. China green hydrogen LCOE model: key assumptions and results

Data input:

Solar		**Loan payment calculation:**	
Capacity (MW)	100	Annual Interest Rate	5.0%
Effective operating hours	1200	Payback period (yrs)	10
System investment cost (RMB/W)	3.79	payment per year	12
Inflation	4.0%		
Discount rate	6.0%		
Discount period (yrs)	20		
Debt/asset ratio	70.0%		
Solar total investment cost (RMBm)	379.34		
Hydrogen		**Results:**	
Capacity (MW)	100	LCOE solar (RMB/kWh)	0.31
Effective operating hours	1200	LCOE hydrogen (RMB/kg)	24.19
Conversion efficiency (kwh/kg H2)	56		
Electrolyser system investment cost (RMB/W)	4.00		
Inflation	4.0%		
Discount rate	6.0%		
Discount period (yrs)	20		
Debt/asset ratio	70.0%		
Electrolyser system total investment cost (RMBm)	400.00		
Green hydrogen total investment cost (RMBm)	779.34		

Note= maintenance cost and degradation are not shown in this table but are factored in.

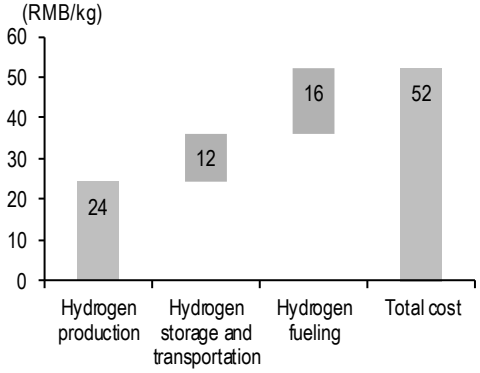
Source: HSBC Qianhai Securities estimates

Exhibit 32. China coal-made hydrogen cost (RMB/kg) at different coal price and carbon emission tariff

		Carbon emission tariff (RMB/ton)									
		40	70	100	130	160	190	220	250	280	310
Coal price (RMB/ton)	300	7.82	8.48	9.14	9.80	10.46	11.12	11.78	12.44	13.10	13.76
	390	8.99	9.65	10.31	10.97	11.63	12.29	12.95	13.61	14.27	14.93
	480	10.16	10.82	11.48	12.14	12.80	13.46	14.12	14.78	15.44	16.10
	570	11.33	11.99	12.65	13.31	13.97	14.63	15.29	15.95	16.61	17.27
	660	12.50	13.16	13.82	14.48	15.14	15.80	16.46	17.12	17.78	18.44
	750	13.67	14.33	14.99	15.65	16.31	16.97	17.63	18.29	18.95	19.61
	840	14.84	15.50	16.16	16.82	17.48	18.14	18.80	19.46	20.12	20.78
	930	16.01	16.67	17.33	17.99	18.65	19.31	19.97	20.63	21.29	21.95
	1020	17.18	17.84	18.50	19.16	19.82	20.48	21.14	21.80	22.46	23.12
	1110	18.35	19.01	19.67	20.33	20.99	21.65	22.31	22.97	23.63	24.29
	1200	19.52	20.18	20.84	21.50	22.16	22.82	23.48	24.14	24.80	25.46
	1290	20.69	21.35	22.01	22.67	23.33	23.99	24.65	25.31	25.97	26.63
	1380	21.86	22.52	23.18	23.84	24.50	25.16	25.82	26.48	27.14	27.80

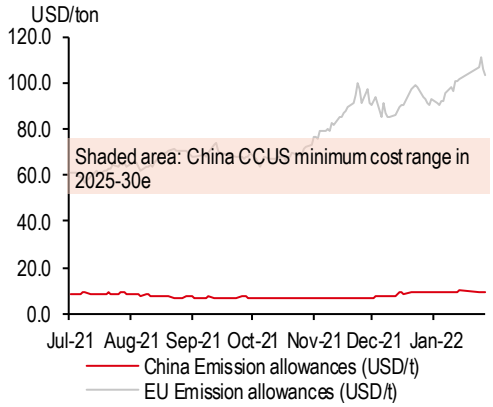
Source: China Iron and Steel Association, HSBC Qianhai Securities estimates

Exhibit 33. China green hydrogen total cost breakdown (for vehicle use, 2021)



Source: China Hydrogen Alliance, HSBC Qianhai Securities estimates

Exhibit 34. Carbon emission allowance prices: EU and China vs China CCUS cost



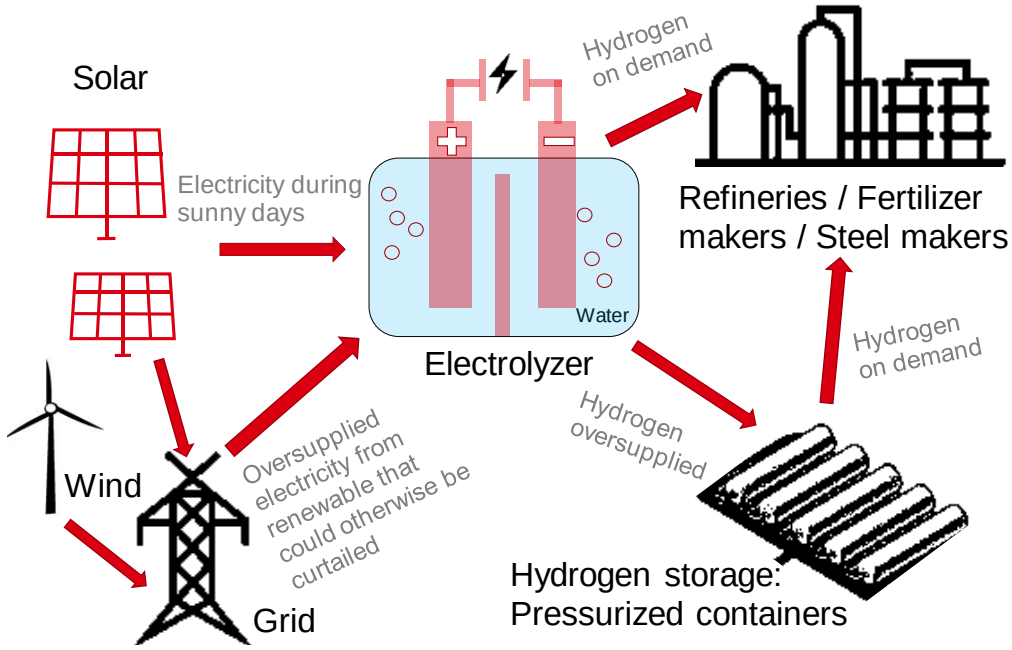
Source: IRENA, HSBC Qianhai Securities

Green hydrogen: cheap storage to help reduce solar and wind curtailment

More wind and solar power will increase power grid instability and in the longer term incur curtailment risks. Our global research team suggests that, rather than curtailing this electricity, producing hydrogen would provide a solution to an excess of renewable electricity production and can dramatically reduce the unit costs of hydrogen production. In the report *Global Hydrogen: Why the journey from grey to green is taking off* (30 January 2020), they found the higher the proportion of power from variable renewable energy sources, the more hydrogen will be needed to balance the system. The underlying logic is that electrolysers are flexible and storing hydrogen is at least 5-15x cheaper than chemical-based lithium batteries, according to our estimates. The cost of hydrogen storage varies depending on the utilisation of pressurised containers, which meet the daily storage needs.

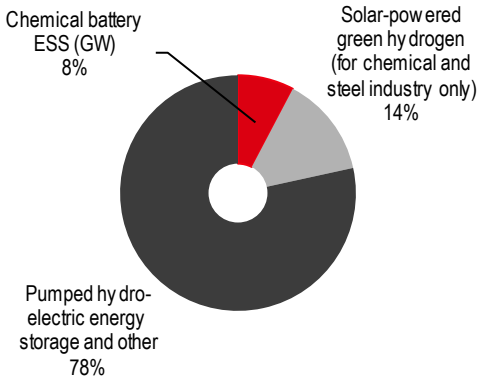
In our report *A-share Infrastructure Renewables: How to play the energy storage investment upcycle?* (2 November 2021), we estimated that China needed 865GW of peak-shaving demand (leveling out peaks in electricity use for the grid) by 2027e, driven by an increasing share of solar and wind power in the power grid. Under our assumption that China will have 120GW of electrolyser facilities installed by 2027e, these green hydrogen capacities will contribute to 14% of China's peak-shaving capability. For the 120GW of solar-powered green hydrogen facilities, we assume that hydrogen storage capacity could be c360GWH in electricity equivalent, which could store up to three hours of hydrogen production through electrolysis at full capacity, or close to the maximum volatility of the grid during the daytime.

Exhibit 35. Green hydrogen storage could help avoid curtailment of solar and wind



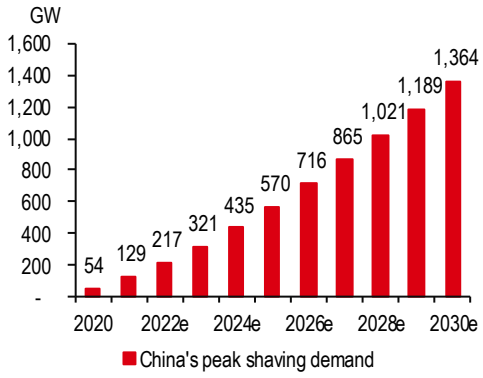
Source: HSBC Qianhai Securities

Exhibit 36. We estimate green hydrogen will account for 14% of China's peak-shaving capability by 2027e



Source: Wind, HSBC Qianhai Securities estimates

Exhibit 37. Our forecasted China energy peak-shaving demand, entailed by increasing share of solar and wind powers



Source: Wind, HSBC Qianhai Securities estimates

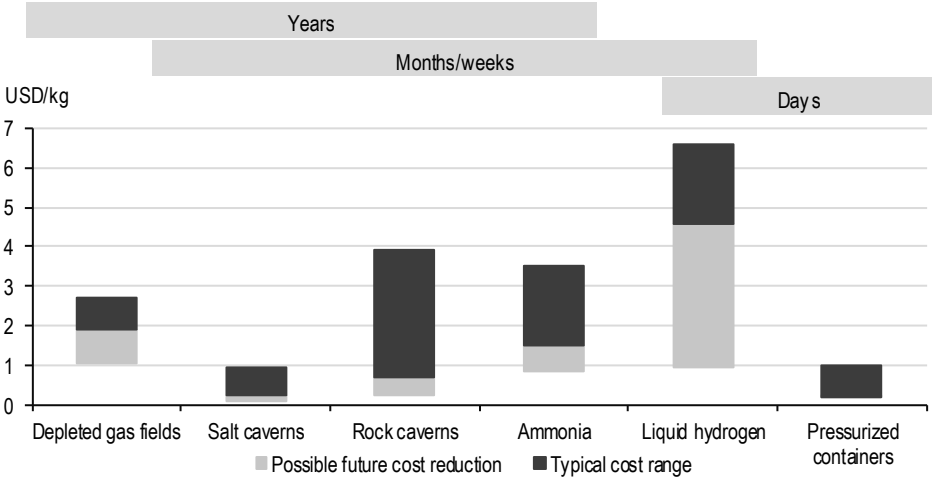
Exhibit 38. Energy storage technology comparison: hydrogen storage is 5-15x cheaper than chemical-based lithium batteries

	Cost (LCOE: RMB/kwh)	Useful life (rounds)	Safety	Energy storage capacity	Development cycle
Pumped hydro-electric energy storage	0.21-0.25	20000	More	Larger	Longer
Li-ion battery ESS	0.45-1.20	5000	Less	Smaller	Shorter
Hydrogen storage (electricity equivalent)	0.03-0.10	20000	Medium	Larger	Medium

Note: Our calculation of hydrogen storage cost translated into electricity measures does not include the cost of generating electricity using hydrogen

Source: BNEF, Chinese Society of Hydroelectric Engineering, GGII, HSBC Qianhai Securities estimates

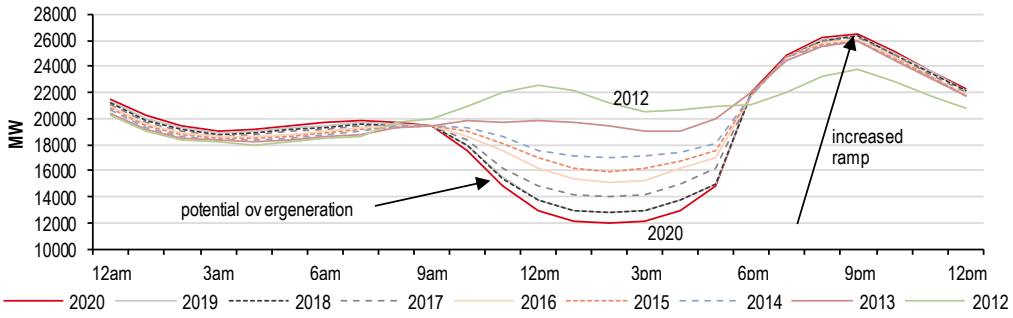
Exhibit 39. Levelised cost of hydrogen storage (USD/kg) and typical storage duration (2020)



Note: The cost range depends on different conditions and utilisation rate

Source: BNEF, HSBC, HSBC Qianhai Securities;

Exhibit 40. The duck curve – California's grid load mismatch is increasing due to the rising share of solar power



Source: CASIO, HSBC Qianhai Securities

Prefer green hydrogen to CCUS

Some investors worry that a competing technology route called blue hydrogen---which produces hydrogen from coal or natural gas and captures the carbon emitted—could produce hydrogen at a much cheaper price without carbon emissions. In terms of its future market potential, we believe the outlook for carbon capture, a key process in producing blue hydrogen, will not be as promising as green hydrogen, primarily because of relatively rigid costs and a lack of a mature permanent sequestration solution. We expect the cost of green hydrogen to become, by 2025e, cheaper than blue hydrogen in regions with good sunlight conditions. At the same time, we contend that green hydrogen and CCUS can often be combined to provide carbon reduction solutions together (e.g. in steel making), rather than seen as two mutually exclusive alternatives.

Carbon capture, usage and storage (CCUS) is a technology that can capture and make effective use of the high concentrations of CO2 emitted by industrial activities. According to the Chinese Academy of Environmental Planning, by 2021, China had 40 projects with 3mn tonnes annual capacity in operations or under construction (compared to 42mn tonnes of global capacity, according to Rystad Energy). There are more projects in the pipeline in China and which show the potential for their economic feasibility in applications such as enhanced oil recovery (injecting CO2 into oil & gas formation to improve recovery rates) or fertiliser production.

Exhibit 41. China's major CCUS projects pipeline

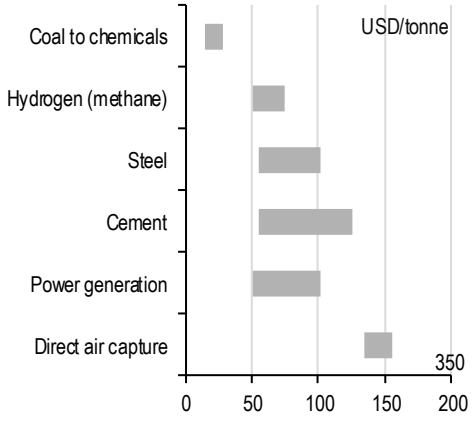
	Capacity (m tonnes/per year)	Phase
Qilu Petro-Shengli oilfiled project	1.0	Started construction in July 2021
Yanchang Petro	5.0	Under planning
Shengli power plant	2.0	Under feasibility study
Guanghui Energy Xinjiang	3.0	Under planning
Jiangsu Taizhou power plant	0.5	To start construction

Source: Company data, HSBC Qianhai Securities

However, we believe the outlook for CCUS adoption will not be as promising as green hydrogen, primarily because of the relatively rigid costs and lack of a mature permanent sequestration solution:

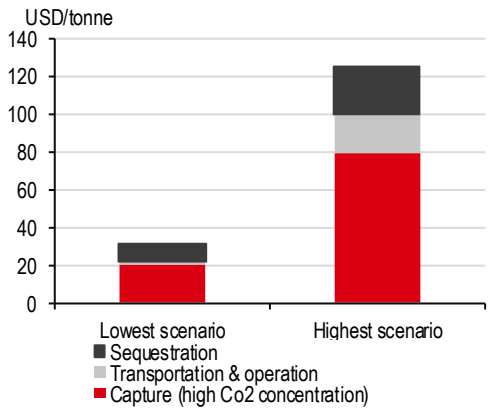
- Cost: Carbon capture equipment typically involves a compressor that liquefies or compresses CO2 using electricity. As a compressor is a relatively mature piece of industrial equipment, we see limited room for cost reductions and efficiency improvement. According to China's CCUS report (2021) by the Chinese Academy of Environmental Planning, the levelised total cost of CCUS is estimated to be a minimum of RMB400/tonne (assuming 250km transportation distance) by 2025, and can only decline by 23% to RMB310/tonne (lowest cost) by 2030 (note that their cost estimates for the lowest scenario in 2025 are higher than IEAs' in 2021, as they assumed a higher transportation cost). While it may be hard to lower the cost of CCUS in the next ten years, we believe CCUS can achieve economic feasibility in certain scenarios such as coal to chemical production, as higher concentrations of CO2 in flue gases (typical in coal to chemical production) can improve the effectiveness and efficiency of the process, as well as reducing its cost.
- Lack of a mature permanent sequestration solution: Once captured, the carbon dioxide needs to be handled and transported (via a pipeline or is liquefied and shipped) to a suitable sequestration site for permanent storage. The continual monitoring and verification of emissions (normally for 200 years as required) is an important aspect of ensuring that the CO2 does not leak over time (see *Carbon Capture & Sequestration: Back in the debate, but no silver bullet*, 23 March 2021). However, a geographical disaster could endanger the storage and pose an environmental risk. Transforming captured carbon into other chemicals has limited market potential. Therefore, up till now, there has not been a mature solution to the problem of permanent storage for captured carbon.

Exhibit 42. Levelised cost of capture with different levels of carbon dioxide concentration (2019)



Source: IEA, HSBC Qianhai Securities

Exhibit 43. Levelised cost of CCUS cost (2021)



Source: IEA, HSBC, HSBC Qianhai Securities

Where do the opportunities lie?

Seeking visibility in evolving green hydrogen technology trends

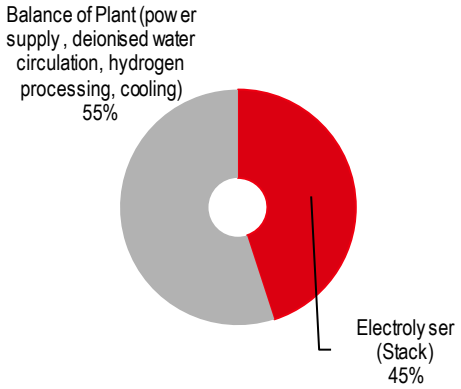
Two electrolyser technologies, alkaline and proton exchange membrane (PEM), each have their pros and cons, and are likely to co-exist in the next three to five years. In China, Longi has chosen to study and manufacture alkaline electrolysers while Sungrow Power has selected PEM electrolysers as its technology route. The main differences between the two technologies are as follows:

- Currently, alkaline electrolysis is the most mature technology used commercially, as its system equipment cost is 20-40% lower than a PEM electrolyser.
- PEM technology is better suited for pairing with variable loads from non-dispatchable renewables such as wind and solar, thanks to its ability to offer rapid dispatchability.
- Scarce materials can push up PEM electrolyser costs and make it difficult to scale them up. The current production of iridium and platinum for PEM electrolysers only supports an estimated 3 GW-7.5 GW annual manufacturing capacity, according to IRENA. Efforts are being made to reduce the dependence on such critical material.
- The learning rate for developing PEM electrolysers can further improve, to some extent, by sharing research and experience on fuel cell technology, since this involves the same fundamental process, but in the reverse direction.

We prefer players with revenue exposure to components that have larger market potential and higher entry barriers.

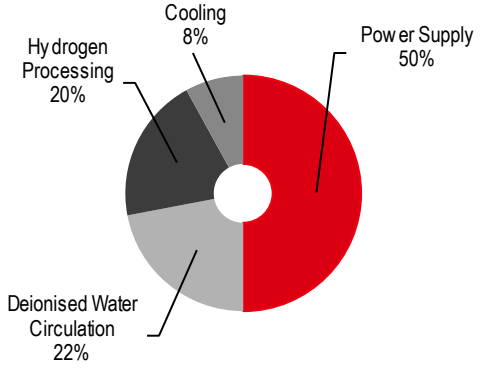
- While it may be difficult to conclude which technology will prevail, the two technologies share some similar upstream components or processes such as Porous Transport Layer (PTLs), Bipolar Plates (BPs), and stack assembly and end plates. These components are used in both PEM and alkaline electrolysers and can be used in fuel cell too, so therefore have larger market potential.
- PEM technology is usually regarded as having higher technology barriers than alkaline.
- The Balance of Plant (or BOP which refers to various supporting and auxiliary components of a power plant system) accounts for c55% of the electrolyser system cost and is compatible with both types of electrolyser, and has a more visible improvement path given the standardisation of design and supply chains. Within a BOP, the compressor is a major component that only a few players have an advantage in.

Exhibit 44. Electrolyser system cost breakdown for alkaline and PEM (2020)



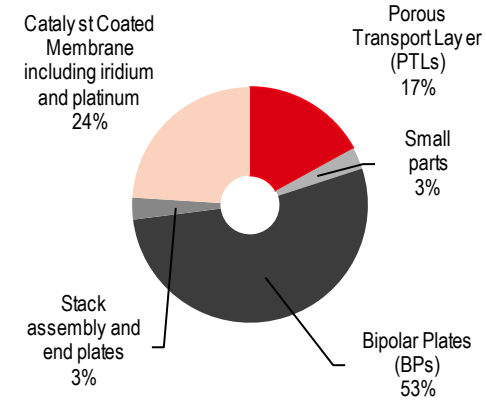
Source: IRENA, HSBC Qianhai Securities

Exhibit 45. Balance of Plant cost breakdown (2020)



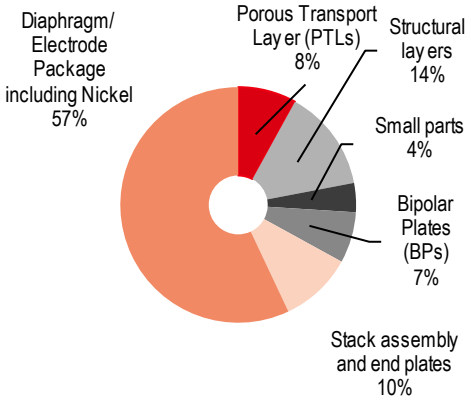
Source: IRENA, HSBC Qianhai Securities

Exhibit 46. PEM electrolyser stack cost breakdown (2020)



Source: IRENA, HSBC Qianhai Securities

Exhibit 47. Alkaline electrolyser stack cost breakdown (2020)



Source: IRENA, HSBC Qianhai Securities

Transferable skills and resources are key assets in this emerging industry

In the new markets of green hydrogen and CCUS, it may be difficult to identify winners as the market is emerging and the technology is changing. What is likely though is that players with resources that are transferable to such businesses are likely to have an edge. For example:

- China National Chemical has EPC experience in various chemical projects with different clients so it may be easier for them to provide solutions in integrating electrolyser systems with chemical companies' production lines, or to secure a green hydrogen or CCUS contract with existing clients, most of which are chemical producers.
- Sinopec has been a pioneer in both green hydrogen (started construction on 30 November 2021 of a 20k tons green hydrogen capacity facility in Xinjiang) and CCUS (started construction in July 2021 on its Qilu Petro-Shengli oilfiled CCUS project). Sinopec Group is the major customer and controlling shareholder of subsidiary Sinopec Oilfield Equipment. Given that Sinopec Oilfield Equipment manufactures compressors for natural gas exploitation, we believe it could be easier technologically for them to develop compressors for both electrolyser systems and carbon capture systems, and secure orders from their major customer and controlling shareholder, Sinopec Group.
- Solar giants such as Longi can, we believe, leverage their lower solar system costs to win more orders in green hydrogen solutions. Longi, one of the global largest solar module and wafer producers, announced on 16 October that they have achieved 500MW of electrolyser manufacturing capacity and will increase the capacity to 5-10GW in five years.
- CIMC Enric (3899 HK, HKD10.20, *latest report*), one of the largest LNG equipment makers globally, may benefit as the hydrogen market grows, and its hydrogen JV with HexPur exploits market opportunities in H2 canisters and systems.

Company section

CNCEC (601117 CH)

- A pioneer in undertaking green hydrogen and CCUS projects
- CNCEC's strong footing in CO2 reduction technology gives it an advantage in winning new chemical projects
- Maintain Buy with RMB15.60 TP (was RMB15.20)

Investment case

Investment summary

China National Chemical Engineering (CNCEC), the country's largest oil and chemical engineering and construction company, stands to benefit from green hydrogen and CCUS development in China, in large part because it has client and technology resources that are transferable to these businesses. Even though green hydrogen and CCUS are only set to contribute to a combined 14% of revenue by 2024e, on our estimates, the indirect positive impact is more than that: we expect CNCEC's strong footing in CO_2 reduction technology to give it an advantage in winning new chemical projects given rising emission requirements by the government. Up to 40% of CNCEC's new orders are related to CO_2 reduction in 2021, based on our estimates.

To be sure, the share price has corrected by 13.0% in the past four months (vs. a 13.0% decline in the CSI 300 during same period), mainly because of sluggish new contract growth (down 13.9% in 2H21). But we believe the market has not priced in its hydrogen story. We expect more carbon-reduction projects can smooth out downstream chemical operators' capex cyclicality, while more sustainable self-operating business such as adiponitrile production could also help reduce CNCEC's earning cyclicality (see below). Our new target price of RMB15.60 (previously RMB15.20) implies c67% upside from the current share price. We maintain our Buy rating on the stock, given improving earnings stability and less cyclicality from its engineering, procurement and construction (EPC) business, smoothed by hydrogen, CCUS and other carbon reduction solutions.

CNCEC to benefit from green hydrogen and CCUS development in China

As stated above, we believe green hydrogen and CCUS can together contribute 14% of CNCEC's revenue by 2024e. Our estimates are as follows:

- We assume 7% of China's carbon emissions from coal-fired plants, petro chemical projects, and coal chemical projects are captured by CCUS by 2029e, so that annual project spending can be RMB33bn from 2024-29e. If CNCEC takes a c30% market share, annual revenue contribution to CNCEC could be RMB10bn. Since CNCEC helped with Guohua Jinjie Energy coal-fired power plant in July 2021, which has 150k ton/year capacity, one of the largest CCUS project completed in 2021, we believe CNCEN could maintain a competitive market share of 30% going forward.
- We assume CNCEC occupies c25% market share of China's electrolyser equipment system annual spending of RMB79bn (on our estimates) during 2022-26e, so that annual

revenue contribution to CNCEC could be RMB20bn. We arrive at this market share assumption, based on our estimated 2021 market size in China (less than 800MW) and the fact that CNCEN helped with Baofeng's installed 200MW green hydrogen project. We assume CNCEN to maintain a lower market share of 25% going forward.

We believe CNCEC possesses strength in this emerging market for the following reasons:

- **First-mover:** Notable projects that CNCEC has completed include green hydrogen projects for Baofeng Energy in March 2021, the largest solar-hydrogen project globally at the time, and a CCUS project for Guohua Jinjie Energy coal-fired power plant in July 2021.
- **Overlapping client base:** Given chemical project experience and a diverse client base, we believe CNCEC can secure green hydrogen or CCUS contracts with existing clients, most of which are chemical producers.
- **Active in technology upgrade.** CNCEC is integrating technology into green hydrogen and chemical production equipment, especially for the coal chemical industry, according to company disclosures. Meanwhile, CNCEC is also cooperating with Longi and some universities to develop hydrogen electrolysers and purification equipment; The company is also developing hydrogen liquefaction equipment, as well as synthesis methanol technology (where green hydrogen and CO2 is the raw material).

Carbon reduction solutions to smooth out cyclicality

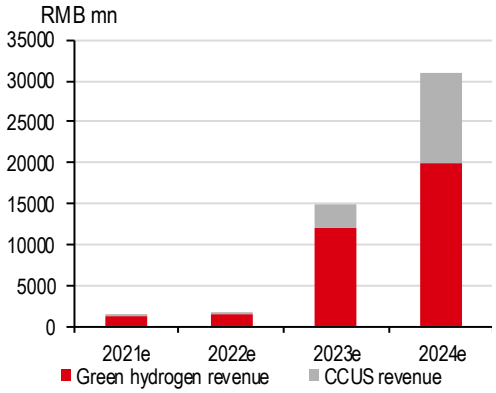
Chemical, petro chemical, and coal chemical sectors accounted for 33%/21%/20% of CNCEC's 2020 new contracts, respectively. These areas were cyclical in terms of new orders. The notable order increase in 2020 and 2021e for chemical projects was mainly a result of chemical capacity expansion to meet the robust downstream demand which, in turn, was driven by increasing product exports from China. Upstream chemical capacity expansion may not necessarily continue when downstream product export growth slows. CNCEC's new orders decreased 13.9% in 2H21, a demonstration of such cyclicality.

However, we believe more carbon-reduction projects can smooth out downstream chemical operators' capex cyclicality. As disclosed on 11 November 2021, c40% of CNCEC's new orders in 9M21 were from renewable energy and new material sectors, as well as from demand in the chemical and petro chemical sectors to reduce their emissions. We believe these, as well as new demand from green hydrogen and CCUS, could help to counteract any potential decline in contracts from traditional chemical capacities. We believe green hydrogen and CCUS could serve as effective solutions for CNCEC's downstream chemical producer - solutions that allow them to build new capacity while meeting emission requirements, and resulting in new orders to CNCEC.

Adiponitrile project on track

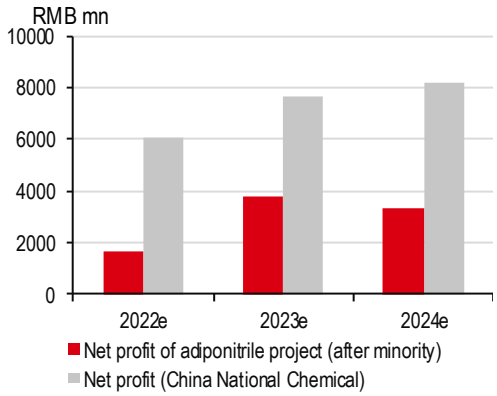
As disclosed by the company on 9 March 2022, the 200k tonne/year adiponitrile project will produce the first batch of qualified product in early April. Adiponitrile is the main raw material required for the production of nylon 66 (used in fibers for the auto, apparel and electronic sectors) and the company's new project is the first large one owned by a Chinese company. With competitive costs, we believe the new project could enable a wider range of applications for nylon 66. We expect the annual 200k ton adiponitrile capacity to contribute RMB1651m, RMB3773m and RMB3302m net profit in 2022e/23e/24e respectively.

Exhibit 48. Green hydrogen and CCUS could together contribute 14% of CNCEC's revenue by 2024e



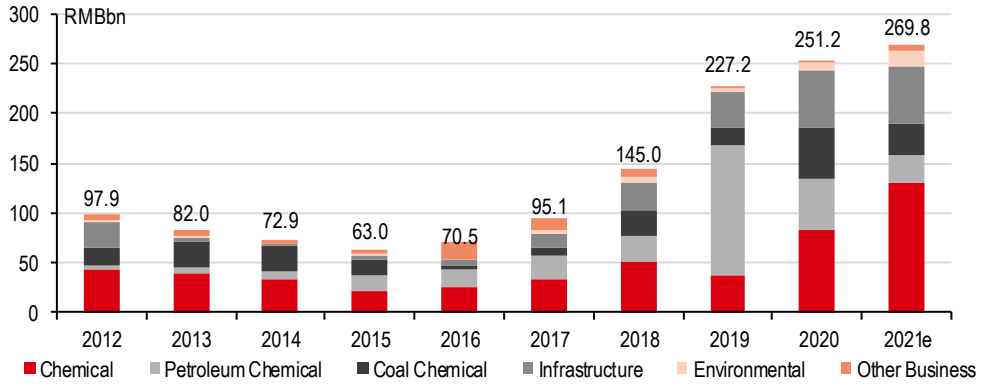
Source: Company, HSBC Qianhai Securities estimates

Exhibit 49. Earnings contribution from adiponitrile to increase significantly



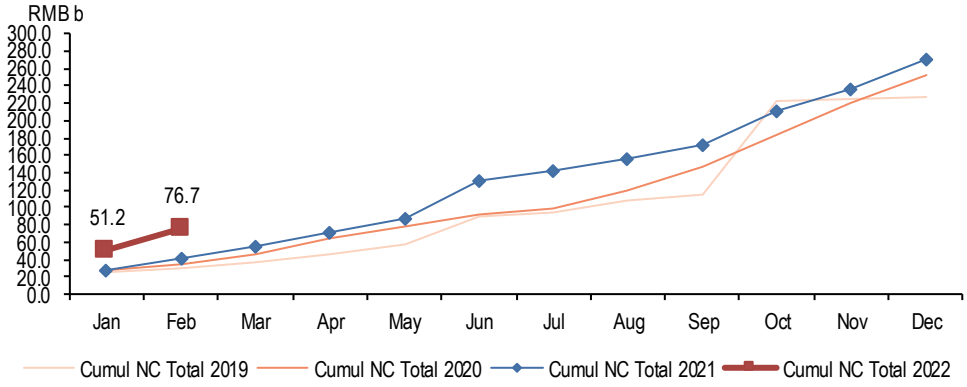
Source: Company, HSBC Qianhai Securities estimates

Exhibit 50. CNCEC's new contract breakdown by sector



Source: Company data, HSBC Qianhai Securities estimates

Exhibit 51. CNCEC's cumulative new contract



Source: Company, HSBC Qianhai Securities

What's changed?

Adjusting earnings estimates

We lower our 2021e, 2022e, and 2023e EPS estimates by 15.0%, 6.0% and -1.0%, respectively. This is mainly a result of lower revenue estimates, partially offset by higher gross margins in 2022-23e. We lower our 2021e revenue estimates by 14%, mainly to reflect slower-than-expected adiponitrile capacity completion. We lower our 2022-23e revenue estimates by 15% and 11%, respectively, to reflect lower-than-expected new contracts in 2H21 (down 13.9% y-o-y), partially offset by a more optimistic outlook on green hydrogen, CCUS and other carbon reduction-related projects in 2022-23e. The higher gross margin assumption stems from a rosier outlook on adiponitrile projects which have higher margins in 2022-23e.

Exhibit 52. Earnings estimate changes

	2021e			2022e			2023e		
RMBm	Old	New	Changes	Old	New	changes	Old	New	Changes
Revenue	160,968	137,696	-14%	194,308	165,657	-15%	220,717	196,412	-11%
Gross profit	16,485	14,053	-15%	20,246	18,229	-10%	23,470	23,545	0%
Net profit	4,994	4,233	-15%	6,480	6,079	-6%	7,790	7,742	-1%
EPS	0.78	0.66	-15%	1.01	0.95	-6%	1.21	1.21	-1%
ROE	11.2%	9.6%	-1.6ppt	12.0%	11.4%	-0.6ppt	13.1%	13.2%	0.1ppt

Source: Company, HSBC Qianhai Securities estimates

Exhibit 53. Earnings sensitivity to adiponitrile price

		Earnings sensitivity		
		2021e	2022e	2023e
Price of adiponitrile (RMB/tonne)	40,000	0.0%	38.6%	64.2%
	35,000	0.0%	30.9%	51.4%
	30,000	0.0%	0.0%	0.0%
	25,000	0.0%	-15.4%	-25.7%
	20,000	0.0%	-7.7%	-12.8%

Source: Company data, HSBC Qianhai Securities estimates

Valuation and target price

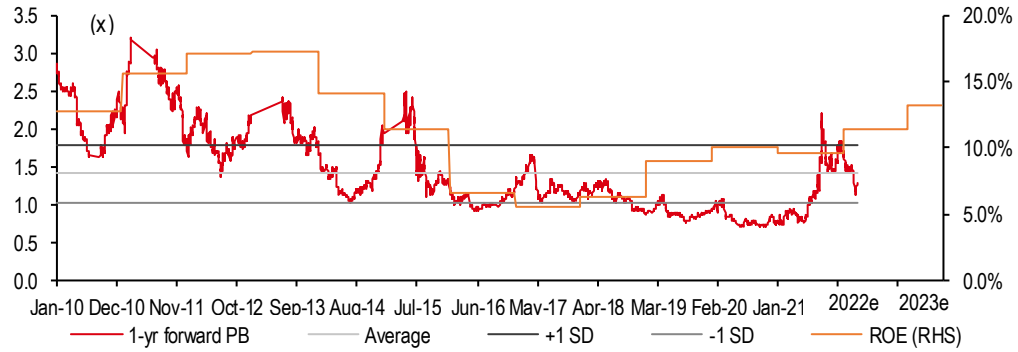
We continue to use a PB multiple to value the stock, and roll over our valuation base year. Our new target price is based on a 1.8x one-year forward PB (1 SD above its historical average, unchanged) and our 2022e BVPS estimates of RMB8.67 (previously an average of RMB8.43 in 2021-22e). We believe the stock deserves a premium to its historical PB level 1.4x since 2010, considering its improving ROE outlook (2021-23e ROE of 9.6-13.2%, above the historical average of 10.8% since 2010). The stock is trading at a 1.1x 2022e PB, and lower than the c2.0x level during a period of high earnings growth in 2010-12 (36% CAGR) and the bull market in 2015.

Our target price of RMB15.60 (previously RMB15.20) implies c67% upside from the current share price. We maintain our Buy rating on the stock, given improving earnings stability and potential upside from the hydrogen business.

Potential share price catalysts: Ramp-up of adiponitrile capacity, new self-operating chemical project launches, SOE reform-led industry consolidation, and major hydrogen-related project wins.

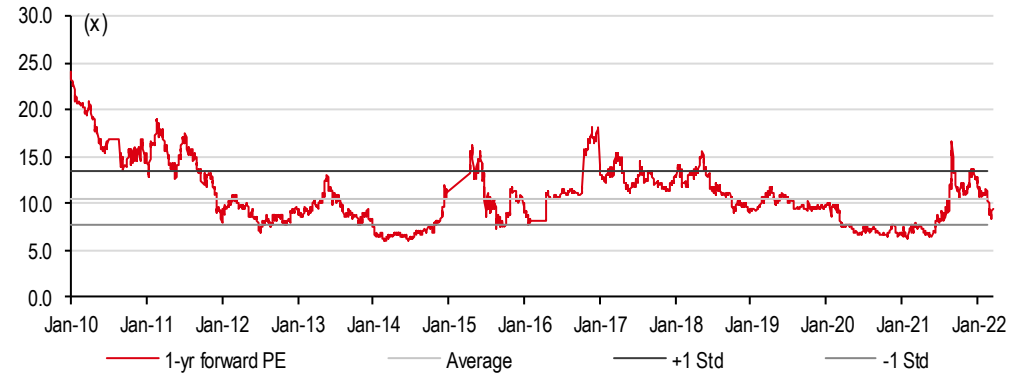
Key downside risks: Fluctuations in crude oil prices; chemical industry capex cuts; foreign exchange risks; lower-than-expected adiponitrile capacity ramp-up; lower-than-expected development in hydrogen and CCUS business

Exhibit 54. CNCEC: Historical PB-ROE



Source: Wind, HSBC Qianhai Securities estimates

Exhibit 55. CNCEC: Historical PE



Source: Wind, HSBC Qianhai Securities estimates

Financials & valuation: China National Chemical

Buy

Financial statements

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Profit & loss summary (CNYm)				
Revenue	109,995	137,696	165,657	196,412
EBITDA	6,984	7,008	9,714	12,870
Depreciation & amortisation	-1,134	-1,010	-1,010	-226
Operating profit/EBIT	5,850	5,998	8,704	12,644
Net interest	-532	-222	-145	-150
PBT	4,544	5,286	8,091	11,901
HSBC Qianhai PBT	4,544	5,286	8,091	11,901
Taxation	-702	-841	-1,288	-1,894
Net profit	3,659	4,233	6,079	7,742
HSBC Qianhai net profit	3,659	4,233	6,079	7,742
Cash flow summary (CNYm)				
Cash flow from operations	8,329	16,483	16,982	19,794
Capex	-878	-4,000	-3,000	-2,000
Cash flow from investment	-1,466	-4,000	-3,000	-2,000
Dividends	-1,100	-1,273	-1,828	-2,328
Change in net debt	-5,584	-21,382	-12,709	-15,966
FCF equity	7,451	12,483	13,982	17,794
Balance sheet summary (CNYm)				
Intangible fixed assets	2,387	2,387	2,387	2,387
Tangible fixed assets	11,873	14,863	16,853	18,627
Current assets	105,926	131,313	152,102	177,254
Cash & others	38,868	56,251	68,960	85,226
Total assets	136,008	164,385	187,164	214,090
Operating liabilities	85,965	104,996	122,244	140,690
Gross debt	9,292	5,292	5,292	5,592
Net debt	-29,576	-50,958	-63,668	-79,634
Shareholders' funds	37,661	50,794	55,600	61,514
Invested capital	-4,646	-12,683	-19,862	-27,648

Ratio, growth and per share analysis

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Y-o-y % change				
Revenue	5.6	25.2	20.3	18.6
EBITDA	9.2	0.3	38.6	32.5
Operating profit	9.7	2.5	45.1	45.3
PBT	16.2	16.3	53.1	47.1
HSBC Qianhai EPS	19.5	10.2	43.6	27.3
Ratios (%)				
Revenue/IC (x)	-31.6	-15.9	-10.2	-8.3
ROIC	-142.1	-58.2	-45.0	-44.8
ROE	10.1	9.6	11.4	13.2
ROA	3.1	3.0	3.9	5.0
EBITDA margin	6.3	5.1	5.9	6.6
Operating profit margin	5.3	4.4	5.3	6.4
EBITDA/net interest (x)	13.1	31.6	67.2	85.6
Net debt/equity	-72.6	-94.2	-106.8	-117.5
Net debt/EBITDA (x)	-4.2	-7.3	-6.6	-6.2
CF from operations/net debt				
Per share data (CNY)				
EPS Rep (diluted)	0.60	0.66	0.95	1.21
HSBC Qianhai EPS (diluted)	0.60	0.66	0.95	1.21
DPS	0.22	0.20	0.29	0.36
Book value	6.16	7.92	8.67	9.59

Valuation data

Year to	12/2020a	12/2021e	12/2022e	12/2023e
EV/sales	0.2	0.0	-0.0	-0.1
EV/EBITDA	3.9	0.9	-0.7	-1.8
EV/IC				
PE*	15.6	14.1	9.8	7.7
PB	1.5	1.2	1.1	1.0
FCF yield (%)	13.1	21.9	24.5	31.2
Dividend yield (%)	2.4	2.1	3.1	3.9

* Based on HSBC Qianhai EPS (diluted)

ESG metrics

Environmental Indicators	12/2020a
GHG emission intensity*	n/a
Energy intensity*	n/a
CO_2 reduction policy	No
Social Indicators	**12/2020a**
Employee costs as % of revenues	6.4
Employee turnover (%)	n/a
Diversity policy	No

Governance Indicators	12/2021a
No. of board members	8
Average board tenure (years)	n/a
Female board members (%)	0
Board members independence (%)	37.5

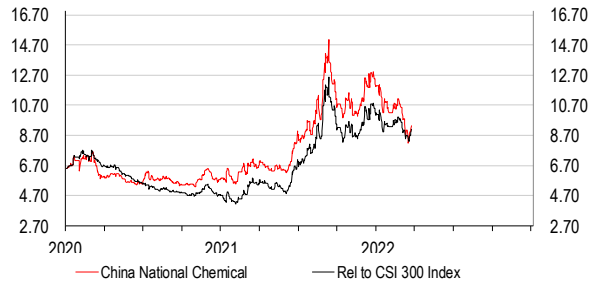
Source: Company data, HSBC Qianhai Securities

* GHG intensity and energy intensity are measured in kg and kWh respectively against revenue in USD '000s

Issuer information

Share price (CNY)	9.33	Free float	31%
Target price (CNY)	15.60	Sector	Machinery
RIC (Equity)	601117.SS	Country/Region	China
Bloomberg (Equity)	601117 CH	Analyst	Dun Wang
Market cap (USDm)	8,953	Contact	+86 21 6081 3827

Price relative



Source: HSBC Qianhai Securities

Note: Priced at close of 22 Mar 2022

Longi (601012 CH)

- The largest wafer supplier and module supplier globally in 2021
- Plans to expand its electrolyser capacity to 5-10GW in five years
- Maintain Hold with target price unchanged at RMB72.60

Investment case

Investment summary
Longi is both the largest wafer supplier and module supplier globally, in terms of 2021 sales volumes. We also see potential upside from better-than-expected contribution from its green hydrogen equipment business. Longi started R&D on green hydrogen in 2018 and aims to become the leading hydrogen equipment supplier globally. Longi can leverage its lower solar system costs to win more orders in green hydrogen solutions, we believe. In April 2021, Longi entered into an agreement with Chinese oil and gas conglomerate Sinopec Group to cooperate on green hydrogen (*Bloomberg*, 16 April 2021). As of October 2021, the company has 500MW of manufacturing capacity in electrolysers and said it will expand this to 5-10GW in five years (*Sohu*, 17 October 2021). Assuming 5GW in annual delivery, we estimate that the electrolyser system business could account for 5-9% of Longi's revenue in five years.

Valuation and target price
We base our target price of RMB72.60 (unchanged) on a DCF valuation model. Key assumptions are: (1) cost of equity of 9.0% (unchanged), derived from a risk-free rate of 2.0%, a market risk premium of 6.0% and a beta of 1.16. (all unchanged), (2) after-tax cost of debt of 4.3% (unchanged), (3) debt-to-capital ratio of 12% (unchanged), (4) operating cash flow (before changes in working capital) CAGR of 12% (unchanged) in 2020-29e, (5) capex of RMB15.8bn in 2021e, RMB7.4bn in 2022e, and RMB7.3bn in 2023e, and RMB2-5bn (unchanged) per year in 2024-29e, and (6) a terminal growth rate of 2% (unchanged). With 9.8% downside from the current share price to our target price, we maintain our Hold rating on the stock, as we see great potential in its green hydrogen equipment business.

Key upside risks: Higher-than-expected wafers cost reductions in non-Silicon parts, faster-than-expected wafer capacity expansion, and better-than-expected wafer demand.

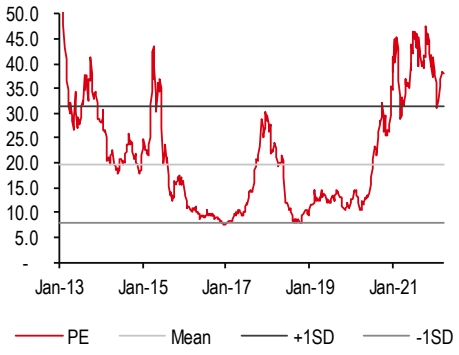
Key downside risks: Weaker-than-expected photovoltaic (PV) demand, equity dilution from a potential fundraising exercise, and greater-than-expected cuts to wafer ASPs.

Exhibit 56. Longi: Earnings sensitivity to polysilicon and wafer ASP changes (2022e)

	Polysilicon						
Wafer	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**
20%	79%	70%	60%	51%	42%	33%	24%
15%	66%	57%	48%	38%	29%	20%	11%
10%	53%	44%	35%	26%	16%	7%	-2%
5%	40%	31%	22%	13%	4%	-6%	-15%
0%	28%	18%	9%	0%	-9%	-18%	-28%
-5%	15%	6%	-4%	-13%	-22%	-31%	-40%
-10%	2%	-7%	-16%	-26%	-35%	-44%	-53%
-15%	-11%	-20%	-29%	-38%	-48%	-57%	-66%
-20%	-24%	-33%	-42%	-51%	-60%	-70%	-79%

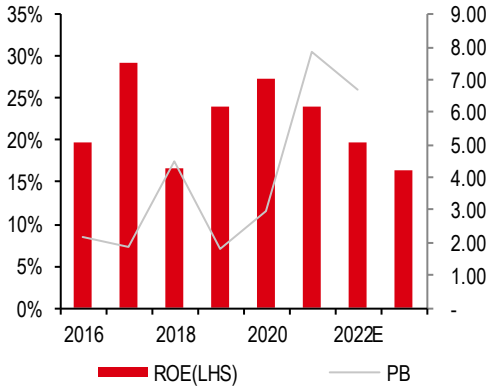
Note: HSBC Qianhai Securities estimates

Exhibit 57. Longi's 12-month forward PE



Source: Company data, HSBC Qianhai Securities estimates

Exhibit 58. Longi's historical PB vs ROE



Source: Company data, HSBC Qianhai Securities estimates

Exhibit 59. Longi: Discounted cash flow valuation

RMBm	2015	2016	2017	2018	2019	2020	2021e	2022e
Profit after tax	**521**	**1,551**	**3,549**	**2,567**	**5,557**	**8,700**	**10,556**	**11,865**
YoY growth		198%	129%	-28%	117%	57%	21%	12%
Add: Depreciation & amortisation	285	426	748	1,206	1,499	2,230	1,566	1,910
Net finance expense	88	83	326	371	181	385	80	176
Operating cash flow before W/C changes	**893**	**2,060**	**4,623**	**4,144**	**7,238**	**11,315**	**12,202**	**13,951**
Changes in working capital	-656	-1,766	-2,860	-2,917	447	-272	-6,912	1,559
Net operating cash flow	**237**	**294**	**1,763**	**1,227**	**7,685**	**11,043**	**5,289**	**15,509**
CAPEX	-1,216	-2,152	-3,774	-3,169	-2,753	-5,171	-15,840	-7,400
Free Cash Flow	**-979**	**-1,858**	**-2,011**	**-1,942**	**4,932**	**5,872**	**-10,551**	**8,109**
Discount Factor								
Gross PPE	3,617	5,981	12,814	16,239	19,623	31,389	32,288	45,140
Depreciation Rate	8%	7%	6%	7%	8%	7%	5%	4%
PV of FCF								

RMBm	2023e	2024e	2025e	2026e	2027e	2028e	2029e	Terminal Value
Profit after tax	**12,189**	**13,398**	**16,077**	**19,293**	**22,187**	**25,515**	**28,066**	
YoY growth	3%	10%	20%	20%	15%	15%	10%	
Add: Depreciation & amortisation	2,452	2,880	2,995	3,112	3,230	3,349	3,470	
Net finance expense	-12	-75	-78	-81	-84	-87	-91	
Operating cash flow before W/C changes	**14,629**	**16,202**	**18,995**	**22,324**	**25,333**	**28,777**	**31,445**	
Changes in working capital	-1,120	-1,190		0	0	0	0	
Net operating cash flow	**13,508**	**15,012**	**18,995**	**22,324**	**25,333**	**28,777**	**31,445**	
CAPEX	-7,250	-5,300	-2,500	-2,525	-2,550	-2,576	-2,602	
Free Cash Flow	**6,258**	**9,712**	**16,495**	**19,799**	**22,782**	**26,201**	**28,844**	**460,093**
Discount Factor	1.00	0.92	0.85	0.79	0.72	0.67	0.62	0.62
Gross PPE	53,980	62,248	64,748	67,273	69,823	72,399	75,001	
Depreciation Rate	5%	5%	5%	5%	5%	5%	5%	
PV of FCF	**6,258**	**8,960**	**14,039**	**15,546**	**16,503**	**17,510**	**17,783**	**283,662**

Summary of PV (Enterprise Value)	**380,261**
Less: Net debt (incl. perpetual)	20,408
Equity value	**400,669**
Less: Minority interest	-1,463
Shareholder Equity Value	**399,206**
Total share issued by year-end 2022	5,498
Per Share Value - RMB	**72.60**
Assumptions	
Risk free rate	2.0%
ERPch	6.0%
Beta	1.16
Cost of equity = RFR + BETA*ERPch	**9.0%**
Cost of debt	5.0%
Income tax	15%
After tax cost of debt	**4.3%**
Debt/Capital	12%
WACC	**8.4%**
Terminal Growth	**2%**

Source: Wind, Company data, HSBC Qianhai Securities estimates

Financials & valuation: Longi Green

Hold

Financial statements

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Profit & loss summary (CNYm)				
Revenue	54,583	111,820	119,120	107,578
EBITDA	12,521	13,925	15,653	16,666
Depreciation & amortisation	-2,230	-1,566	-1,910	-2,452
Operating profit/EBIT	10,290	12,359	13,743	14,214
Net interest	-378	-80	-176	12
PBT	9,912	12,280	13,567	14,225
HSBC Qianhai PBT	9,912	12,280	13,567	14,225
Taxation	-1,212	-1,724	-1,702	-2,037
Net profit	8,552	10,068	11,383	11,611
HSBC Qianhai net profit	8,552	10,068	11,383	11,611
Cash flow summary (CNYm)				
Cash flow from operations	11,015	4,501	13,290	12,862
Capex	-5,171	-15,840	-7,400	-7,250
Cash flow from investment	-5,171	-15,840	-7,400	-7,250
Dividends	-2,051	-1,222	-1,439	-1,626
Change in net debt	-3,635	7,641	-11,276	-3,998
FCF equity	5,844	-11,339	5,890	5,612
Balance sheet summary (CNYm)				
Intangible fixed assets	774	759	744	730
Tangible fixed assets	26,985	41,274	46,779	51,591
Current assets	55,101	87,313	101,688	98,870
Cash & others	26,967	19,326	29,602	33,600
Total assets	87,635	134,909	156,994	159,619
Operating liabilities	43,123	76,064	81,722	73,785
Gross debt	8,913	8,913	7,913	7,913
Net debt	-18,054	-10,413	-21,689	-25,686
Shareholders' funds	35,106	48,951	65,896	75,881
Invested capital	12,769	33,955	37,887	43,806

Ratio, growth and per share analysis

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Y-o-y % change				
Revenue	65.9	104.9	6.5	-9.7
EBITDA	56.6	11.2	12.4	6.5
Operating profit	58.4	20.1	11.2	3.4
PBT	58.7	23.9	10.5	4.9
HSBC Qianhai EPS	10.2	14.8	11.3	2.0
Ratios (%)				
Revenue/IC (x)	4.7	4.8	3.3	2.6
ROIC	79.3	45.5	33.5	29.8
ROE	27.3	24.0	19.8	16.4
ROA	11.8	9.5	8.1	7.7
EBITDA margin	22.9	12.5	13.1	15.5
Operating profit margin	18.9	11.1	11.5	13.2
EBITDA/net interest (x)	33.1	174.6	88.9	
Net debt/equity	-50.7	-20.9	-32.2	-33.0
Net debt/EBITDA (x)	-1.4	-0.7	-1.4	-1.5
CF from operations/net debt				
Per share data (CNY)				
EPS Rep (diluted)	1.62	1.86	2.07	2.11
HSBC Qianhai EPS (diluted)	1.62	1.86	2.07	2.11
DPS	0.23	0.27	0.30	0.30
Book value	6.65	9.04	11.99	13.80

Valuation data

Year to	12/2020a	12/2021e	12/2022e	12/2023e
EV/sales	7.7	3.8	3.5	3.8
EV/EBITDA	33.4	30.6	26.4	24.6
EV/IC	32.7	12.6	10.9	9.4
PE*	49.7	43.3	38.9	38.1
PB	12.1	8.9	6.7	5.8
FCF yield (%)	1.3	-2.6	1.4	1.3
Dividend yield (%)	0.3	0.3	0.4	0.4

* Based on HSBC Qianhai EPS (diluted)

ESG metrics

Environmental Indicators	12/2020a
GHG emission intensity*	n/a
Energy intensity*	773.1
CO_2 reduction policy	Yes
Social Indicators	**12/2020a**
Employee costs as % of revenues	8.1
Employee turnover (%)	n/a
Diversity policy	Yes

Governance Indicators	12/2021a
No. of board members	10
Average board tenure (years)	7.1
Female board members (%)	30
Board members independence (%)	30

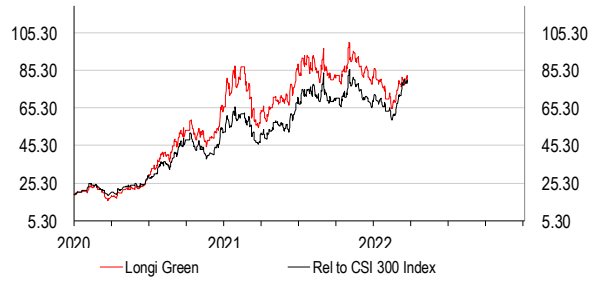
Source: Company data, HSBC Qianhai Securities

* GHG intensity and energy intensity are measured in kg and kWh respectively against revenue in USD '000s

Issuer information

Share price (CNY)	80.49	Free float	73%
Target price (CNY)	72.60	Sector	Energy Equipment
RIC (Equity)	601012.SS	Country/Region	China
Bloomberg (Equity)	601012 CH	Analyst	Corey Chan
Market cap (USDm)	68,435	Contact	+86 21 6081 3801

Price relative



Source: HSBC Qianhai Securities

Note: Priced at close of 22 Mar 2022

MCC (601618 CH)

- Largest metallurgical E&C contractor in China (c.90% market share)
- Completed design of a hydrogen-steel pilot project
- Maintain Buy with TP unchanged at RMB7.20

Investment case

Investment summary

China Metallurgical Group Corporation (MCC) is the largest metallurgical engineering and construction (E&C) contractor in China (c90% market share) and globally (c60% market share). Metallurgical construction accounted for around 13% of MCC's new E&C contracts in 2021. Most of the metallurgical projects are for steel production, which we believe will start to use hydrogen (we assume 5% of the steel in China will use hydrogen instead of carbon monoxide by 2027e). We believe MCC will benefit from hydrogen's application in the steel industry. On 18 May 2021, MCC disclosed it has helped Chinese iron and steel manufacturing conglomerate Hbis Group to design its hydrogen-steel pilot project in Zhangjiakou. The project, once completed, could reduce CO2 emission by 60%, according to the company MCC. MCC says it attaches strategic importance to the development of technology that can be used for the application of hydrogen in steel production.

Valuation and target price

Our TP is based on a sum-of-the-parts approach. Engineering & construction: We value this division by applying a 2023e PE multiple of 10x (unchanged), which is close to the historical average of global E&C peers. Property development: We value this division by applying a 2023e PE multiple of 7x (unchanged), which is close to the historical average of industry peers. Resources development: We value this division using DCF. Our WACC assumption is 7.9% (unchanged). Equipment manufacturing: We value this division by applying a 2023e EV/EBITDA multiple of 6x (unchanged), which is close to the historical average of industry peers. We keep our target price unchanged at RMB7.20. Our TP implies 88% upside from current levels, and we maintain our Buy rating on the stock.

Exhibit 60. MCC: Earnings sensitivity to gross margin and revenue change (2022e)

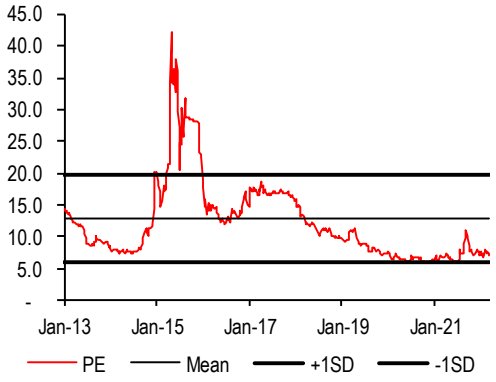
	Gross Margin						
Revenue	-3ppt	-2ppt	-1ppt	0ppt	+1ppt	+2ppt	+3ppt
+20%	-97%	-51%	-5%	40%	86%	132%	178%
+15%	-101%	-57%	-14%	30%	74%	118%	162%
+10%	-106%	-64%	-22%	20%	62%	104%	146%
+5%	-110%	-70%	-30%	10%	50%	90%	130%
0%	-114%	-76%	-38%	0%	38%	76%	114%
-5%	-119%	-83%	-46%	-10%	26%	62%	99%
-10%	-123%	-89%	-54%	-20%	14%	48%	83%
-15%	-127%	-95%	-63%	-30%	2%	35%	67%
-20%	-132%	-101%	-71%	-40%	-10%	21%	51%

Source: Company, HSBC Qianhai Securities

Share price catalysts: 1) New infrastructure orders; 2) new metallurgical orders; and 3) speed-up in the issuance of local government special bonds (LGSB).

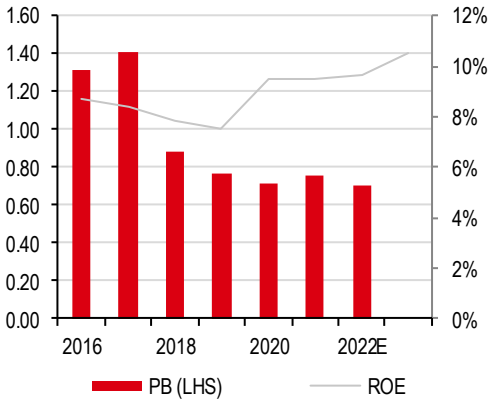
Key downside risks: 1) A slowdown in metallurgical investment; 2) weaker-than-expected margins on intensifying competition; 3) higher-than-expected capex in mining; 4) project delays or cancellations; and 5) profit volatility from non-recurring items.

Exhibit 61. MCC: 12-month forward PE



Source: Wind, HSBC Qianhai Securities estimates

Exhibit 62. MCC: Historical PB vs. ROE



Source: Wind, HSBC Qianhai Securities estimates

Exhibit 63. MCC: Sum-of-parts analysis

RMBm Business	Valuation Procedure	% Stake	Fair Value 2022e	%
Engineering & Construction	PE - 10x 2023e	Various	160,399	85%
Property Development	PE - 7x 2023e	Various	14,165	8%
Resource Development	DCF @ WACC of 7.9%	Various	8,593	5%
Equipment Manufacturing	EV/EBITDA - 6x 2023e	Various	4,452	2%
Gross Asset Value			**187,609**	**100%**
Less: Net Debt (incl. perpetual)	End 2022e		-38,250	
Total Equity Value			**149,359**	
/ No. of Shares			20,724	
Fair Value (RMB)			**7.20**	

Source: Company data, Wind, HSBC Qianhai Securities estimates

Financials & valuation: MCC A

Buy

Financial statements

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Profit & loss summary (CNYm)				
Revenue	400,115	535,130	626,705	711,580
EBITDA	17,306	20,226	23,455	26,466
Depreciation & amortisation	-3,622	-3,081	-3,243	-3,470
Operating profit/EBIT	13,685	17,145	20,212	22,996
Net interest	-1,767	-2,468	-2,624	-2,413
PBT	11,917	14,677	17,588	20,583
HSBC Qianhai PBT	11,917	14,677	17,588	20,583
Taxation	-2,535	-3,452	-4,153	-4,867
Net profit	7,113	8,641	10,493	12,404
HSBC Qianhai net profit	7,113	8,641	10,493	12,404
Cash flow summary (CNYm)				
Cash flow from operations	28,032	8,311	15,821	18,386
Capex	-12,287	-5,913	-7,095	-7,805
Cash flow from investment	-12,287	-5,913	-7,095	-7,805
Dividends	-900	-2,653	-3,058	-3,475
Change in net debt	-26,546	4,460	-1,526	-3,240
FCF equity	15,744	2,398	8,726	10,581
Balance sheet summary (CNYm)				
Intangible fixed assets	17,492	17,016	16,540	16,064
Tangible fixed assets	35,193	38,501	42,830	47,640
Current assets	389,254	445,780	484,237	519,844
Cash & others	55,393	45,933	42,459	40,699
Total assets	506,393	567,030	610,682	652,034
Operating liabilities	297,209	354,275	392,550	426,662
Gross debt	67,911	62,911	57,911	52,911
Net debt	14,816	19,276	17,750	14,510
Shareholders' funds	97,892	104,644	112,844	122,538
Invested capital	89,336	101,089	108,597	116,187

Ratio, growth and per share analysis

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Y-o-y % change				
Revenue	18.2	33.7	17.1	13.5
EBITDA	10.5	16.9	16.0	12.8
Operating profit	11.4	25.3	17.9	13.8
PBT	21.8	23.2	19.8	17.0
HSBC Qianhai EPS	35.3	21.5	21.4	18.2
Ratios (%)				
Revenue/IC (x)	4.3	5.6	6.0	6.3
ROIC	11.9	14.2	15.1	15.9
ROE	9.5	9.5	9.6	10.5
ROA	1.9	2.1	2.3	2.5
EBITDA margin	4.3	3.8	3.7	3.7
Operating profit margin	3.4	3.2	3.2	3.2
EBITDA/net interest (x)	9.8	8.2	8.9	11.0
Net debt/equity	10.6	12.9	11.1	8.5
Net debt/EBITDA (x)	0.9	1.0	0.8	0.5
CF from operations/net debt	189.2	43.1	89.1	126.7
Per share data (CNY)				
EPS Rep (diluted)	0.34	0.42	0.51	0.60
HSBC Qianhai EPS (diluted)	0.34	0.42	0.51	0.60
DPS	0.07	0.09	0.11	0.13
Book value	3.73	5.05	5.45	5.91

Valuation data

Year to	12/2020a	12/2021e	12/2022e	12/2023e
EV/sales	0.3	0.2	0.2	0.2
EV/EBITDA	7.3	6.5	5.7	5.0
EV/IC	1.4	1.3	1.2	1.1
PE*	11.2	9.2	7.6	6.4
PB	1.0	0.8	0.7	0.6
FCF yield (%)	23.0	3.5	12.8	15.5
Dividend yield (%)	2.0	2.4	2.9	3.4

* Based on HSBC Qianhai EPS (diluted)

ESG metrics

Environmental Indicators	12/2020a
GHG emission intensity*	51.8
Energy intensity*	160.9
CO_2 reduction policy	Yes
Social Indicators	**12/2020a**
Employee costs as % of revenues	5.1
Employee turnover (%)	3.4
Diversity policy	Yes

Governance Indicators	12/2021a
No. of board members	7
Average board tenure (years)	6.8
Female board members (%)	0
Board members independence (%)	42.9

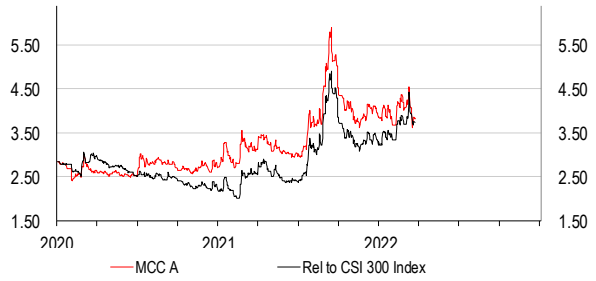
Source: Company data, HSBC Qianhai Securities

* GHG intensity and energy intensity are measured in kg and kWh respectively against revenue in USD '000s

Issuer information

Share price (CNY)	3.83	Free float	24%
Target price (CNY)	7.20	Sector	Construction & Engineering
RIC (Equity)	601618.SS	Country/Region	China
Bloomberg (Equity)	601618 CH	Analyst	Corey Chan
Market cap (USDm)	10,740	Contact	+86 21 6081 3801

Price relative



Source: HSBC Qianhai Securities

Note: Priced at close of 22 Mar 2022

Sinopec Oilfield Equipment (000852 CH)

- Sinopec Oil Equipment is Sinopec Group's in-house oil and gas equipment manufacturer
- Sinopec Oil Equipment to benefit from aggressive carbon reduction efforts by largest customer + controlling shareholder, Sinopec Group
- Maintain Hold with TP RMB6.40 (was RMB5.60)

Investment case

Investment summary
Sinopec Oil Equipment can benefit from the aggressive carbon reduction efforts by its largest customer and controlling shareholder, Sinopec Group. However, as its share price has risen by 47% in the past year, outperforming the Oilfield Services Index which rose 10.5% during the same period (comprising 11 A-share listed oilfield services providers), we believe the improving prospect for its hydrogen business has been priced in. Meanwhile, we remain cautious on Sinopec Oil Equipment's growth prospects as it has yet to prove its competitiveness in oilfield equipment or hydrogen products. We raise our target price to RMB6.40 from RMB5.60 and maintain our Hold rating.

Compressor maker finds new growth drivers
One of the key pieces of equipment that Sinopec Oil Equipment manufactures is compressors used in natural gas extraction. It disclosed on 10 January 2022 that it now focuses on the R&D of hydrogen compressors for hydrogen refueling stations, hydrogen purification equipment and other key hydrogen-related equipment. We believe the company will benefit from the aggressive carbon reduction efforts by its largest customer and controlling shareholder, Sinopec Group.

Other than green hydrogen and CCUS, Sinopec Oil Equipment can also generate additional revenue from hydrogen compressors for hydrogen refueling stations, of which Sinopec has announced (on 27 April 2021) it will build a thousand units during the 14th Five-Year Plan period. Assuming the compressor is priced at RMB6mn/station, 1,000 stations implies a RMB6bn market or RMB1.2bn annual spending (during five years). If Sinopec Oil Equipment can secure a 30% market share, the refueling station compressor alone could contribute up to 6% of its RMB6213mn revenue in 2020. According to Leading Industry research, Sinopec Oilfield Equipment had 25%-30% market share in domestic oil/gas fracturing equipment. We believe the company could obtain similar market share of 30% in the hydrogen station compressor market.

Capacity upgrade via private placement
On 30 November 2021, Sinopec Oil Equipment's RMB1bn private placement plan was approved by the China Securities Regulatory Commission. As the private placement has not

been completed, we do not factor it into our model. The company plans to use the funds to develop its electric drive fracturing solution business (instead of merely providing the fracturing equipment) and to upgrade its existing manufacturing capacities. The company estimates the new projects could bring in an additional annual revenue of RMB530m and net profit of RMB76m. At the same time, assuming the company raises the funds at RMB6.45/share based on the recent share price, we estimate the private placement (if successfully executed) could dilute current ownership by 20%.

Remain conservative

We remain cautious on the company's growth prospect for the following reasons: 1) Sinopec's capex would shrink in 2022-23e, we believe, in line with Bloomberg consensus. This limits the growth potential of Sinopec Oilfield Equipment's traditional business. 2) Sinopec Oilfield Equipment has yet to prove its capability or competitiveness in manufacturing hydrogen equipment. 3) In the oil & gas fracturing equipment sector, Jereh (002353 CH, RMB46.31, Buy) had a much better financial performance than Sinopec Oilfield in 2016-21, with higher revenue growth and gross margin. This indicates the company's R&D and production efficiency has room for improvement.

What's changed?

Adjusting earnings estimates

We raise our 2022-23e EPS estimates by 15.0% and 12.0%, respectively. This is a result of higher revenue estimates; we raise our 2022-23e revenue estimates by 3% and 7%, respectively, to reflect the company's plan to develop its hydrogen business. Our earnings estimates change is more than revenue estimate change, due to operating leverage.

Valuation and target price:

We raise our target price to RMB6.40 from RMB5.60, mainly to reflect our higher earnings estimates in 2022-23e. We apply a 12-month forward multiple of 2.65x (previously 2.32x) to our average 2021-22e BVPS estimate of RMB2.40 (unchanged). Our target multiple is 20% below (previously 30%) the stock's historical average of 3.31x between 2015 and August 2020. We raise the target multiple to 20% below the historical average (30% below previously), given the higher ROE projection (2022e ROE of 2.1% vs 1.9% previously). We maintain our Hold rating on the stock.

Key upside risks: 1) Stronger-than-expected shale gas development in China; 2) faster-than-expected overseas expansion; 3) a higher-than-expected crude oil price; 4) larger-than-expected upstream capex by the China oil majors; and 5) stronger-than-expected development of hydrogen business.

Key downside risks: 1) Slowdown in shale gas and oil field equipment, 2) intense competition, 3) working capital management risks, and 4) weaker-than-expected development of the hydrogen business.

Exhibit 64. Earnings estimate changes

	2021e			2022e			2023e		
RMBm	Old	New	changes	Old	New	changes	Old	New	changes
Revenue	6,388	6,388	0%	6,876	7,070	3%	6,945	7,399	7%
Gross profit	1,132	1,132	0%	1,223	1,253	3%	1,229	1,301	6%
GPM	17.7%	17.7%	0.0%	17.8%	17.7%	-0.1%	17.7%	17.6%	-0.1%
Net profit	36	36	0.0%	35	40	15%	37	42	12%
EPS	0.046	0.046	0.0%	0.045	0.051	15%	0.048	0.053	12%

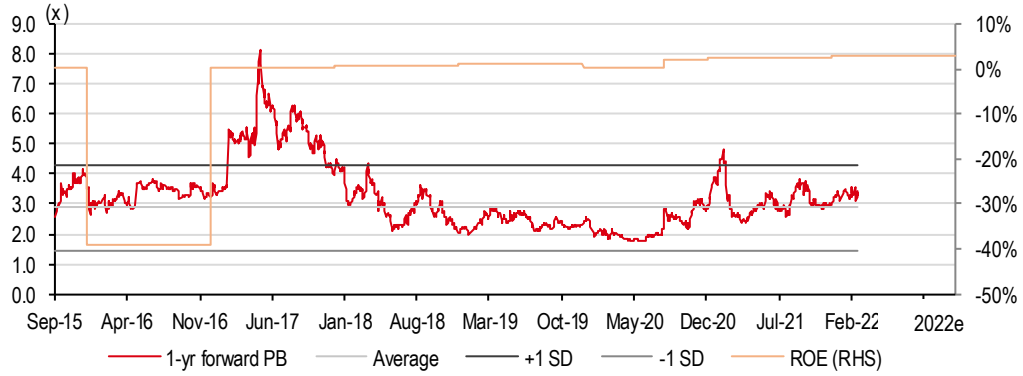
Source: Company data, HSBC Qianhai Securities estimates

Exhibit 65. EPS sensitivity to segment revenue growth

	EPS changes		
	2021e	2022e	2023e
Sales of oilfield machinery growth rate are 5ppt higher than our estimates	17.10%	14.30%	12.30%
Sales of oil and gas pipeline growth rate are 5ppt higher than our estimates	-14.00%	-10.70%	-8.40%

Source: HSBC Qianhai Securities estimates

Exhibit 66. Sinopec Oilfield Equipment historical PB/ROE trend



Source: Bloomberg, HSBC Qianhai Securities estimates

Financials & valuation: Sinopec Oil Equipment

Hold

Financial statements

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Profit & loss summary (CNYm)				
Revenue	6,213	6,388	7,070	7,399
EBITDA	341	332	353	347
Depreciation & amortisation	-175	-169	-165	-162
Operating profit/EBIT	166	163	188	185
Net interest	-147	-122	-127	-122
PBT	49	95	106	110
HSBC Qianhai PBT	49	95	106	110
Taxation	-18	-35	-39	-41
Net profit	7	36	40	42
HSBC Qianhai net profit	7	36	40	42
Cash flow summary (CNYm)				
Cash flow from operations	225	183	-518	325
Capex	-105	-108	-119	-125
Cash flow from investment	-45	-108	-119	0
Dividends	0	0	0	0
Change in net debt	-231	-98	262	-154
FCF equity	120	76	-637	201
Balance sheet summary (CNYm)				
Intangible fixed assets	91	91	91	91
Tangible fixed assets	1,308	1,247	1,201	1,163
Current assets	6,716	7,283	7,678	7,927
Cash & others	99	498	235	389
Total assets	8,205	8,710	9,059	9,270
Operating liabilities	2,767	2,912	3,195	3,337
Gross debt	3,474	3,774	3,774	3,774
Net debt	3,375	3,277	3,539	3,385
Shareholders' funds	1,809	1,845	1,885	1,927
Invested capital	5,249	5,210	5,539	5,455

Ratio, growth and per share analysis

Year to	12/2020a	12/2021e	12/2022e	12/2023e
Y-o-y % change				
Revenue	-5.7	2.8	10.7	4.7
EBITDA	25.9	-2.6	6.2	-1.5
Operating profit	73.6	-1.7	15.1	-1.2
PBT	-22.5	95.1	11.4	4.3
HSBC Qianhai EPS	-71.5	403.6	11.4	4.3
Ratios (%)				
Revenue/IC (x)	1.2	1.2	1.3	1.3
ROIC	2.0	2.0	2.2	2.1
ROE	0.4	2.0	2.1	2.2
ROA	0.4	0.7	0.7	0.8
EBITDA margin	5.5	5.2	5.0	4.7
Operating profit margin	2.7	2.6	2.7	2.5
EBITDA/net interest (x)	2.3	2.7	2.8	2.8
Net debt/equity	171.9	162.0	169.3	156.8
Net debt/EBITDA (x)	9.9	9.9	10.0	9.7
CF from operations/net debt	6.7	5.6		9.6
Per share data (CNY)				
EPS Rep (diluted)	0.01	0.05	0.05	0.05
HSBC Qianhai EPS (diluted)	0.01	0.05	0.05	0.05
DPS	0.00	0.00	0.00	0.00
Book value	2.33	2.37	2.42	2.48

Valuation data

Year to	12/2020a	12/2021e	12/2022e	12/2023e
EV/sales	1.3	1.3	1.2	1.1
EV/EBITDA	24.4	24.7	24.0	23.9
EV/IC	1.6	1.6	1.5	1.5
PE*	700.0	139.0	124.8	119.7
PB	2.8	2.7	2.6	2.6
FCF yield (%)	2.4	1.5	-12.8	4.0
Dividend yield (%)	0.0	0.0	0.0	0.0

* Based on HSBC Qianhai EPS (diluted)

ESG metrics

Environmental Indicators	12/2020a
GHG emission intensity*	n/a
Energy intensity*	n/a
CO_2 reduction policy	No
Social Indicators	**12/2020a**
Employee costs as % of revenues	16.1
Employee turnover (%)	n/a
Diversity policy	No

Governance Indicators	12/2021a
No. of board members	8
Average board tenure (years)	n/a
Female board members (%)	12.5
Board members independence (%)	37.5

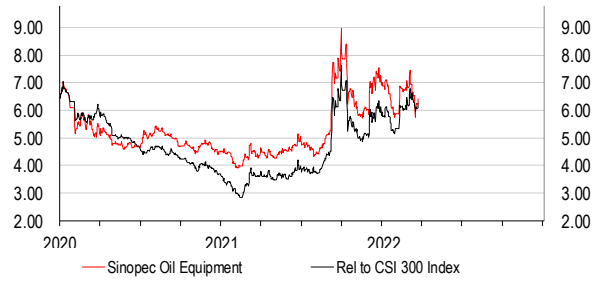
Source: Company data, HSBC Qianhai Securities

* GHG intensity and energy intensity are measured in kg and kWh respectively against revenue in USD '000s

Issuer information

Share price (CNY)	6.40	Free float	41%
Target price (CNY)	6.40	Sector	Energy Equipment
RIC (Equity)	000852.SZ	Country/Region	China
Bloomberg (Equity)	000852 CH	Analyst	Dun Wang
Market cap (USDm)	782	Contact	+86 21 6081 3827

Price relative



Source: HSBC Qianhai Securities

Note: Priced at close of 22 Mar 2022

Disclosure appendix

Analyst Certification

The following analyst(s), economist(s), or strategist(s) who is(are) primarily responsible for this report, including any analyst(s) whose name(s) appear(s) as author of an individual section or sections of the report and any analyst(s) named as the covering analyst(s) of a subsidiary company in a sum-of-the-parts valuation certifies(y) that the opinion(s) on the subject security(ies) or issuer(s), any views or forecasts expressed in the section(s) of which such individual(s) is(are) named as author(s), and any other views or forecasts expressed herein, including any views expressed on the back page of the research report, accurately reflect their personal view(s) and that no part of their compensation was, is or will be directly or indirectly related to the specific recommendation(s) or views contained in this research report: Dun Wang, Corey Chan and Yi Ru

Important disclosures

Equities: Stock ratings and basis for financial analysis

HSBC and its affiliates, including the issuer of this report ("HSBC") believes an investor's decision to buy or sell a stock should depend on individual circumstances such as the investor's existing holdings, risk tolerance and other considerations and that investors utilise various disciplines and investment horizons when making investment decisions. Ratings should not be used or relied on in isolation as investment advice. Different securities firms use a variety of ratings terms as well as different rating systems to describe their recommendations and therefore investors should carefully read the definitions of the ratings used in each research report. Further, investors should carefully read the entire research report and not infer its contents from the rating because research reports contain more complete information concerning the analysts' views and the basis for the rating.

From 23rd March 2015 HSBC has assigned ratings on the following basis:

The target price is based on the analyst's assessment of the stock's actual current value, although we expect it to take six to 12 months for the market price to reflect this. When the target price is more than 20% above the current share price, the stock will be classified as a Buy; when it is between 5% and 20% above the current share price, the stock may be classified as a Buy or a Hold; when it is between 5% below and 5% above the current share price, the stock will be classified as a Hold; when it is between 5% and 20% below the current share price, the stock may be classified as a Hold or a Reduce; and when it is more than 20% below the current share price, the stock will be classified as a Reduce.

Our ratings are re-calibrated against these bands at the time of any 'material change' (initiation or resumption of coverage, change in target price or estimates).

Upside/Downside is the percentage difference between the target price and the share price.

Prior to this date, HSBC's rating structure was applied on the following basis:

For each stock we set a required rate of return calculated from the cost of equity for that stock's domestic or, as appropriate, regional market established by our strategy team. The target price for a stock represented the value the analyst expected the stock to reach over our performance horizon. The performance horizon was 12 months. For a stock to be classified as Overweight, the potential return, which equals the percentage difference between the current share price and the target price, including the forecast dividend yield when indicated, had to exceed the required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). For a stock to be classified as Underweight, the stock was expected to underperform its required return by at least 5 percentage points over the succeeding 12 months (or 10 percentage points for a stock classified as Volatile*). Stocks between these bands were classified as Neutral.

*A stock was classified as volatile if its historical volatility had exceeded 40%, if the stock had been listed for less than 12 months (unless it was in an industry or sector where volatility is low) or if the analyst expected significant volatility. However, stocks which we did not consider volatile may in fact also have behaved in such a way. Historical volatility was defined as the past month's average of the daily 365-day moving average volatilities. In order to avoid misleadingly frequent changes in rating, however, volatility had to move 2.5 percentage points past the 40% benchmark in either direction for a stock's status to change.

Rating distribution for long-term investment opportunities

As of 31 December 2021, the distribution of all independent ratings published by HSBC is as follows:

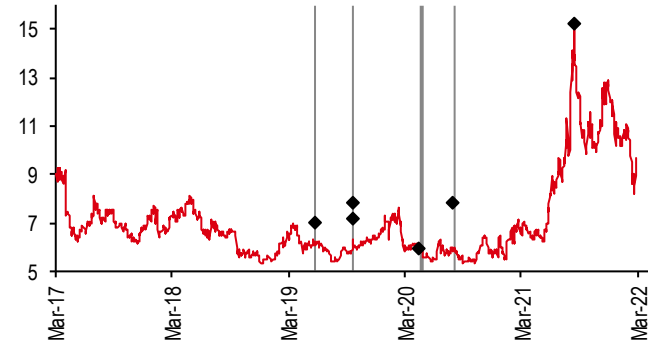
Buy	61%	(15% of these provided with Investment Banking Services in the past 12 months)
Hold	33%	(14% of these provided with Investment Banking Services in the past 12 months)
Sell	6%	(15% of these provided with Investment Banking Services in the past 12 months)

For the purposes of the distribution above the following mapping structure is used during the transition from the previous to current rating models: under our previous model, Overweight = Buy, Neutral = Hold and Underweight = Sell; under our current model Buy = Buy, Hold = Hold and Reduce = Sell. For rating definitions under both models, please see "Stock ratings and basis for financial analysis" above.

For the distribution of non-independent ratings published by HSBC, please see the disclosure page available at http://www.hsbcnet.com/gbm/financial-regulation/investment-recommendations-disclosures.

Share price and rating changes for long-term investment opportunities

China National Chemical (601117.SS) share price performance CNY Vs HSBC rating history



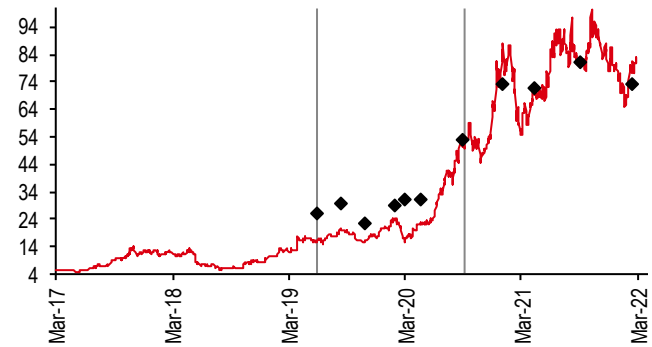
Source: HSBC

Rating & target price history

From	To	Date	Analyst
Buy	Hold	13 Jun 2019	Thomas C. Hilboldt
Hold	Buy	11 Oct 2019	Thomas C. Hilboldt
Buy	Hold	08 May 2020	Thomas C. Hilboldt
Hold	N/A	14 May 2020	
N/A	Buy	21 Aug 2020	Bonan Li
Target price	**Value**	**Date**	**Analyst**
Price 1	7.00	13 Jun 2019	Thomas C. Hilboldt
Price 2	7.10	11 Oct 2019	Thomas C. Hilboldt
Price 3	7.80	15 Oct 2019	Thomas C. Hilboldt
Price 4	5.90	08 May 2020	Thomas C. Hilboldt
Price 5	N/A	14 May 2020	
Price 6	7.80	21 Aug 2020	Bonan Li
Price 7	15.20	07 Sep 2021	Amy Hu

Source: HSBC

Longi Green (601012.SS) share price performance CNY Vs HSBC rating history



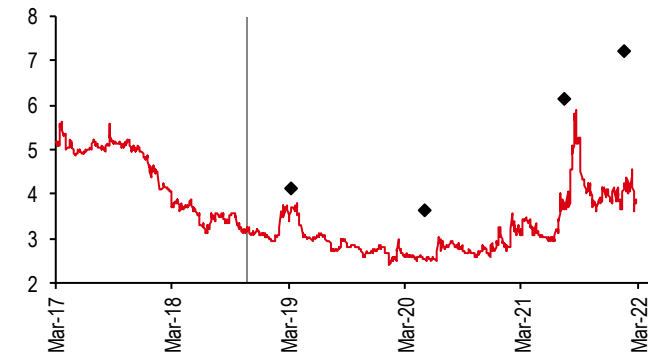
Source: HSBC

Rating & target price history

From	To	Date	Analyst
N/A	Buy	20 Jun 2019	Corey Chan
Buy	Hold	22 Sep 2020	Corey Chan
Target price	**Value**	**Date**	**Analyst**
Price 1	25.86	20 Jun 2019	Corey Chan
Price 2	29.43	03 Sep 2019	Corey Chan
Price 3	22.29	19 Nov 2019	Corey Chan
Price 4	28.57	19 Feb 2020	Corey Chan
Price 5	30.93	24 Mar 2020	Corey Chan
Price 6	30.71	11 May 2020	Corey Chan
Price 7	52.57	22 Sep 2020	Corey Chan
Price 8	72.64	24 Jan 2021	Corey Chan
Price 9	71.21	06 May 2021	Corey Chan
Price 10	80.60	23 Sep 2021	Corey Chan
Price 11	72.60	08 Mar 2022	Corey Chan

Source: HSBC

MCC A (601618.SS) share price performance CNY Vs HSBC rating history



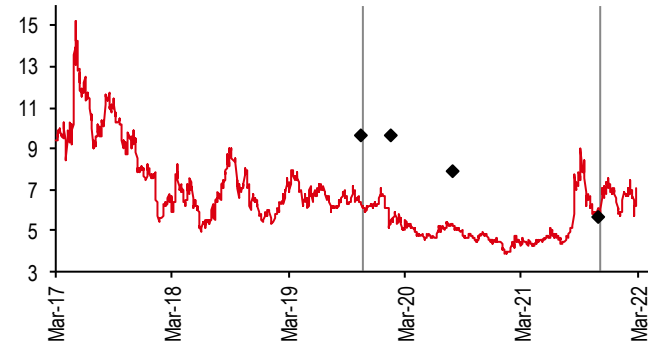
Source: HSBC

Rating & target price history

From	To	Date	Analyst
N/A	Buy	09 Nov 2018	Corey Chan
Target price	**Value**	**Date**	**Analyst**
Price 1	4.10	03 Apr 2019	Corey Chan
Price 2	3.60	26 May 2020	Corey Chan
Price 3	6.10	09 Aug 2021	Corey Chan
Price 4	7.20	11 Feb 2022	Corey Chan

Source: HSBC

Sinopec Oil Equipment (000852.SZ) share price performance CNY Vs HSBC rating history



Source: HSBC

Rating & target price history

From	To	Date	Analyst
N/A	Buy	08 Nov 2019	Bonan Li
Buy	Hold	23 Nov 2021	Amy Hu
Target price	**Value**	**Date**	**Analyst**
Price 1	9.60	08 Nov 2019	Bonan Li
Price 2	9.60	07 Feb 2020	Bonan Li
Price 3	7.90	21 Aug 2020	Bonan Li
Price 4	5.60	23 Nov 2021	Amy Hu

Source: HSBC

To view a list of all the independent fundamental ratings disseminated by HSBC during the preceding 12-month period, please use the following links to access the disclosure page:

Clients of Global Research and Global Banking and Markets: www.research.hsbc.com/A/Disclosures

Clients of HSBC Private Banking: www.research.privatebank.hsbc.com/Disclosures

HSBC & Analyst disclosures

Disclosure checklist

Company	Ticker	Recent price	Price date	Disclosure
LONGI GREEN	601012.SS	80.50	23 Mar 2022	7

Source: HSBC

1 HSBC has managed or co-managed a public offering of securities for this company within the past 12 months.

2 HSBC expects to receive or intends to seek compensation for investment banking services from this company in the next 3 months.

3 At the time of publication of this report, HSBC Securities (USA) Inc. is a Market Maker in securities issued by this company.

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