CLIMATE ENERGY FINANCE

China's Leadership in Decarbonising Cleantech Manufacturing to Green the World

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In September 2020, President Xi Jinping announced China's national climate target to peak CO_2-e emissions before 2030, and achieve carbon neutrality before 2060.[1] Despite coal-fired generation capacity expanding in China into 2023, deployment of zero emission generation has significantly outpaced fossil fuels.

We examine the aggressive scope 1-3 decarbonisation plans of four Chinese world leaders: CATL, LONGi, JinKO Solar and Trina Solar, far ahead of Australian corporate 'leaders' like BHP, Wesfarmers and BlueScope Steel.

By 9MCY2023, China added 187GW of zero emission generation capacity, accounting for 83% of all new installations YTD.[2] Variable renewable energy now accounts for 33% of total national installed capacity as of September 2023. As a result of China's massive renewable scaling up, China could possibly peak its emissions this year, then plateau, way ahead of expectations.[3]

The accelerated growth of China's domestic cleantech manufacturing has catalysed record renewable energy generation installs, deployment of grid-firming battery systems and world-leading adoption of electrified transport.

In 2022, global EV sales exceeded 10.6 million, and reached 9.6 million in the 9MCY2023, with 58% of global sales in China.[4] Of the top 10 EV manufacturers globally, 6 were from China. BYD is the largest global manufacturer of EVs in 2023, with a 20.6% global market share.

EV battery production grew 44% globally in 9MCY2023 to 486GWh. The top 2 EV battery producers globally, China's CATL and BYD, held a collective 52.6% market share of all sales. Of the top 10, 6 Chinese firms produced 63% of all EV batteries globally in 2023.[5]

Across the solar PV value chain, China dominates global solar manufacturing capacity, which has led to drastic price drop for solar power materials including polysilicon and solar modules.[6]

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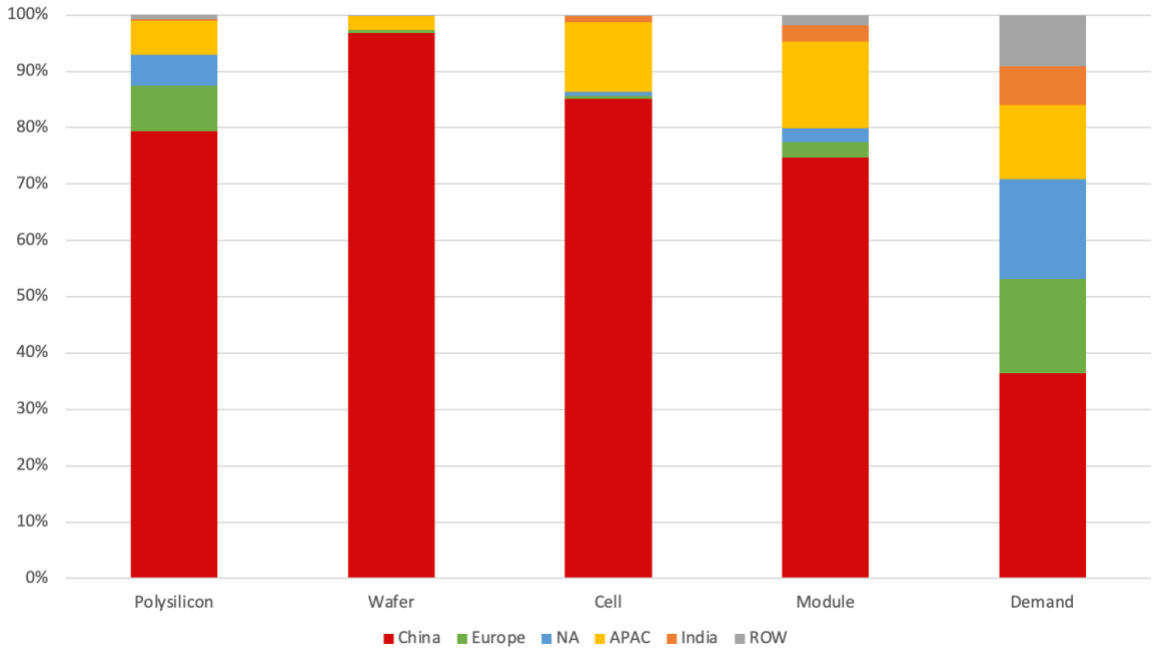
[1] IEA, An Energy Sector Roadmap to Carbon Neutrality in China, September 2021
[2] CEF, Monthly China Energy Update September 2023, 30 October 2023
[3] Carbon Brief, China's emissions set to fall in 2024 after record growth in clean energy, 13 Nov 2023
[4] SNE Research, Jan-Sep 2023 Global EV Deliveries, 8 October 2023
[5] SNE Research, Jan-Sep 2023 Global EV Battery Usage Posted 485.9GWh, 7 October 2023
[6] CEF, Solar pivot: A massive global solar boom is disrupting energy & speeding the transition, 14 June 2023

[7] By the end of 2022, China has a capacity of 381GW polysilicon, 536GW wafer, 493GW cell and 504GW of modules, representing a global market share of 80%, 97%, 85% and 75% respectively.

A report by OPIS indicates that the price for solar module export has been driven down 40% in 2023, to a record low.[8] In 2023, the IEA forecasts capacity additions of 344GW polysilicon, 237GW wafer, 435GW cell and 249GW of modules.[9] Chinese solar module exports grew 34% yoy in 1HCY2023 to 114GW, equivalent to the entire installed capacity of the US (113GW).[10]

Figure: China's Leadership Across Solar PV Value Chain, 2021:



Source: IEA Global Solar PV Supply Chains [11]

As of the end of October 2023, China has installed wind capacity of 404GW, a 16% year-on-year (yoy) increase.[12] China also dominates the global wind turbine manufacturing industry. In 2022, of the top 10 global producers, 6 were Chinese firms. China's Goldwind was the largest wind turbine manufacturer in 2022, producing 12.7GW, 15% of wind turbines commissioned globally. Chinese domestic installations accounted for 90% of Goldwind's installs.

While the growth of China's domestic manufacturing capacity is supporting the burgeoning deployment of zero emission technology in China, China's corporate leaders are also decarbonising global economies by providing world-leading, low-cost cleantech exports at scale.

[7] PV Magazine, Solar module prices may reach $0.10/W by end 2024, 23 November 2023
[8] PV Magazine, Solar Module Prices Dive to Record Low, 27 October 2023
[9] IEA, Solar PV Manufacturing Capacity by Component in China 2021-24, 24 May 2023
[10] Ember, Solar Exports from China Increase by a Third, 14 September 2023
[11] IEA, Global Solar PV Supply Chains, 5 July 2022
[12] NEA, National Energy Administration Releases National Power Industry Statistics, 20 November 2023

Without China's leadership, there is no plausible path to limiting global warming to 1.5ºC. China's speed and scale of cleantech manufacturing has facilitated world's leaders' commitment to economy-wide emissions reduction pathways and fossil-fuel abatement. Despite significant growth in output across all cleantech industries, China's corporate leaders are embedding decarbonisation into operations and value chains, both ahead of China's national targets and that of most nations' industry giants.

Contemporary Amperex Technology Ltd. (CATL)

CATL (300750.SZ) remains the largest supplier of batteries in EVs and energy storage (ESS) globally in 2023, with a 37% global EV battery market share YTD September 2023, and 43% global ESS market share across 2022.[13] In 2022, CATL had a consolidated annual capacity of 390GWh, producing 325GWh, a 100% rise from 2021. CATL's sales rose 117% to 289GWh.[14]

CATL has continued to invest at speed and scale to bring new products and capacity online to facilitate the global decarbonisation of transport and energy grids. In October 2023, CATL's new US$960m 30GWh Guiyang production base (phase 1) was commissioned.[15] CATL invested a staggering US$2bn into Research & Development (R&D) in 2022, with 18,000 research staff.[16]

CATL has committed to achieving carbon neutrality in core operations (net zero Scope 1 + 2 emissions) by 2025, with full supply chain decarbonisation by 2035. In 2022, CATL's emissions profile was 451.8kt CO_2-e Scope 1 (2.7%), 1.98Mt CO_2-e Scope 2 (11.6%), and 14.63Mt CO_2-e Scope 3 (85.7%). Purchased electricity accounts for 81% of operational emissions as of 2022.[17]

In 2022, CATL's operational GHG intensity declined by over 28% to 9.99t CO_2-e/MWh of lithium-ion batteries produced.[18] Carbon intensity reduction in CATL's battery manufacturing has been driven by increasing penetration of self-generated solar PV. In 2022, CATL generated over 58.4GWh from solar, a 23% increase from 2021, abating 44,677 tCO_2-e from displaced fossil-fuel generation. Across the consolidated CATL group, renewable energy accounts for 26.6% of electricity demand in 2022.

In 2022, 3 production bases are powered from 100% renewable energy in China, including the major 15GW Yibin, Sichuan (CATL-SC) facility.[19] In October 2023, CATL received certification of its fourth zero-carbon factory in Chengdu, Sichuan (CATL-XJ).[20]

LONGi

LONGi (601012.SS) is the largest solar PV wafer manufacturer in the world, producing 85GW monocrystalline wafer sales in 2022, up 21.5% from 2021. LONGi's module shipments also grew

[13] SNE Research, Battery Sales for EV and ESS 2022, 2 March 2023
[14] CATL, Annual Report 2022, 10 March 2023
[15] CATL, CATL's Guiyang Plant Put into Operation, 29 October 2023
[16] FT, Can Anyone Challenge China's EV Battery Dominance, 28 August 2023
[17] CATL, Carbon Accounting Report, 2022
[18] CATL, Carbon Accounting Report, 2022
[19] Note: Yibin production base has received PAS 2060 certification for carbon neutrality since 2021
[20] CATL, CATL Secures its Fourth Zero-Carbon Factory, 2 October 2023

by 21.4% in 2022 to 46.8GW, continuing as the largest module producer globally for the previous 3 consecutive years.[21]

In 1HCY2023, LONGi produced 52GW of monocrystalline wafers, up 31% from 1HCY2022, with 23GW external sales. Over the same period, module shipments grew 55% to 30GW.

In January 2023, LONGi announced a planned investment of RMB 42.5 billion (US$6.7bn) into an integrated solar manufacturing hub, with 100GW of wafer capacity and 50GW of cell capacity in Shaanxi province.[22] LONGi has signed an investment agreement with the local government of Xixian New District, with commissioning expected by 2025, generating more than 15,000 jobs. In 2022, LONGi invested RMB 7.14 billion (US$1bn) into R&D, 5.5% of revenue.[23]

LONGi has committed to a 60% reduction in operational emissions by 2030, relative to 2020. In 2022, LONGi's emissions profile was 158kt CO_2-e (Scope 1), 2.93Mt CO_2-e (Scope 2) and 29.75Mt CO_2-e across the value chain. Currently, Scope 2 accounts for 95% of operational GHG emissions.[24]

LONGi simultaneously joined the RE100 and EV100 climate initiatives, committing to achieving 70% of energy demand sourced from renewable energy by 2027, and 100% by 2028. The EV100 initiative is the aim to install EV charging facilities across 100% of operational sites by 2030. In 2022, renewable energy accounted for over 47% of LONGi's electricity demand, a 17% increase in penetration from 2021 (40%). LONGi's Baoshan manufacturing base is powered by 99% renewable energy in 2022, with the aim to operate as a zero-carbon plant in 2023.

Reaching 100% energy demand sourced from renewable energy by 2028 would abate 95% of LONGi's operational emissions profile by 2028, far outpacing the company's Science Based Targets (SBTi). LONGi has also committed to decarbonising its supply chain, targeting a 52% reduction, per tonne of purchased materials, of Scope 3 emissions by 2030, relative to 2020.[25]

JinKO Solar

JinKO (JKS) is a top 3 global solar module manufacturer, in the 9MCY2023, JinKO produced 52GW of modules, up 83% yoy. It produced 44.5GW of modules in 2022, up 100% from 2021.[26]

JinKO invests significantly into R&D and capacity expansion each year, lowering the cost of high-quality modules exported globally. In 2022, JinKO invested RMB 5.6 billion (US$790m) into R&D, 6.8% of the firm's operating revenue.[27]

In June 2023, JinKO announced a US$7.78bn investment to build a 56GW vertically integrated facility in Shanxi province, a staggering 19 times bigger manufacturing facility than the biggest

[21] LONGI, 2022 and 2023Q1 Investor Presentation, 28 April 2023
[22] PV Magazine, LONGi Plans New 100GW Wafer Plant, 50GW Solar Cell Factory, 18 January 2023
[23] LONGi, Sustainable Development
[24] LONGi, Sustainability Report, 2022
[25] LONGi, Sustainable Development
[26] JinKO, Q4 2022 Earnings Call Presentation, 10 March 2023
[27] JinKO, JinKO ESG Report, 2022

in construction in the US.[28] The production base will be constructed in four phases over two years, with the first two phases set to begin production in 2024.

JinKO has committed to a 50% reduction in Scope 1 + 2 emissions by 2032, relative to 2022. Additionally, a commitment to reduce Scope 3 emissions by 58% per MW of modules, cells and wafers produced by 2032, relative to 2022. JinKO announced its commitment in November 2021 to achieving net zero GHG emissions across JinKO's value chain by 2050.

In 2022, JinKO's emissions profile was 59.9 kt CO_2-e (Scope 1), 3.15Mt CO_2-e (Scope 2) and 17.13Mt CO_2-e (Scope 3).[29] Scope 2 emissions were responsible for 98% of operational emissions. JinKO has significantly ramped up its fossil-fuel abatement strategy, targeting 100% renewable energy in all manufacturing plants and global operations by 2025.

Trina Solar

China's Trina Solar (688599.SS) is another leading global solar manufacturer. In 2022, Trina shipped 43GW of modules.[30] In the 9MCY2023, Trina produced 45GW of modules, 56% growth yoy, ranking as the second largest manufacturer globally.[31]

Trina has set an ambitious decarbonisation target to reduce Scope 1 + 2 GHG emissions intensity of PV products (cells and modules) by 50% in 2025, relative to 2020.[32] LONGi recorded its emissions profile in 2022 at 19.3kt CO_2-e (Scope 1), 1.17Mt CO_2-e (Scope 2) and 17.1Mt CO_2-e (Scope 3).

Trina's targets will be achieved by a combination of energy efficiency improvements, and increasing the sourcing of renewable energy. Trina has targeted a 40% decrease in energy consumption per MW of solar PV productions by 2025, relative to 2020. Further, Trina has committed to using 100% renewable energy in global manufacturing and operations by 2030.

China's clean technology manufacturing domination and the implication on Australia

China's ambition has catalysed the world's ability to adopt and install low-cost, high-quality technology critical to decarbonising national grid systems and abating inflationary, high-emission fossil fuels in transport and heavy industry. This is an often-overlooked aspect of global supply chains.

China's leading solar and battery manufacturers have set ambitious decarbonisation pathways, far ahead of national commitments to peak emissions by 2030 and achieve net zero by 2060. As global economies race to secure pipelines of clean technology manufacturing, China's leaders are embedding decarbonisation into direct operations and their respective value chains.

[28] PV Magazine, JinKO to Build 56GW Vertically Integrated PV Factory, 16 June 2023
[29] JinKO, JinKO ESG Report, 2022
[30] Trina, Trina Solar Reports Increase of 83% in YoY Revenues, 28 April 2023
[31] Trina, Trina Solar Boosts Revenue and Shipments During First Nine Months of 2023, 2 November 2023
[32] Trina, Corporate Social Governance Report 2022, 12 June 2023

China is Australia's no.1 trading partner, and largest customer of our nation's legacy bulk commodity exports. Fostering strong trade, technology and investment partnerships with China is critical for Australia to realise its renewable energy targets and emissions reduction pathways, as well as enabling Australia to become a renewable superpower. China has demonstrated their commitment to supply decarbonised exports to Australia. It is in Australia's national interest to step up our industrial climate ambition, recognising the importance of providing decarbonised, zero-emissions new energy metals and minerals including iron ore, lithium, nickel and aluminium. Exports critical to manufacturing the technology required to achieve net zero.

While the world is witnessing the incredible actions and ambition in accelerating renewable manufacturing capacity from Chinese energy corporate leaders, and the US has been galvanised into action by President Biden's staggeringly ambitious Inflation Reduction Act, Australian corporate and political leaders continue to delay the phase-out of still subsidised fossil-fuels across mining and refining operations. This headwind to decarbonisation [33] is endangering Australia's economy as our key trade allies will look elsewhere to source zero emission supply chains.

We need to act alongside China, and every other country, to decarbonise our global economy at speed and at scale. With Australia's abundant solar and wind resources to decarbonise our domestic and export industries, and China's world-leading cleantech exports, our two nations can go green together, crowding in both public and private capital via bilateral or multilateral climate cooperation platforms.

[33] CEF, Fuel Tax Credit Scheme and Heavy Haulage EV Manufacturing in Australia, 11 Sept 2023