CLIMATE ENERGY FINANCE

New green energy surges past coal in China

24 May 2023

Xuyang Dong, China Energy Policy Analyst, Climate Energy Finance

---

In the global race to decarbonize and meet growing energy demand, China is setting the pace for solar, wind and EVs.

Renewable energy is now leading China's newly added power capacity for the first time, even as new coal power plants continue to come online. During the first quarter of 2023, China added a record 50 GW of renewable energy capacity — making up 84% of total newly installed energy (see graph). Newly added coal power was 8.1 GW, just a 14% share, according to the National Bureau of Statistics (NBS).

With the U.S. Inflation Reduction Act (IRA) now driving decarbonizing investment in America and strong response initiatives underway in Europe, Canada, India and the U.K., an investment and technology race is now on around the world, not only to deliver emissions reductions but to take market leadership in emerging low and no carbon technologies and systems.

More than 70% of global energy demand growth is expected to come from China and greater Asia, according to a newly released Electricity Market Report 2023 from the International Energy Agency (IEA).

New capacity installed in China in 1QCY2023

		1Q2023	SHARE OF NEW ADDS	CHANGE (YOY%)	1QCY2022
Thermal power	GW	8.1	14%	39%	5.8
Hydropower	GW	2.7	5%	-21%	3.4
Nuclear power	GW	1.2	2%	3%	1.2
Wind power	GW	10.4	18%	32%	7.9
Solar power	GW	33.7	57%	155%	13.2
Other (biomass, W2E)	GW	3.0	5%	1200%	0.2
Total capacity added	**GW**	**59.0**	**100%**	**86%**	**31.7**
Renewable energy adds	GW	49.8	84%		24.8
Zero emissions capacity adds	GW	51.0	86%		25.9

Source: NBS, CEF Estimates

China continues to lead the world in all aspects of zero- emissions industries, both in domestic deployment and manufacturing supply chains for the domestic and export markets.

NBS data, however, shows that thermal power — mostly coal — still dominates China's installed electricity capacity at 1,340 GW, a 51% share (see graphic below), with hydro also a world leading 415 GW, including 47 GW of pumped hydro storage. China's wind capacity reached 375 GW and solar 426 GW, a combined 30% share of capacity, but far lower utilization rates means this translates into a modest 13% share of generation.

China approved two new coal power plants per week in 2022, the highest level of approvals since 2015, even as policy prioritized expansion of renewable energy capacity. As the South China Morning Post reports, this increase has raised concerns that these new coal plants will quickly become redundant, serving only as backup capacity if needed, while imposing a sizable financial burden on Chinese power generators.

Coal power expansion paints only half the picture. China is still very much the renewable energy world leader.

China's installed energy capacity at end March 2023

		1Q2023	SHARE OF CAPACITY	CHANGE (YOY%)	1QCY2022
Thermal power	GW	1,340	51%	3.0%	1,301
Hydropower	GW	415	16%	5.4%	394
Nuclear power	GW	57	2%	4.3%	54
Wind power	GW	376	14%	11.7%	336
Solar power	GW	426	16%	33.7%	319
Total of installed capacity	**GW**	**2,623**	**100%**	9.1%	2,405
Renewable energy adds	GW	1,217	46%	16.0%	1,049
Zero emissions capacity adds	GW	1,274	49%	15.4%	1,104

Source: NBS, CEF Estimates

Coal power expansion in China is a drag on global decarbonization efforts. Research by the IEA has shown that China must shift away from coal power as soon as possible, and accelerate its diversification into zero-emissions alternatives if the world is to stay below 1.5C of warming. The portion of zero-emissions power generation in China's electricity grid needs to scale up quickly in order to meet growing domestic energy demand.

During China's National People's Congress (NPC) and Chinese People's Political Consultative Conference (CPPCC) in March, China set targets for further reducing the energy intensity of the country's GDP by 2% annually, but without setting a cap on energy consumption in its new development plan.

Solar burst

In the first quarter of 2023, China invested RMB 52.2 billion (US$7.46bn) in solar PV power, up a massive 178% year on year. Some 33.7 GW of newly built solar power was connected to the grid, an increase of 154.8% year on year. As a result, by the end of the first quarter, China's installed capacity of PV power reached 426 GW in total, including 249 GW of centralized PV and 176 GW of distributed PV. This is over 40% of the total global installed solar capacity in 2022 of 1,047 GW reported by the International Renewable Energy Agency (IRENA).

China sails ahead on wind power

Wind power investment in China reached about RMB 24.9 billion (US$3.56bn) in the first quarter of 2023, a year-on-year increase of 15.0%. Newly added grid-connected capacity reached 10.4 GW — 9.9 GW of onshore and 0.5 GW of offshore wind power. As of the end of the first quarter, installed wind power capacity reached 376 GW — 345 GW onshore and 30.9 GW offshore — a year-on-year increase of 11.7%.

China is the world's leading operator of both offshore wind — with a global share of 49%, double the U.K.'s 22% — and of onshore wind, with a 40% global share, more than double the U.S.'s 17%.

Slowing the flow of hydro

After decades of increasing capacity in hydro power, China is transitioning its focus away in 2023, reflecting the approaching capacity limits on remaining rivers.

As of the end of the first quarter of 2023, cumulative installed hydro power capacity reached 415 GW, comprising 368 GW conventional hydro power and 46.99 GW pumped storage, a 5.4% year-on-year increase. However, newly added grid-connected hydro power capacity declined to 2.7 GW in the first quarter, down 21% year-on-year. New investment for hydro power during the first quarter fell 7.8% to RMB 16.8 billion (US$2.4bn).

Nuclear still powering on

China is expected to become the world's largest generator of nuclear power by 2030, with the country expected to further expand its nuclear capacity to become an economic growth point.

In the first quarter of 2023 China added 1.2 GW of new nuclear power capacity, an increase of 2% year on year. Total installed nuclear capacity by March 2023 was 56.8 GW, a 4% increase year on year. There are currently 24 nuclear power units under construction, with a capacity of about 26.8 GW, an expansion that ranks first globally. Some 54 commercial nuclear power units are online in mainland China, with a total capacity of 56.8 GW, ranking third globally. Nuclear power accounts for 2.2% of China's installed electricity capacity.

Scaling biomass

China is also scaling up its biomass power generation. In the first quarter of 2023, the country's biomass power generation added 630 MW to the grid, and the cumulative installed capacity reached 41.95 GW, a year-on-year increase of 8%.

Pumped hydro and battery storage to shore up grid reliability

Pumped hydro storage (PHS) increased by 1.5 GW in the first quarter of 2023 to 47 GW, making China by far the largest operator of PHS in the world, ahead of second-ranked Japan, with 22 GW, and the U.S. with 19 GW. PHS and batteries will both play an increasingly critical role in ensuring grid reliability as the penetration of variable renewable energy rises. New energy storage capacity, principally batteries, reached 8.7 GW by the end of 2022, up 110% year on year. This puts China on track for its 50 GW target of battery capacity by 2025, second only to the U.S.

Massive drive toward EVs

Beyond the staggering numbers around renewable power generation expansion, China has also been massively electrifying its mobility. A recent Climate Energy Finance report showed that in the first quarter of 2023 China's auto-export market grew 71% year on year to almost 1 million vehicles, with 25% of these being electric. China surpassed Germany to become the second-largest auto exporter of all types of vehicles, behind Japan.

EVs reached a 29% market share of domestic passenger vehicle sales in China and the country is dramatically escalating the manufacturing of EVs for both its domestic market and for export.

With China leading the world in all aspects of the global development of zero-emissions industries in both domestic deployment and exports, and the world's leading markets now responding with aggressive decarbonizing investment and technology initiatives, global climate ambition may be starting to level up to the size and scale of the global climate challenge.

Contributing editors: Annemarie Johnson, CEF; Tim Buckley, CEF; Blair Palese, Climate Capital Media