



China's Strategy and Implementation Plan to Achieve Carbon Neutrality and To Become the Leading Green Energy, Zero-Carbon Factory Floor of the World

By [Nicholas V. Chen](#)*

*Special thanks to Victoria Lee, Jose Ponce, Juan Madrigal
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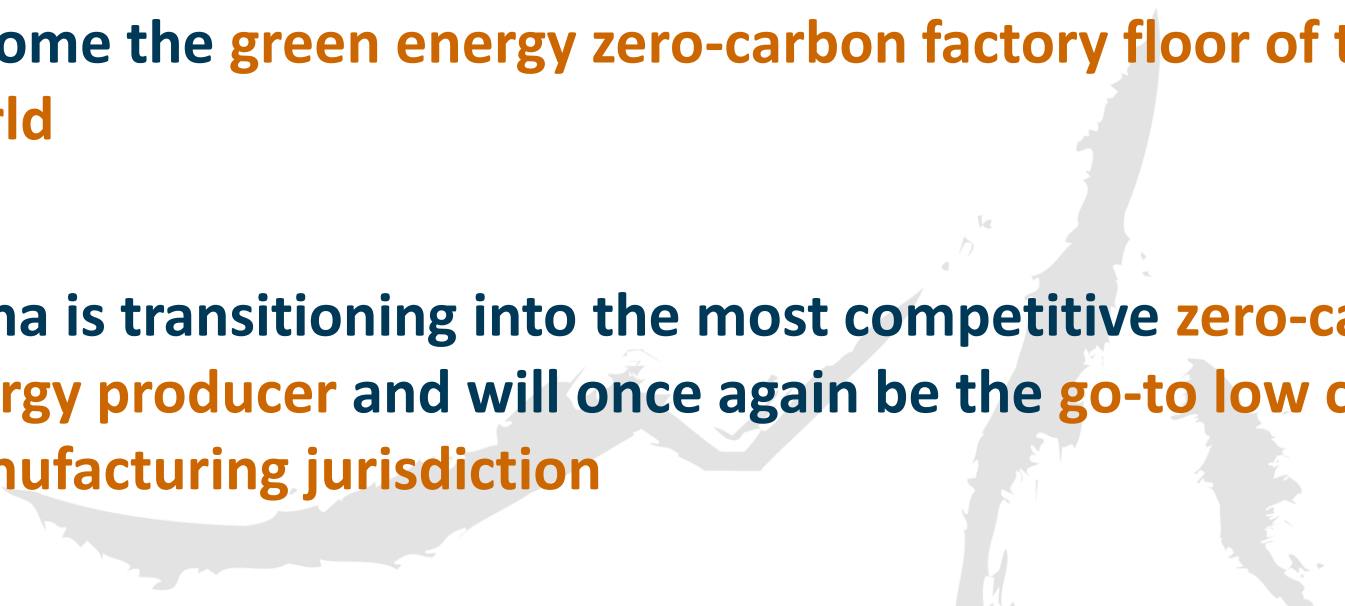
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Introduction

- Future successful economies must produce enough zero-carbon energy to ensure their exports are competitive to meet the rising global trend of border carbon taxes
 - China is actually implementing and funding its plan to become the **green energy zero-carbon factory floor of the world**
 - China is transitioning into the most competitive **zero-carbon energy producer** and will once again be the **go-to low cost manufacturing jurisdiction**
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Introduction

- China is **implementing an energy transition process** to transform itself from current **68%/32%** fossil fuel/zero-carbon energy to a future **14%/86%** fossil fuel/zero-carbon energy jurisdiction by 2060
- With China's green energy transition, **many global companies will migrate to the most competitive green energy jurisdiction**

China is the World's Largest GHG Emitter

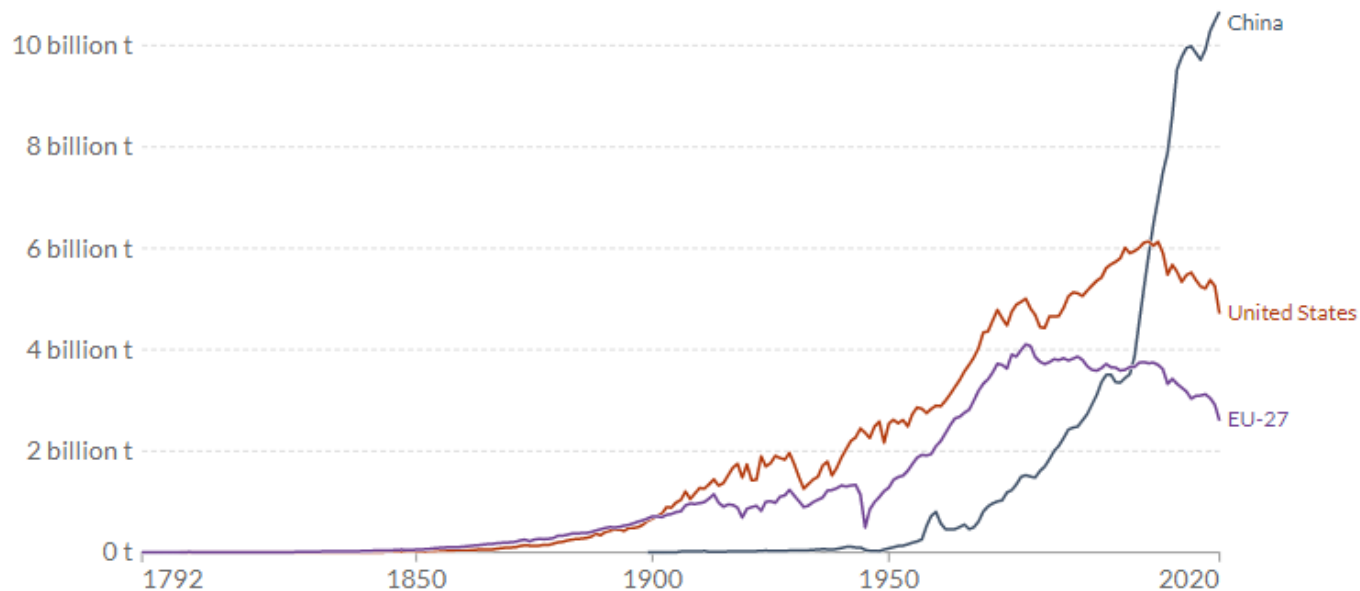
China is the largest emitter of GHG globally

Annual CO₂ emissions

Carbon dioxide (CO₂) emissions from the burning of fossil fuels for energy and cement production. Land use change is not included.

Our World
in Data

LINEAR LOG **+** Add country Relative change



Source: Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

Note: CO₂ emissions are measured on a production basis, meaning they do not adjust for emissions embedded in traded goods.

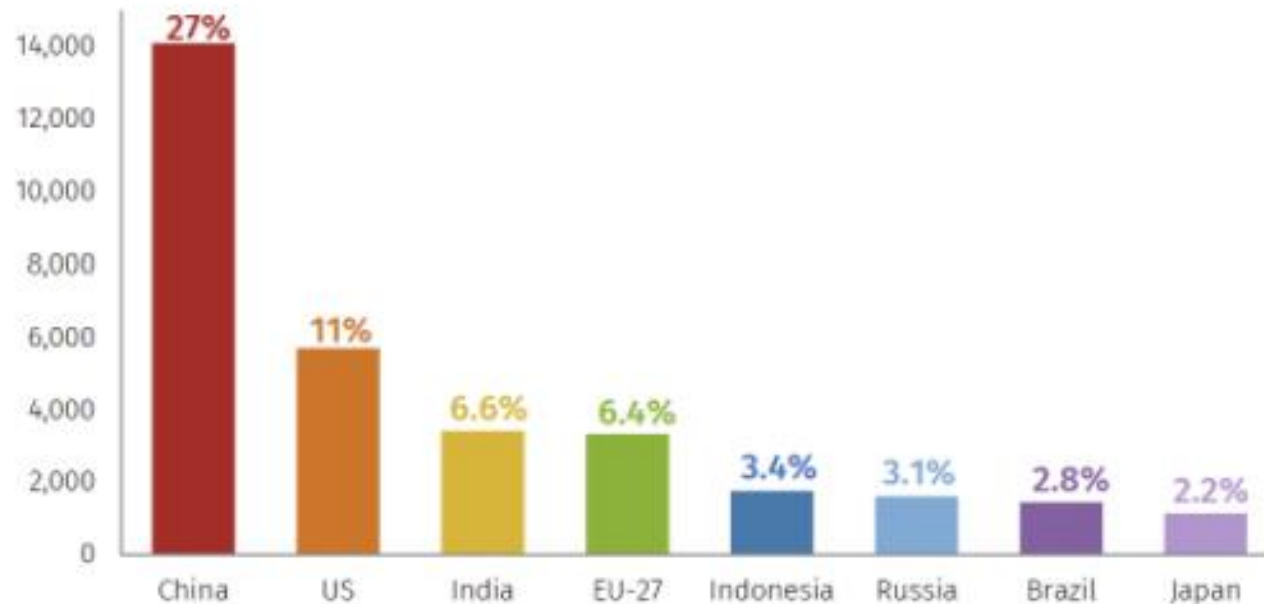
China is the World's Largest GHG Emitter

China accounts for 27% of total worldwide GHG emissions

FIGURE 1

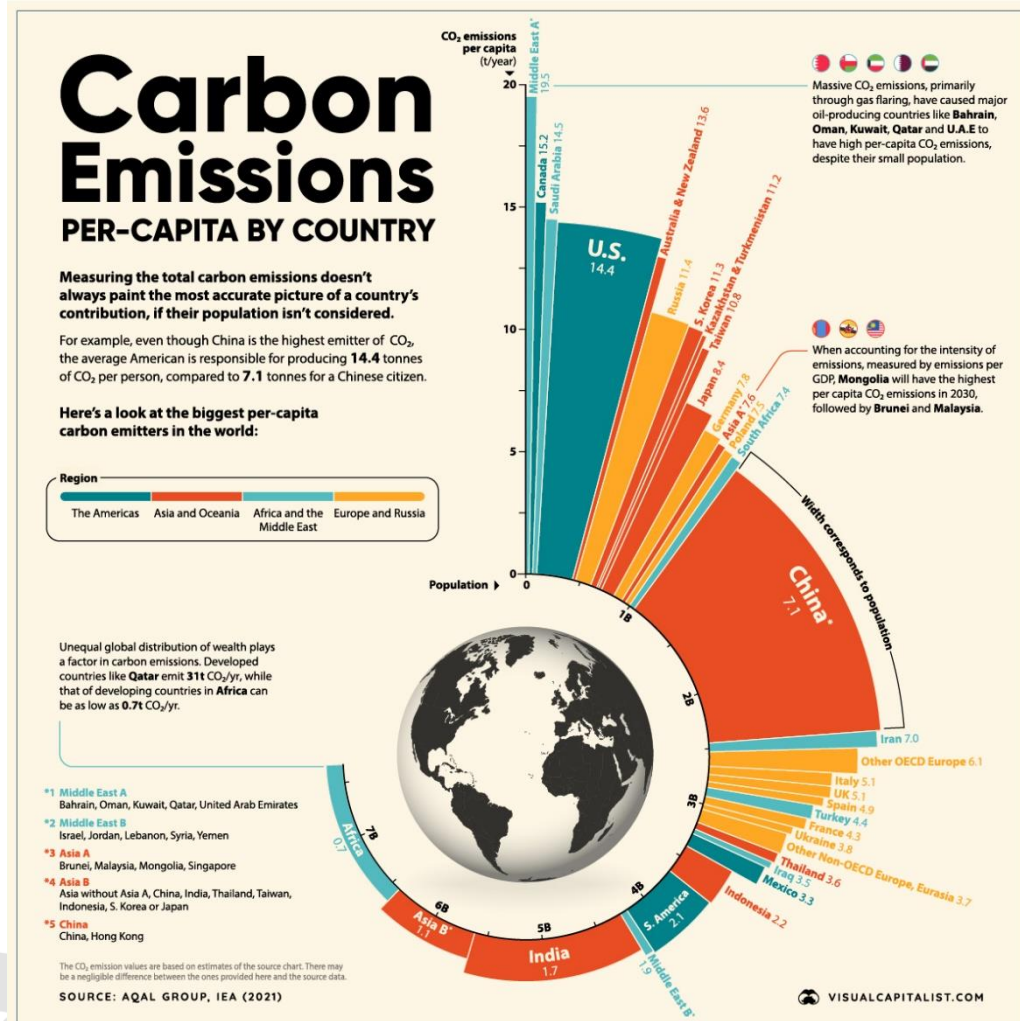
2019 net GHG emissions from the world's largest emitters

Million metric tons of CO₂e, including emissions and removals from land-use and forests and share of global total



Source: Rhodium Group

China is the World's Largest GHG Emitter



China is the 34th largest emitter per capita (7.4 tons per year) of carbon emissions

Inadequate Power Supply and Increasing Demand

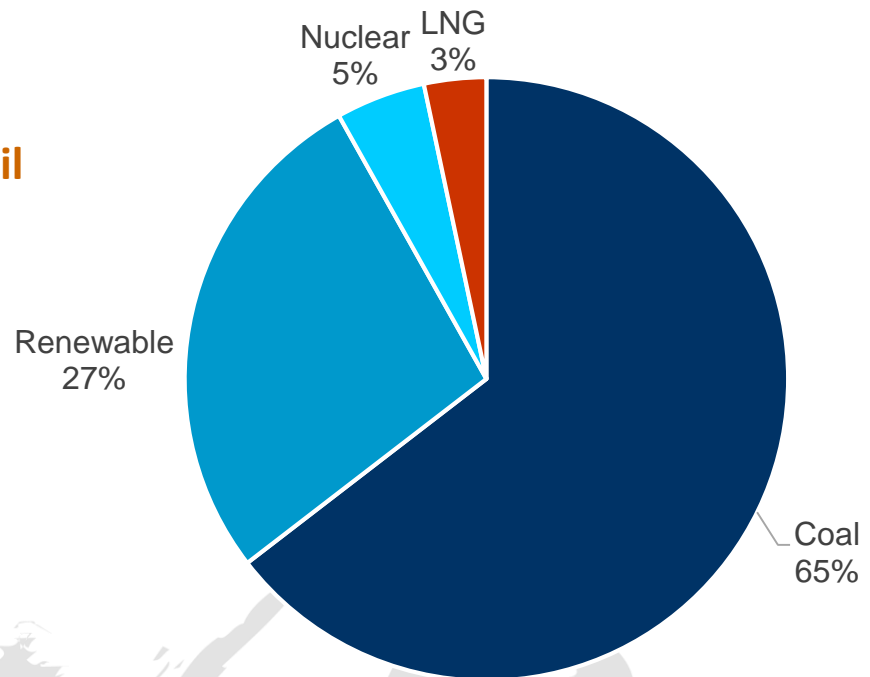
- During 2021, factories in 20 of China's 31 provinces suffered power losses
- China is the largest coal producer and its prices soared last year in response to increasing demand
- China **opposes the continued production of electricity to be dependent on coal**
- In many provinces, **outages were ordered by officials seeking to meet administrative energy targets**
- China has been rapidly expanding its energy output in natural gas, solar panels, wind turbines and hydroelectric dams. **Yet China still does not have enough energy to meet demand.**

China Key Energy Statistics (2020)

Energy Generation Rates Mirror Consumption Rates

- **Total Installed Capacity:**
 - ▶ 2,200 GW (2020)
- **32% zero-carbon supply vs 68% fossil**
- **Electricity Generation:**
 - ▶ 7,626,400 GWh (2020)
- **Electricity Consumption:**
 - ▶ 7,514,000 GWh (2020)
- **Generation Growth Rate:**
 - ▶ 9.26% (2000-2020 avg.)
- **Consumption Growth Rate:**
 - ▶ 9.25% (2000-2020 avg.)

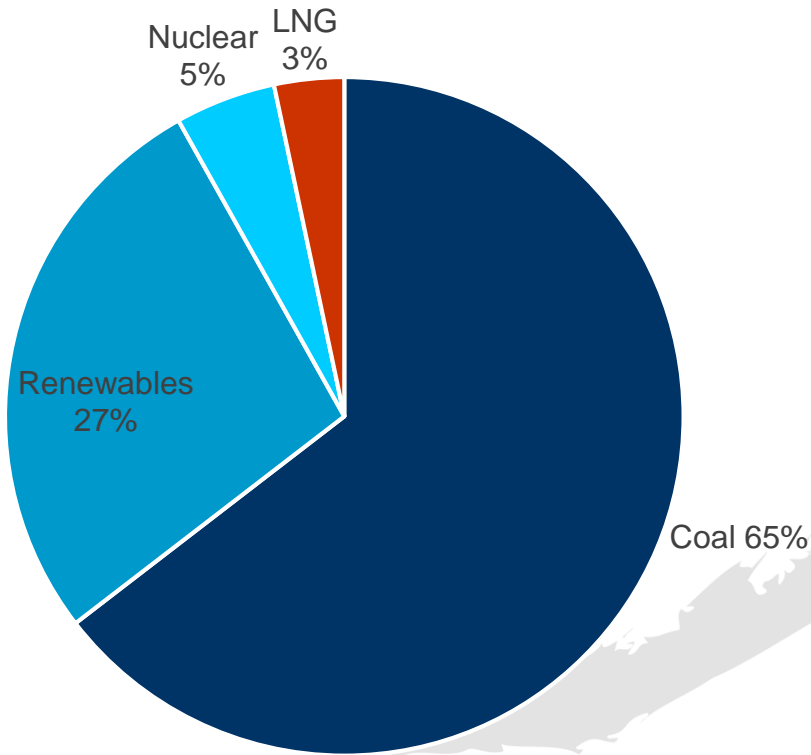
Electricity Generation



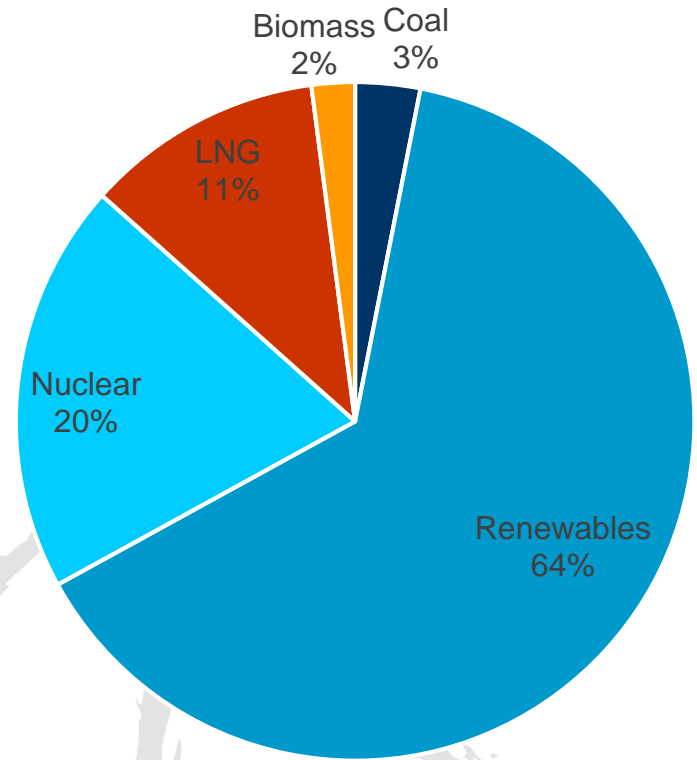
China Plans to Increase its Share of Zero-Carbon Energy Generation

China plans to increase zero-carbon energy production by 163% between 2020 and 2060

Electricity Generation 2020



Electricity Generation 2060



China Plans to Increase its Share of Zero-Carbon Energy Generation

Energy Source	2020	2060	% Change	
Coal	65%	3%	-95%	↓
Renewables	27%	64%	+137%	↑
Nuclear	5%	20%	+300%	↑
LNG/Oil*	3%	11%	+266%	↑

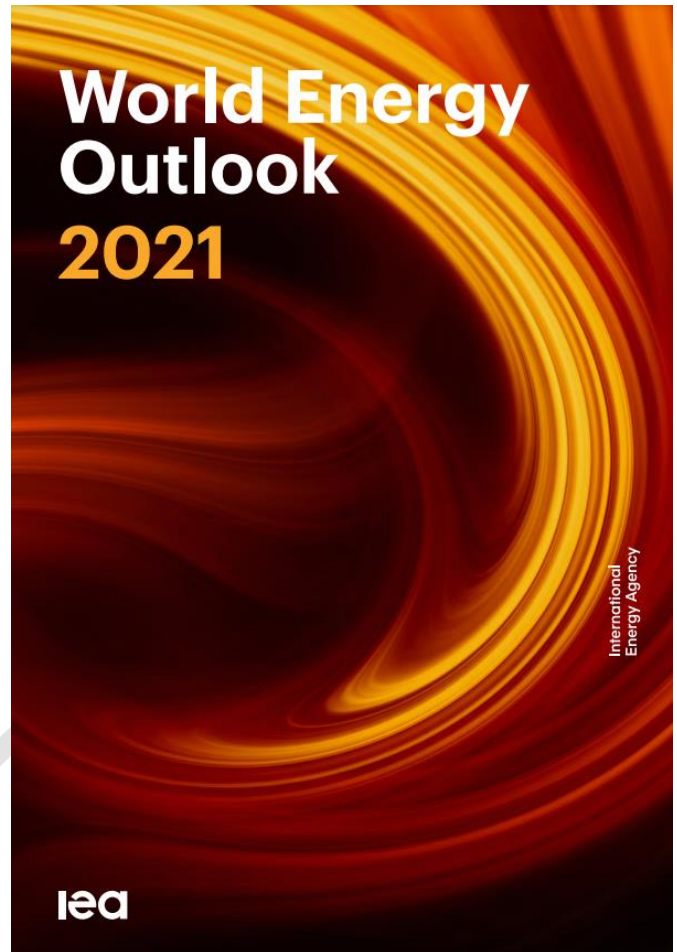
* The rise in the use of LNG/Oil is due to the relationship and pipelines between China and Russia. LNG is slightly cleaner than coal and is considered a transition fuel by the new EU Taxonomy.

The Global Imperative for Decarbonization

- The global economy is going carbon free. **China is planning to rapidly decarbonize its electricity supply**
 - **China plans to replace 68% of its fossil fuel-generated electricity with carbon-free sources**
 - **China cannot risk not being able to export to global markets**
 - **Chinese industries face an existential threat from the “perfect storm” combination of:**
 - ▶ Global Climate Crisis
 - ▶ Global Border Carbon Taxes (Public Sector Push)
 - ▶ RE100 Commitments by MNC Supply Chains (Private Sector Push)
 - ▶ Global Supply Chain
- 

Global Climate Crisis

“It is hard to understate the dangers inherent in today’s shortfall in spending on clean energy transitions, compared with the levels required. If we do not correct it soon, the risks of destabilising volatility will only grow as we move forward.”



China's Energy Transition

China is the number 1 country investing in energy transition

- **Global investment in energy transition hit USD775 billion in 2021**
- **China accounted for over 35% of the total global investment with USD266 billion**
- **China increased its overall energy transition investment by 60% from 2020 levels**

China's Energy Transition

China is the number 1 country investing in energy transition

	Country	Investment (Billions of US\$)	% of Global Total
1	China	266	35
2	United States	114	15
3	Germany	47	6
4	United Kingdom	31	4
5	France	27	4
6	Japan	26	3
7	India	14	2
8	South Korea	13	2
9	Brazil	12	2
10	Spain	11	2

Source: CSIS China Power Project; BloombergNEF

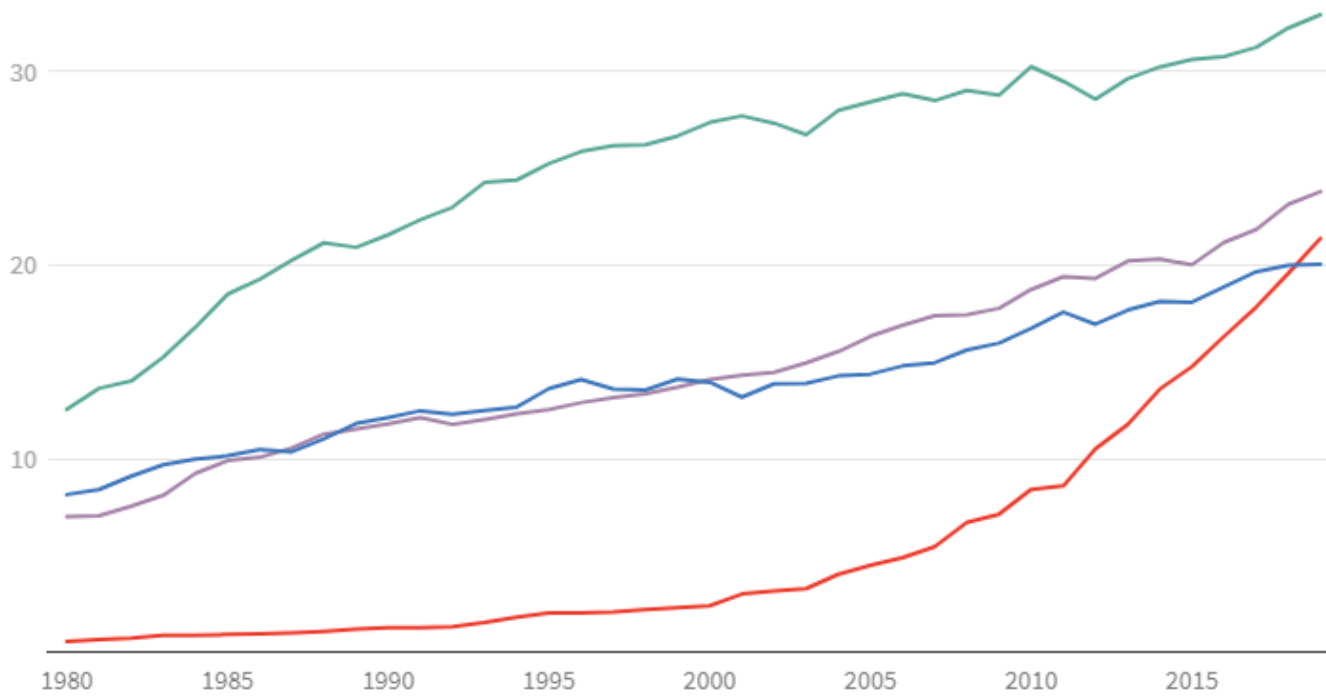
China's Energy Transition

Between 2000 and 2019 China increased its zero-carbon energy production by **776%**

Global Renewable and Nuclear Energy Production

Quadrillion BTU (Quad BTU)

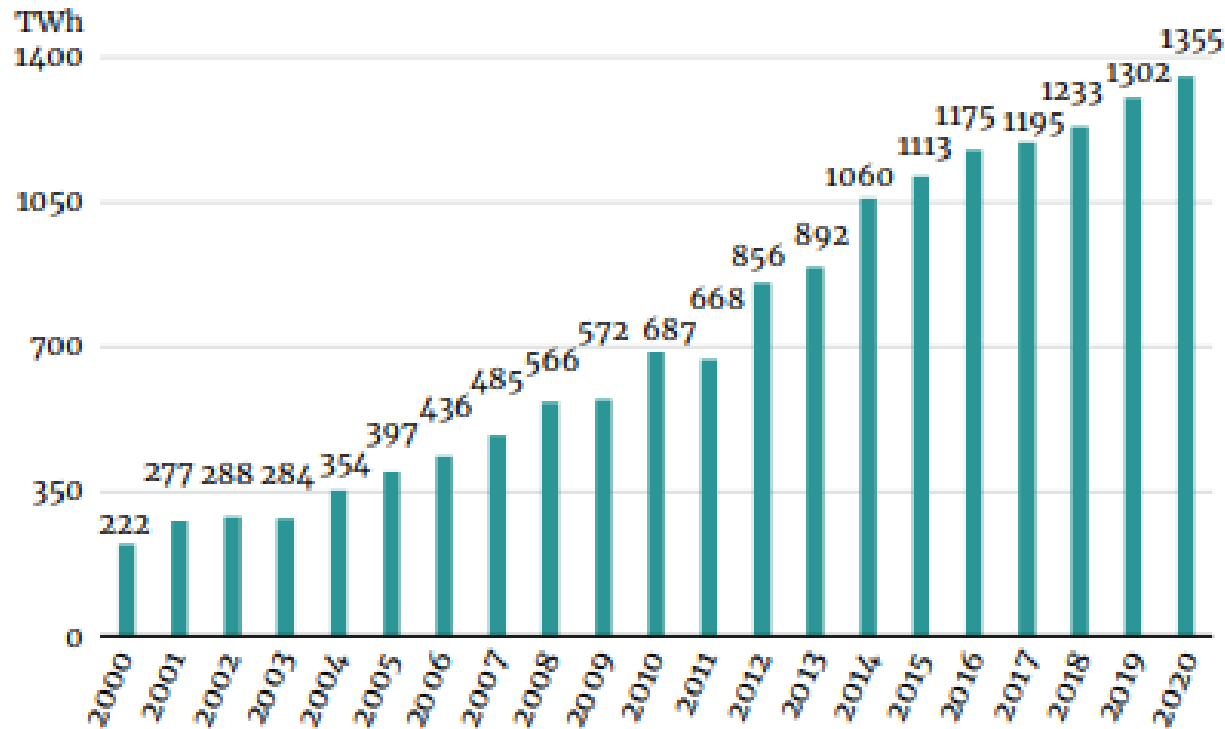
— China — United States — Rest of OECD — Rest of World



Source: CSIS China Power Project; US Energy Information Administration

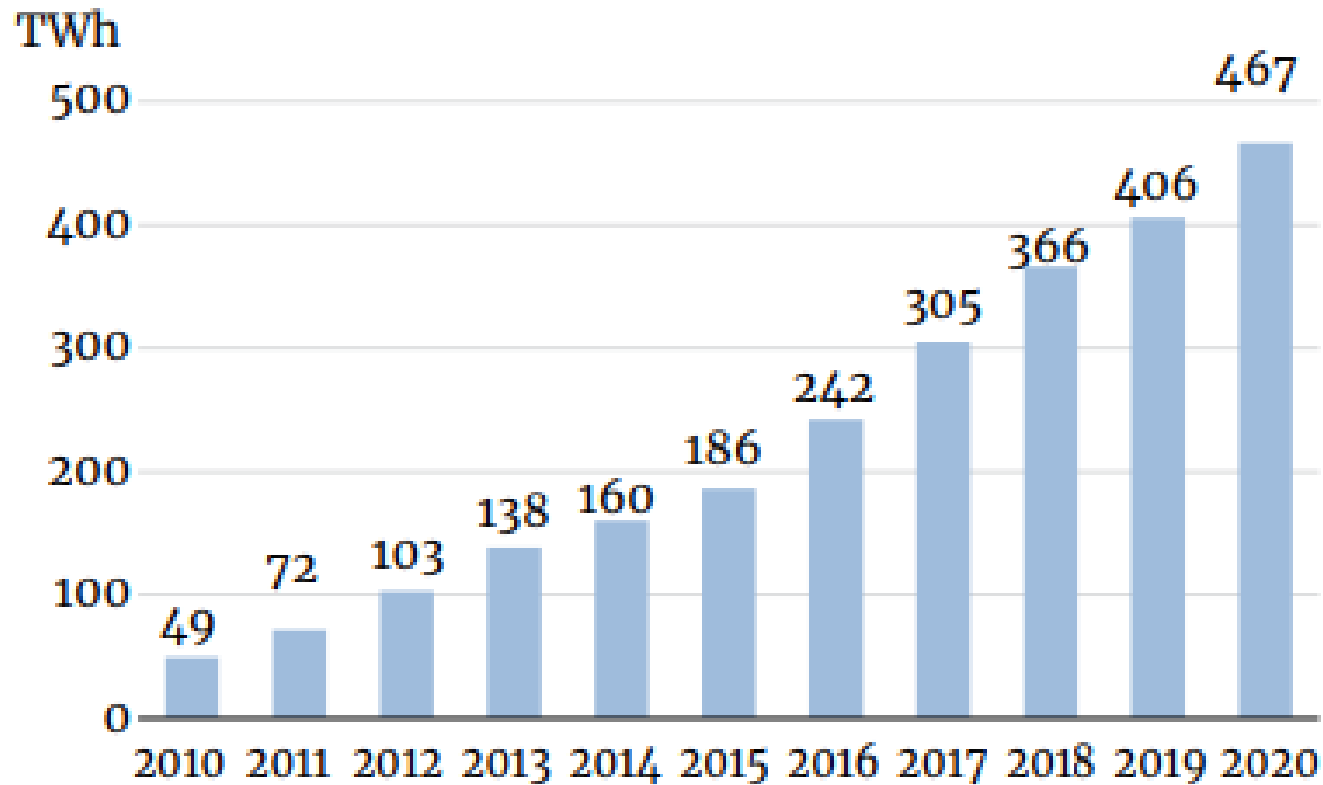
China's Energy Transition

Hydro energy generation has grown **510%** in past 20 years



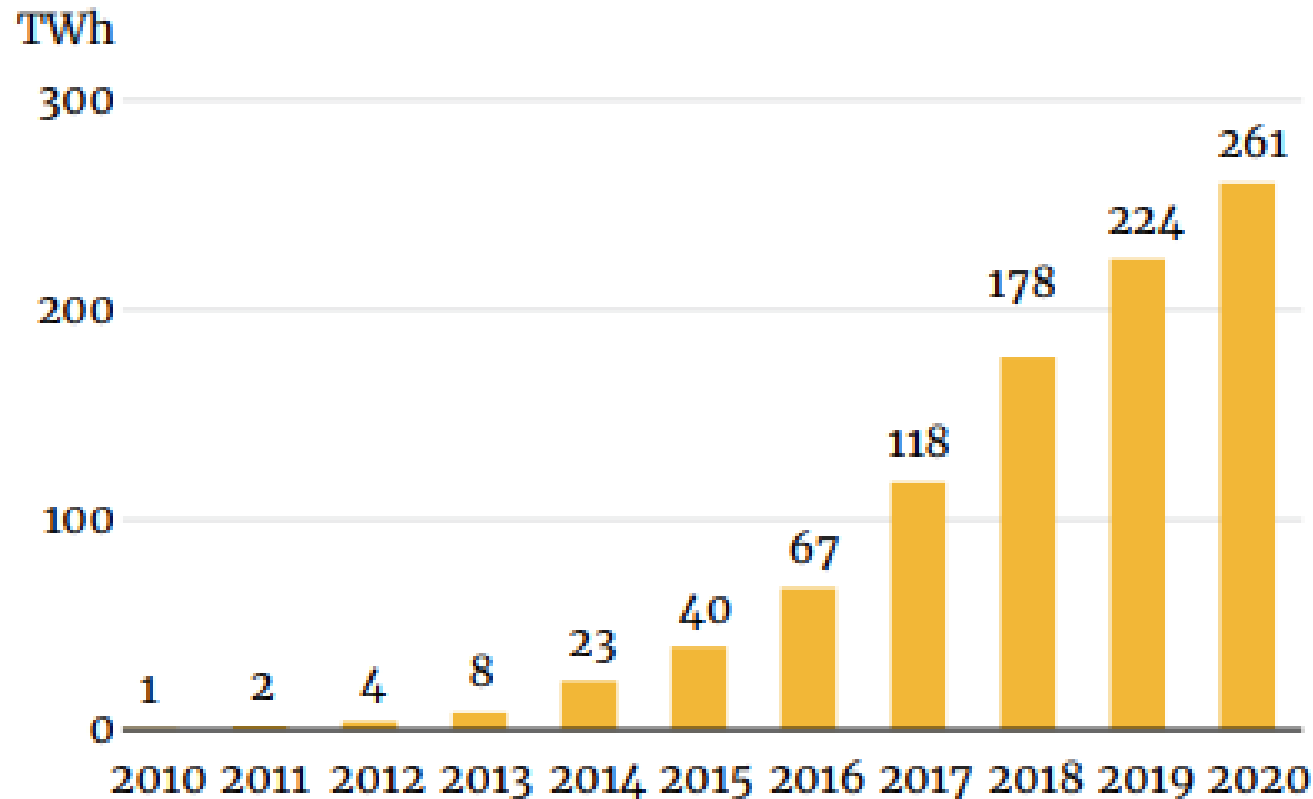
China's Energy Transition

Wind energy generation has grown over **850%** in the past 10 years



China's Energy Transition

Solar energy generation has grown **26,000%** in the past 10 years



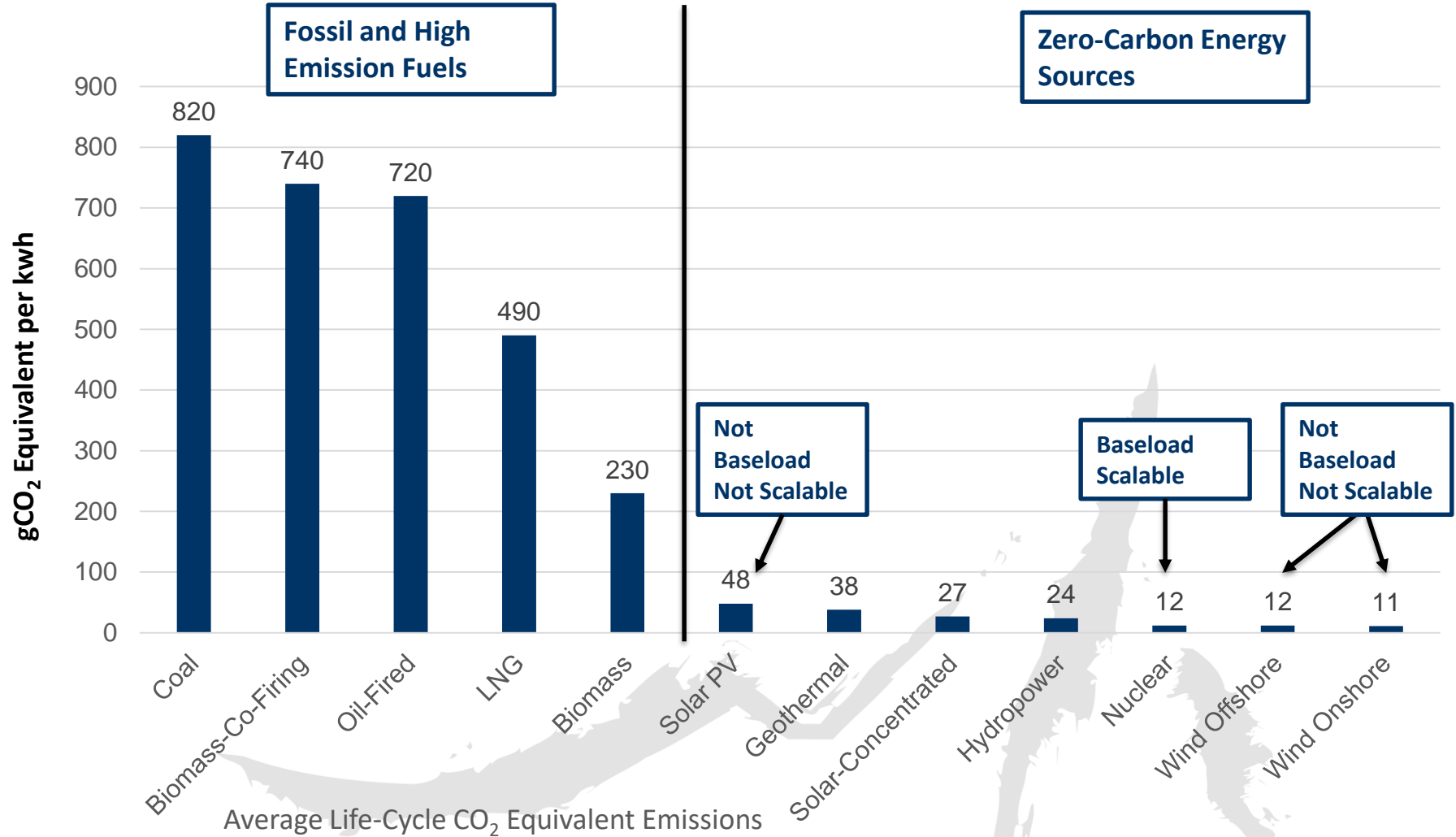
Global Carbon Taxes

- **The European Union’s Carbon Border Adjustment Mechanism (“CBAM”) will effectively levy a carbon tax on products with high carbon footprints**
 - ▶ Certain products will require disclosure of “embedded emissions” in 2023, and tariffs will enter into effect in 2026
 - ▶ The list of “in-scope” products will likely expand over time
- **The U.S. is behind, but moving in the same direction**
 - ▶ There are currently over 10 bills introduced to the House of Representatives authorizing different forms of carbon taxes
- **China recently launched a national emissions trading scheme**
 - ▶ It has been criticized for not being ambitious enough, however it shows the government’s intention to move in this direction

RE100 Commitments

- **Over 300 global companies have made public commitments to source 100% renewable energy in the next decade (RE100)**
 - ▶ Including **over 88 MNCs active in China and 4 China-based companies**
 - ▶ **28% of RE100 members will depend on China to achieve 100% renewable electricity globally**
- **China RE100 Members**
 - ▶ **Envision Group, Jinko Solar, LONGi, Sun Grow**
- **It will be impossible for RE100 members to reach their commitments with the current electricity mix in China, which relies heavily on fossil fuels**

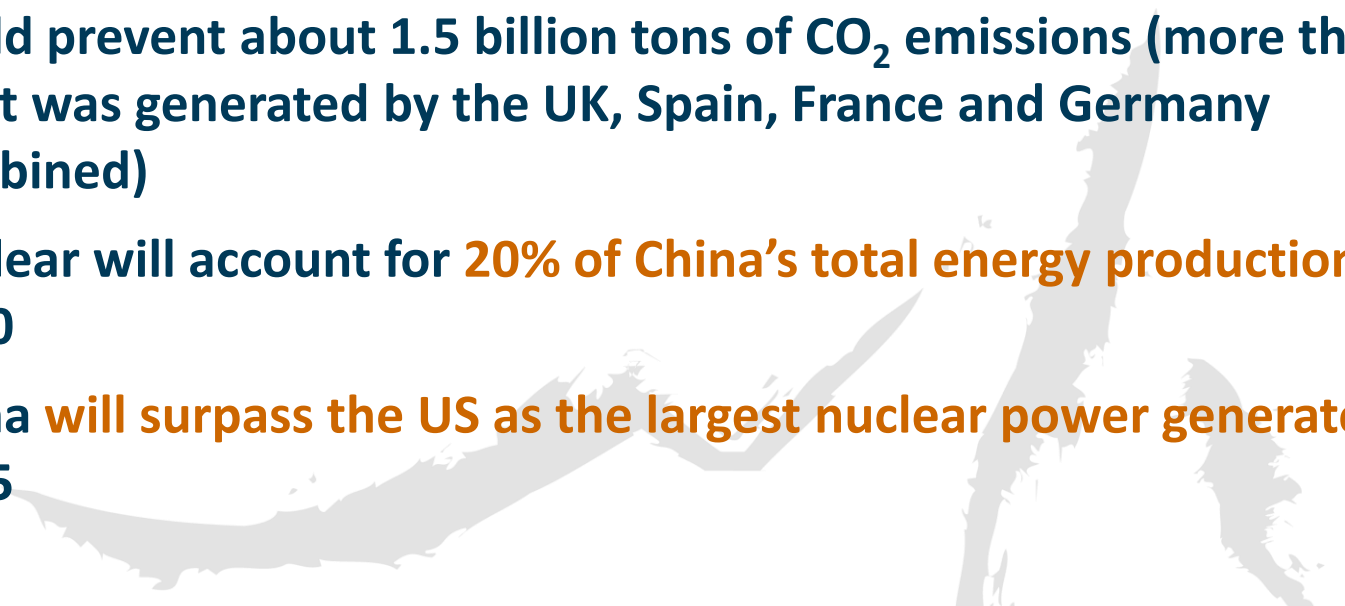
Nuclear Is a Reliable Source of Baseload Carbon-Free Energy



Source: <https://www.world-nuclear.org/information-library/energy-and-the-environment/carbon-dioxide-emissions-from-electricity.aspx>

China Will Rely Heavily on Nuclear Energy to Decarbonize

China will build 150 new nuclear reactors in the next 15 years

- **USD440bn Investment**
 - **China General Nuclear Power Corp (GNC) will produce 200 GW by 2035, enough power for more than a dozen cities the size of Beijing**
 - **Could prevent about 1.5 billion tons of CO₂ emissions (more than what was generated by the UK, Spain, France and Germany combined)**
 - **Nuclear will account for 20% of China's total energy production by 2060**
 - **China will surpass the US as the largest nuclear power generator by 2025**
- 

Source:

<https://www.taipeitimes.com/News/editorials/archives/2021/11/06/2003767397>

China Will Rely Heavily on Nuclear Energy to Decarbonize

Nuclear energy is zero-carbon, consistent and steady for baseload power as well as price competitive

- Nuclear power is the world's **best hope for a low-carbon or zero-carbon future**
- China is engaged in a wholesale transition of its energy sector
- China's goal is to **replace nearly all of its 2,990 coal fired generators by 2060**
- This will produce windfall revenues and profits to GNC, China National Nuclear Power Co and China Nuclear Engineering and Power Corp, all listed companies

Source:

<https://www.taipeitimes.com/News/editorials/archives/2021/11/06/2003767397>

China Will Rely Heavily on Nuclear Energy to Decarbonize

- **Since 1993, China has built 5 overseas reactors in:**
 - ▶ Pakistan (2), Romania(2), Argentina(1)
- **In 2019, the former chairman of GNC stated they could build up to 30 overseas reactors by 2030 earning USD145billion**
 - ▶ Iran, Kenya, Egypt, Sudan, Kazakhstan, UK, South Africa, Armenia
- **China's nuclear technology is the most cost effective and safe and flexible nuclear reactors**

China Will Rely Heavily on Nuclear Energy to Decarbonize

- China has enhanced reactor technology and counts with multiple reactor types to be used both in China and abroad
 - ▶ Hualong One
 - ▶ CAP1000
 - ▶ CPR-1000
 - ▶ ACP100
 - ▶ ACPR1000



Hualong One reactor in Karachi, Pakistan

China Will Rely Heavily on Nuclear Energy to Decarbonize

- 70% of the costs of Chinese reactors are covered by low interest state bank loans 1.4% interest
- Nuclear costs **USD42/MWh in China vs USD97/MWh in developed countries**
- World Nuclear Association says China can build plants at about USD2500/KW, about 1/3 the cost of US/France.
- Following Fukushima, China has completed deep safety reviews and now includes active safety measures
- China has addressed technical and safety concerns that continue to limit public support and investment in democratic countries
- **The Chinese Hualong reactor has been proven safe by other countries including the UK**
 - ▶ China wants to showcase its technical skill in Europe with a different reactor design

China Will Rely Heavily on Nuclear Energy to Decarbonize

- In September 2021 China announced a successful test of a new modular, **thorium-fuelled reactor**
- Experts say that **China is the first to have a shot at commercializing the technology**
- The reactor is unusual in that it has molten salts circulating inside instead of water
- It has the potential to produce nuclear energy that is relatively safe and cheap, while also generating a much smaller amount of very long-lived radioactive waste than conventional reactors.

China's Goal is to Achieve Net-Zero by 2060

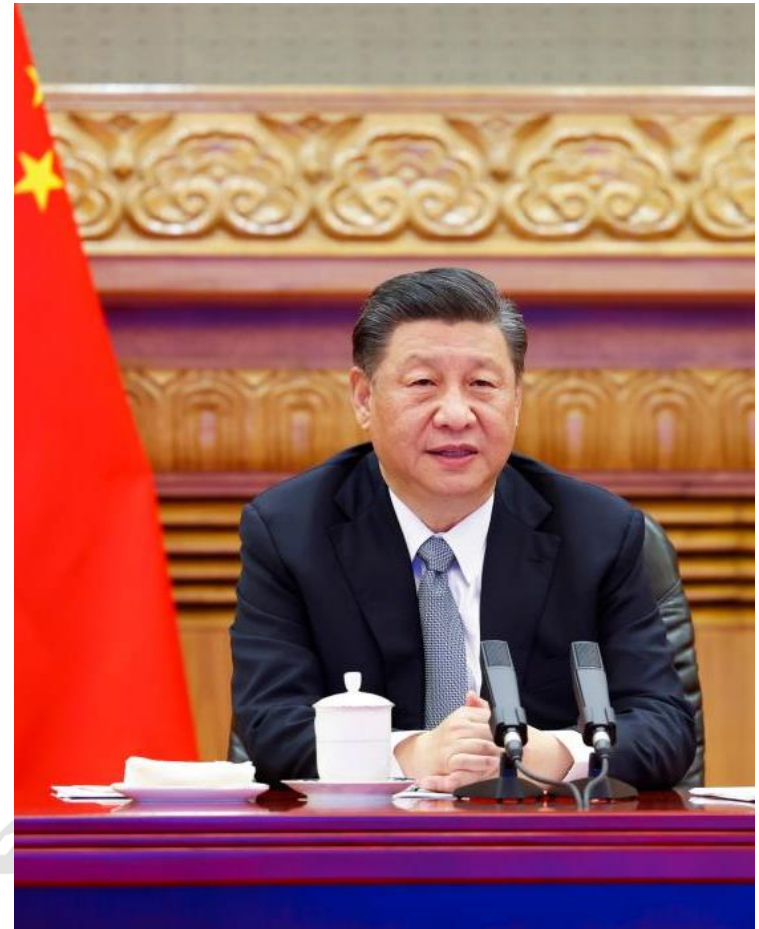
China's goals

- Achieve **peaking of CO₂ emissions before 2030**
 - Achieve **carbon neutrality before 2060**
 - Lower CO₂ emissions per unit of GDP by more than 65% from the 2005 level by 2030
 - Increase share of non-fossil energy consumption to 25% by 2030
 - Increase the forest stock volume by around 6bn m³ on the 2005 level by 2030
 - Raise installed capacity of wind and solar to more than 1200GW by 2030
-

China's Goal is to Achieve Net-Zero by 2060

Phasing down coal

- China is the Saudi Arabia of coal
- China plans to reach peak coal consumption by 2025
- “China will start phasing down coal use from 2026 as part of its efforts to slash greenhouse gas emissions”
- “China has committed to move from carbon peak to carbon neutrality in a much shorter timespan than what many developed countries might take, and that requires hard efforts from China” - **President Xi Jinping**

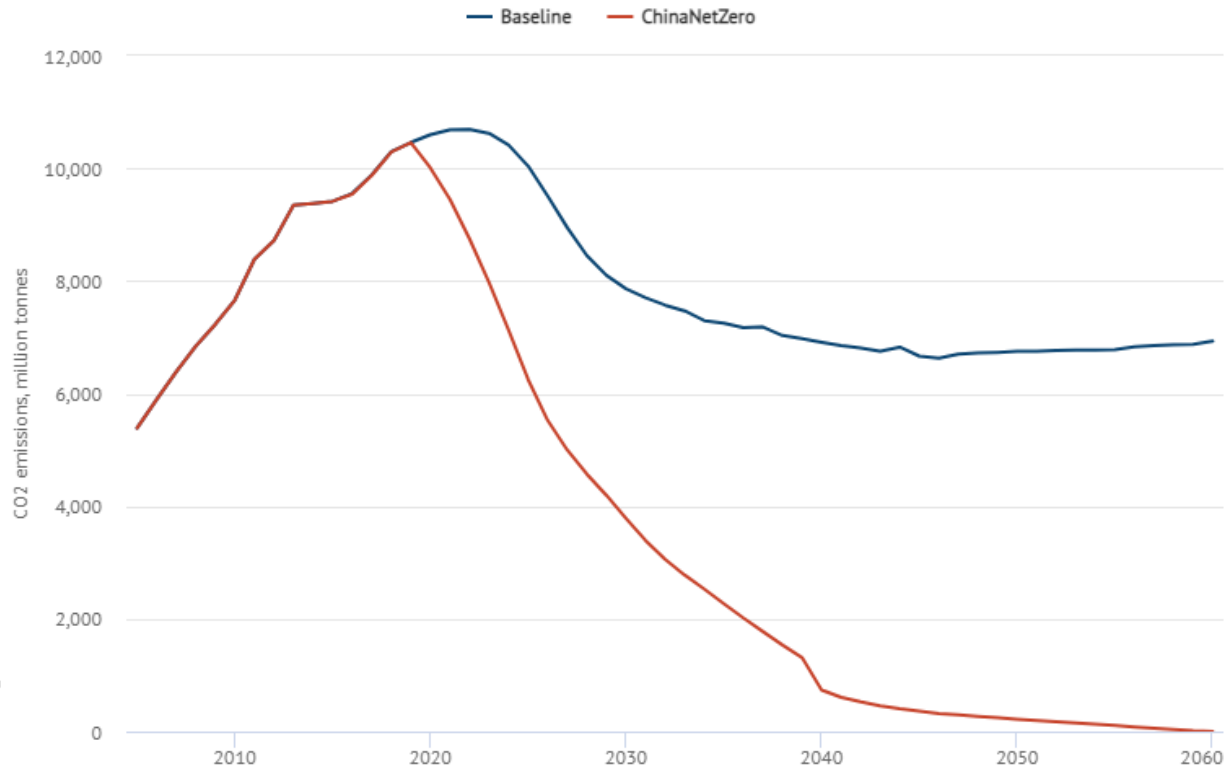


China's Goal is to Achieve Net-Zero by 2060

Under the 2060 net-zero pledge, China would reduce emissions larger than those from the state of California every year between 2030 and 2060

China's 2060 'carbon neutrality' pledge could avoid 215bn tonnes of CO2 emissions

CO2 emissions under baseline policies versus the 2060 'carbon neutrality' goal, millions of tonnes



China's Goal is to Achieve Net-Zero by 2060

Unlike most countries, China has surpassed most of its climate and energy related targets and has set even more ambitious goals



Target type	13th FYP (2016–2020)	Actual achievement by 2020	14th FYP (2021–2025)*
Carbon intensity	18% decrease from 2015	18.8%	18% decrease from 2020
Energy intensity	15% decrease from 2015	13.7%	13.5% decrease from 2020
Nonfossil share of primary energy consumption	15%	15.9%	20%
Hydropower	350 gigawatts	370.16 gigawatts	-
Wind power	200 gigawatts	281.53 gigawatts	-
Solar power	100 gigawatts (increased to 150 gigawatts during 13th FYP period)	253.43 gigawatts	-
Nuclear power	58 gigawatts	49.89 gigawatts	70 gigawatts

China's Goal is to Achieve Net-Zero by 2060

China's domestic Emissions Trading Scheme ("ETS")

- ETS objective is to contribute to the effective control and gradual reduction of carbon emissions in China
 - ▶ Started operating in 2021
 - ▶ Has been criticized as a pay-to-pollute scheme
- **The scope of the ETS starts with the power sector and will be gradually expanded to cover seven other sectors:** petrochemical, chemical, building materials, steel, nonferrous metals, paper, and domestic aviation
- At first it will cover over 2,200 companies from the power sector that emit more than 26,000 tons of CO₂ per year
- **ETS is estimated to cover more than four billion tons of CO₂, accounting for ~40% of national carbon emissions**
- Provincial-level ecological and environmental authorities will organize the verification of GHG reports.

China's Goal is to Achieve Net-Zero by 2060

“China has the means and capabilities to accomplish an even faster clean energy transition. **An accelerated transition would put China's CO2 emissions into marked decline after 2025, opening up the possibility of China reaching carbon neutrality well before 2060.**”

– Faith Birol, Director,
International Energy Agency



The Opportunity

- In the next 40 years China plans to transition to using energy that is:
 - ▶ Carbon-Free
 - ▶ Reliable (produces baseload power)
 - ▶ Safe
 - ▶ Affordable
 - ▶ Scalable
 - ▶ Resilient (resistant to natural disasters or armed conflict)
 - **This is the largest supply/demand gap opportunity for the next century in China**
 - **The ample supply of carbon-free power will force supply chains to stay in or migrate to China**
- 


China's Compelling Green Competitive Advantage

Measures are actually taken to meet **energy demand** and **net-zero goals**

China is on the way to become the green factory floor of the world

- China has actual decarbonization plans
- China will be able to provide green energy and attract companies in the global supply chain with zero-carbon energy requirements (e.g. RE100)
- China will continue to be the factory floor of the world with lower costs of power and zero-carbon energy
- Other markets will be pressured to develop zero-carbon energy

Comparing China and Taiwan's Decarbonization Progress

- Other than the stated 80%/20% fossil fuels/renewable energy goal, **Taiwan lacks further energy transition plans**
 - Foreign direct investment was the lowest in Taiwan in 2020, whereas China was the largest recipient
 - Taiwanese companies and industry associations are concerned about **lack of energy**
 - Companies and their supply chains will be forced to leave Taiwan
 - Eventual **failure to export** to regions with **strict green requirements**
 - Taiwan's economy would be in danger of collapsing if manufacturing supply chains are forced to move to a zero-carbon jurisdiction
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For More Information

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