



**Statement before the Senate Finance Subcommittee
on Fiscal Responsibility and Economic Growth**

***“Defending and Investing in U.S.
Competitiveness”***

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Chair Warren, Ranking Member Cassidy, and distinguished Members of the Subcommittee on Fiscal Responsibility and Economic Growth, thank you for the opportunity to appear before you to discuss the rise of Chinese competitiveness in energy technology sectors and their environmental and climate implications.

China's emergence as a globally competitive force in energy technology sectors is a complex and evolving story. The country is the largest producer and consumer of coal as well as the top official financier and exporter of coal-fired power plants in the world. At the same time, the country is a leading exporter of clean energy technology components, as well as the preeminent force along the supply chains for many minerals important for such technologies today. The rise of China as a manufacturer and exporter of a range of energy technologies has been fueled by their government's long-term commitment towards investing in public research and development capacity, and nurturing manufacturing clusters in these sectors. The lagging state of environmental protections as well as weak climate considerations have also aided China's emergence in various energy technology fields. While China may continue to manufacture and export carbon-intensive energy projects, the country is also a major manufacturer and exporter of energy technologies that have more limited emissions profiles. My testimony focuses on the status of the Chinese position in select energy technology sectors and their climate implications.

Coal-fired power generation:

In his speech to the United Nations General Assembly in September 2020, President Xi Jinping of China announced the country's intent to achieve carbon neutrality by 2060. Moreover, at the Leaders' Summit on Climate in April, Xi reaffirmed his earlier commitment to peak the country's emissions by 2030, and announced China's intent to begin phasing down coal consumption in the latter half of this decade. These are undoubtedly welcomed developments.

However, coal continues to be a major source of China's energy supply as well as a focus of energy infrastructure exports and financing. While the share of coal-fired power generation has been declining in line with the country's official reduction targets, domestic construction has not ceased. In 2020, China built 38.4 gigawatts (GW) of new coal-fired generation capacity domestically. What's more, China is a major financier and exporter of high-carbon energy projects in the world. While China has provided its energy-related official development finance to a variety of fuel sources and technologies, the portfolio has historically been carbon intensive. Since 2000, China's two global policy banks—the China Development Bank and the Export-Import Bank of China—have financed over \$51.6 billion worth of coal projects globally, or about 21 percent of their total

energy related financing.¹ Although the share of coal financing under the Belt and Road Initiative (BRI) has declined since its peak at 46 percent in 2015, it still accounted for 27 percent in 2020.²

A combination of the desire of the Chinese government to address excess manufacturing capacity at home, the capacity of leading Chinese policy banks to support coal-fired power plant exports, as well as a wave of coal-finance bans/restrictions by multilateral development banks and other major investors have propelled Chinese banks to become a major source of financing for coal-fired power plants in the world. Coal-fired power plant export has allowed China to find work for its laborers and export plants that no longer met domestic environmental regulations.³ Unlike its peers in the advanced, industrialized countries, China's leading policy banks are not obligated to abide by the Organization of Economic Cooperation and Development (OECD) Sector Understanding on Export Credits for Coal-Fired Electricity Generation Projects that restricts coal-fired power finance. In fact, these official Chinese institutions merely subject their coal-fired power official development finance to existing host market environmental regulations.⁴ Moreover, Chinese policies governing the environmental aspects of their overseas investments are much weaker than those governing their domestic investment.⁵

Solar and wind power:⁶

China's strong export position has come to extend to other energy technologies including those with much more limited emissions profiles, such as solar and wind power. The government's support to develop these industries included generous feed-in-tariffs and robust credit to new equipment makers by China's development finance institutions. By the early 2010s, Chinese manufacturing of solar and wind equipment was booming, driving down the equipment prices and facilitating their deployment in advanced, industrialized economies.

¹ Boston University Global Development Policy Center, "China's Global Energy Finance," <https://www.bu.edu/cgef/#/all/EnergySource>

² Christoph Nedopil Wang, "China Belt and road Initiative Investment Report 2020," The Green Belt and Road Initiative Center, January 21, 2021. <https://green-bri.org/china-belt-and-road-initiative-bri-investment-report-2020/>

³ Council on Foreign Relations, "China's Belt and Road: Implications for the United States," Independent Task Force Report No. 79, Council on Foreign Relations, 2021, p.57.

⁴ Bo Kong and Kevin P. Gallagher, "The New Coal Champion of the World," *Energy Policy* 155 (2021) 112334, March 11, 2021.

⁵ Kelly Sims Gallagher and Qi Qi, "Chinese Overseas Investment Policy: Implications for Climate Change," *Global Policy* (2021) doi 10.1111/1758-5899.12952.

⁶ Portions of this section are adapted from Sarah Ladislav, Ethan Zindler, Nikos Tsafos, Logan Goldie-Scot, Lachlan Carey, Pol Lezcano, Jane Nakano, and Jenny Chase, "Industrial Policy, Trade, and Clean Energy Supply Chains," February 2021. A report by the CSIS Energy Security and Climate Change Program and BloombergNEF. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210224_Ladislav_Industrial_Policy.pdf?DRja.V6axwyBE_PV6Chmdi5k2VqOq33n

In solar PV value chains, China leads the world in the manufacturing of polysilicon and wafers, accounting for two-thirds of the global polysilicon manufacturing capacity (regardless of factory location) and over 90 percent of the global wafer manufacturing capacity today. Even in the segments where China is less dominant, such as solar cell and module manufacturing, leading Chinese companies are vertically integrated, allowing them to exert better cost control and manage output certainty. For example, Chinese companies own about 72 percent of the world's module manufacturing capacity (regardless of factory location) today.

Chinese presence is less dominant in wind power supply chains as the industry preference for larger projects to drive down costs has led the components to be heavier and costlier to ship, thus encouraging supply chains to grow near demand centers. Nonetheless, China is home to about 40-60 percent of the global manufacturing capacity for key wind power components, such as nacelles, wind towers, turbines, and gearboxes.

Electric vehicles and batteries:⁷

China is beginning to establish a commanding position in the electric vehicle (EV) sector, too. Today, the country is the largest EV market in the world. Notably, China has been focused on expanding local manufacturing capacity in every phase of lithium-ion battery and EV production, rather than overall EV sales numbers the way many western leaders in the EV industry have. As a result, China has also emerged as a leading producer of key EV components, such as cathodes, anodes, and separators. While the market is more diverse in the final stages of battery production given the legacy production capacities in Japan and South Korea for battery cells, and new facilities in Europe and the United States, cell manufacturing remains concentrated in China.

A host of policies and actions, including demand and supply incentives, public procurement, and R&D (research and development) funding, has propelled the rise of China's EV sector. Since EVs were identified as one of seven "strategic emerging industries" in 2010, and as a key target industry under the *Made in China 2025* plan, China has deployed multiple measures to support the sector. For example, under the Energy-Efficient and New-Energy Vehicles Industrial Plan 2012–2020, China focused both on research and development work on EVs, especially to drive down battery costs as well as to improve performance, and on a mass rollout of EVs. The Chinese government spent a large sum of public R&D funding through national labs and universities, developed a few leading companies in each stage of EV battery value chain so as to avoid overcapacity issues,

⁷ Portions of this section are adapted from Sarah Ladislav, Ethan Zindler, Nikos Tsafos, Logan Goldie-Scot, Lachlan Carey, Pol Lezcano, Jane Nakano, and Jenny Chase, "Industrial Policy, Trade, and Clean Energy Supply Chains," February 2021. A report by the CSIS Energy Security and Climate Change Program and BloombergNEF. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210224_Ladislav_Industrial_Policy.pdf?DRja.V6axwyBE_PV6Chmdi5k2VqOq33n

accelerated EV demonstration, and led the development of charging infrastructure. While China has rebalanced its spending towards R&D and government procurement in the recent years, direct purchase subsidies also played a major role in expanding EV sales.

Minerals:⁸

A key factor underpinning China's competitiveness in these clean energy technologies is its commanding position along the supply chains for rare-earth minerals and other minerals as well as metals that are vital to clean energy technology components, such as wind turbines, photovoltaic cells, and EV batteries. China has cultivated its mineral wealth and developed mid- and downstream capabilities through various industrial policies. For example, China accounts for roughly two-thirds of global production of rare-earth elements. Where it lacks access to minerals, China has invested in mining and upstream projects abroad. For example, limited in cobalt resources, China has invested in cobalt mines and participated in cobalt smelting projects in the Democratic Republic of the Congo, which accounts for nearly two-thirds of cobalt production in the world; China has come to account for about 70 percent of the global cobalt refining capacity.

China made it a priority to “develop research and production of advanced rare-earth applications and new materials (e.g., permanent magnets and lasers) for domestic consumption and export” as early as in the mid 1980s, under the seventh *National Five-Year Plan for Rare Earth Industry* (1986–1990). By 1985, there already were more than 300 public research institutes and university research centers in China working on research projects related to rare-earth mining, smelting, and applications. Moreover, export and production quotas were among the measures that helped to grow their materials industry.⁹

As China's own demand for minerals for advanced energy technology production rises, China has introduced plans, such as the *National Mineral Resource Plan for 2016–2020*, to establish the country's capabilities to safeguard its supply chains against various causes of potential supply disruptions. More recently, in January 2021, China introduced draft *Regulations on Rare Earth Management*. The regulations would reinforce the protection of what the government regards as the “prized resources [with] irreplaceable significance for the upgrade of traditional industries, and

⁸ Portions of this section are adapted from Jane Nakano, “The Geopolitics of Critical Minerals Supply Chains,” March 2021. A report by the Center for Strategic and International Studies. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210311_Nakano_Critical_Minerals.pdf?DR03x5JlrwLnNjmPDD3SZjEkGEZFEcgt

⁹ The export quota, introduced in 1999, ended following a World Trade Organization (WTO) dispute settlement panel ruling against China. China's rare earth production quota, introduced in 2006, remains in effect.

the development of emerging industries,”¹⁰ by strengthening the approval process for mining and processing projects, as well as the rare-earth trade.

The country’s preeminence in the mineral supply chains came with a high environmental cost, however. The mining and processing of rare earth elements use a variety of chemical substances and generate significant quantities of waste. In China, rare-earth ore is commonly laced with radioactive materials, such as thorium, and the separation process requires large amounts of carcinogenic toxins, such as sulphates, ammonia and hydrochloric acid.¹¹ Without proper environmental protections, such mineral extraction and process can be a source of soil and water contamination. There have been a numerous Chinese and western academic and journalistic accounts of environmental and health damages from these mining activities in China. While China began a large-scale mining of these minerals in the mid-1980s, it was not until the mid-2010s that the government introduced stringent environmental regulations, including technical standards and specifications for rare-earth mining processes.¹²

Nuclear:¹³

Nuclear energy is also a sector where China is emerging as a global technology supplier, following a remarkable expansion of its domestic nuclear power generation fleet. Between 2011 and 2019, China brought 35 reactor units online at home, 10 units more than all of non-Chinese new units combined worldwide. Although the Fukushima accident tempered its original, robust expansion vision, China’s installed nuclear capacity targets remain strong. Per the country’s 14th five-year plan (2021-2025), China will have a total installed capacity of 70 GW by 2025, overtaking France (61 GW), as the second largest in the world behind the United States (96 GW).

Thus far, China’s only destination for its nuclear power plant exports is Pakistan. China is pursuing multiple deals in its effort to become a global leader in nuclear power, however, by combining “good enough” technologies with attractive financing. Again, not bound by OECD regulations, China has offered financing that is large (in total amount provided), cheap (with low interest rates) and long-lived (with long repayment periods). China’s most active export efforts underway in the United Kingdom and Argentina suggest that China uses financing and a willingness to execute projects others find unattractive as a lever to land additional nuclear projects that can advance its

¹⁰ Liu Zhihua and Liu Yukun, “China to step up protection of rare earth resources,” China Daily, January 16, 2021, <https://global.chinadaily.com.cn/a/202101/16/WS60023d3aa31024ad0baa3039.html>.

¹¹ Jonathan Kaiman, “Rare earth mining in China: the bleak social and environmental costs,” The Guardian, March 20, 2014. <https://www.theguardian.com/sustainable-business/rare-earth-mining-china-social-environmental-costs>

¹² Hongqiao Liu, et al., “Rare Earths: Shades of Gray,” China Water Risk, June 2016, p.37-38. <https://chinawaterrisk.org/wp-content/uploads/2016/08/China-Water-Risk-Report-Rare-Earths-Shades-Of-Grey-2016-Eng.pdf>

¹³ Portions of this section are adapted from Jane Nakano, “The Changing Geopolitics of Nuclear Energy,” Center for Strategic and International Studies, March 2020. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/200416_Nakano_NuclearEnergy_UPDATED%20FINAL.pdf

interest. China's rise as a global supplier of nuclear energy technology has profound implications from nuclear safety and nonproliferation, as well as geopolitical perspectives.

Conclusion:

More needs to be done to address China's financing practices for energy exports that have market distorting effects against cleaner energy sources and technologies, as well as energy technologies that are manufactured by advanced, industrialized democracies like the United States. The United States should work more closely with multilateral development banks and fellow OECD member governments to remedy the lack of international mechanisms to reign in China's public high-carbon financing and export practices.

Also, while China's contribution to reducing the costs of low-emission technologies is undeniable, their practices in mining and processing minerals that are key to clean energy technologies warrant closer evaluation from the environmental, social, and governance perspectives. Concurrently, our over reliance on Chinese supplies of these minerals and metals needs to be remedied.

Fundamentally, however, the United States needs to do more to enhance its energy technology competitiveness. The effort to promote American global competitiveness will benefit from the U.S. government playing a strategic role in creating more demand for these technologies, investing in research and innovation, and providing a supportive environment for their manufacturing to thrive. The government also has an essential role to play in strengthening the supply chains for minerals and metals that underpin our clean energy economic activities.

Being competitive in energy technology sectors means preserving a strong innovation eco-system, rebuilding a manufacturing base, and securing supply chains. Moreover, being competitive in *clean* energy technology sectors is not simply about doing our share in reducing emissions. These technologies are no longer niche and they already account for hundreds of billions of dollars in investment and consumer spending, with strong outlook for further growth.¹⁴ The endeavor therefore has a strategic value to our nation as competitive clean energy sectors can augment the U.S. position in the global economy.

¹⁴ Nikos Tsafos, Lachlan Carey, Jane Nakano, and Sarah Ladislaw, "Reshore, Reroute, Rebalance A U.S. Strategy for Clean Energy Supply Chains," Center for Strategic and International Studies, May 2021. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210519_Tsafos_Reshore_Reroute.pdf?oIS49QNCeuHW43Hqwm83aOuBEuxfVqbx