Critical Minerals and Battery Supply Chains: The Logic of "Commanding Heights" as a National Security Concern

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With the rise of electric vehicles, renewables, and battery storage, energy and transportation systems are changing and will ultimately drive a transformation in economies around the world. The resources required for the 21st century economy involve a host of minerals such as lithium, graphite, cobalt, nickel, copper, and manganese. Sourcing, refining, and procuring these resources are not only economic and environmental challenges; there are also major national security and geopolitical implications.

While these minerals and refined products are sourced from various countries, China heavily dominates their processing and other stages along various supply chains, including batteries for electric vehicles. China now aims to dominate the market for electric vehicles (EV) in the same way it dominates the solar photovoltaic market. With China the core geopolitical competitor to the United States, Republican and Democratic lawmakers alike have suggested that dependence on China for metals and materials is a national security risk.

One national security risk of China's domination of mineral and battery supply chains involves the "commanding heights" of the economy. The logic of commanding heights roughly is as follows: the material basis of state power is partially military and partially economic. Because economic power can be converted into military capability, states have an interest in nurturing strategically important sectors that can generate wealth to finance their militaries. Clean technology is one of a handful of growth sectors that are central to the future of modern economies.

This memo unpacks the strategic logic of commanding heights, how China successfully reshaped its economy, and available options for the United States.

The Strategic Logic of Commanding Heights

The risk to the commanding heights of the U.S. economy was one of the key drivers for the Biden Administration's efforts to develop a domestic metals and material supply chain for electric vehicles and batteries. The logic was similar to the rationale for the CHIPS and Science Act. Lithium-ion batteries are becoming like semiconductors: key building blocks of a host of military and civilian technologies, including armored vehicles, drones, electricity systems, and cars. Having a healthy manufacturing sector for the civilian economy, particularly in batteries and automotive related industries, would ensure the United States retains capabilities to sustain the defense industrial base of the country and generate wealth to finance its national defense needs.

The notion of "commanding heights" of the economy, of strategically important sectors that states want to sustain, was once seen as a reflection of a bygone era of heavy state intervention in Western economies and the failed policies of communism in the Soviet Union. In the era of globalization, private sector actors were thought better equipped than governments to make decisions about investment and employment based on logics of market efficiency and profit.

However, China's success and ability to change its source of comparative advantage through patterns of state subsidy and investment has changed the conversation, particularly in an era when market forces alone will not deliver the clean energy transition as quickly as is required to avoid dangerous climate change.

Industrial policy, the intentional efforts by states to support certain industries and discourage others, has become integral to efforts to hasten the clean energy transition. Alongside that change is the

COVID-era realization that globalization wrought undesirable supply chain vulnerabilities that could only be addressed with more domestic production. States are now seeking to reclaim a more explicit role in directing which industries to attract and support, to generate tax revenue to pay for services, to provide good employment, and to support other public purposes such as environmental sustainability.

China has played that game to great effect, subsidizing and encouraging a competitive ecosystem of clean technology industries to see which ones thrive and survive. By 2024, clean energy technologies in China (which include but are not limited to renewables, batteries, and electric vehicles) drove more than ¼ of the country's economic growth and contributed 10% of the country's GDP. Clean energy investments in 2023 reached $940 billion.

Though China is deploying clean energy technologies domestically by orders of magnitude more than any other country, China's capacity for manufacturing exceeds its own domestic needs. While that is good news for prices of renewables and battery storage technologies which have declined dramatically, that makes it harder for other countries who wish to manufacture these goods to maintain viable industries.

The Biden Administration sought to address this challenge through a "foreign policy for the middle class," seeing an important role for the federal government to spur a manufacturing revival through the Bipartisan Infrastructure Act, the Inflation Reduction Act, and the CHIPS and Science Act. Jake Sullivan, President Biden's National Security Advisor, identified clean technologies alongside computing infrastructure and biotechnology as strategically important sectors that will shape the 21st century.

Ceding clean technology markets to other states, notably the People's Republic of China, would mean the United States would forgo revenue from a major growth industry. Once these industries are as pervasive as chips, the United States could face more systemic risks in the event of supply disruptions. The United States would also be comparatively poorer than it otherwise might be. From an international relations perspective, China's domination of solar, batteries, and cars would confer large relative gains with which China could finance military expenditure. From a geo-strategic competitive perspective, that would allow China to close the gap in military capability with the United States and perhaps contribute to an even more dangerous power transition moment.

The current scale of cleantech industries is only a small fraction of what those industries will ultimately become. For example, in 2023 the lithium-ion battery market was valued at $56.8 billion but by one estimate is expected to rise to nearly $187.1 billion in 2032. Similarly, the global solar photovoltaics panel market was nearly $184.9bn in 2021 and estimated to grow to almost $300 billion by 2028.

China is much better poised to reap the rewards of the growing market for clean technology. China's net exports of clean technologies were nearly $100 billion in 2023. By one estimate from the International Energy Agency, China's clean technology exports under current policies will surpass $340 billion in 2035, which would exceed the export revenue that Saudi Arabia and the UEA together earn now from oil. The United States could position itself to profit from clean technology, through both deployments at home but also for export. One analysis by scholars at SAIS estimated the U.S. export potential for cleantech to be as much as $50 billion by 2030.

The China Playbook

There is a cottage industry of scholars and analysts who have sought to unpack how China became dominant in clean energy technologies, since many of the original innovations were initially developed in the West. Lael Brainerd, who served as President Biden's National Economic Advisor,

likened this to a "playbook" which she described as driven by investment and industrial overcapacity and export-driven growth: "China's overcapacity is achieved by firms selling at or below cost—enabled by policy decisions that unfairly depress capital, labor, and energy costs."

One analyst described this playbook as consisting of four stages: (1) the Chinese state targets certain sectors to support, and the central and state governments provide low-interest loans and real estate for companies to work in that sector, (2) companies ramp up production and end up competing with each other and foreign rivals, leading to a price crash, (3) collective capacity exceeds local demand, leading to a search for global markets, and (4) the Chinese state sees which companies look like survivors and drives others from the market.

China's play for electric vehicles was part of its ambitious 2015 program "Made in China 2025" which identified key sectors where the country's leadership saw opportunities to play catchup, leapfrog Western competitors, and reduce its own dependencies. At early stages of this process, China sought to gain intellectual property by encouraging foreign investors to come into the country. Market access and access to subsidies would only be granted if foreign firms were willing to transfer intellectual property to local actors or if they used components produced by local actors.

The Rhodium Group assessed the efficacy of these efforts and concluded that strategy had reduced a number of the country's dependencies on Western inputs and created reversed dependencies on Chinese inputs in a number of areas. By one calculation from CSIS, the Chinese state provided $230.9 billion in support for the Chinese EV sector alone between 2009 and 2023 through rebates, sales tax exemptions, infrastructure subsidies, research and development, and government procurement.

This does not include support for other related sectors like mining which has also benefited from state support. Whether intentional or inadvertent, over the last two years, Chinese overcapacity has led to a drop in minerals prices for lithium, cobalt, nickel, graphite, cathodes, and anodes, which has made it challenging for Western mining companies and components producers to stay in the market. As is well-known, China's advantages in minerals largely come from processing rather than endowments.

Available Strategies for the United States

Developing a strategy requires having a sense of the end goal. From a commanding heights perspective, the goal would be to for the United States to have its own economically competitive production capacity for clean technologies both for domestic consumption and for export. That would likely require some on-shoring and/or friend-shoring of supply chains beginning with minerals production to processing to manufacturing of components and finished products. Policymakers could decide that some parts of the cleantech space might be more viable for competition (some suggest that solar manufacturing might be less viable given low profits).

One way to achieve these goals would be to run the China playbook in reverse to on-shore or ally-shore production of lithium-ion battery supply chains. This would involve, at least initially, subsidies and tax incentives to encourage more domestic mining, processing, and manufacturing. It could involve targeted efforts to transfer intellectual property to the United States through licensing, joint ventures, and efforts to encourage foreign direct investment in the United States including from Chinese firms. Other approaches would seek to build the supply chain for cleantech manufacturing without Chinese inputs through decoupling. An alternative or perhaps complementary strategy would focus on research and development and commercialization of next generation battery chemistries such as lithium metals and solid state batteries which allow the US to leapfrog China rather than catch up in lithium-ion batteries. Trade policies like tariffs and permitting could also be used to shield domestic production from competition and to advance new projects more quickly. As part of this strategy, the US

could also engage with China with voluntary export restraints as it did with Japan in the 1980s, perhaps to spur FDI.

The Biden Administration sought to counter China's emergent advantages primarily through tax incentives and investments but also through targeted tariffs. The Inflation Reduction Act, the CHIPS and Science Act, and the Bipartisan Infrastructure Law as well as other tools such as the Defense Production Act were among the major sources of incentives to support domestic production of semi-conductors, electric vehicles, batteries, and minerals processing. The Inflation Reduction Act included both incentives for consumers to buy electric vehicles (section 30D) and tax credits for manufacturers (including section 45X). Section 45X provided a 10% tax credit for production of solar and wind energy components, batteries, inverters, battery components, and processing of critical minerals.

Together, these incentives were intended to spur demand for electric vehicles and spur production of components including batteries and finished vehicles. The consumer tax incentives provided up to $7500 for eligible vehicles and included local content requirements that became more onerous over time, split between the battery and the minerals that went into them. These rules incentivized sourcing of minerals domestically or from countries with which the US has a free trade agreement and production/assembly of batteries in North America.

The Inflation Reduction Act also expanded the lending capacity of the DOE Loans Office by $100 billion which made loans/loan commitments to Redwood Materials for minerals recycling, Rhyolite Ridge for lithium processing, Syrah Vidalia for graphite processing, Li-Cycle for battery recycling, and Project ATLiS for lithium hydroxide production. Separately, the Office of Manufacturing and Energy Supply Chains, with funding from the Bipartisan Infrastructure Law, was investing $20 billion in supply chains with grants in a range of sectors including 18 projects in battery materials processing and battery and critical mineral recycling.

The IRA also provided $500mn for the Defense Production Act split between the DOE and DOD, with the DOD portion set to be invested in energy storage, batteries, and critical minerals projects through loans, loan guarantees, purchase commitments, and purchases. By November 2024, DOD had supported some 12 projects through IRA funding including Graphite One in Alaska, Lithium Nevada, and Albemarle's efforts to reopen a lithium mine in North Carolina. The DPA was also capitalized in 2022 with an additional $600mn in funds from a Ukraine supplemental to support both munitions and missiles as well as critical minerals projects.

In addition to these moves to support minerals processing and battery manufacturing, the Biden also used tariffs to shield U.S. producers from foreign competitors. In May 2024, the Biden Administration imposed tariffs on Chinese electric vehicles (100%), lithium-ion batteries (25%), solar cells (50%), natural graphite (25%), permanent magnets (25%), and other critical minerals (including ores of manganese, cobalt, zinc, aluminum, and chromium (25%). While most went into effect in September 2024, the graphite and magnet tariffs were delayed until January 2026, given the U.S. vulnerabilities in these areas.

The Trump administration, for its part, is set to rely more on permitting and tariff policies rather than investments to spur domestic production of minerals. In March 2025, the Trump administration issued an executive order to speed domestic minerals production and identified 20 projects for fast permitting in April and May, including expansion of Albermarle's lithium mine in Nevada and Standard Lithium's direct lithium extraction project in Arkansas. In April 2025, the Trump administration also announced an inquiry of all critical minerals and derivative products through Section 232 of the Trade Expansion Act of 1962 to assess what steps are required to guarantee the

resilience of the U.S. economy. That report will be issued in six months. In President Trump's first term, a similar inquiry led to the imposition of 25% tariffs on aluminum and steel imports.

While these moves are consistent with an effort to incentivize domestic mining and processing, the administration has also signaled that perhaps it is too late to counter China on clean technologies. The administration is seeking to sunset many of the provisions of the Inflation Reduction Act that incentivized and supported electric vehicles and renewables. Instead, the Trump administration is largely seeking to support the energies and technologies that the United States already produces a lot of like oil and gas. Among clean energy technologies, the administration is more open to nuclear energy than renewables.

Under the terms of the recently passed House budget bill for FY 2026, most of these section 30D consumer incentives for EV will be phased out at the end of 2025, eliminating the local content requirements for EVs in the process. The manufacturing tax credits begin their phase down in 2029 and would now end in 2031. These would now have foreign entity of concern restrictions that would largely restrict foreign content from China, but in the process may be so restrictive that few facilities would be eligible for the credits. The legislation would also make licensing agreements like the proposed Ford-CATL arrangement to make lithium iron phosphate batteries in Michigan ineligible for 45X incentives. It is not clear whether unwinding these incentives will lead to large-scale battery project cancellations.

The status of the DOE Loans Portfolio in the Trump administration is unclear as loan projects were paused for review and there are indications that the portfolio may be privatized. Staffing levels at the Department of Energy have also declined which may make it harder for the administration to manage remaining programs.

As a candidate, President Trump invited Chinese electric vehicle manufacturers to establish manufacturing facilities in the United States. However, as president, his administration appears largely hostile to electric vehicles, despite Elon Musk being close to the president. The Trump administration repealed the Biden administration's target for 50% of new vehicles being electric by 2030 and supported efforts by the Senate to overturn California's EV mandate that would have phased out gasoline cars and truck sales by 2035.

At the same time, President Trump has also broken with globalization era orthodoxy to let the market decide what sectors to invest in. In February 2025, he issued an executive order asking the Secretaries of Treasury and Commerce to develop a plan for a sovereign wealth fund to guide investments in the economy. The Development Finance Corporation (DFC), which had supported loans for overseas minerals projects like the Lobito Corridor railway project in Angola, was authorized by Executive Order in March 2025 to support domestic investments through the Defense Production Act including in the minerals space. DFC may become home for a sovereign wealth fund, should it be established.

Mining companies may welcome co-investment from the US government in mining and processing projects through a sovereign wealth fund. Many of them have been advocating for price premiums or floors to be able to compete with Chinese firms and would likely welcome additional resources to support riskier investments. While these developments suggest an interest by the Trump administration in industrial policy, particularly in mining, there are concerns about how it would be managed and funded. Given the mixed track record by other governments with such funds, any sovereign wealth fund would have to clear management criteria and investment guidelines. Finally, given the administration's posture towards electric vehicles and renewables, there may be a disconnect between the pro-mining orientation and support for the downstream industries that would benefit from mined and processed materials.

Concluding Thoughts

Decisions about whether and how to compete with China to have a domestic cleantech manufacturing sector ultimately have to address:

- (1) Which cleantech sectors are valuable enough that the United States needs domestic capability?
- (2) How much of the upstream mining and midstream processing can or should happen in the United States? Which other partners is the United States comfortable relying on for minerals and components for this sector?
- (3) What is the price premium the United States is willing to pay for production in the United States or from trusted partners?
- (4) Which spending, tax, or trade instruments individually or together would send a strong enough signal to private producers to enter the market, what would keep them there, and can those industries mature to the point that those incentives are no longer required?

Other practical and national security considerations will likely inform answers to these and other questions, but these provide a point of departure if the United States regards the cleantech sector part of the commanding heights of its economy in the 21st century.

Whatever policies the US adopts *vis a vis* minerals and battery supply chains have to have a degree of realism about how private sector transnational supply chains work. As Jonas Nahm notes, different components are sourced from all over the world. Any de-risking or more profound decoupling from China (or other countries) would not lead to instantaneous adjustment but require years of coordinated policy coordination both internally and with friendly countries to build up alternative supply chains.