

Technology Must Advance Freedom



A Roadmap for Winning the Energy Transition

By The Hon. Frank Fannon
Senior Visiting Fellow

Issue Brief

June 2022

techdiplomacy.org

A Roadmap for Winning the Energy Transition

Hon. Frank R. Fannon¹

Executive Summary

The 2018 Paris Climate Change Conference established a framework for governments to limit the effects of climate change. Policy makers have called for a transition away from a hydrocarbon-based economy and toward a zero-emissions energy generation, transportation systems, and manufacturing economy. Societies have evolved through multiple energy transitions over time. These transitions typically followed a pattern of technological innovation, improved efficiency, scaled deployment, and the development of an eventual regulatory framework to manage competition, reliability, and more recently environmental externalities.

In contrast to historical precedent, today's energy transition is policy-driven and on an accelerated timescale. This presents three distinct challenges. First, the scale of the clean energy transition is staggering and requires a complete reordering, design, and manufacture across industries and societies. Clean energy technologies require an entirely different set of inputs than traditional fossil-based energies. As such, the energy transition substitutes one set of natural resources for different categories of minerals, metals, and chemicals.

Second, in moving away from fossil energy, policy makers are calling for a transition away from domestic energy abundance in the form of oil and natural gas to metals and minerals which are controlled by the People's Republic of China (PRC). The PRC developed and successfully executed a holistic and integrated domestic and international strategy over the course of decades. China now holds dominant positions across the entire clean energy supply chain from the mining, processing, marketing, and manufacturing of key clean energy technologies.

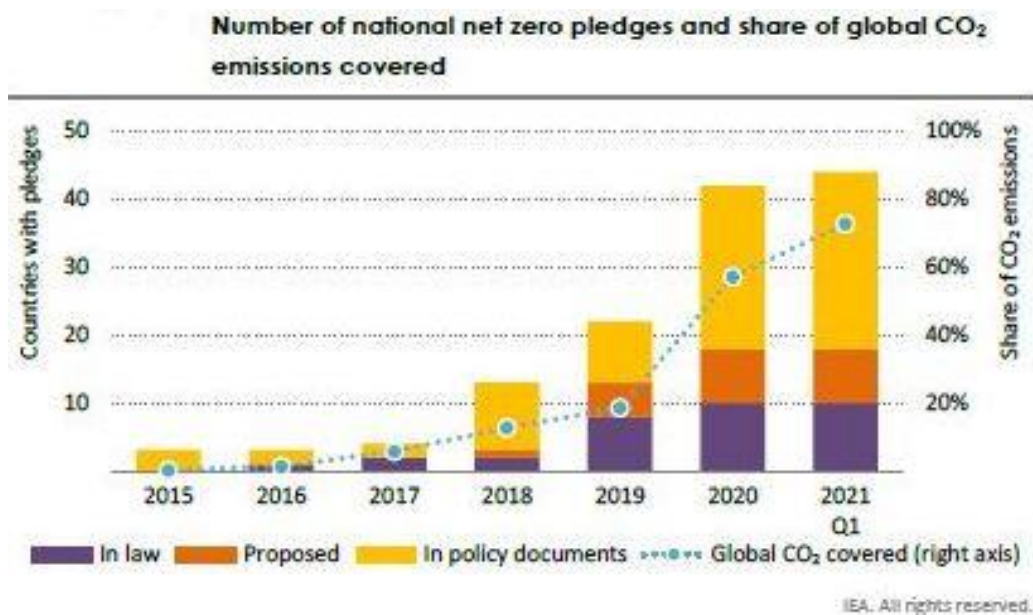
Third, the United States recognized its reliance on a strategic competitor was contrary to both domestic clean energy and climate ambitions and national security. Three successive presidents—Obama, Trump, and now Biden—have elevated America’s vulnerabilities and taken successive actions. These countermeasures, however, had limited effect since they were limited and tactical rather than part of an integrated strategy.

In order for the U.S. to regain its clean energy advantage, America’s leaders must rethink the notion that it is “competing” against China and instead realize that both countries are playing entirely different games. The U.S. has a short window of opportunity to develop and deploy a whole-of-government strategy in close coordination with like-minded free nations. This paper explores the three central issue pillars—scale, China, and the U.S.—and recommends a new strategy to win the clean energy transition.

I. Introduction: Energy Transition Requires Big Shovels

A. Unprecedented Clean Energy Transition: Motivation, Scope, Scale

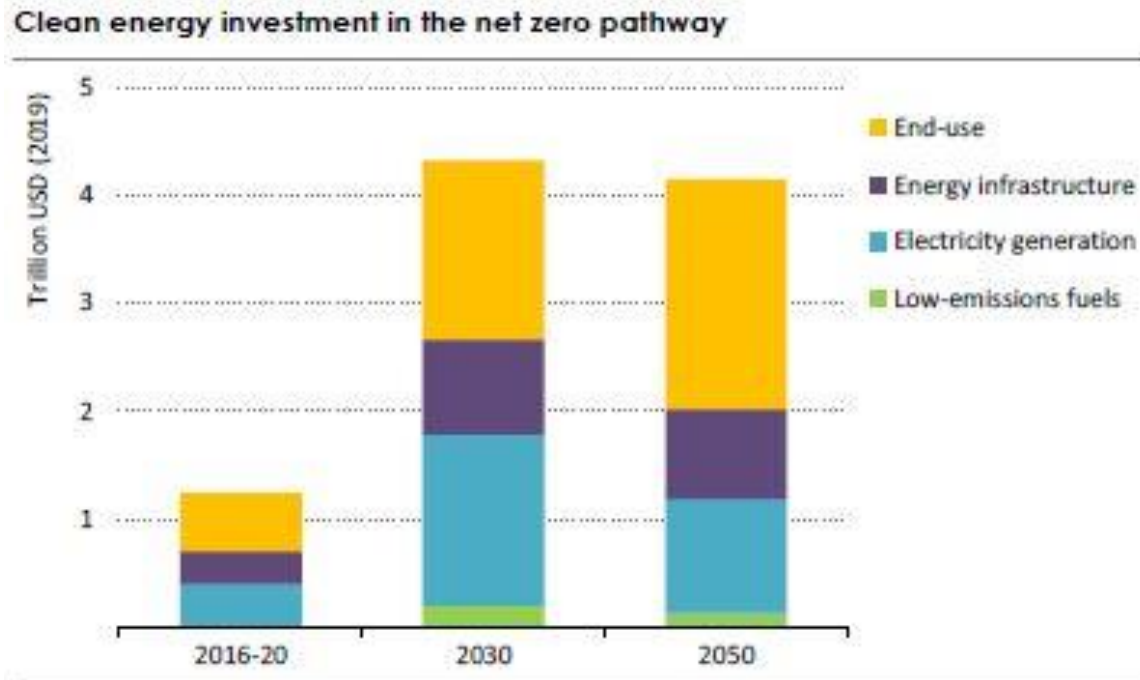
The public’s concern over climate change has grown in the last three decades. In response, governments have sought to answer their citizens’ call for action. Today, 136 countries, representing roughly 90 percent of global economic output and 88 percent of greenhouse gas emissions have pledged to reach net-zero carbon emissions by 2050 or shortly thereafter.²



Many of the largest corporations and banks have similarly adopted net zero pledges. Two-thirds of the world's biggest carbon emitting companies have released their own zero pledges.³ Other companies have taken a more aggressive course. According to climate activist groups, 1,500 financial institutions, with nearly 40 trillion dollars in assets under management will also divest from investments directly linked to fossil fuels.⁴ While calls for decarbonization have become the norm, operationalizing pledges, commitments, and announcements present meaningful challenges for the United States and free nations.

There have been multiple transformations of the global energy system—from wood to coal, coal to oil, and oil to natural gas. Previous “transitions,” however, tended to follow a similar pattern. Technological innovation would unlock considerable improvement in power, efficiency, and environmental performance. Over time, the consuming public would demonstrate its preference for the new technology, phase down utilization of the older energy system, and markets would expand as a result.

Today's energy transition is unique as it does not follow the normal technological innovation, efficiency improvements, and large-scale distribution model. Rather, our modern clean energy transition is principally policy-driven, and governments expect the innovation to follow. The International Energy Agency (IEA) states, “reaching net-zero emissions will require the widespread use...of technologies *still under development today*. In 2050, almost 50% of CO₂ emissions reductions...come from technologies currently at demonstration or prototype stage.”⁵ Innovation, efficiency, adoption, and systems and regulatory integration can take decades. For example, the U.S. invested in ways to improve solar power for more than five decades before it was able to produce less expensive energy per kilowatt-hour than natural gas and other carbon-based energy sources.⁶ This energy transition is not premised on cost savings, but mitigating the harmful effects of climate change. Faster adoption of development-stage technologies will likely increase immediate costs. Therefore, achieving policy success will require considerable political will that has, thus far, been largely absent.



Source: IEA

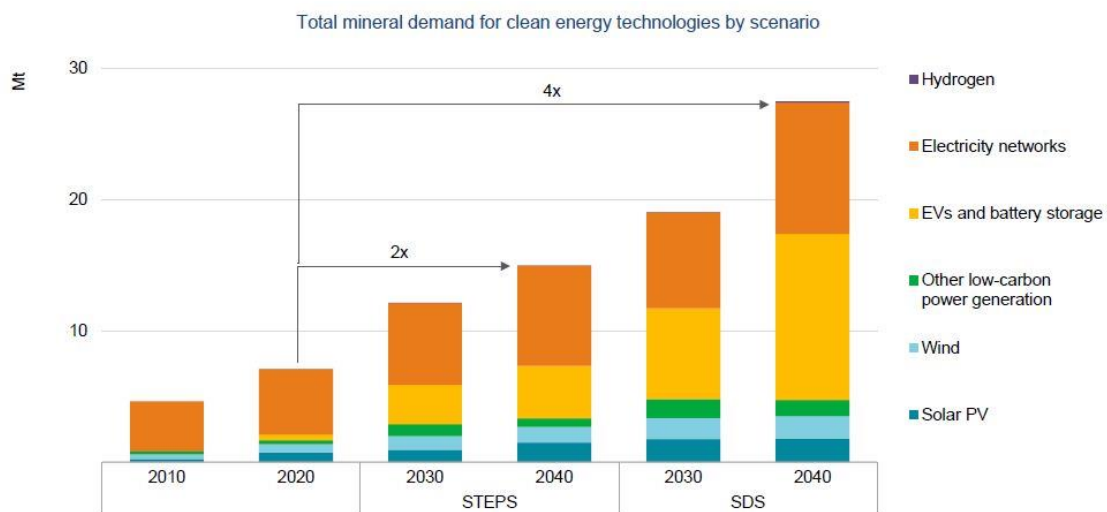
The scale, scope, and pace of the clean energy transition presents an unprecedented challenge for governments and society as a whole. It requires an entire recreation from the literal ground up of the entirety of the global energy system.

A recent report by the United Nation’s International Panel on Climate Change (IPCC) states, “There is no historical precedent for the scale of these necessary transitions.”⁷ The next decade represents a “make-or-break” moment during which the most aggressive investments need to occur.⁸ Currently, the global economy invests roughly two trillion dollars every year in energy infrastructure, which equals roughly 2.5 percent of global GDP. Although considerable, the current energy spend is wholly inadequate to achieve the scale of the clean energy transition.

According to estimates by the IEA, Bloomberg New Energy, and the International Renewable Energy Alliance (IRENA) nations must increase their current spending to levels ranging from \$3.8 trillion a year to nearly \$6 trillion a year by 2030 while reducing fossil fuels.⁹ One estimate by IRENA holds that over 130 trillion dollars is needed for investment in renewable energy and decarbonization projects by 2050 to meet climate goals.¹⁰ Most of these investments will center on energy production and the transportation sector, which are responsible for the majority of carbon emissions.

B. Critical Minerals

The clean energy transition requires a switch from energy-dense hydrocarbons to metals, minerals, and chemicals. This will require an exponential increase in demand for these critical clean energy minerals. Increasing “climate ambition” and the pace of action will require a proportionate increase in mineral demand.¹¹ According to the IEA, in a scenario where the world fails to meet net zero goals and instead caps global warming around three degrees Celsius, mineral demand increases by 200%. The IEA, however, predicts mineral demand will quadruple by 2040 in a scenario where the world is on track to meeting its net zero emission goals.¹²

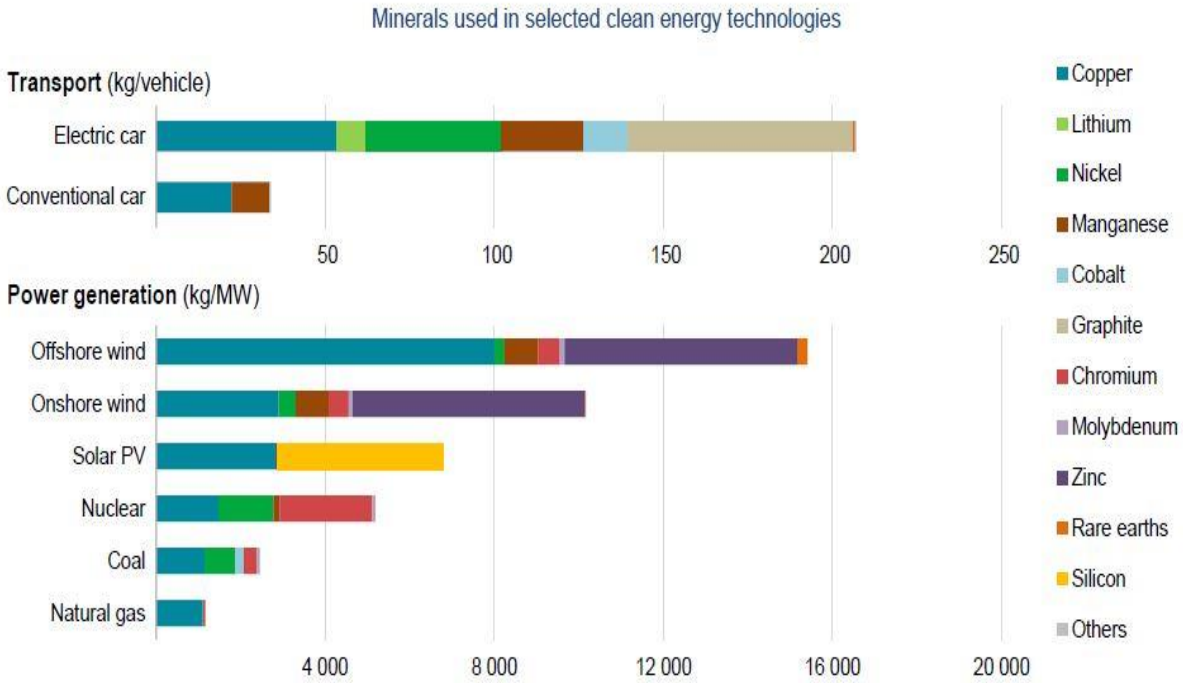


IEA. All rights reserved.

Notes: Includes all minerals in the scope of this report, including chromium, copper, major battery metals (lithium, nickel, cobalt, manganese and graphite), molybdenum, platinum group metals, zinc, REEs and others, but does not include steel and aluminium (see Annex for a full list of minerals). Mt = million tonnes.

The World Bank expects even greater mineral demand in order to reach climate goals. In a conservative estimate, the Bank found meeting clean energy targets would increase demand for many metals by 500 to 1,000 percent by 2050.¹³

Some critical minerals like lithium, cobalt, nickel, and graphite are used for specialized applications such as for electric vehicle batteries. Other metals, such as copper and aluminum, are widely applicable to clean energy technologies and electrification more broadly. Calls to “electrify everything” are well intentioned to be sure. Yet, the scale of copper needed in order to do so is staggering. According to the World Bank, we will



IEA. All rights reserved.

need to mine as much copper in the next 25 years as humanity has produced in the last 5,000 (approximately 550 million tons) to meet clean energy targets.¹⁴ An electric vehicle requires about six times the mineral inputs of an internal combustion powered car.¹⁵ According to the consulting firm McKinsey, generating one terawatt-hour of electricity from solar and wind could consume 300 percent and 200 percent respectively more metals than generating the same number of terawatt-hours from a gas-fired power plant.¹⁶

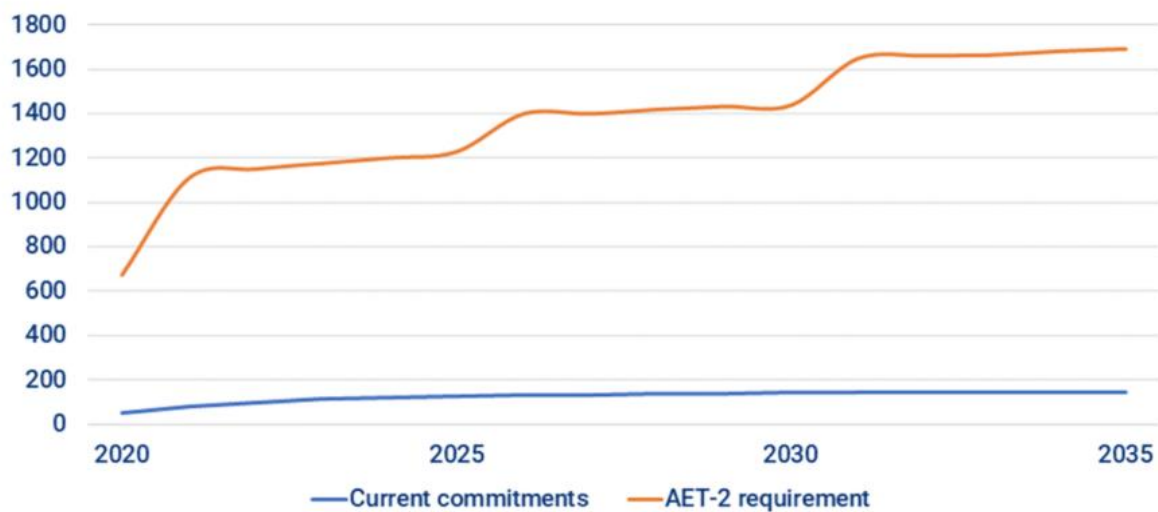
Certain critical minerals like lithium, which are experiencing record high prices, are projected to realize some of the largest demand growth in the coming decades. A leading industry research and consultancy, Benchmark Minerals Intelligence, finds annual demand for lithium will grow to 7 million tons by 2040, nearly 17 times its current amount.¹⁷ The IEA even predicts lithium demand could increase 42 times by 2040 if countries were to limit global warming to less than 2 degrees Celsius.¹⁸

C. Mining Capital

Although analysts have been predicting increased demand for critical minerals, the mining industry has been underfunded for years. This chronic underinvestment means that the world may lack sufficient supplies of the key minerals and metals required to produce the windmills, solar panels, advanced batteries, and other technologies needed for the energy transition. According to Wood Mackenzie, investors funneled only \$600 billion into increasing lithium, cobalt, nickel, aluminum, and copper production from 2005 to 2020. For an accelerated energy transition, Wood Mackenzie predicts nearly three times more investment, almost \$1.7 trillion, is required to increase supplies of these metals by 2035.¹⁹ This level of investment has yet to materialize and there are serious concerns if they ever will.²⁰

More than \$1 trillion of investment is needed in key energy transition metals by 2035

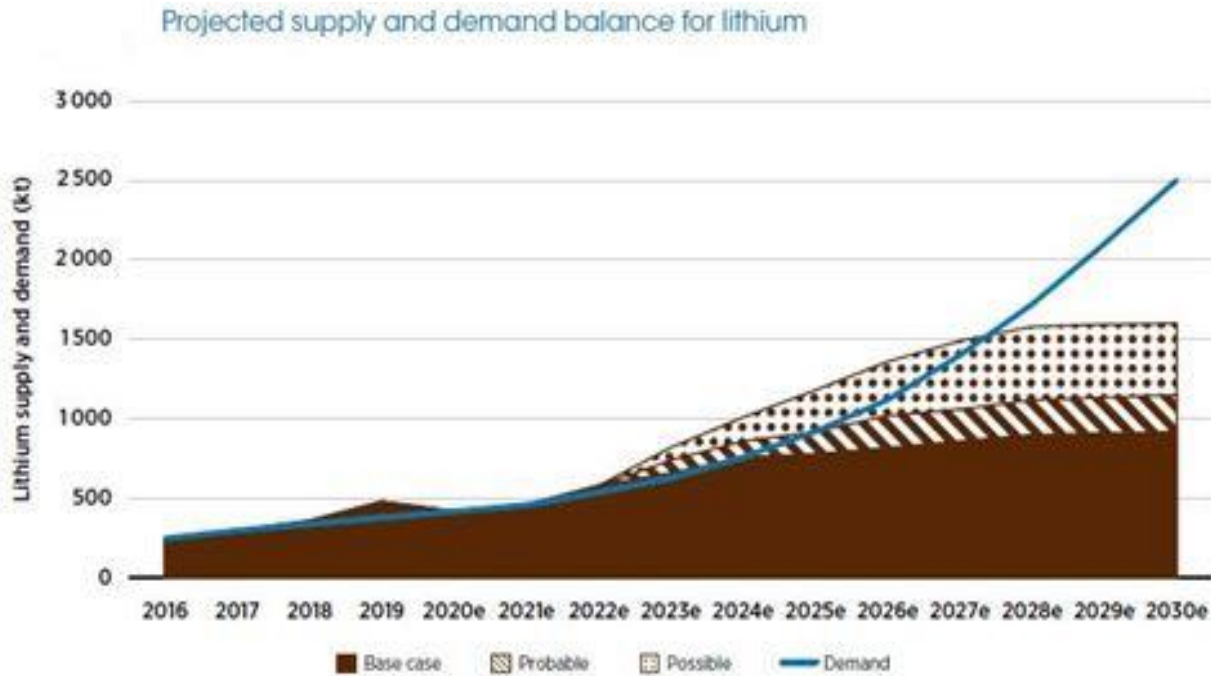
Cumulative capex: current commitments and AET-2 scenario requirements, US\$bn



Source: Wood Mackenzie

Markets are already feeling the effects of widening supply and demand gaps. In 2021 and 2022, deficits in the supply of various critical minerals like graphite, cobalt, and lithium sent prices soaring.²¹ In 2021, the price of lithium carbonate jumped from 9,600 dollars to 50,000 dollars per ton.²² Raw materials, which traditionally made up around 40% of the costs of a typical lithium-ion battery, now can make up as much as 80 percent of a battery's cost. As such, battery costs have already started reflecting rising material prices in Asian markets.²³ In response to rising battery prices, many

automakers are raising prices and scaling back production goals.²⁴ By all measures, current levels of investment lag behind predicted requirements.



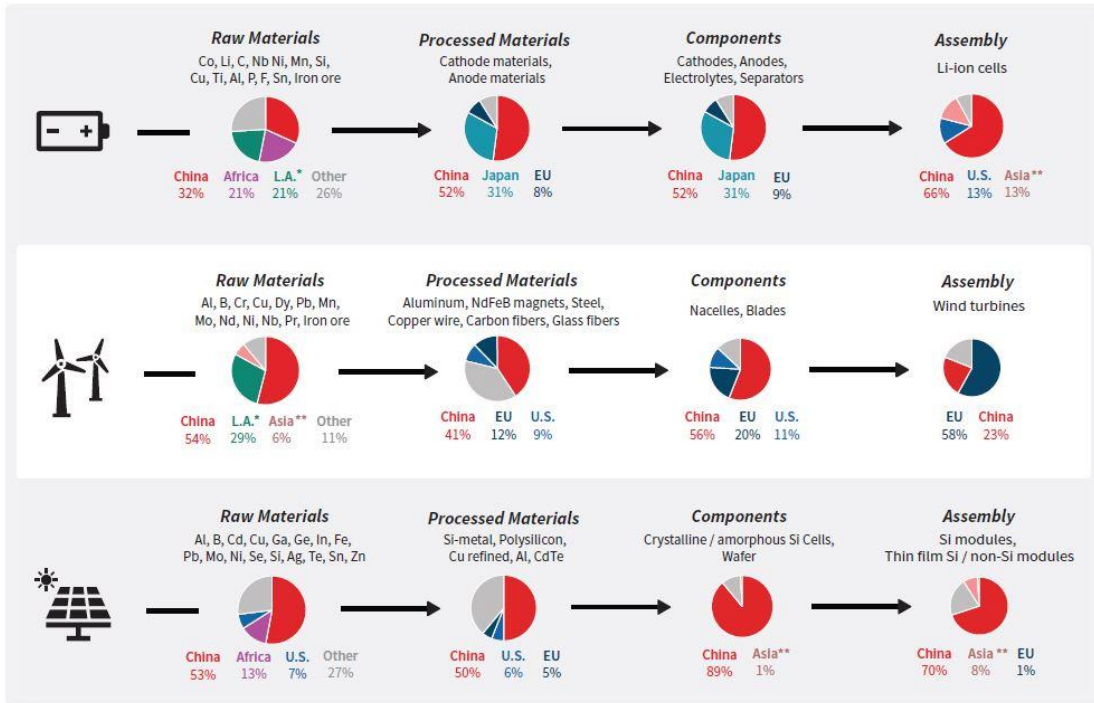
Source: Gielen, Dolf, and Martina Lyons, IRENA, *Outlook for Lithium 2022*

II. China and the Commanding Heights of the Energy Transition

China holds a dominant role in the clean energy minerals and technology supply chains required for the energy transition and meeting climate policy goals. Free nations' reliance on Beijing represents a material threat to U.S. economic competitiveness and security. If the U.S. maintains its current course, it will trade relative oil and natural gas-related energy and economic security for dependence on China. China's Communist government will be able to exercise its relative dominance over clean energy supply chains to influence energy markets, pricing, and the composition and pace of the energy transition.²⁵

Clean Energy Mineral Supply Chains and Top Global Suppliers

Batteries, Wind, and Solar PV



* Latin America

** Excluding China and Japan

Source: Created by Ian Barlow based on data from European Commission, *Critical materials for strategic technologies and sectors in the EU - a foresight study, 2020* (Brussels: European Commission, 2020).

CSIS | ENERGY SECURITY AND CLIMATE CHANGE PROGRAM

A. Mapping China's Stranglehold on New Energy Supply Chains

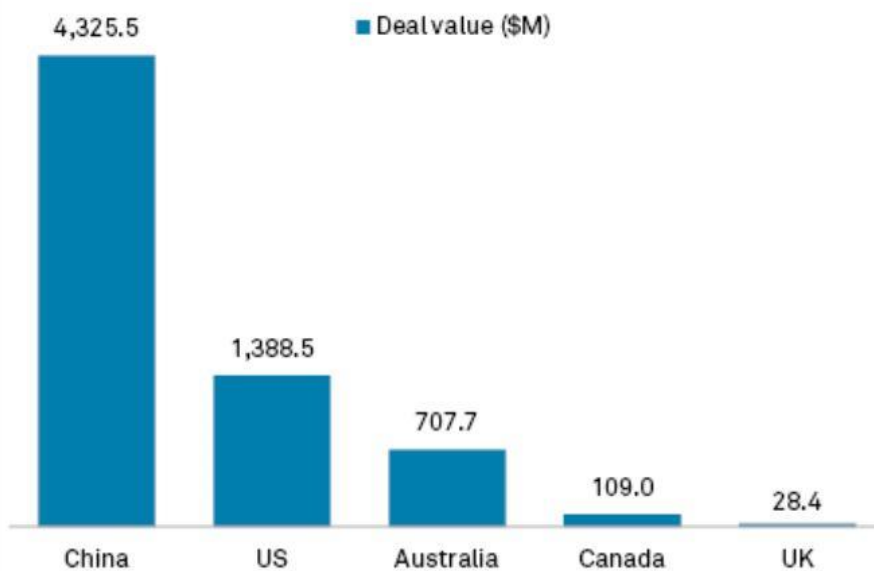
China dominates the new energy supply chains, including critical mineral extraction and processing as well as those involved with manufacturing the technologies required for the energy transition.²⁶ Beijing's control of critical mineral supply chains goes beyond what is commonly reported, as Chinese investors and state backed companies control many of the key mining and processing operations outside of China.

1. Lithium

The lithium-ion battery market is projected to grow from \$41 billion in 2021 to \$117 billion by 2030.²⁷ From 2018 to 2021, Chinese companies spent more in acquisitions of foreign lithium mining and processing facilities than all other countries combined.²⁸ China dominates lithium processing and refining, with over 60 percent occurring in China. This reality gives China a significant stranglehold over the production of battery grade lithium products.²⁹

Chinese companies have majority or controlling stakes in many of the leading assets and companies extracting lithium and producing battery grade lithium products outside the country. For example, the Chinese company Tianqi Lithium holds a majority stake in the joint venture owning the largest lithium mine in the world in Greenbushes, Australia.³⁰ As of 2018, Tianqi Lithium also became the second largest shareholder in the largest supplier of lithium to the battery market, Chile's Sociedad Química y Minera de Chile (SQM).

Lithium deals by buyer country, 2018-H1'21 (\$M)



Data as of Aug. 30, 2021.
Data only includes deals with lithium in reserves and resources and does not include lithium streaming, or "off-take", deals, royalty deals or terminated deals.
Source: S&P Global Market Intelligence

The U.S. government was aware of China's growing control of the clean energy supply chain, but lacked sufficient tools to counter CCP-directed and state-backed companies. While serving as Assistant Secretary of State for Energy Resources, my office engaged multiple free world governments and companies in order to generate an alternative investor in SQM's Tier 1 lithium mine. At my encouragement, multiple Western companies dedicated teams to review the investment option. Unfortunately, none of the firms were able to meet, much less beat, Beijing's terms. A Chinese company was able to secure a \$4.4 billion loan from state-owned Citic Group as the investment aligned with the CCP's strategic policy goals.³¹

China has been buying majority, controlling or significant interests in early-stage lithium mines in order to secure future supplies. Ganfeng Lithium is the largest stakeholder in Lithium America's Cauchari-Olaroz project in Jujuy, Argentina.³² In January 2021, China's Zijin Mining, whose largest shareholder is a government-backed investment group, bought Neo Lithium, a Canadian company owning and operating the 3Q lithium brine project in Argentina.³³ For the foreseeable future, lithium is likely to remain the indispensable material in the advanced batteries needed for mobility and energy storage.

2. Cobalt

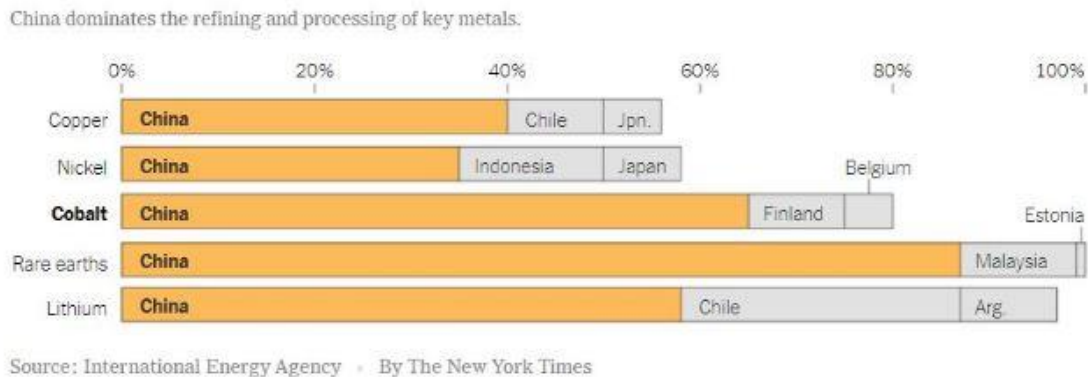
Cobalt is integral to the manufacturing of many types of cathodes in advanced lithium-ion batteries. More than 70 percent of the world's cobalt is produced in the Democratic Republic of Congo. Chinese companies control or finance 15 of the 19 cobalt-producing mines in the country.³⁴ Chinese companies are investing to expand production and solidify their dominant position in the global cobalt market. State champion, China Molybdenum, is investing \$2.5 billion to double its cobalt output in the DRC to become the world's largest cobalt producer in 2023, displacing Swiss mining giant Glencore.³⁵

Over many years, China developed an extractive supply chain to export commodities from sub-Saharan Africa for beneficiation at home. Today, three quarters of global cobalt processing and refining into battery grade material occurs in China. Jinchuan Group, Zhejiang Huayou Cobalt, and GEM lead cobalt refining. Jinchuan is state-owned and funded, and all three companies have received substantial state subsidies.³⁶ The trio are expected to maintain their dominant position for years to come.³⁷

3. Rare Earth Elements

Rare earth elements are critical for a number of clean energy and defense industry technologies. In 2020, companies in China were responsible for nearly 60 percent of the world's rare earth extraction and nearly 90 percent of rare earth element processing and refining.³⁸ The situation is even worse than these official numbers purport. In neighboring Myanmar, the world's third largest exporter of rare earths responsible for an additional 15 percent of global production, Chinese investors and mining companies have largely taken over the country's rare earth sector in the past year.³⁹ Since the 2021 coup deposing the democratically elected government, Chinese companies have partnered with local militias and warlords to illicitly mine heavy rare earths in the north of the country. In so doing, Chinese companies exert significant control over rare earth

production through their support of a black market.⁴⁰ In December 2021, China’s second largest rare earth mining company, Minmetal Rare Earth, merged with two other Chinese producers to form a giant state-backed monopoly, responsible for 70 percent of China’s heavy rare earth production.⁴¹ This CCP-driven action will amplify China’s control over pricing and the global rare earth market in general.⁴²



4. Manganese & Graphite

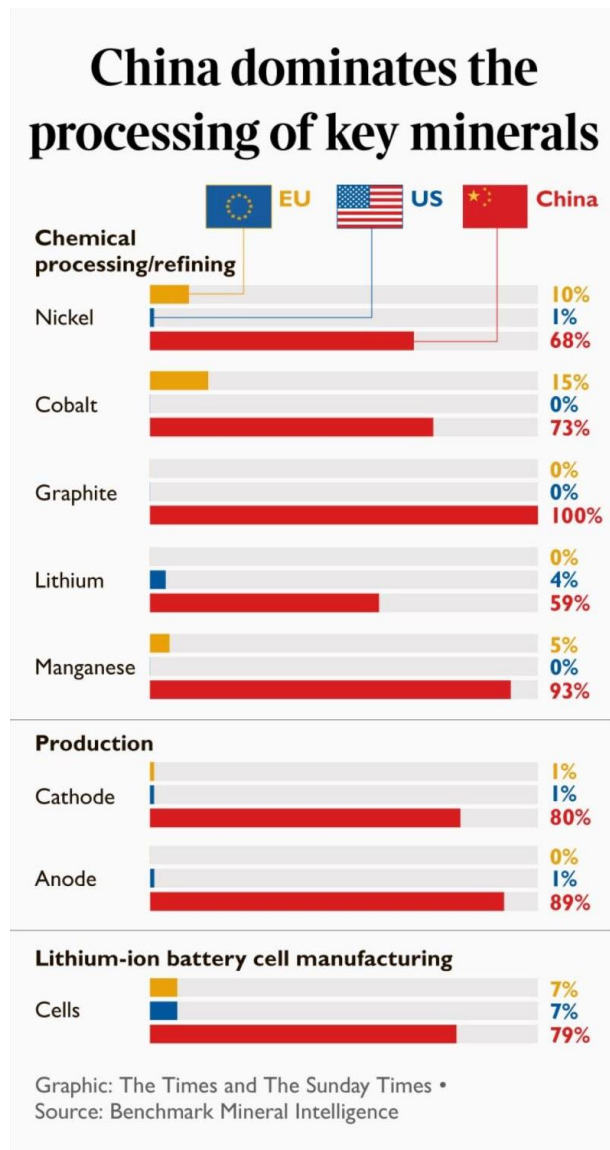
Manganese is a necessary material for the manufacture of battery cathodes. While Manganese is mined primarily outside of China and primarily for other industrial purposes, almost all battery grade refined manganese is processed in the country.⁴³ Furthermore, the top twelve manganese-processing companies in China recently formed a state-backed “Manganese Innovation Alliance.” According to industry experts, the “Alliance” represents a production cartel dedicated to centralizing control over supply of key products, coordinating prices, stockpiling, and forming networks for mutual financial assistance.⁴⁴ Virtually all battery producers rely on the products made by this organization.

Graphite is the primary raw material comprising the anode in a lithium-ion battery. In fact, graphite is by far the largest raw material input by weight in most battery types.⁴⁵ Approximately 60 percent of natural graphite is mined outside of China, but almost all battery grade spherical graphite and synthetic graphite is produced in China.⁴⁶

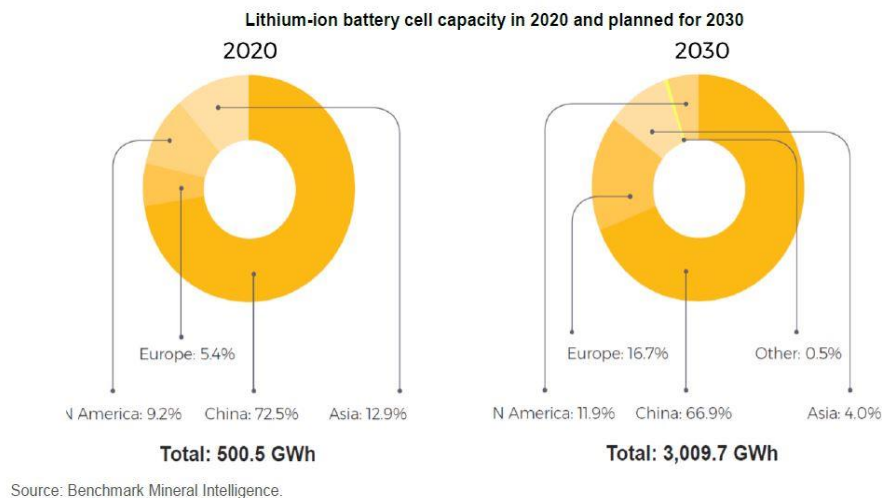
B. Electric Vehicles

Beyond raw upstream mineral extraction and mid-stream processing, China dominates the advanced manufacturing of clean energy technologies.

In 2021, China integrated its state-driven extraction strategy with its domestic manufacturing and industrial policy. Today, China controls 52 percent of global cathode production, 78 percent of anode production, and 78 percent of battery cell manufacturing.⁴⁷ In 2020, Contemporary Amperex Technology Co. (CATL), China's battery-making "national champion," with a valuation larger than General Motors and Ford combined, became the world's largest battery maker.⁴⁸



According to Benchmark Minerals Intelligence, China has 122 operating advanced battery mega factories, with an additional 26 planned. China will have nearly three fourths of the world’s 200 advanced battery mega factories by 2030. In 2021, Europe and North America only had 21 operating and 11 planned factories.⁴⁹ Benchmark reports that China is building one battery factory every week, as opposed to the U.S where one is built every four months.⁵⁰



In light of Beijing’s strong lead, China is expected to maintain nearly 70 percent of global battery capacity in 2030.⁵¹ The battery is the car. As such, China’s dominance of battery manufacturing effectively means that it can hold significant influence—if not effective control—over the West’s evolving modern mobility.

C. China’s Operationalizing Clean Energy Strategy

China and the West are both pursuing the clean energy transition, but for vastly different reasons. Whereas the U.S. and EU seek a reduce global warming gas to mitigate climate change, the PRC is motivated by a security imperative. By controlling clean energy supply chains, China can finally break free of its reliance on the U.S. Naval protectorate of oil transiting sea lanes while pushing the West toward their own dependence on China.⁵² Chinese President Xi Jinping views the energy transition as a part of his forth industrial revolution, ushering “changes unseen in a century...bringing the world into a period of fluidity and transformation.”⁵³ By dominating the new energy technologies and their supply chains, the CCP aspires to emulate Western

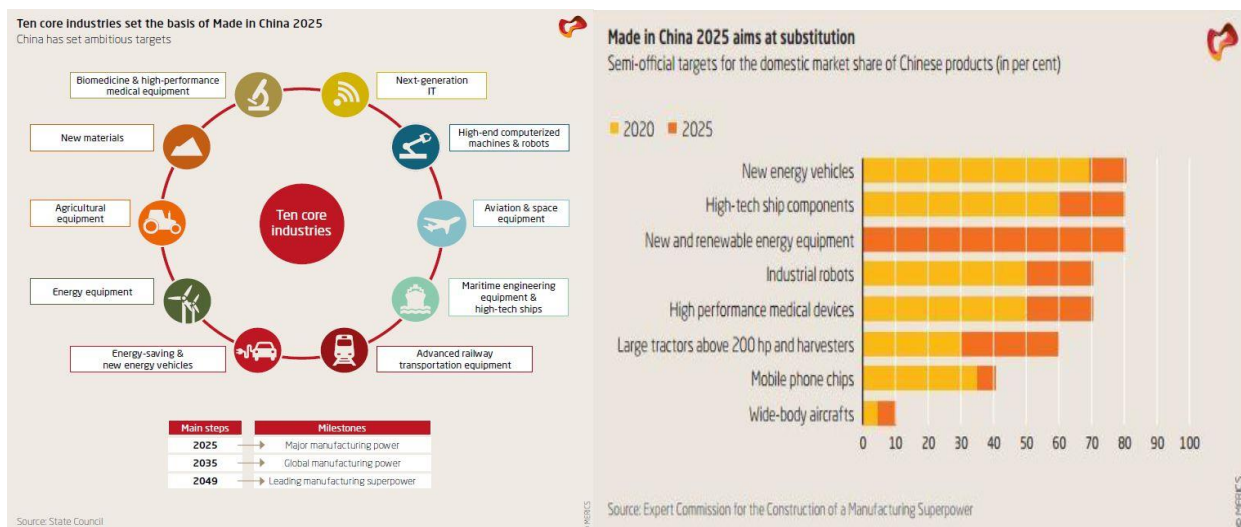
powers, which led previous industrial revolutions and utilized new technologies to degrade China into “a semi-colonial, semi-feudal society suffering great ravages.”⁵⁴

For the CCP, a recreation of the global energy landscape is a once-in-a-lifetime opportunity for China to gain a technological upper hand similar to that which foreign powers once used to China’s detriment over generations.⁵⁵ In free nations and especially in the United States, opposing political parties spent the first decades of the 21st century arguing the scientific and economic merits of decarbonization, while the CCP exerts control over the Chinese economy, mobilizing it to pursue the transition and dominate the global economy. Unaccountable to voters and intent on correcting perceived historical slights, Beijing seeks to assume the commanding heights of the new century energy landscape.⁵⁶

1. Industrial Policy Designed for Dominance

Beijing’s top-down industrial policies reveal the true motivations behind its aggressive pursuit of the energy transition. These overarching policy directives focus on displacing foreign companies and establishing control over increasingly valuable segments of new energy supply chains. In 2010, the CCP released an industrial policy aimed at establishing preeminence in 10 strategically emerging industries (SEIs) driving the fourth industrial revolution.⁵⁷ Three of these were at the heart of the energy transition: new materials (critical minerals), new energy vehicles (electric vehicles), and renewable energy.⁵⁸

In 2015, Xi Jinping and the CCP’s State Council unveiled “Made in China 2025” (MIC2025) specifically to displace Western firms across advanced product supply



chains, including renewable energy and low carbon technologies.⁵⁹ MIC2025 called for Chinese produced components to comprise 70 percent of advanced technologies like electric vehicle motors, lithium-ion batteries, solar panels, wind turbines, and other new energy products.⁶⁰

MIC2025 established hundreds of specific policies issued by various state ministries and regional governments, designed to support the displacement of foreign rivals and China's ascension as the leading technological and economic superpower.

In implementing MIC2025, national and local governments launched a series of policies designed to help China dominate EV and battery supply chains while supplanting foreign automakers.⁶¹ Starting in 2010, Beijing required all foreign brands with access to the Chinese market to form joint ventures (JV) with Chinese automakers and hand over trade secrets and intellectual property relating to three technologies—electric motors, complex electronic controls, and electric vehicle batteries.⁶² As a general matter, foreign companies that failed to comply with these requirements would be barred from selling their electric vehicles in the country.⁶³

Although Beijing permitted foreign companies into its domestic market to gain access to their IP, the CCP developed strategies to ensure Chinese buyers would prefer domestic brands. For example, in 2011, Beijing enacted regulations making only domestically manufactured electric vehicles eligible for generous point-of-sale subsidies, which could slash more than \$10,000 from an electric vehicle's price.⁶⁴

Beijing went one step further by not only denying the subsidies but also placing a 25 percent tariff on foreign EVs produced in China unless they sourced their batteries from domestic brands like CATL. By 2017, seven of the ten largest EV manufacturers in the world were Chinese.⁶⁵ The country's aggressive pursuit of the energy transition and preeminence in new energy supply chains offers a convenient means to advance the CCP's nationalist ambitions and world view.

2. State Capitalism Mobilized for Economic Warfare

The CCP exerts control over state owned enterprises (SOE) and private sector companies to advance Beijing's strategic priorities, including to control the technology-enabled clean energy transition.⁶⁶ Setting the stage for Xi Jinping's landmark policy effort, Made in China 2025, the CCP began reversing a decades-long era of financial liberalization in the early 2000s.⁶⁷ The CCP reasserted itself in the Chinese economy and

designed ways to direct trillions of dollars from state budgets and the private sector to select industries to tip the scales in favor of its “national champions.”⁶⁸

The CCP’s control over capital flows represents a powerful potent tool to direct the massive Chinese economy and to dominate the energy transition.⁶⁹ China’s banks, companies, and investors must submit to the party’s goals ahead of profits, if necessary. This control of capital and the Chinese economy is at the heart of China’s dominance over new energy supply chains.



Source: Nakamura, Yu, *Chinese Enterprises Write Communist Party Role Into Charters*, *Nikkei Asian Review*, 2017

3. The State-Owned Banking Sector: Unlimited Financing on Demand

The role of the CCP and the PRC’s state-owned banks financing China’s energy transition is instructive. Known as the “mini politburo,” the State Council has direct authority over all state-owned banks (SOB) and its Vice Premiere appoints the banks’ senior leadership with decision-making authority over banks’ lending. China’s SOBs, policy banks, and local government banks collectively own over \$26 trillion in assets under management, totaling about 65 percent of the country’s banking sector.⁷⁰

Given the order from Beijing, China’s SOBs are required by law to provide cheap financing, known as policy loans, to any company, project, or otherwise geostrategic investment regardless of its profitability or risk profile.⁷¹ In November 2016, the China Development Bank, a state owned “policy bank” pledged \$45 billion towards

implementing MIC2025.⁷² Following the release of MIC2025 and similar initiatives, other SOBs provided an estimated 60 billion dollars in below market loans for Chinese EV manufacturers and battery makers.⁷³

These cheap government-backed loans helped to fuel CATL's meteoric rise to the world's largest battery maker. In 2015 and 2016, the company received at least \$24 billion in direct government subsidies, based on incomplete central government data.⁷⁴ In 2016, "Build Your Dreams" (BYD), China's largest EV producer, received over \$1 billion in government financing, and this is just what was reported.⁷⁵ SOBs lent Xpeng, a leading Chinese EV maker, \$2 billion in 2020.⁷⁶

Further, the CCP directs SOBs to finance the acquisition of resources and assets around the world to control the clean energy supply chain. In 2015, U.S. copper and gold miner, Freeport McMoran, was desperate for capital and sold its DRC copper and cobalt assets to China Molybdenum and other Chinese investors.⁷⁷ Over half of the funding came from Chinese state-owned banks.⁷⁸ In fact, an investigation by the New York Times discovered Chinese mining companies in the DRC received at least \$12 billion in zero-interest loans from Chinese SOBs. The five biggest Chinese mining companies in the Congo had lines of credit from state-backed banks totaling over \$120 billion.⁷⁹ The total amounts of state-backed financing to EV companies, critical mineral miners, and companies in renewable energy is unknown, as a significant number of Chinese state-owned bank loans are unreported.⁸⁰

4. Beijing's National Champions

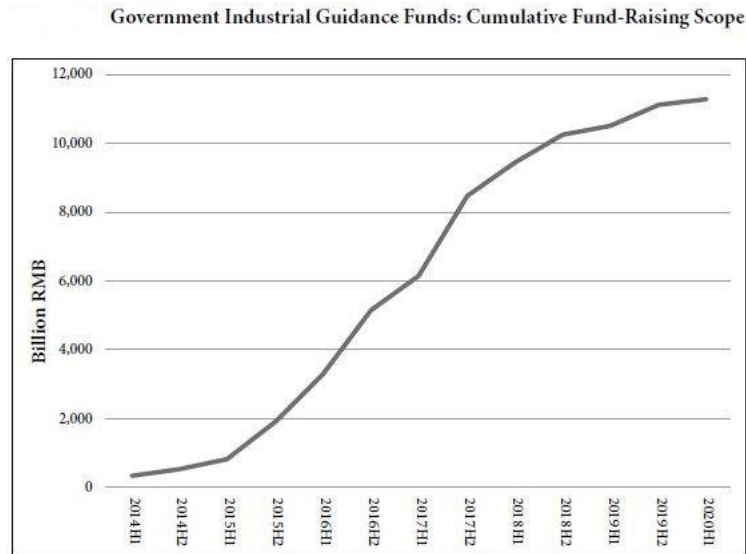
Beyond the banking sector, state owned enterprises (SOE), comprising about half of China Inc.'s overall market capitalization, are mandated by law to allocate funds and mobilize resources to advance CCP policy objectives such as leapfrogging the West in the energy transition.⁸¹ China's state-owned monopolies from unrelated industries such as tobacco, textiles, and others are regularly required to divert billions of dollars to government initiatives to bolster domestic manufacturing in strategic industries.⁸²

Chinese SOEs are also called to provide cheap raw materials and components to downstream companies the CCP wishes to support in order to displace free world rivals. This can provide considerable advantage to capital intensive industries like the automotive sector, where material and component purchases can comprise up to 60 percent of a manufacturer's cost.⁸³

According to China experts at the Center for Strategic International Studies (CSIS), Western companies do not really compete against Chinese counterparts, but "it is the

entirety of the Chinese government’s balance sheet they must contend with.”⁸⁴ All SOEs are directly managed by the State Council’s State-Owned Assets Supervision and Administration Commission (SASAC).

In 2020, the CCP required all SOEs to amend their corporate charters to formally include CCP party organizations in their corporate governance system.⁸⁵ SOEs stand ready at the “beck and call” of state officials to support Chinese companies in the energy transition.



Source: Prof. Barry Naughton

5. Leveraging State Funds

The CCP developed the government-guided industrial fund, or GGF, to finance its industrial policy designed to propel China to the commanding heights of the new energy economy. Since their proliferation in 2015, GGFs have pledged to raise nearly \$2 trillion for investment in the SEIs focused on Made in China 2025.⁸⁶ With the GGFs, Beijing is able to wield another tool to funnel hundreds of billions of zero interest or other favorable financings to dominate new energy supply chains.⁸⁷

Government-controlled GGFs are initiated at the bequest of a specific government ministry or local government body. They are run by professional fund managers and funds are raised from a mix of state and private sector money. As is usually the case, these funds are opaque and tracking their activities is next to impossible.⁸⁸ Unlike loans

from publicly traded western banks, the GGF funds are not required to realize returns on investment or turn a profit. According to one fund manager: “Rarely do you have a government-guided fund that is chasing returns.” Instead, they are vehicles for national and local governments to leverage funds raised from various sources to pursue goals laid out in Made in China 2025.⁸⁹

On average, eight new government-guided funds are created every month, and each fund has close to Renminbi (RMB) 2.5 billion, US \$360.99 million, in capital. There are now more than 1,600 of these funds in the country dedicated to financing the state’s growing ambitions in industrial sectors like electric vehicle manufacturing and renewable energy.⁹⁰ GGF investment reporting is opaque, but some examples exist. In 2020, Xpeng received 4 billion RMB covering land acquisition, construction, and raw material costs from such vehicles.⁹¹ That same year, Nio, another Chinese EV company, received a \$1 billion dollar bailout from a mixture of public and private funds.⁹² Total amounts raised by GGFs remain unknown, but given their proliferation and expressed role in supporting MIC2025, it is reasonable to think that they funnel hundreds of billions of dollars into strengthening China’s new energy supply chains.

China also employs a number of coercive, demand-side policies meant to hasten the uptake of EVs. Starting in 2016, China’s largest cities began issuing new license plates only to applicants who owned EVs. Those wishing to receive driving privileges in China’s largest cities for their gasoline-powered automobiles would have to wait.⁹³ Odds for receiving a license plate if an applicant had an EV were nearly one in five, while applicants with traditional vehicles faced a less than 1 percent likelihood of winning the license plate lottery.⁹⁴ Finally, various city governments and government fleets were electrified in the 2010s, creating large markets for Chinese NEV makers.⁹⁵

6. China’s Control of the Global Supply Chain

China’s Belt and Road Initiative (BRI) is one of the largest development projects in history and a cornerstone of Chinese foreign policy. BRI allows Beijing another mechanism to gain access to key raw materials and preferential access to foreign markets through government-to-government arrangements, bringing member countries into the CCP’s sphere of influence. Through BRI, Chinese state investments work symbiotically with Beijing’s diplomatic efforts. According to influential U.S. think tanks, BRI contributed to at least \$70 billion of investment and construction in the mining sector from 2014-2021.⁹⁶

The total number is likely far greater. Chinese firms with state funding and cheap loans have acquired prized critical mineral investments across BRI states, including massive

lithium, copper, and cobalt projects in Latin America and Africa.⁹⁷ China's new energy "national champions," including CATL, China Molybdenum, Ganfeng, Zijin Mining, MMG Group, and many others, receive billions of dollars in state funding to acquire assets in BRI countries.

This foreign direct investment, coupled with hundreds of billions of dollars from China's policy banks and development banks, edges out foreign competitors with less political clout or access to cheap credit. Finally, the same firms who acquire critical mineral assets overseas with state money are then directed to provide the same raw materials to downstream Chinese companies so they can outcompete foreign rivals with access to cheaper goods.

D. China and Environment, Social, and Governance (ESG)

The World Economic Forum notes, "raw materials needed for batteries are extracted at a high human and environmental toll. This includes, for example, child labor, health and safety hazards in informal work, poverty and pollution."⁹⁸ The International Renewable Energy Agency found that the "largest reserves of metals and minerals required for renewable technologies are found in weak states with poor governance records."⁹⁹ According to the IEA and IRENA, many current extraction and processing practices are inefficient, unsafe, and result in pollution.¹⁰⁰

In most cases, Chinese companies are at the center of these mining controversies, corruption, and environmental destruction.

1. Tibet: Lithium

The vast majority of China's "domestic" lithium production occurs in Tibet. For decades, the CCP has systematically oppressed ethnic Tibetans and other minority groups through forced relocation, arbitrary arrest, torture, forced sterilization, political imprisonment, and many other methods.¹⁰¹ In 2020, experts who uncovered the CCP's use of slave labor in Xinjiang, China's westernmost region where the CCP carries out genocide against the Uyghur people, also claim similar forced labor and military-style reeducation camps exist in Tibet.¹⁰² Forced relocation, including the seizing of holy lands, and a program funneling up to 15 percent of the local population to reeducation camps, have led to protests in which Tibetans have died at the hands of PLA soldiers and other security services.¹⁰³

These policies of repression in Tibet have extended to China's lithium industry. In 2016, Xi Jinping visited Qinghai's salt flats to reiterate the state's support of the region's

lithium industry as well as the need for national unity, a nod to the forced Sinicization of the region.¹⁰⁴ State subsidies and investment have supported multiple mines in the region including projects by BYD and CATL.¹⁰⁵ In 2021, lithium output from Qinghai doubled.¹⁰⁶ China has developed dozens of large-scale mines in Tibet in the past ten years alone.¹⁰⁷

2. Myanmar: China's Rare Earth Militias

In neighboring Myanmar's illegal rare earth mines, Chinese state funds also support the development of mining activities, leading to environmental destruction, violence, and blatant disregard for human decency.¹⁰⁸ Following Myanmar's February 2021 coup, Chinese state-owned mining companies joined with warlords and ethnic militias to profit off black market rare earth element mining just south of China's border with the country.¹⁰⁹ In a matter of months, local environmental groups estimate the number of mines in the area have doubled from 50 to over 100 with most owned by Chinese investors and Chinese mining companies.¹¹⁰

This black market operates without environmental or human rights standards, poisoning the surrounding environment with heavy rare earth mining and spewing radioactive sediment into local streams.¹¹¹ The unregulated mining of rare earths in Myanmar has skyrocketed, with huge environmental implications.

The number of rare earth mines have doubled and environmental and human rights conditions are on the decline in the country. Over twenty villages have suffered from polluted soil and water, and rivers in the area have turned red multiple times.¹¹²

3. The Congo: Cobalt

China plays an outsized role in the well-documented human rights abuses tied to cobalt mining in the DRC. The rapidly expanding mines, operated and owned by companies like China Molybdenum and China Nonferrous Metal Mining Company, exhibit "conditions reminiscent of the colonial era."¹¹³

According to a report by Rights and Accountability in Development, a British NGO, and Centre d'Aide Juridico Judiciaire, a Congolese legal aid organization, racism and abuse occur regularly at all Chinese-owned cobalt mines in the DRC.¹¹⁴ The same report and reporting by the New York Times noted a lack of similarly overt racism and physical abuse at mines operated by non-Chinese firms such as Glencore, and until recently, Freeport McMoran.¹¹⁵

As Chinese companies operating cobalt mines in the DRC plan to double output in the coming year and become the largest cobalt producers in the world, their lack of concern for human rights and environmental protection offer a large advantage over more established players like Glencore.

III. Free Nations and the West

Businesses in free nations are accountable to a diverse group of stakeholders, including governments, environmental groups, shareholders, and workers. Citizens democratically elect governments who oversee regulatory agencies that hold companies accountable. In turn, companies must operate transparently and disclose to the public, shareholders, and regulators material information about their past liabilities, current operations, and future plans. Furthermore, America's banks, hedge funds, and private equity funds have elevated Environment, Social, and Governance as conditions for finance. As a result, U.S. firms have integrated ESG into their business operations and growth plans.

By contrast, the world's largest clean energy minerals and technology producer, China, is unencumbered by these principles. In fact, their SOEs operate as an extension of the state—or the CCP. The investment community, Chinese citizens, and NGOs lack the legal standing or agency to contest SOE actions or decision making. While Chinese firms may speak about ESG, there is no meaningful or transparent reporting or tracking, and investment success is often linked advancement of CCP strategic goals.

A. The West's self-imposed limitations

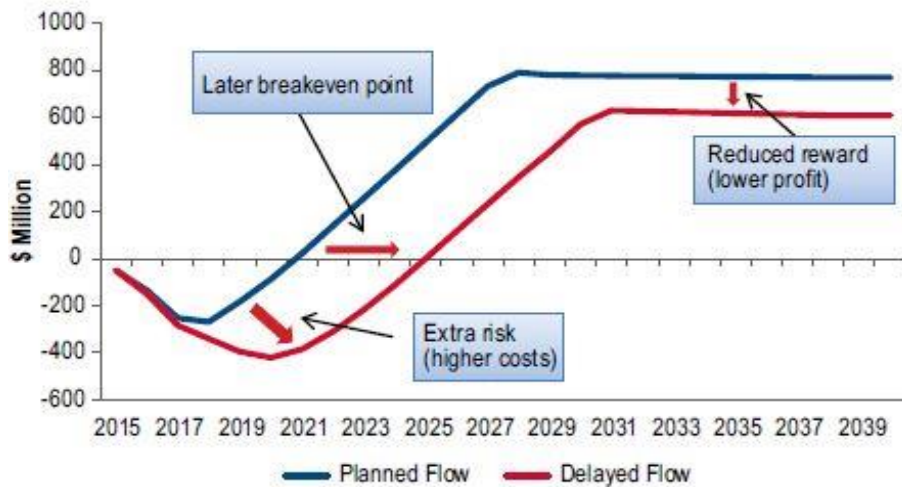
In the U.S., a single mining project can face up to thirty or more federal, state, and local regulatory programs.¹¹⁶ Environmental protection and mine reclamation regulations are preconditions to protect the public and the environment. However, the mining industry claims that uneven application of these well-intentioned policies disadvantage U.S. companies and deter needed investment.

Permitting certainty is foundational to assessing relative investment risk and return expectations. A mine that faces unreasonable and unforeseen delays is unable to enter production, and therefore, unable to generate returns. In the U.S., a typical mining project loses a third of its value due to regulatory uncertainty and permitting delays.¹¹⁷

By contrast, in many parts of China, less than 10 percent of mines operate according to the country's environmental regulations.¹¹⁸ Furthermore, China's REE mining industry

operates across an extensive black market network that includes hundreds of small-scale mines operating completely outside of the law to this day.¹¹⁹

FIGURE 8 CHANGES TO CUMULATIVE CASH FLOWS DUE TO DELAYS



Source: SNL Metals & Mining

U.S. citizens and stakeholders are right to have reasonable and meaningful avenues to express their views concerning shared federal public lands. In fact, public decision-making transparency and Americans' right to participate in that decision process are bedrocks of the U.S. system. By contrast, in China, there is little to no outlet for activists to protest the development of new energy projects. For example, in Qinghai, security forces forcibly relocated local communities in order to develop lithium mines and shot protestors who dared to stand in the way.¹²⁰

The U.S. must not abrogate its values and become more "China-like." America, however, must reconcile its climate goals with the fact that clean energy technologies require big shovels, mining, and minerals processing. Yet, several clean energy minerals mines under development face multiple lawsuits. Projects ranging from North Carolina to Nevada to Minnesota and Arizona find themselves overwhelmed by extensive litigation.¹²¹ According to the mining industry and chambers of commerce, today's permitting administrations can effectively halt or imperil a mine's development.¹²²

B. Failed Western Responses

As discussed, China and the West are pursuing clean energy for very different reasons. In many ways, the CCP views an international order based on free market principles, transparency, and the rule of law as inherent weaknesses and has constructed a clean energy supply chain to exploit them. As such, the West cannot “compete” in a traditional sense, since doing so would suggest both parties play the same game or operate according to similar principles and standards.

Furthermore, the West’s traditional tools to remedy trade violations presume countries are operating on a relatively level playing field. Specific remedies, such as tariffs, the WTO’s Dispute Settlement Body, or countervailing duties are tactical and targeted countermeasures designed to rebalance the playing field when one party has “cheated.” They cannot, and were not envisioned to, serve as a response to an authoritarian one-party state deploying a whole-of-government strategy challenging the entire rules-based international order.

The West’s countermeasure toolkit has proved to be inadequate in multiple instances concerning China. This was especially borne out in the case of REEs and solar Photovoltaic (PV) supply chains.

1. Case Study: REEs

China always regarded rare earth elements as an important domestic resource. In 1992, Deng Xiaoping, the former Chinese head of state, stressed “the Middle East has oil; China has rare earths,” and in the last year of the 20th century, Chinese President Jiang Zemin said “Improve the development and application of rare earth, and change the resource advantage into economic superiority.”¹²³ Over the course of twenty years, China solidified its control of the entire value chain. Beijing achieved this through a potent mix of state subsidies, protectionist trade policies, forced technology transfer, and the state-funded acquisition of foreign companies and assets. In sum, this became China’s clean energy playbook.¹²⁴

The West, and especially the United States, paid little to no attention to this rising threat. In fact, the U.S. was so willfully unaware that, in 1995, the government approved the sale of the only manufacturer of permanent magnets needed for a wide range of military applications to Chinese investors.¹²⁵ Until this acquisition, the U.S. and Japan were the only countries manufacturing the most technologically advanced applications from rare earth concentrates. After the Chinese bought the firm, it was shuttered and

moved to China along with its key intellectual property.¹²⁶ The U.S. Department of Defense found itself reliant on China for some of its most advanced components.

In 2010, the Japanese Coast Guard detained Chinese vessels illegally fishing and ramming Japanese ships in waters owned by Osaka but claimed by China. To apply pressure on Japan, the Chinese Ministry of Commerce banned rare earth exports to Japanese companies and enacted steep quotas, sending global prices skyrocketing.¹²⁷ This action deprived Japanese manufacturers of the raw materials needed for hybrid vehicles, advanced motors, and a host of other technologies. In 2010, Japan, with U.S. and EU support, initiated a WTO challenge of China's rare earth export quotas.

It took nearly four years for the WTO to finally rule against China in 2014 and another year before China began implementing the judgement in 2015.¹²⁸ During those crucial five years, China continued to manipulate the market. After constraining supplies and inflating prices, Chinese SOEs dumped product into the market, crashing prices and forcing scores of non-Chinese downstream manufacturers out of business. With prices artificially high on international markets and low in the domestic Chinese market, foreign firms manufacturing goods derived from rare earths either closed, relocated to China, or were acquired by Chinese companies with CCP loans. Although the WTO eventually ruled against China, the damage had already been done; the free world effectively exited the REE industry in the intervening years.

China moved up the value chain during the rare earth disputes from 2010 to 2015 to solidify control of processing and manufacturing of advanced technologies. Ultimately, the slow WTO resolution process failed to stop China's increasing control of the entire sector in the half decade the exports ban was in place. The WTO judgement did nothing to address underlying issues and Beijing's questionable practices to capture increasing share of the rare earth value chain.¹²⁹

President Xi Jinping understands that he wields considerable geopolitical as well as market power over the West's reliance on China's rare earth dominance. At the height of the US-China trade war, in 2019, Xi Jinping visited a rare earth element processing facility as an unmistakable and powerful message to the U.S. administration that China could again use the rare earth weapon if it felt that it was being treated unfairly.¹³⁰

2. China's Solar Dominance

According to the U.S. Department of Energy, solar power will meet about 45 percent of global electricity demand by 2050.¹³¹ Chinese companies produce roughly 70 percent of the world's polysilicon, the primary raw material needed to make solar panels.¹³²

Production of the ingots, wafers, and other components needed to make solar cells is almost exclusively carried out in China.¹³³ Further downstream, both solar cell and module manufacturing are largely dominated by China. Currently, eight of the ten largest solar companies were Chinese and 80 percent of solar cells and modules shipped globally came from the PRC.¹³⁴ Yet, China's dominance of the solar industry is a relatively recent achievement.

By the early 2000s, the U.S. and other free nations had a sizeable and burgeoning solar industry. In 2003, China represented only two percent of global solar cell manufacturing. By the mid-2010s, China controlled nearly three quarters of global production. Beijing achieved this remarkable growth by deploying its playbook to displace foreign rivals through massive state subsidies, protectionist trade barriers, and low environmental and human rights standards. Many Chinese solar companies received billions in state-backed funding, subsidized energy costs, free land, and cheap government financing. The Chinese solar industry had poor financial performance over several years, but continued to grow to scale due to massive state subsidies.¹³⁵

In 2010, the Chinese government designated its solar industry as a Strategic Emerging Industry (SEI). This designation and elevation as a MIC2025 industry meant that state-backed finance kept unprofitable companies afloat and increased their investment in ways that would be impossible in the West. Heavily subsidized Chinese companies produced solar panels and components at rock-bottom prices and drove hundreds of U.S. and European solar companies into bankruptcy.¹³⁶ Furthermore, Chinese national and state government enticed foreign firms to relocate and establish their manufacturing in the "Middle Kingdom."

American solar executives at the time credited their decision to uproot factories from the U.S. to China to "easy access to capital from state-owned banks."¹³⁷ Although those foreign firms could export their Chinese-manufactured products overseas, they were prohibited from competing against local companies for market share of the domestic market.¹³⁸

In response to Beijing's dumping solar panels on the world market, the U.S. Department of Commerce in 2012 issued anti-dumping and counter-veiling duties against China-made solar panels ranging from 25% to 250%.¹³⁹ While these were some of the highest tariffs enacted under the Obama administration, they did little to prevent the hollowing out of the U.S. solar industry to Chinese companies. To circumvent the Obama-era tariffs, Chinese manufacturers simply relocated production outside of China, skirting the tariffs, and continued to export to the United States.¹⁴⁰ Furthermore, Beijing introduced steep tariffs on polysilicon imported from the U.S. for solar PV components

made in China. This action devastated the U.S. polysilicon industry, which at the time made 24 percent of the world's polysilicon.¹⁴¹

By the time China stopped buying U.S. polysilicon, their control over the supply chain was so strong the U.S. was completely at their mercy.¹⁴² The U.S. polysilicon market shrank from \$1 billion in 2011 to \$107 million in 2018.¹⁴³

President Trump imposed import limits and tariffs as high as 30 percent on all foreign solar cells and photovoltaic panels in 2018, not just those made in China.¹⁴⁴ The Biden administration has maintained the Trump era tariffs. These limited countermeasures, however, have had little impact on China's dominant position in the global solar industry.

IV. A New Plan

The United States and free nations' clean energy transition goals have already begun to strain existing supplies of key critical minerals, sending prices to historic highs. Governments' calls to increase the scale and speed of climate action increases the demand for these minerals. However, governments have, thus far failed to advance commensurate supply-side policies. As a result, Western mining companies have underinvested and are currently ill-prepared to meet growing demand.

For decades, U.S. and European governments have quietly relied on an out-of-sight-out-of-mind minerals and processing policy. China was able to provide inexpensive clean energy technologies at a time when the West needed. Our ongoing supply chain challenges, however, have laid bare the vulnerabilities of the West's dependence on this opaque, global, just-in-time supply chain. We lack sufficient supplies of critical minerals to realistically meet our clean energy targets, and, even if we had sufficient volumes, our supply chain would be unable to deliver them.

On top of that, China—America and Europe's chief adversary—controls the vast majority of the critical minerals that enable clean energy technologies. From the steps of the Glasgow Climate Conference, President Biden called on the Organization of Petroleum Exporting Countries (OPEC) to increase oil production to blunt rising fuel costs at home. OPEC is a multi-country organization that controls 40 percent of global oil production. We must avoid a situation where the President of the United States must ask President Xi Jinping to increase exports of clean energy minerals so that we can meet our climate change targets or provide reliable and affordable energy for American families.

The CCP views and controls the massive Chinese economy as an instrument of strategic statecraft. A decade ago, China used its market power in rare earth elements to affect geopolitical events, and threatened to do so again a few years ago. Successive U.S. administrations have acknowledged this threat and have developed an incrementalistic suite of tactical countermeasures. These have been wholly insufficient, as China's anti-democratic power has expanded.

The U.S. must adopt a new strategy in collaboration with allies and partners framed by our shared values, such as respect for human rights, the environment, and good governance. This will require bold leadership and a political will to take on diverse political constituencies at home and abroad. The following policy recommendations provide a roadmap to win the clean energy transition.

A. Establish a Clean Energy Supply Chain Tsar or Envoy

The United States has tremendous resources across the federal interagency. Yet, navigating across multiple agencies' points of view and respective equities is complex and time consuming. Further, a president's stated priorities can easily get lost in bureaucratic confusion when it comes to operationalize a policy statement in practice. As such, it is customary for Presidents to appoint a special envoy, advisor, or "tsar" to ensure that the presidential priority gets the appropriate level of attention and is implemented in a reasonable and near-term timetable. The "tsar" concept dates from WWII and has grown over time.¹⁴⁵

The "tsar" can serve an important role as the single point of accountability to advance a key presidential priority. The Biden administration has repeatedly stated the importance of developing a domestic and secure critical minerals supply chain.¹⁴⁶ In order to realize this ambition, President Biden should designate a Clean Energy Supply Chain Tsar.

The "Tsar" should have high-level private sector experience and have the president's designated authority to reconcile the inevitable interagency conflicts and bureaucratic challenges. He or She should have a prominent role within the White House, which could be as an extension of an existing office, such as the National Economic Council, in order to leverage existing staff and infrastructure.

B. Establish a Transparent Global Standard

The clean energy technology supply chain is opaque. Media have recently reported on mineral and metal exploitation under abhorrent conditions involving environmental destruction, human rights violations, and corruption. The situation has gotten so dire that some civil society activists have begun to caution against the use of “blood batteries.”¹⁴⁷ Free nations must act now if we are to meet projected minerals demand growth in a responsible way consistent with our values.

Clean energy companies would like to partner with government to reform this situation for two reasons. First, they understand that reliance on a single vendor or supplier presents a single point of failure, which can increase price volatility. Second, the clean energy industry understands the public’s growing expectation that their solar panels or EVs are sourced and produced responsibly. To do otherwise could lead to terminal reputational damage and market failure. In response, some leading electric vehicle companies have quietly begun to assess their supply chain from the mine up, and ranked suppliers’ relative performance across environmental, labor, and other key metrics.¹⁴⁸

Resource-rich developing nations often want to attract best-in-class investors and western mining firms. Most western companies, however, have been reluctant to enter certain jurisdictions because of historic or perceived corruption risk. To answer this call, in 2019, the United States established the Energy Resources Governance Initiative (ERGI) alongside Australia, Botswana, Canada, and Peru. ERGI established an international best practice “toolkit” that assists countries to establish or ensure responsible mineral development over the long-term. Countries joining ERGI pledge to ensure the highest environmental, social, and labor standards in the extraction and processing of the many minerals needed to power the energy transition.¹⁴⁹

ERGI established a strong foundation and should be expanded. The European Union proposed new regulations to ensure that batteries and related inputs uphold human rights and environmental protections. The United States should engage the EU to harmonize strong standards that align with our shared democratic values.

Both the U.S. and EU have called for sweeping climate action and an accelerated clean energy transition. Governments in free societies tend only to offer policy direction via encouragement and incentives; citizens can choose to act on them or not. A coordinated U.S.-EU approach based on our shared democratic values would hasten public support for and adoption of clean energy technologies at scale.

The CCP views the free world's values as an inherent weakness. Yet, our values could be a force multiplier, and represent the most significant and comprehensive countermeasure to Beijing's economic coercion. This values-based clean energy market would effectively shine light on supply chains from the mine source to the end product. It would be framed on certain foundational principles.

1. Permissive not prescriptive. Western countries cannot "compete" with China. Beijing's coercive government controls the state, society, and enterprise, and exercises that power to overwhelm the west. As such, western governments will never be able to match China's spending or prescriptive mandates. American citizens, however, and other western nations have repeatedly demonstrated a willingness to choose right from wrong if presented the choice. Consider boycotts against apartheid South Africa, against conflict diamonds, or more recently, against all things Russian from energy to Wimbledon.
2. Support and celebrate freedom, including and especially of individual choice. The CCP prioritizes a collectivist mindset that prioritizes the state over liberty. A western values-integrated clean energy market would empower the individual through greater information rather than prescription.
3. Transparency and disclosure made easy. In response to public and stakeholder demands, corporations, banks, and financial institutions have elevated Environment, Social, and Governance reporting. In so doing, ESG has gotten more complex and spawned myriad of disclosure structures and related cottage industries. Although these efforts may be well-intentioned, such ESG reporting is often time consuming, costly, and tends to operate as public relations campaigns. However, we do not have any time to waste if we are to meet climate targets, accelerate the transition, and retake our clean energy leadership. A values-based reporting system should be easy to increase widespread acceptance adoption. All companies involved in the clean energy supply chain should be encouraged to self-report and do so in plain language.
4. Enforcement by the public not bureaucracy. A coordinated, values-based clean energy market would be self-selecting. The public could make informed purchase decisions based on the reporting of a particular product and reward companies that disclose a responsibly sourced and manufactured clean energy technology with their business. For example, if such a voluntary disclosure regime were available, it is more likely than not that Amazon or Walmart would

integrate responsible sourcing as key criterion in procuring their next fleet of electric trucks. Interested non-government organizations would help to increase awareness, and activist investors would provide additional encouragement to mobilize and integrate values.

5. Pro-transparency, human rights, environment. A values-based clean energy market should be positive and inclusive rather than singling out or excluding a particular country. All market participants would be invited to participate in this market. Market participants, however, must demonstrate their values through disclosures and reporting, public review, and opportunity for shareholders to take action in a manner consistent with western public markets.

C. U.S. Domestic Leadership

Multiple U.S. administrations have recognized America’s dependency on critical minerals and have taken modest actions. These actions tend to follow a familiar pattern—a market or geopolitical event would trigger public outcry, government officials would cobble together a tactical response, claim public victory, and suggest that they addressed the problem. In reality, these tactical responses have proven wholly inadequate since U.S. dependency has continued to grow.



- Obama Administration’s critical mineral policies primarily a response to 2010 rare earth embargo by China
- Ignored underlying questions: How did China come to dominate the rare earth market?
- Response limited in scope and efficacy, WTO ruling came 4 years later
- In 2010 DOE issued first-ever “Critical Materials Strategy”, the White House formed Interagency Working Group
- Efforts primarily focused on studying level of import dependence, questions of R&D, workforce development, and ambiguous policy recommendations



- Executive Order #13817 called for US government to strengthen mineral supply chains
- White House report released in 2017 including 61 specific policy recommendations
- In 2019, Energy Resource Governance Initiative (ERGI) established
- Executive Order 13953 declared national emergency to deal with the threat to US economy and security from country’s dependence on China, called for tariffs
- Issue now framed as National Security Threat & Economic Security



- Continued many of Trump Administration’s policies
- Expanded focus on both national security and economic competitiveness to include climate change
- Included critical mineral spending in 2021 infrastructure package
- Other initiatives include: DOE’s National Blueprint for Li-Ion Batteries, DOE loans and grants for battery supply chain, DOI/White House working group to identify sites for critical mineral production

America faces a stark choice and a limited and fading window of opportunity. We can either revert to the familiar tactical, politically expedient, and ineffective playbook, or America's leaders can meet the challenges head on. This will not be easy or immediate and neither will the transition to a net zero economy. First, America's leaders must have an honest and direct conversation with the public about the costs, benefits, and necessary tradeoffs. Second, it will require leaders to demonstrate a unique and strong political will to engage and potentially contest diverse and powerful constituencies.

The following section describes some of the key elements required for America to develop a reliable, resilient, and secure clean energy supply chain.

1. Setting the Standard

In 2021, the U.S. stock market represented more than 50 percent of the world's exchanges.¹⁵⁰ America's dominant position in the global market offers a significant and underutilized comparative advantage. The Securities and Exchange Commission (SEC), the public market regulator, could be an important instrument to harness that advantage.

The SEC has three primary missions: protecting investors, maintaining fair, orderly, and efficient markets, and facilitating capital formation.¹⁵¹ The Commission routinely updates its reporting guidance to keep pace with evolving market conditions and shareholder demands. To that end, the SEC recently proposed new rules that would require public companies to disclose information about climate-related risks that are reasonably likely to have a material impact on their business.¹⁵²

Critics of the proposal argue that carbon emissions-related risks are speculative, and future climate regulatory action, which could affect their business, is uncertain. Proponents argue that climate disclosures could aid the public in assessing investment risk. Regardless of the form and timetable, calls for climate-related disclosure continue to grow. Many companies have begun to voluntarily disclose in response to shareholder requests.

The SEC should refocus its efforts and encourage disclosure of the clean energy supply chain. As discussed, many clean energy companies are already experiencing challenges, from reputation-related risks to high commodity prices. Companies' reliance on one country for the majority of their commodities or manufacturing represents an unsustainable level of market concentration, which can contribute to price volatility. The projected exponential growth in clean energy demand will stress the current system further, increasing prices and jeopardizing business plans.

Some may argue that it would be too difficult for companies to self-report on the integrity and resilience of their supply chain. Yet, if companies are increasingly expected to track the emissions of invisible gases, then they should also be able to know whether their products are tainted by human rights abuse, child labor, corruption, or environmental destruction.

Many western companies are striving to maintain the highest standards. Their efforts, however, are not measured against those of opaque market participants. The SEC, investors, and the public should recognize companies' good works. For example, if a company's project falls under ERGI, then the Commission should provide a positive presumption of good governance.

The market should distinguish between commodities produced responsibly and the alternative. Investors and market participants require sufficient information to make that determination.

2. Stimulate Responsibly Sourced Demand

America and other free nations lack domestic or responsibly-sourced supplies of clean energy minerals. In order to stimulate such supplies, the United States and allies must do more to encourage their demand. Currently, there is little way for market participants to differentiate whether the metals in an electric vehicle were produced well or are violative of our values. Producing commodities and products responsibly likely costs more than those produced with slave labor, corruption, or without environmental safeguards. Supply chain transparency, reporting, and disclosure will go a long way to address this critical gap.

Yet, even the best reporting information cannot solve for supply-side latency. It takes time to build mines and get products to market. If all or most clean energy companies procured responsibly sourced inputs, then their costs may increase in the near term. As such, the administration and Congress should provide appropriate financial incentives for manufacturers, such as an auto company, to source from responsible producers.

The U.S. government has a long history of providing tax credits and grants to incentivize renewable procurement and utilization. Policy makers should develop a parallel model for responsibly produced and processed minerals and metals. These tax credits should apply to domestic sources as well as to verified foreign jurisdictions or

projects, such as ERGI participants. The incentives should be phased out over time as supplies increase.

3. Support Responsibly Sourced Supplies

Reestablishing the domestic mining industry will take time and money. Multiple U.S. administrations have proposed government support programs. These programs include the Department of Energy's grants and finance guarantees and the Department of Defense's Defense Production Act (DPA) Title III grants.

Although promising, these programs are still in their relative infancy and slow to implement. The U.S. should expedite and expand these programs. The DPA grants should align with America's national security goals, and there are a few precedent-setting examples. The DOD's grants to Lynas Rare Earths, MP Materials, and other firms sought to catalyze a domestic rare earth mining and processing industry.¹⁵³ These kinds of investments represent far greater value than just the dollars at issue. U.S. government financial support signals high-level validation to market participants and investors and can help to de-risk the business case for a particular project or sector. The administration should expand the applicability of U.S. funding to include domestic mining rather than the more modest feasibility studies or efficiency improvements of current operations.¹⁵⁴

In 2019, Congress established the \$60 billion U.S. International Development Finance Corporation (DFC). In response to years of criticism, Congress sought to ensure that taxpayer investments would align with U.S. foreign policy goals.¹⁵⁵ In addition to providing traditional loans, the DFC is authorized to make equity-level investments in projects and funds that advance these objectives. In light of widespread and overwhelming bipartisan support for creating a more resilient, responsible, and secure clean energy supply chain, the DFC should publicly recommit to these goals. Such an action reduces perceived policy uncertainty across presidential administrations. Furthermore, the DFC could operationalize this declaration through greater financing efficiency and increase its equity-level investments in specific mining projects and related private sector funds.

President Biden's 100-day interagency supply chain review report made several recommendations on how the U.S. could retake its leadership across several industries, including in critical minerals. In particular, the Biden administration should take action to implement a proposed Export-Import Bank domestic financing program to support American clean energy transition exports.¹⁵⁶

The U.S. should increase its partnership with allied nations' development and finance institutions. In particular, the administration should elevate partnerships with institutions such as Japan's JOGMEC, Japan Oil, Gas, and Metals National Corporation. JOGMEC systematically invests in mining and processing projects for key commodities. After Beijing banned rare earth exports to Japan in 2010, JOGMEC invested in Australia's Lynas Corporation's rare earth projects in Oz and in the United States.¹⁵⁷ These investments helped Japan to reduce its import reliance on Chinese rare earths from over 90 percent to under 60 percent.¹⁵⁸ JOGMEC continues to invest in lithium, cobalt, and other critical mineral projects around the world, as well as maintaining rare earth stockpiles.¹⁵⁹

The U.S. should develop a specific mechanism to partner with Japan, which could include shared financing of key critical minerals projects in third countries. For example, under the auspices of the Japan-United States Strategic Energy Partnership (JUSEP), the two countries committed to co-invest to improve Vietnam's energy security. JUSEP provides a meaningful model for broader expansion into critical minerals.¹⁶⁰

4. Improve Permit Certainty

High-level policy statements are important signals, but press releases do not produce energy or key commodities. In order to realize a clean energy transition and a responsible supply chain, projects must be permitted and actually built. Multiple domestic and international organizations have cited how permitting uncertainty can kill projects. In response, organizations like the IEA have consistently recommended that governments streamline permitting processes in order to improve the certainty of critical mineral development.¹⁶¹ The IEA focused most of its attention on the American system, which is more complicated, lengthy, and uncertain than nearly any other Western country.

Bipartisan U.S. policymakers have recognized this deficiency for years. As early as 2010, the Obama White House conducted studies and directed working groups like the DOE's Critical Raw Material Strategy. The Obama administration recognized the need to develop more efficient permitting processes in order to develop alternative critical mineral supply chains to China.¹⁶² Federal strategies under the Obama, Trump, and now Biden administrations include similar recommendations, but have failed to operationalize them.

It is critical to reconcile clean energy and climate ambitions with the realities of the largely broken U.S. permitting system. The administration could do considerable good for the country if it would tackle these challenges head on. The Biden administration has repeatedly stated that America, and indeed, the global community have little time to waste in addressing climate change. Under the current system, with renewable energy projects being cancelled from Maine to Arizona, it is hard to imagine how the U.S. will achieve its clean energy goals.¹⁶³ The scale of the clean energy transition requires the electrification of our entire power, mobility, and industrial systems.

To advance permit streamlining, not-in-my-backyard campaigners and related special interest groups will pose difficulties and be politically uncomfortable. The administration, however, could craft a policy for the majority of Americans who are looking for the federal government to take on the hard challenges. At the very least, it should align U.S. mine permitting and licensing regimes in line with best-in-class countries like Canada and Australia.

Conclusion

We are in the beginning stages of an energy transition unprecedented in scale, scope, and breadth. The transformation of the world's power generation, mobility, industrial and manufacturing sectors, and buildings will require a complete shift away from today's predominant fossil-based economy. Whereas today's economy is largely fueled by the remnants of ancient organic material, tomorrow's will be powered by inorganic minerals and metals. Energy metals tend to occur geographically far from traditional fossil fuel resources. As such, the clean energy transition has set in motion a fundamental shift in the geopolitics of energy.

The United States, Europe, Japan, and other free nations have committed to transition to clean energy to mitigate the effects of climate change. Yet, they currently lack sufficient domestic supplies of the critical resources, processing, and manufacturing capabilities to achieve their goals. By contrast, China, the world's largest and growing carbon emitter, owns or controls anywhere from 50 to 90 percent of the metals and processing to actualize the energy transition.

Over two decades ago, the PRC recognized that their dependence on oil imports and the U.S. navy to protect sea lanes and reliance on foreign technologies posed material security vulnerabilities. In response, they launched a whole-of-government effort to develop domestic alternative energy capabilities – not just deployment of alternative energy but a commitment to the entire supply chains that underpin their production.

China sought to improve its domestic energy security while at the same time encourage the West to adopt a dependence on Beijing to achieve their clean energy goals.

China's relative success was the product both of CCP-directed economic statecraft and the West's willful blindness and prioritization of the deployment of inexpensive clean energy with little regard to how and where they are produced. America slowly reduced its diplomatic and military presence and economic engagement with much of the developing world. China exploited the void, and through systematic and predatory "debt-diplomacy," secured mineral rights and control of key infrastructure across much of Africa, Latin America, and broader Asia. Unfortunately, many of the countries desperate for investment are no better now, or are even worse off. According to multilateral institutions and civil society groups, Chinese companies often are associated with corrupt practices, human rights violations, and environmental harm.

The United States and other free nations have become increasingly aware of how dependency on China's clean energy supply chain – from the mine to the manufacturing plant – threatens both our energy security and ability to mitigate climate change. Successive U.S. administrations have taken selected tactical countermeasures, but with limited effect. These past actions were designed to remedy a particular violation and therefore were purposefully temporal and with limited scope. The imposition of tariffs, anti-dumping duties, or WTO challenges are measures to once again "level the playing field," as if the free world and PRC are playing the same game. As discussed here, the U.S. and China have been engaged in an asymmetric contest with completely different rules, capabilities, and objectives.

Free nations' well-intentioned climate policies are helping to drive the clean energy transition and catalyze an unprecedented demand for key minerals and processing. Yet, the growth of environment, social, and governance, coupled with a reputational risk averse investor class, have contributed to America's underinvestment in the very resources needed to achieve those climate goals. China's state-led economy, by contrast, faces no such pressures. The CCP built the world's dominant clean energy supply chain to help meet the West's climate ambitions in full violation of their ESG and core democratic values.

The United States and other free nations understand that the current situation is untenable. Governments are beginning to take some substantive actions, but these have proven insufficient and modest compared to China's dominant position. Just as climate change requires global coordination, so too does meeting the scale of minerals and metals needed in order to realize the clean energy transition.

The clean energy transition is underway. China has been ascending toward the commanding heights for years while the West was asleep at the wheel. For the U.S. and allied nations to regain their agency and assert leadership will require a new approach. We must encourage a new level of transparency across the clean energy supply chain. This will require American and White House-level leadership, buy-in from states, and local government integration. Next, the United States should lead a globally coordinated set of transparency principles to ensure that our clean energy supply chain advances our shared democratic values.

America has realized that the race to determine who will control the commanding heights of the clean energy economy began more than a decade ago. We are playing catch up and it is imperative that we do so both for U.S. security and the health of the environment. Government action is often slow, faces political paralysis, and historically follows the private sector and civil society. As such, government should establish permissive principles and frameworks, but empower the private sector to lead in implementation. This approach will expedite widespread adoption, as much of the West's clean energy industry, banks, and investors have called for greater clarity in light of growing but uneven ESG demands, geopolitical tensions, and evolving consumer preferences. By elevating awareness, companies can better assess their vulnerabilities, identify single points of failure, and mitigate against reputational and related risks.

Shareholders and investors should reward companies that are able to identify their supply chain vulnerabilities and take action to remedy deficiencies. Greater transparency empowers free citizens to choose between responsible producers and suppliers and rewards companies and investors accordingly. Similarly, market participants should, over time, deselect or "punish" those that fail to meet operational, social, environmental or other expected standards of care.

Building a more responsible, resilient, and secure supply chain will not be without cost. Nor should we expect or believe that a reorientation of our multi-faceted energy complex would be easy. Yet, the U.S. government can help to realize this objective through by improving the permitting process, de-risking the cost of capital, and building on and expanding current direct mining and processing investments.

Governments around the world have elevated climate change as one of our most pressing issues. Issuing policy and political statements is easy. Execution on the ground has proven more challenging. The United States has the greatest free market system in the world. It is time to marshal this uniquely American of comparative advantages while also advancing our values.

Endnotes

¹ Hon. Frank R. Fannon is currently Managing Director of Fannon Global Advisors. He recently served as the inaugural Assistant Secretary of State for Energy Resources. Frank would like to acknowledge and Erik Romanin for his diligent research and support.

² “Net Zero Tracker *Net Zero Tracker* |, Energy & Climate Intelligence Unit, <https://zerotracker.net/>.

³ “Two Thirds of the World's Heaviest Emitters Have Set a Net-Zero Target.” *BloombergNEF*, Bloomberg Finance LP, 24 Sept. 2021, <https://about.bnef.com/blog/two-thirds-of-the-worlds-heaviest-emitters-have-set-a-net-zero-target>.

⁴ “The Database of Fossil Fuel Divestment Commitments Made by Institutions Worldwide.” *Global Fossil Fuel Commitments Database*, Stand.Earth, 350.Org, 2022, <https://divestmentdatabase.org/>.

⁵ International Energy Agency, Paris, France, 2021, p. 184, *Net Zero by 2050: A Roadmap for the Global Energy Sector*.

⁶ “Renewables' Power Ahead to Become the World's Cheapest Source of Energy in 2020.” *World Economic Forum*, World Economic Forum, July 2021, <https://www.weforum.org/agenda/2021/07/renewables-cheapest-energy/>.

⁷ *IPCC Summary for Policymakers*, IPCC, <https://www.ipcc.ch/sr15/chapter/spm/>.

⁸ McKinsey & Company, 2022, pp. 11–17, *The Net-Zero Transition: What It Would Cost, What It Could Bring*.

⁹ “New Energy Outlook 2021.” *BloombergNEF*, Bloomberg Finance LP, 2021, <https://about.bnef.com/new-energy-outlook/>. ; International Energy Agency, Paris, France, 2021, p. 22, *Net Zero by 2050 A Roadmap for the Global Energy Sector*. ; International Renewable Energy Agency, Paris, France, 2021, p. 100, *World Energy Transitions Outlook: 1.5°C Pathway*.

¹⁰ Energy Transition for Sustainable Development and Climate Action. IRENA, 19 Oct. 2021, <https://www.irena.org/events/2021/Oct/Energy-Transition-for-Sustainable-Development-and-Climate-Action>.

¹¹ International Energy Agency, Paris, France, 2021, p. 4, *The Role of Critical Minerals in Clean Energy Transitions*

¹² *Ibid.*, 8

¹³ The World Bank Group, 2020, p. 93-94, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*

¹⁴ Minerals for Climate Action. The World Bank Group, <https://thedocs.worldbank.org/en/doc/761501550004005661-0110022019/render/CSMMiningforClimateActionInfographic2.8ilovepdfcompressed.pdf>.

¹⁵ *iea. Minerals Used in Electric Cars Compared to Conventional Cars – Charts – Data & Statistics*. IEA, 4 May 2021, <https://www.iea.org/data-and-statistics/charts/minerals-used-in-electric-cars-compared-to-conventional-cars>.

¹⁶ McKinsey & Company, 2022, *The Raw-Materials Challenge: How the Metals and Mining Sector Will Be at the Core of Enabling the Energy Transition*, <https://www.mckinsey.com/industries/metals-and-mining/our-insights/the-raw-materials-challenge-how-the-metals-and-mining-sector-will-be-at-the-core-of-enabling-the-energy-transition>.

¹⁷ Fannon, Frank. “US Needs to Lead the Way in Building a New Energy Supply Chain.” *Financial Times*, Financial Times, 21 Dec. 2021, <https://www.ft.com/content/e1fd7f3b-5ee9-4fb1-a88e-5891acc0486c>. ; Sanderson, Henry, and Robert Colbourn. “Can the Auto Industry Meet Ambitious COP26 Pledges?” *Benchmark Mineral Intelligence*,

Benchmark Mineral Intelligence, 10 Nov. 2021, <https://www.benchmarkminerals.com/membership/can-the-auto-industry-meet-ambitious-cop26-pledges/>

¹⁸ International Energy Agency, Paris, France, 2021, p. 4, *The Role of Critical Minerals in Clean Energy Transitions*

¹⁹ Kettle, Julian. “Faster Decarbonisation and Mining: A Crisis of Confidence or Capital?” *Faster Decarbonisation And Mining: A Crisis Of Confidence Or Capital?*, Wood Mackenzie, 15 Dec. 2020, <https://www.woodmac.com/news/opinion/faster-decarbonisation-and-mining-a-crisis-of-confidence-or-capital/>.

²⁰ Ibid.

²¹ Holman, Jacqueline, and Henrique Ribeiro. “Commodities 2022: Global Lithium Market to Remain Tight.” *S&P Global Platts*, S&P Global Inc., 14 Dec. 2021, <https://www.spglobal.com/platts/en/market-insights/latest-news/energy-transition/121421-commodities-2022-global-lithium-market-to-remain-tight-into-2022>.; Erickson, Camille. “Threat of Graphite Supply Shortage Looms over Electric Vehicle Rollout.” *Accelerating Progress*, S&P Global Inc., 26 Jan. 2022, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/threat-of-graphite-supply-shortage-looms-over-electric-vehicle-rollout/>.; Erickson, Camille. “Global Cobalt Supply Deficit 'Not as Dire,' Analysts Say.” *Accelerating Progress*, S&P Global Inc., 28 Sept. 2021, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/global-cobalt-supply-deficit-not-as-dire-analysts-say-66734094#:~:text=The%20market%20is%20expected%20to,Intelligence's%20latest%20forecast%20published%20Sept>.

²² Dizard, John. “Lithium Price Squeeze Adds to Cost of the Energy Transition.” *Financial Times*, Financial Times, 5 Feb. 2022, <https://www.ft.com/content/780f26ed-fd3a-4712-8378-fe3ab2cc3eab>.

²³ Lee, Annie. “The Commodity Boom Is Starting to Push Battery Prices Higher.” *Bloomberg.com*, Bloomberg, 4 Nov. 2021, <https://www.bloomberg.com/news/articles/2021-11-04/the-commodity-boom-is-starting-to-push-battery-prices-higher?sref=QiqTuhXB>

²⁴ Lambert, Fred. *Rivian CEO Warns That Battery Shortage Is Going to Make Chip Supply Issue Look like a 'Small Appetizer'*, Electrek, 18 Apr. 2022, <https://electrek.co/2022/04/18/rivian-ceo-warns-battery-shortage-vs-chip-supply/>.

²⁵ Ferreira Marques, Clara. “China Is Redrawing the World’s Energy Map.” *Bloomberg.com*, Bloomberg, 10 Aug. 2021, <https://www.bloomberg.com/news/articles/2021-08-10/china-is-redrawing-the-world-s-energy-map?sref=QiqTuhXB>.

²⁶ Colthorpe, Andy. “China Continues to Dominate Lithium Battery Supply Chains but Policy Support Gives Us New Hope.” *Energy Storage News*, 8 Oct. 2021, <https://www.energy-storage.news/china-continues-to-dominate-lithium-battery-supply-chains-but-policy-support-gives-us-new-hope>.

²⁷ “Lithium-Ion Battery Market Worth \$116.6 Billion by 2030 - Exclusive Report by MarketsandMarkets.” *Bloomberg.com*, Bloomberg, July 2021, <https://www.bloomberg.com/press-releases/2021-07-01/lithium-ion-battery-market-worth-116-6-billion-by-2030>

²⁸ Erickson, Camille, and Kip Keen. “China Mining, Battery Companies Sweep up Lithium Supplies in Acquisition Blitz.” *Accelerating Progress*, S&P Global Inc., 1 Nov. 2021, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/china-mining-battery-companies-sweep-up-lithium-supplies-in-acquisition-blitz-67205411>.

²⁹ Nakano, Jane. Center for Strategic & International Studies, March 2021, p. 4, *The Geopolitics of Critical Minerals Supply Chains*

-
- ³⁰ Xinhongru. “Tianqi Lithium Completed the IGO Transaction.” *Tianqi Lithium Completed the Igo Transaction_News releases_media_天齐锂业*, Tianqi Lithium, 5 July 2021, http://en.tianqilithium.com/content/details17_700.html.
- ³¹ Mitchell, Tom. “Reprieve for Lithium Producer Shines Light on Beijing's Priorities.” *Financial Times*, Financial Times, 8 Dec. 2020, <https://www.ft.com/content/ffbd94f7-407d-4d74-82d5-d663649280ae>.
- ³² “Cauchari-Olaroz.” *Lithium Americas*, Lithium Americas, <https://www.lithiumamericas.com/cauchari-olaroz/>.
- ³³ Karadeglija, Anja. “Buying Canadian Lithium Firm Part of China's Aim to Dominate High-Tech Manufacturing, Mps Told.” *National Post*, National Post, 26 Jan. 2022, <https://nationalpost.com/news/politics/buying-canadian-lithium-firm-part-of-chinas-aim-to-dominate-high-tech-manufacturing-mps-told>.
- ³⁴ Searcey, Dionne, et al. “A Power Struggle over Cobalt Rattles the Clean Energy Revolution.” *The New York Times*, The New York Times, 20 Nov. 2021, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html>.
- ³⁵ Watanabe, Shine. “Chinese Cobalt Producer to Double Congo Output with Eye on Top Spot.” *Nikkei Asia*, Nikkei Asia, 6 Jan. 2022, <https://asia.nikkei.com/Business/Markets/Commodities/Chinese-cobalt-producer-to-double-Congo-output-with-eye-on-top-spot>.
- ³⁶ VLT Limited. “Major Shareholder.” *JINCHUAN 金川*, JINCHUAN 金川, http://www.jinchuan-intl.com/en/about_us/jinchuan_group.php.
- ³⁷ “Chinese Outbound FDI Held Steady in 2021, as Global FDI Rebounded: Newsroom: Baker McKenzie.” *Baker McKenzie*, 26 Jan. 2022, <https://www.bakermckenzie.com/en/newsroom/2022/01/chinese-outbound-fdi-held-steady-in-2021>.
- ³⁸ U.S. Geological Survey, January, 2021, pp. 132 -133, *Mineral Commodity Summaries 2021*; Zhai, Keith. “WSJ News Exclusive | China Set to Create New State-Owned Rare-Earths Giant.” *The Wall Street Journal*, The Wall Street Journal, 3 Dec. 2021, <https://www.wsj.com/articles/china-set-to-create-new-state-owned-rare-earths-giant/>.
- ³⁹ U.S. Geological Survey, January, 2021, pp. 132 -133, *Mineral Commodity Summaries 2021*; South, Ashley. “Weapons, Power and Money': How Rare Earth Mining in Kachin Enriches a Tatmadaw Ally.” *Frontier Myanmar*, Frontier Myanmar, 11 Aug. 2021, <https://www.frontiermyanmar.net/en/weapons-power-and-money-how-rare-earth-mining-in-kachin-enriches-a-tatmadaw-ally/>.
- ⁴⁰ South, Ashley. “Weapons, Power and Money': How Rare Earth Mining in Kachin Enriches a Tatmadaw Ally.” *Frontier Myanmar*, Frontier Myanmar, 11 Aug. 2021, <https://www.frontiermyanmar.net/en/weapons-power-and-money-how-rare-earth-mining-in-kachin-enriches-a-tatmadaw-ally/>.
- ⁴¹ Ng, Eric. “China Forms Rare Earths Giant to Protect Global Market Dominance.” *South China Morning Post*, South China Morning Post, 23 Dec. 2021, <https://www.scmp.com/business/commodities/article/3160794/china-forms-rare-earths-giant-bid-protect-its-global-dominance>.
- ⁴² Daly, Tom. “Minmetals Confirms China Rare Earths Merger, Creating New Giant.” *Reuters*, Thomson Reuters, 22 Dec. 2021, <https://www.reuters.com/world/china/minmetals-unit-confirms-china-rare-earths-merger-2021-12-22/>.
- ⁴³ Yap, Chuin-Wei. “China Hones Control over Manganese, a Rising Star in Battery Metals.” *The Wall Street Journal*, The Wall Street Journal, 21 May 2021, <https://www.wsj.com/articles/china-hones-control-over-manganese-a-rising-star-in-battery-metals-11621597490>.
- ⁴⁴ “Supply Chain News: China Seeing Results from Creation of Manganese Cartel.” *Supply Chain Digest*, Supply Chain Digest, May 2021, https://www.scdigest.com/ontarget/21-05-25_china_manganese_control.php?cid=18716. ; Yap, Chuin-Wei. “China Hones Control over Manganese, a Rising Star in Battery Metals.” *The Wall Street Journal*, techdiplomacy.org

The Wall Street Journal, 21 May 2021, <https://www.wsj.com/articles/china-hones-control-over-manganese-a-rising-star-in-battery-metals-11621597490>.

⁴⁵ Benchmark Mineral Intelligence. “China Is Constructing Graphite Anode Megafactories for the Lithium Ion Battery Surge.” *Benchmark Mineral Intelligence*, Benchmark Mineral Intelligence, 19 Oct. 2017, <https://www.benchmarkminerals.com/china-is-constructing-four-graphite-anode-megafactories-for-the-lithium-ion-battery-surge/>.

⁴⁶ The Graphite Supply Problem. Northern Graphite, <https://www.northerngraphite.com/about-graphite/the-graphite-supply-problem/#:~:text=Currently%2C%20China%20produces%2070%20to,graphite%20a%20supply%20critical%20mineral>.

⁴⁷ Ladislaw, Sarah, et al. Center for Strategic & International Studies, February 2021, p. 10, *Industrial Policy, Trade, and Clean Energy Supply Chains*

⁴⁸ Bradsher, Keith, and Michael Forsythe. “Why a Chinese Company Dominates Electric Car Batteries.” *The New York Times*, The New York Times, 22 Dec. 2021, <https://www.nytimes.com/2021/12/22/business/china-catl-electric-car-batteries.html>.

⁴⁹ “Global Battery Arms Race: 200 Gigafactories; China Leads.” *Benchmark Mineral Intelligence*, Benchmark Mineral Intelligence, 31 Mar. 2021, <https://www.benchmarkminerals.com/membership/global-battery-arms-race-200-gigafactories-china-leads-2/>.

⁵⁰ “China Is Building One Battery Gigafactory a Week; the US One Every Four Months’: Simon Moores.” *Benchmark Mineral Intelligence*, Benchmark Mineral Intelligence, 21 May 2020, <https://www.benchmarkminerals.com/membership/china-is-building-one-battery-gigafactory-a-week-the-us-one-every-four-months-simon-moores/>.

⁵¹ “Global Battery Arms Race: 200 Gigafactories; China Leads.” *Benchmark Mineral Intelligence*, Benchmark Mineral Intelligence, 31 Mar. 2021, <https://www.benchmarkminerals.com/membership/global-battery-arms-race-200-gigafactories-china-leads-2/>.

⁵² Zenglein, Max, et al. Mercator Institute for China Studies, July, 2020, p. 8, *Evolving Made in China 2025 China’s Industrial Policy in the Quest for Global Tech Leadership*

⁵³ “Xi Focus: Understanding China requires understanding of CPC, says Xi.” *Xinhua* 2 Dec. 2021 http://www.news.cn/english/2021-12/02/c_1310347548.html

⁵⁴ *Full Text of Xi Jinping’s Speech on the CCP’s 100th Anniversary*. Nikkei Asia, 1 July 2021, <https://asia.nikkei.com/Politics/Full-text-of-Xi-Jinping-s-speech-on-the-CCP-s-100th-anniversary>. ; Dr. Rush Doshi testifies before the U.S. Senate Committee on Commerce, Science, and Transportation, July, 2021, <https://www.brookings.edu/testimonies/the-united-states-china-and-the-contest-for-the-fourth-industrial-revolution/>

⁵⁵ Dr. Rush Doshi testifies before the U.S. Senate Committee on Commerce, Science, and Transportation, July, 2021, <https://www.brookings.edu/testimonies/the-united-states-china-and-the-contest-for-the-fourth-industrial-revolution/>

⁵⁶ Zenglein, Max, et al. Mercator Institute for China Studies, July, 2020, p. 12, *Evolving Made in China 2025 China’s Industrial Policy in the Quest for Global Tech Leadership* ;

⁵⁷ Naughton, Barry. *The Rise of China’s Industrial Policy, 1978 to 2020*, Universidad Nacional Autónoma De México, Facultad De Economía, México, 2021, pp. 60–61.

⁵⁸ Naughton, Barry. *The Rise of China's Industrial Policy, 1978 to 2020*, Universidad Nacional Autónoma De México, Facultad De Economía, México, 2021, pp. 60–61. ; Kennedy, Scott. “Made in China 2025.” *Center for Strategic and International Studies*, Center for Strategic and International Studies, 1 June 2015, <https://www.csis.org/analysis/made-china-2025>.

⁵⁹ “‘Made in China 2025’ Industrial Policies: Issues for Congress.” *Congressional Research Service*, Congressional Research Service, 11 Aug. 2021, <https://sgp.fas.org/crs/row/IF10964.pdf>.

⁶⁰ McBride, James. “Is ‘Made in China 2025’ a Threat to Global Trade?” *Council on Foreign Relations*, Council on Foreign Relations, 13 May 2019, <https://www.cfr.org/background/made-china-2025-threat-global-trade>.

⁶¹ John D. Graham, Keith B. Belton, et al. “How China Beat the US in Electric Vehicle Manufacturing.” *Issues in Science and Technology*, Issues in Science and Technology, 18 Nov. 2021, <https://issues.org/china-us-electric-vehicles-batteries/>. ; V., Haley Usha C, and George T. Haley. *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*. Oxford Univ. Press, 2013. pp.139-151

⁶² Bradsher, Keith. “Hybrid in a Trade Squeeze.” *The New York Times*, The New York Times, 6 Sept. 2011, <https://www.nytimes.com/2011/09/06/business/global/gm-aims-the-volt-at-china-but-chinese-want-its-secrets.html>.

⁶³ Ladislav, Sarah, et al. Center for Strategic & International Studies, February 2021, p. 14 *Industrial Policy, Trade, and Clean Energy Supply Chains* ; John D. Graham, Keith B. Belton, et al. “How China Beat the US in Electric Vehicle Manufacturing.” *Issues in Science and Technology*, Issues in Science and Technology, 18 Nov. 2021, <https://issues.org/china-us-electric-vehicles-batteries/>.

⁶⁴ Lu, Shen. “Why China Is Outselling the US in EVs 5 to 1.” *Protocol*, Protocol - The People, Power and Politics of Tech, 24 Jan. 2022, <https://www.protocol.com/china/china-record-ev-sales-tesla>.

⁶⁵ Zenglein, Max, et al. Mercator Institute for China Studies, July, 2020, p. 10, *Evolving Made in China 2025 China's Industrial Policy in the Quest for Global Tech Leadership* ; Agatha Kratz, Janka Oertel. “Home Advantage: How China's Protected Market Threatens Europe's Economic Power.” *European Council on Foreign Relations*, European Council on Foreign Relations, 15 Apr. 2021, <https://ecfr.eu/publication/home-advantage-how-chinas-protected-market-threatens-europes-economic-power/>.

⁶⁶ Milhaupt, Curtis, and Wentong Zheng. “Beyond Ownership: State Capitalism and the Chinese Firm.” *The Georgetown Law Journal*, vol. 103, 2015, p. 689.

⁶⁷ Scissors, Derek. “Deng Undone.” *Foreign Affairs*, Foreign Affairs, 20 Feb. 2021, <https://www.foreignaffairs.com/articles/china/2009-05-01/deng-undone-0#author-info>. ; Naughton, Barry. *The Rise of China's Industrial Policy, 1978 to 2020*, Universidad Nacional Autónoma De México, Facultad De Economía, México, 2021, p. 14

⁶⁸ *Ibid.*, 99-139.

⁶⁹ V., Haley Usha C, and George T. Haley. *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*. Oxford Univ. Press, 2013. p.5.

⁷⁰ Choi, June, and Donovan Escalante. Climate Policy Initiative, 2020, pp. 1–3, Green Banking in China – Emerging Trends. ; “Industry Market Research, Reports, and Statistics.” IBISWorld, IBISWorld, 20 Oct. 2021, [https://www.ibisworld.com/china/market-research-reports/policy-banks-industry/#:~:text=Policy%20Bank%20in%20China%20industry%20trends%20\(2016%2D2021\)&text=This%20includes%20anticipated%20revenue%20growth,4.7%25%20over%20the%20same%20period](https://www.ibisworld.com/china/market-research-reports/policy-banks-industry/#:~:text=Policy%20Bank%20in%20China%20industry%20trends%20(2016%2D2021)&text=This%20includes%20anticipated%20revenue%20growth,4.7%25%20over%20the%20same%20period). ; “Assets of China's City Commercial Banks Exceed 40T Yuan.” *Chinadaily.com.cn*, 1 Nov. 2021, <http://www.chinadaily.com.cn/a/202111/01/WS617f9d7ca310cdd39bc729b5.html>.

⁷¹ Blanchette, Jude. “Confronting the Challenge of Chinese State Capitalism.” *Center for Strategic and International Studies*, Center for Strategic and International Studies, 22 Feb. 2021, <https://www.csis.org/analysis/confronting-techdiplomacy.org>

challenge-chinese-state-capitalism ; Chiang, Ting-Wei. “Chinese State-Owned Enterprises and WTO’s Anti-Subsidy Regime.” *Georgetown Journal of International Law*, vol. 49, no. 2, Dec. 2018, pp. 861–863. ; Milhaupt, Curtis, and Wentong Zheng. “Beyond Ownership: State Capitalism and the Chinese Firm.” *The Georgetown Law Journal*, vol. 103, 2015, p. 689.

⁷² Zenglein, Max, et al. Mercator Institute for China Studies, July, 2020, p. 12, *Evolving Made in China 2025 China’s Industrial Policy in the Quest for Global Tech Leadership*

⁷³ Whalen, Jeanne. “The next China Trade Battle Could Be over Electric Cars.” *The Washington Post*, The Washington Post, 17 Jan. 2020, <https://www.washingtonpost.com/business/2020/01/16/next-china-trade-battle-could-be-over-electric-cars/>.

⁷⁴ Fang, Frank. “China Takes Control of Cobalt Mines as It Advances Its Battery Industry for Electric Vehicles.” *The Epoch Times*, 13 Aug. 2018, https://www.theepochtimes.com/china-takes-control-of-cobalt-mines-as-it-advances-its-battery-industry-for-electric-vehicles_2622794.html

⁷⁵ Huang, Echo. “Beijing Gave Its Biggest Electric-Vehicle Maker \$1 Billion in Help toward a Single Year of Sales.” *Quartz*, Quartz, 26 Mar. 2019, <https://qz.com/1579568/how-much-financial-help-does-china-give-ev-maker-byd/> ; Lu, Shen. “Why China Is Outselling the US in EVs 5 to 1.” *Protocol*, Protocol - The People, Power and Politics of Tech, 24 Jan. 2022, <https://www.protocol.com/china/china-record-ev-sales-tesla>.

⁷⁶ Cheng, Evelyn. “Chinese Electric Car Start-up Xpeng Gets \$2 Billion in Credit from State-Owned Banks.” *CNBC*, CNBC, 12 Jan. 2021, <https://www.cnbc.com/2021/01/12/chinese-electric-car-start-up-xpeng-gets-2-billion-in-credit.html.%20>

⁷⁷ Searcey, Dionne, et al. “A Power Struggle over Cobalt Rattles the Clean Energy Revolution.” *The New York Times*, The New York Times, 20 Nov. 2021, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html.%20>

⁷⁸ China Molybdenum Corporation. Annual Financial Report for 2020.

⁷⁹ Searcey, Dionne, et al. “A Power Struggle over Cobalt Rattles the Clean Energy Revolution.” *The New York Times*, The New York Times, 20 Nov. 2021, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html>.

⁸⁰ Horn, Sebastian, et al., National Bureau of Economic Research, July, 19, *China’s Overseas Lending*

⁸¹ Borst, Nicholas. “Has China given up on State-Owned Enterprise Reform?” *Lowy Institute*, Lowy Institute, 17 May 2021, <https://www.lowyinstitute.org/the-interpretor/has-china-given-state-owned-enterprise-reform>. ; Benoit, Philippe, and Alex Clark. “Making State-Owned Enterprises Work for Climate in China and Beyond.” *Columbia University Center on Global Energy Policy*, Columbia University Center on Global Energy Policy, 24 Sept. 2020, <https://www.energypolicy.columbia.edu/research/op-ed/making-state-owned-enterprises-work-climate-china-and-beyond>.

⁸² Naughton, Barry. *The Rise of China’s Industrial Policy, 1978 to 2020*, Universidad Nacional Autónoma De México, Facultad De Economía, México, 2021, pp. 106-131

⁸³ V., Haley Usha C, and George T. Haley. *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*. Oxford Univ. Press, 2013. p.138

⁸⁴ Blanchette, Jude. “Confronting the Challenge of Chinese State Capitalism.” *Center for Strategic and International Studies*, Center for Strategic and International Studies, Jan. 2021, <https://www.csis.org/analysis/confronting-challenge-chinese-state-capitalism>.

⁸⁵ Yu-Hsin Lin, Lauren. “Institutionalizing Political Influence in Business: Party-Building and Insider Control in Chinese State-Owned Enterprises.” *Oxford Business Law Blog*, Oxford University, 19 Nov. 2021, <https://www.law.ox.ac.uk/business-law-blog/blog/2021/11/institutionalizing-political-influence-business-party-techdiplomacy.org>

building-and. ; Nakamura, Yu. “Chinese Enterprises Write Communist Party's Role into Charters.” *Nikkei Asian Review*, Nikkei Asian Review, 17 Aug. 2017, <https://www.google.com/search?q=Chinese+Enterprises+Write+Communist+Party%27s+Role+into+Charters+nikkei>

⁸⁶ Naughton, Barry. *The Rise of China's Industrial Policy, 1978 to 2020*, Universidad Nacional Autónoma De México, Facultad De Economía, México, 2021, pp. 106-131

⁸⁷ Ibid.

⁸⁸ Colvin, Thomas J., et al. IDA, Arlington, Virginia, 2020, pp. 30–31, *A Brief Examination of Chinese Government Expenditures on Artificial Intelligence R&D*.

⁸⁹ *The Chinese State Is Pumping Funds into Private Equity*, The Economist , 5 June 2021, <https://www.economist.com/finance-and-economics/2021/06/03/the-chinese-state-is-pumping-funds-into-private-equity>. ; Huang, Tianlei. Government-Guided Funds in China: Financing Vehicles for State Industrial Policy, Peterson Institute for International Economics, 17 June 2019, https://www.piie.com/blogs/china-economic-watch/government-guided-funds-china-financing-vehicles-state-industrial-policy#_ftn1.

⁹⁰ Huang, Tianlei. Government-Guided Funds in China: Financing Vehicles for State Industrial Policy, Peterson Institute for International Economics, 17 June 2019, https://www.piie.com/blogs/china-economic-watch/government-guided-funds-china-financing-vehicles-state-industrial-policy#_ftn1.

⁹¹ *XPeng Announces Cooperation Agreement for New Smart EV Manufacturing Base in Guangzhou*, Businesswire, 27 Sept. 2020, <https://www.businesswire.com/news/home/20200927005080/en/XPeng-Announces-Cooperation-Agreement-for-New-Smart-EV-Manufacturing-Base-in-Guangzhou>. ; Kharpal, Arjun. “Chinese Tesla Rival Xpeng Motors Gets \$76 Million Investment from Government.” Chinese Tesla Rival Xpeng Motors Gets \$76 Million Investment from Government, CNBC, 9 Apr. 2021, <https://www.cnbc.com/2021/03/15/chinese-tesla-rival-xpeng-motors-gets-76-million-investment-from-government.html>. ; XPeng and Guangdong Provincial Investment Arm Ink Strategic Agreement, XPeng, 15 Mar. 2021, https://en.xiaopeng.com/news/news_info/3813.html.

⁹² *NIO Enters into Definitive Agreements for Establishing NIO China's Headquarters in Hefei*, NIO, 29 Apr. 2020, <https://www.nio.com/news/nio-enters-definitive-agreements-establishing-nio-chinas-headquarters-hefei>.

⁹³ Zhuge, Chengxiang, et al. “The Role of the License Plate Lottery Policy in the Adoption of Electric Vehicles: A Case Study of Beijing.” *Energy Policy*, 11 Apr. 2020.

⁹⁴ “Why a Licence Plate Costs More than a Car in Shanghai.” *The Economist*, The Economist , 18 Apr. 2018, <https://www.economist.com/china/2018/04/19/why-a-licence-plate-costs-more-than-a-car-in-shanghai>. ; Bing, Kang. “Green Number Plate for a Green Car Is Surely a Good Deal.” *Chinadaily.com.cn*, Chinadaily.com.cn, 6 July 2021, <http://www.chinadaily.com.cn/a/202107/06/WS60e39419a310efa1bd65fd95.html>.

⁹⁵ John D. Graham, Keith B. Belton, et al. “How China Beat the US in Electric Vehicle Manufacturing.” *Issues in Science and Technology*, Issues in Science and Technology, 18 Nov. 2021, <https://issues.org/china-us-electric-vehicles-batteries/>.

⁹⁶ *China Global Investment Tracker*, American Enterprise Institute, <https://www.aei.org/china-global-investment-tracker/>.

⁹⁷ Daly, Tom. *China's Ganfeng to Pay \$130 Million for Stake in Mali Lithium Mine*. Reuters, 14 June 2021, <https://www.reuters.com/article/us-ganfeng-lithium-mali-mine/chinas-ganfeng-to-pay-130-million-for-stake-in-mali-lithium-mine-idUSKCN2DQ108>. ; *China's Huayou Buys Lithium Mine in Zimbabwe for \$422 Mln*. Reuters, 22 Dec. 2021, <https://www.reuters.com/business/chinas-huayou-buys-lithium-mine-zimbabwe-422-mln-2021-12-22/>. ; Riseborough , Jesse. “Minmetals Group Buys Glencore Peru Mine for \$5.85 Billion.” *Bloomberg.com*, Bloomberg, Apr. 2014, <https://www.bloomberg.com/news/articles/2014-04-13/minmetals-group-to-buy-glencore-copper-project-for-5-85-billion?sref=QiqTuhXB>. ; Nyabiage, Jevans. “China Cancels Democratic Republic of Congo Loans as It Joins Belt and Road.” *South China Morning Post*, South China Morning Post, 7 Jan. 2021, <https://www.scmp.com/news/asia/south-china-morning-post>.

<https://www.scmp.com/news/china/diplomacy/article/3116837/china-cancels-democratic-republic-congo-loans-it-joins-belt>.

⁹⁸ Broom, Douglas. *The Dirty Secret of Electric Vehicles*. World Economic Forum, 27 Mar. 2019, <https://www.weforum.org/agenda/2019/03/the-dirty-secret-of-electric-vehicles/>.

99 Global Commission on the Geopolitics of Energy Transformation, 2019, *A New World: The Geopolitics of the Energy Transformation*, [http://geopoliticsofrenewables.org/assets/geopolitics/Reports/wp-content/uploads/2019/01/Global commission renewable energy 2019.pdf](http://geopoliticsofrenewables.org/assets/geopolitics/Reports/wp-content/uploads/2019/01/Global%20commission%20renewable%20energy%202019.pdf).

¹⁰⁰ Katwala, Amit. *The Spiraling Environmental Cost of Our Lithium Battery Addiction*. WIRED , 5 Aug. 2018, <https://www.wired.co.uk/article/lithium-batteries-environment-impact>

¹⁰¹ *2020 Country Reports on Human Rights Practices: China (Includes Hong Kong, Macau, and Tibet) - Tibet*. U.S. Department of State, 2020, <https://www.state.gov/reports/2020-country-reports-on-human-rights-practices/china/tibet/>.

¹⁰² Cadell, Cate. “Exclusive: China Sharply Expands Mass Labor Program in Tibet.” *Reuters*, Reuters, 22 Sept. 2020, <https://www.reuters.com/article/us-china-rights-tibet-exclusive/exclusive-china-sharply-expands-mass-labor-program-in-tibet-idUSKCN26D0GT>. ; Zenz, Adrian. *Xinjiang's System of Militarized Vocational Training Comes to Tibet*. Jamestown Foundation, 9 Oct. 2020, <https://jamestown.org/program/jamestown-early-warning-brief-xinjiangs-system-of-militarized-vocational-training-comes-to-tibet/>.

¹⁰³ Khadka, Navin. *Tibetans Displaced within Region 'amid Rampant Mining'*. BBC, 13 Dec. 2013, <https://www.bbc.com/news/science-environment-25359391>. ; Wong, Edward. *Fatal Landslide Draws Attention to the Toll of Mining on Tibet*. *The New York Times*, 2 Apr. 2013, https://www.nytimes.com/2013/04/03/world/asia/deadly-tibetan-landslide-draws-attention-to-mining.html?_r=0. ; “Free Tibet: Machine Guns Used against Environmental Protesters.” Youtube, FreeTibet.com, 9 Oct. 2013, <https://www.youtube.com/watch?v=7-6lQyzAi24>. ; “Lithium in Tibet - Tibet's Geography.” *FreeTibet.com*, <https://freetibet.org/freedom-for-tibet/land-and-environment/lithium-in-tibet/>. ; Katwala, Amit. *The Spiraling Environmental Cost of Our Lithium Battery Addiction*. WIRED , 5 Aug. 2018, <https://www.wired.co.uk/article/lithium-batteries-environment-impact>

¹⁰⁴ *Xi Jinping Visit to Qinghai Reveals Strategic Importance of Tibet's Water, Minerals; Highlights CCP's Advanced Plans*. International Campaign for Tibet, 22 Mar. 2021, <https://savetibet.org/xi-jinping-visit-to-qinghai-reveals-strategic-importance-of-tibets-water-minerals-highlights-ccps-advanced-plans/#1>. ; Volodzko, David. *Resources, 'National Unity' Underpin Xi's Trip to Western China*. *For The Diplomat*, 4 Sept. 2016, <https://thediplomat.com/2016/09/resources-national-unity-underpin-xis-trip-to-western-china/>.

¹⁰⁵ Bradsher, Keith, and Michael Forsythe. *Why a Chinese Company Dominates Electric Car Batteries*. *New York Times*, 22 Dec. 2021, <https://www.nytimes.com.cdn.ampproject.org/c/s/www.nytimes.com/2021/12/22/business/china-catl-electric-car-batteries.amp.html>.

¹⁰⁶ *China's Companies Are Going to Any Length for a Hold on Lithium*. MINING.COM, 29 Nov. 2021, <https://www.mining.com/web/chinas-companies-are-going-to-any-length-for-a-hold-on-lithium/#:~:text=Even%20though%20China's%20lithium%20reserves,the%20high%20altitude%20Tibetan%20plat eau>.

¹⁰⁷ Wangmo, Dhondup. “China Eyes Bolstering Mining across Tibet.” *Asia Times*, 9 Dec. 2021, <https://asiatimes.com/2021/12/china-eyes-bolstering-mining-across-tibet/>.

¹⁰⁸ *How Chinese Mining Investment Funds the Myanmar Military*. Publish What You Pay Australia, Oct. 2021, <https://static1.squarespace.com/static/5dfc4510ad88600d53f93358/t/6168dc8dbe1ab212ec15aca4/1634262165056/PWYP+-+How+Chinese+Mining+Investment+Funds+the+Myanmar+Military.pdf>.

¹⁰⁹ Carvalho, Raquel. *Chinese Firms Urged to Exit from Myanmar Mines amid Escalating Violence*. South China Morning Post, 16 Jan. 2022, <https://www.scmp.com/week-asia/economics/article/3163580/chinese-companies-urged-cease-myanmar-mines-investments-amid>.

¹¹⁰ *Illegal Rare Earth Mines on China Border Multiply since Myanmar's Coup*. The Irrawaddy, 13 July 2021, <https://www.irrawaddy.com/news/burma/illegal-rare-earth-mines-china-border-multiply-since-myanmars-coup.html>.

¹¹¹ Kyodo News. *Group Says Illegal Rare Earth Mining by Chinese Jumps in Myanmar*. Kyodo News, 17 May 2021, <https://nordot.app/766983273961308160?c=445918389795193953>.

¹¹² *Illegal Rare Earth Mines on China Border Multiply since Myanmar's Coup*. The Irrawaddy, 13 July 2021, <https://www.irrawaddy.com/news/burma/illegal-rare-earth-mines-china-border-multiply-since-myanmars-coup.html>.

¹¹³ Rights and Accountability in Development, London, 2021, p. 4, *The Road to Ruin? Electric Vehicles and Workers' Rights Abuses at DR Congo's Industrial Cobalt Mines*.

¹¹⁴ Thomas November 9th 2021 Africa , David, et al. *Workers Report "Colonial-Era" Abuse at Congolese Cobalt Mines*. African Business, 12 Nov. 2021, <https://african.business/2021/11/energy-resources/workers-report-colonial-era-abuse-at-congolese-cobalt-mines/>.

¹¹⁵ Searcey, Dionne, et al. *A Power Struggle over Cobalt Rattles the Clean Energy Revolution*. The New York Times, 20 Nov. 2021, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html>. ; Rights and Accountability in Development, London, 2021, p. 4-10, *The Road to Ruin? Electric Vehicles and Workers' Rights Abuses at DR Congo's Industrial Cobalt Mines*.

¹¹⁶ Fellows, Mark. *Permitting, Economic Value and Mining in the United States*. SNL Metals and Minerals, 19 June 2015, http://mineralsmakelife.org/assets/images/content/resources/SNL_Permitting_Delay_Report-Online.pdf.

¹¹⁷ Ibid.

¹¹⁸ Greenovation Hub, 2014, pp. 26–38, *China's Mining Industry at Home and Overseas*.

¹¹⁹ *China to Step up Crackdown on Rare Earth Sector: Ministry*. Reuters, 4 Jan. 2019, <https://www.reuters.com/article/us-china-rareearths/china-to-step-up-crackdown-on-rare-earth-sector-ministry-idUSKCN1OY0R3>.

¹²⁰ Davidson, Helen. *'You Follow the Government's Agenda': China's Climate Activists Walk a Tightrope*. The Guardian, 16 Aug. 2021, <https://www.theguardian.com/world/2021/aug/16/you-follow-the-governments-agenda-chinas-climate-activists-walk-a-tightrope>.

¹²¹ Burmeister, Timothy. *Lithium: A Year of Progress and Protests*. Elko Daily Free Press, 1 Jan. 2022, https://elkodaily.com/mining/lithium-a-year-of-progress-and-protests/article_6f35f8be-34a8-5406-b1fb-afaeabec81d.html. ; *'Like Putting a Lithium Mine on Arlington Cemetery': The Fight to Save Sacred Land in Nevada*. The Guardian, 2 Dec. 2021, <https://www.theguardian.com/us-news/2021/dec/02/thacker-pass-lithium-mine-fight-save-sacred-land-nevada>. ; Stone, Maddie. *The West Has a New Front in the War over Electric Cars*. Grist, 6 Apr. 2021, <https://grist.org/climate/the-west-has-a-new-front-in-the-war-over-electric-cars/>. ; *Sibanye-Stillwater to Invest US\$490m in Rhyolite Ridge*. Ioneer, 25 Oct. 2021, <https://rhyolite-ridge.ioneer.com/sibanye-stillwater-to-invest-us490m-in-rhyolite-ridge/>.

¹²² *Minnesota DNR Stops Environmental Review of Twin Metals*. Duluth News Tribune, 15 Feb. 2022, <https://www.duluthnewtribune.com/business/minnesota-dnr-stops-environmental-review-of-twin-metals>. ; Scheyder, Ernest. *U.S. Appeals Court Hints at Support for Rio's Resolution Copper Mine*. Reuters, 22 Oct. 2021, <https://www.reuters.com/technology/us-appeals-court-hints-at-support-for-rios-resolution-copper-mine>.

<https://www.reuters.com/legal/litigation/us-appeals-court-hints-support-rios-resolution-copper-mine-2021-10-22/>. ; Wolman, Jordan. *Biden's Green Agenda Requires Batteries, but Building Them Is Dirty Business*. POLITICO, 18 Jan. 2022, <https://www.politico.com/news/2022/01/18/green-agenda-batteries-527263>.

¹²³ Hanke, Steve. *China Rattles Its Rare-Earth-Minerals Saber, Again*. CATO Institute, 25 Feb. 2021, <https://www.cato.org/commentary/china-rattles-its-rare-earth-minerals-saber-again#:~:text=As%20the%20Global%20Times%2C%20a,rare%20earths%20can%20be%20weaponized.> ; Kalantzakos , Sophia. “How China Came to Dominate the Rare Earth Industry.” *China and the Geopolitics of Rare Earths*, OXFORD UNIV PRESS, S.I., 2021

¹²⁴ Ibid.

¹²⁵ Tapper, Jake. *Hoosier Responsible?*, ABC News Network, 30 Apr. 2009, <https://abcnews.go.com/Politics/Vote2008/story?id=4757257&page=1>.

¹²⁶ Ibid.

¹²⁷ Bradsher, Keith. *Amid Tension, China Blocks Vital Exports to Japan*. The New York Times, 23 Sept. 2010, <https://www.nytimes.com/2010/09/23/business/global/23rare.html>. ; Kalantzakos , Sophia. “How China Came to Dominate the Rare Earth Industry.” *China and the Geopolitics of Rare Earths*, OXFORD UNIV PRESS, S.I., 2021

¹²⁸ Ibid., 160-164.

¹²⁹ Kalantzakos , Sophia. “How China Came to Dominate the Rare Earth Industry.” *China and the Geopolitics of Rare Earths*, OXFORD UNIV PRESS, S.I., 2021, pp. 153-154.

¹³⁰ Li, Yun. “Don't Say We Didn't Warn You': A Phrase from China Signals the Trade War Could Get Even Worse.” *CNBC*, CNBC, 30 May 2019, <https://www.cnbc.com/2019/05/29/dont-say-we-didnt-warn-you---a-phrase-from-china-signals-the-trade-war-could-get-even-worse.html>

¹³¹ “Solar Futures Study.” Energy.gov, Department of Energy, Sept. 2021, <https://www.energy.gov/eere/solar/solar-futures-study>.

¹³² Ladislaw, Sarah, et al. Center for Strategic & International Studies, February 2021, pp. 9-11, *Industrial Policy, Trade, and Clean Energy Supply Chains*

¹³³ Ibid.

¹³⁴ Hanada, Yukinori. *China's Solar Panel Makers Top Global Field but Challenges Loom*, Nikkei Asia, 31 July 2019, <https://asia.nikkei.com/Business/Business-trends/China-s-solar-panel-makers-top-global-field-but-challenges-loom>.

¹³⁵ Bradsher, Keith. *Chinese Solar Panel Giant Is Tainted by Bankruptcy*. The New York Times, 20 Mar. 2013, <https://www.nytimes.com/2013/03/21/business/energy-environment/chinese-solar-companys-operating-unit-declares-bankruptcy.html>.

¹³⁶ Ferry, Jeff. *Coalition for A Prosperous America*, Washington, D.C., 2021, p. 5, *Reclaiming the US Solar Supply Chain from China*.

¹³⁷ V., Haley Usha C, and George T. Haley. *Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy*. Oxford Univ. Press, 2013. p.1.

¹³⁸ Fitzgerald, Joan. *The Case for Taking Back Solar*. The American Prospect, 24 Mar. 2021, <https://prospect.org/environment/climate-of-opportunity/case-for-taking-back-solar/>.

¹³⁹ Bradsher, Keith, and Diane Cardwell. *U.S. Slaps High Tariffs on Chinese Solar Panels*. The New York Times, 17 May 2012, <https://www.nytimes.com/2012/05/18/business/energy-environment/us-slaps-tariffs-on-chinese-solar-panels.html>; Pickerel, Kelly. “The U.S. Solar Industry Has a China Problem.” *Solar Power World*, 9 Aug. 2021, <https://www.solarpowerworldonline.com/2021/08/u-s-solar-china-polysilicon-battle/>.

¹⁴⁰ Pickerel, Kelly. “The U.S. Solar Industry Has a China Problem.” *Solar Power World*, 9 Aug. 2021, <https://www.solarpowerworldonline.com/2021/08/u-s-solar-china-polysilicon-battle/>.

¹⁴¹ Ibid.

¹⁴² Chase, Jenny. “How China Beat the U.S. to Become World's Undisputed Solar Champion.” *The Economic Times*, The Economic Times, 4 June 2021, <https://economictimes.indiatimes.com/industry/renewables/how-china-beat-the-u-s-to-become-worlds-undisputed-solar-champion/articleshow/83227315.cms?from=mdr>.

¹⁴³ Pickerel, Kelly. “The U.S. Solar Industry Has a China Problem.” *Solar Power World*, 9 Aug. 2021, <https://www.solarpowerworldonline.com/2021/08/u-s-solar-china-polysilicon-battle/>.

¹⁴⁴ Dlouhy, Jennifer. “How China Beat the U.S. to Become World's Undisputed Solar Champion.” Bloomberg, 4 June 2021, <https://www.bloomberg.com/news/articles/2021-06-04/solar-jobs-2021-how-china-beat-u-s-to-become-world-s-solar-champion?sref=QiqTuhXB>.

¹⁴⁵ *List of U.S. Executive Branch Czars*. Wikipedia, https://en.wikipedia.org/wiki/List_of_U.S._executive_branch_czars.

¹⁴⁶ *FACT SHEET: Securing a Made in America Supply Chain for Critical Minerals*, Whitehouse.gov, 22 Feb. 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/22/fact-sheet-securing-a-made-in-america-supply-chain-for-critical-minerals/>.

¹⁴⁷ <https://www.downtoearth.org.in/blog/renewable-energy/electric-vehicles-have-a-dark-side-too-blood-batteries-and-child-labour-82567>.

¹⁴⁸ <https://cleantechnica.com/2022/05/08/tesla-visited-the-drc-argentina-for-environmental-societal-risk-assessments/>

¹⁴⁹ *About Us*. ERGI, <https://ergi.tools/about>.

¹⁵⁰ *Global Stock Markets by Country 2021*, Statista, 11 Jan. 2022, <https://www.statista.com/statistics/710680/global-stock-markets-by-country/>.

¹⁵¹ *The Role of the SEC | Investor.gov*. SEC, <https://www.investor.gov/introduction-investing/investing-basics/role-sec#:~:text=The%20U.%20S.%20Securities%20and%20Exchange,Facilitate%20capital%20formation>.

¹⁵² *SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors*, U.S. Securities and Exchange Commission, 21 Mar. 2022, <https://www.sec.gov/news/press-release/2022-46>.

¹⁵³ “DoD Awards \$35 Million to MP Materials to Build U.S. Heavy Rare Earth Separation Capacity.” U.S. Department of Defense, 22 Feb. 2022, <https://www.defense.gov/News/Releases/Release/Article/2941793/dod-awards-35-million-to-mp-materials-to-build-us-heavy-rare-earth-separation-c/>; “DOD Announces Rare Earth Element Award to Strengthen Domestic Industrial Base.” U.S. Department of Defense, 1 Feb. 2021, <https://www.defense.gov/News/Releases/Release/Article/2488672/dod-announces-rare-earth-element-award-to-strengthen-domestic-industrial-base/>

¹⁵⁴ *Memorandum on Presidential Determination Pursuant to Section 303 of the Defense Production Act of 1950, as Amended*, Whitehouse.gov, 31 Mar. 2021, <https://www.whitehouse.gov/briefing-room/presidential-techdiplomacy.org>

[actions/2022/03/31/memorandum-on-presidential-determination-pursuant-to-section-303-of-the-defense-production-act-of-1950-as-amended/](https://www.defense.gov/Newsroom/Record/2022/03/31/memorandum-on-presidential-determination-pursuant-to-section-303-of-the-defense-production-act-of-1950-as-amended/).

¹⁵⁵ Runde, Daniel, and Romina Bandura. *The BUILD Act Has Passed: What's Next?*. The Center for Strategic and International Studies, 12 Mar. 2018, <https://www.csis.org/analysis/build-act-has-passed-whats-next>.

¹⁵⁶ Benson, Emily, and Aidan Arasasingham. "Takeaways from President Biden's Supply Chain Plan for 2022." *Takeaways from President Biden's Supply Chain Plan for 2022 | Center for Strategic and International Studies*, 28 Feb. 2022, <https://www.csis.org/analysis/takeaways-president-bidens-supply-chain-plan-2022>.

¹⁵⁷ Hui, Mary. *Japan's Global Rare Earths Quest Holds Lessons for the US and Europe*. Quartz, 23 Apr. 2021, <https://qz.com/1998773/japans-rare-earths-strategy-has-lessons-for-us-europe/>.

¹⁵⁸ *Sojitz and Jorgmec Enter into Definitive Agreements with Lynas Including Availability Agreement to Secure Supply of Rare Earths Products to Japanese Market*. Japan Oil, Gas and Metals National Corporation, 21 Mar. 2022, <https://www.jogmec.go.jp/english/news/release/release0069.html>. ; Hui, Mary. *Japan's Global Rare Earths Quest Holds Lessons for the US and Europe*. Quartz, 23 Apr. 2021, <https://qz.com/1998773/japans-rare-earths-strategy-has-lessons-for-us-europe/>.

¹⁵⁹ *Financial Support for Japanese Companies : Metals: Japan Oil, Gas and Metals National Corporation (JOGMEC)*. Japan Oil, Gas and Metals National Corporation, 21 Mar. 2022, https://www.jogmec.go.jp/english/stockpiling/metal_10_000003.html. ; *Stockpiling : Metals : Stockpiling: Japan Oil, Gas and Metals National Corporation (JOGMEC)*. Japan Oil, Gas and Metals National Corporation, 21 Mar. 2022, https://www.jogmec.go.jp/english/stockpiling/stockpiling_10_000001.html.

¹⁶⁰ *Assistant Secretary Fannon at the JUSEP Trilateral Energy Meeting with Japan and Vietnam*, U.S. Department of State, 2 Dec. 2020, <https://2017-2021.state.gov/assistant-secretary-fannon-at-the-jusep-trilateral-energy-meeting-with-japan-and-vietnam/index.html>.

¹⁶¹ International Energy Agency, Paris, France, 2021, p. 14, 167, *The Role of Critical Minerals in Clean Energy Transitions*

¹⁶² U.S. Department of Energy, Washington, D.C., 2010, *Critical Materials Strategy Summary*.

¹⁶³ Consider the state of Maine recently blocking the construction of a transmission line to bring carbon-free hydroelectric power from Quebec to Massachusetts. See, <https://www.boston.com/news/local-news/2021/11/03/mainers-vote-to-put-kibosh-on-1-billion-electric-transmission-line/>.