

Jeffrey Jeb Nadaner, Ph.D.

Senior Vice President, Government Affairs, Govini

**Testimony on Current and Emerging Technologies in
U.S.-China Economic and National Security Competition
before the
U.S.-China Economic and Security Review Commission**

**Building Chinese-Resistant Battery Supply Chains
February 1, 2024, Statement as Prepared (1-31-2024)**

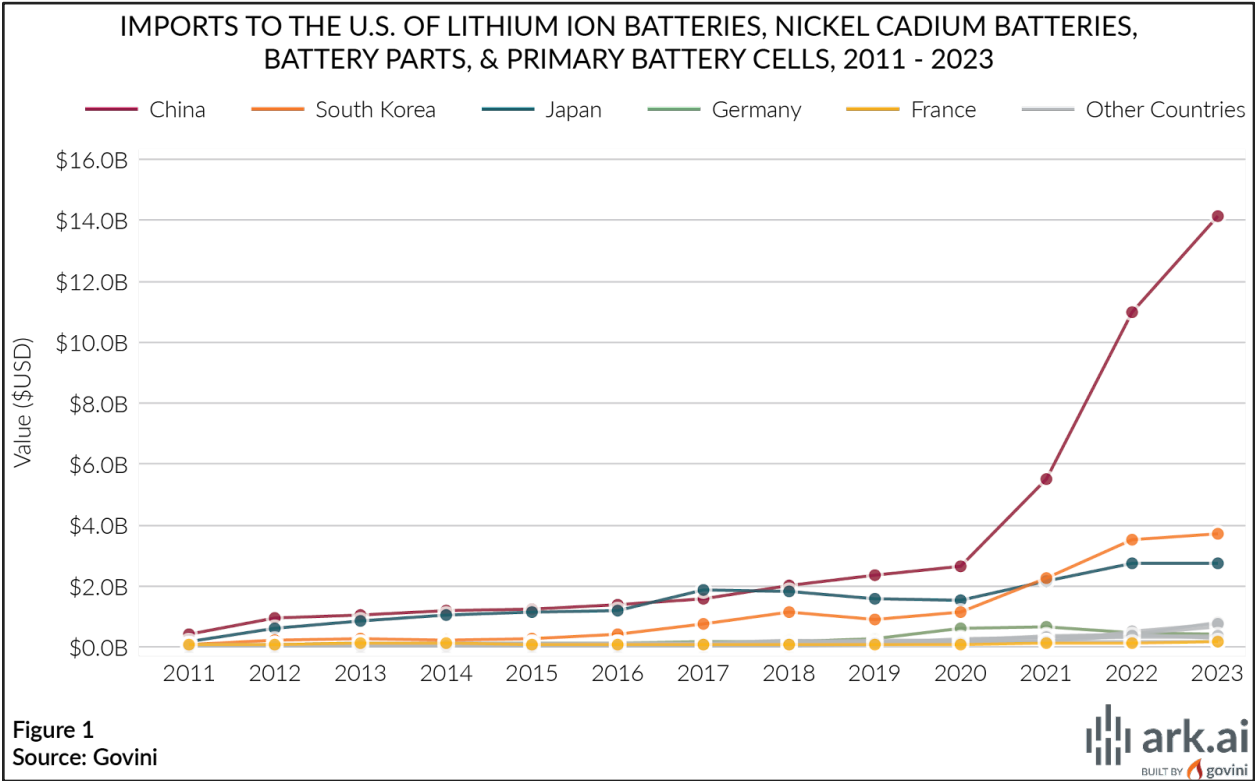
Co-Chairs Helberg and Wessel and honorable Commissioners:

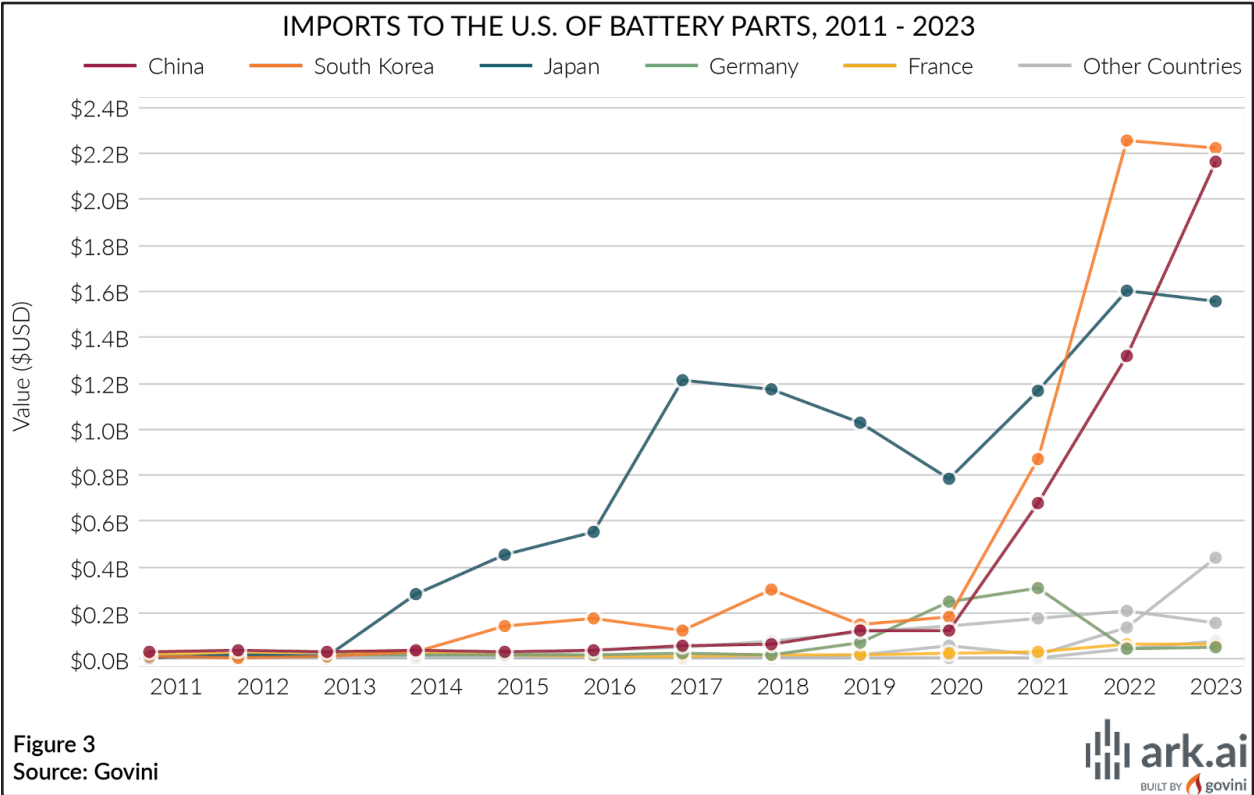
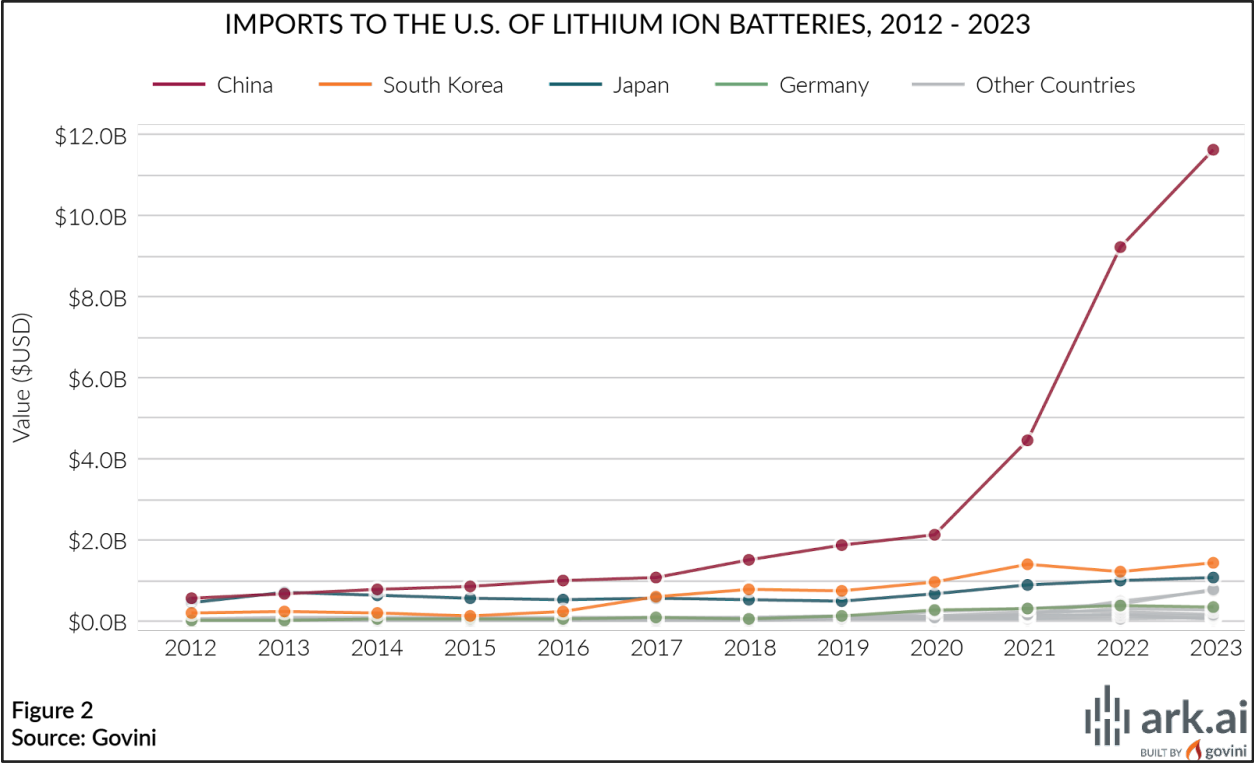
In March 2021, I returned to the private sector after serving as Deputy Assistant Secretary of Defense for Industrial Base Policy. In that post, I saw the significant, indeed alarming, vulnerabilities of the United States relative to the People's Republic of China in several crucial industrial sectors crucial to the readiness and capability of the U.S. military and to America's overall economic and national security. Those included microelectronics (semiconductors), critical minerals and, closely related, advanced batteries, which will be the focus of my testimony today. Here we are talking about the most technically advanced mid-sized batteries needed to operate not just automobiles, but also those required for distributed military weapons systems (satellites and UAVs) and critical infrastructure (from transportation to wastewater).

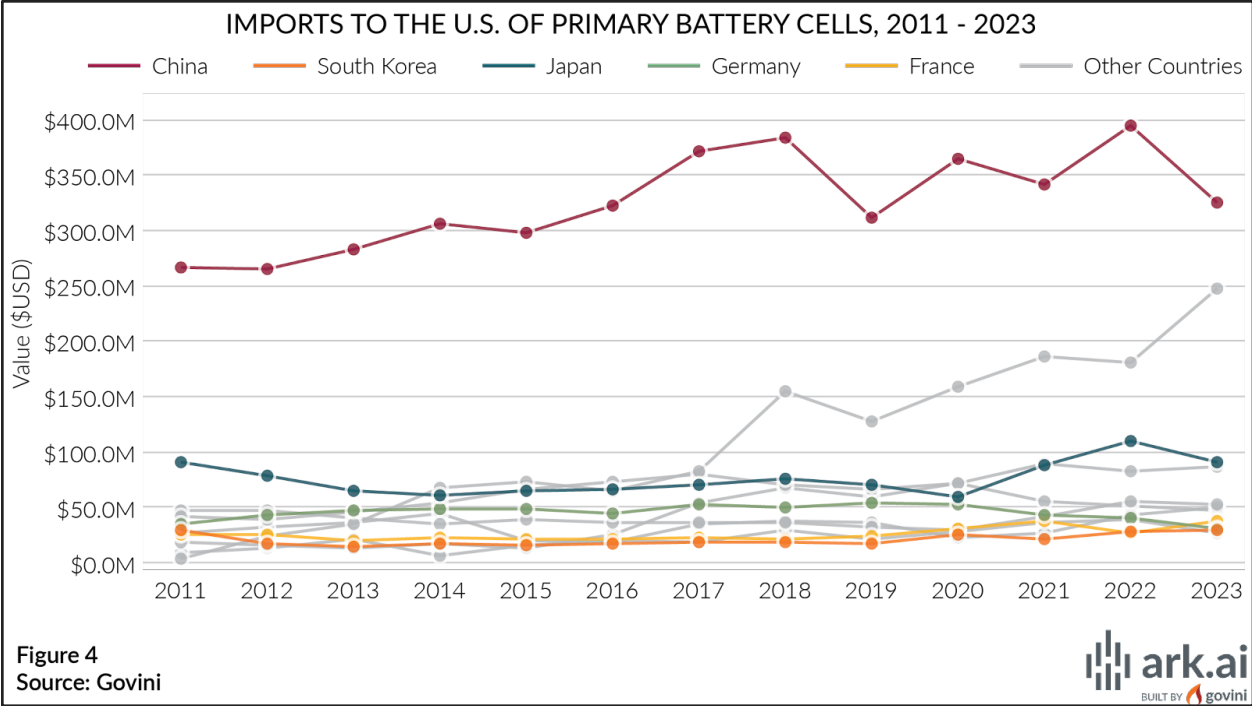
Some three years later, the U.S. government over the last two administrations – via policy and funding, through the executive and legislative branches – has acted to remediate U.S. vulnerabilities concerning battery technologies, components, and materials. One might quibble with the particulars, but collectively, they constitute a series of steps in the right direction. Nonetheless, the fundamental American weakness remains and will continue for advanced batteries. That is, our dependence – in some

cases directly, in most cases indirectly – on China at crucial phases of the supply chain that starts with mineral extraction, moves to processing, then to making components, and ends, after numerous stages, with battery assembly.

Here is telling data from Govini’s Ark.ai, the software platform that uses leading-edge artificial intelligence and machine learning to solve supply chain challenges in acquisitions, production, and sustainment.







IMPORT CONNECTIONS OF COMPANIES BY ORIGIN COUNTRY TO THE USG, 2018 - 2023

■ 1st Highest Connection Count
 ■ 2nd Highest
 ■ 3rd Highest

ORIGIN COUNTRY	LITHIUM-ION	NICKEL CADMIUM	PRIMARY CELLS	BATTERY PARTS	TOTAL
China / Hong Kong	801	68	537	97	1,503
Japan	238	28	140	56	462
Germany	194	41	97	60	392
South Korea	171	4	47	15	237
Taiwan	107	6	51	17	181
Singapore	58	1	82	5	146
Great Britain	35	2	38	37	112
France	26	24	18	38	106
Indonesia	3	0	97	3	103

Figure 5
Source: Govini

ark.ai
BUILT BY govini

TOP USG-LINKED U.S.-BASED IMPORTERS BY ORIGIN COUNTRY, 2018-2023			
CONSIGNEE	CORPORATE HQ LOCATION	% CN/HK IMPORT CONNECTIONS	% OTHER FOREIGN IMPORT CONNECTIONS
Panasonic Corp. of North America	Japan	41.0%	59.0%
Saft America Inc.	France	8.0%	92.0%
Retail Acquisition & Development Inc.	U.S.	83.0%	17.0%
Energizer Manufacturing Inc.	U.S.	33.0%	67.0%
Tenergy Corp.	U.S.	100.0%	0.0%
Ascent Battery Supply LLC	U.S.	96.0%	4.0%

Figure 6
Source: Govini



Batteries represent a prime example of how China’s manufacturing competitiveness has evolved over the past decade. Since its opening to the West in the 1970s, Chinese manufacturing success has been mainly driven by low labor costs and loose environmental regulations in service of foreign export markets – the “Old China,” if you will. But as the Roland Berger firm has noted, there is a “New China” of manufacturing characterized by (a) industrial modernization, (b) low carbon emission development, and (c) rising demand from domestic consumption. Over time, China has demonstrated how repeated practice with large-scale manufacturing – of products initially conceived and designed abroad – turns into proficiency and home-grown innovation in related areas, including precision engineering.

In the case of advanced batteries, China, having bought or pilfered Western technology in years past, is now at the forefront of development and innovation, mainly stemming from its cycles of experience and expertise in complex manufacturing. It is sustained by a massive domestic market for EVs, which blunts the impact of U.S. trade and technology restrictions.

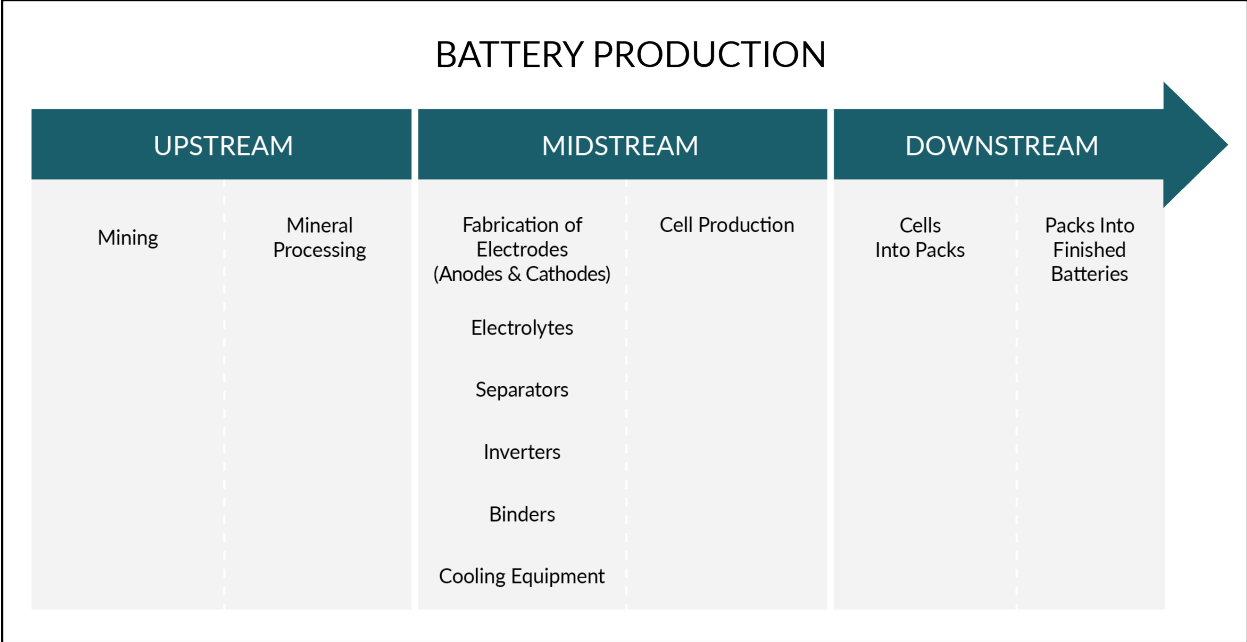
Several U.S. firms with promising battery technologies existed 10 to 15 years ago. However, Federal incentives for these industries tailed off; permitting obstacles remained unabated; we failed to counter predatory Chinese trade practices and subsidies; and the nascent EV market stood too small to sustain these kinds of battery companies. In many cases, Chinese firms were all too happy to scoop up what was left with the permission of all-too-willing U.S. CFIUS regulators.

Roughly the same thing happened with solar panels and wind turbines; though important to advocates of a “green” energy transition, these products are of significantly lesser strategic consequence than batteries.

The demand for advanced batteries – combining lower weight and greater endurance – will only grow across American industry, commerce, and national defense. The two most strategically consequential sectors are automobile manufacturing and the production and operation of military weapons systems. Each is at significant risk in case of a battery supply chain interruption instigated by China or any other natural or man-made cause.

The Challenge Now

In recent years, bipartisan concern has grown over China’s rising dominance over key parts of the battery manufacturing supply chain. Worrisome reports have been written, and legislation has been introduced. Irrespective of one’s view of the Inflation Reduction Act as a whole, it was helpful that Senator Joe Manchin insisted on provisions expanding domestic sourcing and phased-in reduction of “foreign entities of concern.” The Manchin provision has pushed automobile and battery companies to rethink where they operate and how.



Most U.S. public attention and policy action on batteries aims to re-shore slices of the “midstream” and “downstream” phases of battery manufacturing. The midstream includes the production of Chinese-sourced anodes into cells and cathodes into modules. The downstream includes fabricating the cells and modules into packs, and then integrating them into finished batteries.

The focus in the United States on this more visible, higher-value, closing stage of battery manufacturing is understandable given that it is the most visible and politically appealing – the stuff of job fairs and ribbon cuttings. It may produce a “Made in America” label, which is better than the alternative. With a boost from state and federal financial incentives, several battery cell and pack plants have opened in recent years around the United States, providing good jobs for American workers and a more secure source of finished batteries. However, the impression of a growing domestic battery manufacturing strength is partially misleading. In reality, essential parts of the battery are subcomponents and materials originating elsewhere, notably China.

Battery cell facilities within the U.S. are principally driven by Korean and Japanese companies – sometimes owned outright or as joint ventures or partnerships. They bring in the latest battery manufacturing capabilities that the U.S. simply does not have. Acquiring this technical and engineering proficiency is a good thing, especially from countries that are strong U.S. allies. But it also reflects America’s near total surrender of manufacturing know-how and technology leadership in this crucial sector. Consider that of the world’s most important battery companies, few are American. By contrast, the majority are Chinese.

Low Value, High Stakes

Recognizing that, realistically, we can’t do everything all at once to secure the entire battery supply chain, the place to start is the point of maximum Chinese control and, thus, maximum Western vulnerability. And this is the critical but often neglected “upstream” – mineral extraction and mineral processing, and the early stage of the “midstream” – fabricating the refined minerals into positive and negative electrodes (anodes and cathodes), electrolytes, and separators.

Today, at the upstream, China is the world’s dominant processor of copper, nickel, manganese, cobalt, and lithium despite having limited domestic geological deposits of these resources. In the midstream, Chinese-entities dominate not only the production of anodes, cathodes, electrolytes, and separators, but also the inverters, foils, binders, and cooling equipment integral to transforming the cathodes, anodes, electrolytes, and separators into cells.

To grasp the scale of the manufacturing challenge, I find it illustrative to dip into some of the workflows. These include:

- Front stage electrode production: mixing, coating, drying, compression, and slitting.
- Battery cell fabrication: winding, stacking, welding, canning, injection, and sealing.
- Charging, storing, testing, and shipping to another site for integration.

The number of companies in the world that have mastered these multifarious processes is relatively few: Wuxi Lead Intelligent, Yinghe, Kanhoo, MAURA, Pitutaila, and some others. Few are known outside energy storage circles, yet they form a linchpin – and choke point – in the battery supply chain. Most are Chinese. All involve intricate manufacturing. All are capital-intensive.

Nevertheless, many of these manufacturing steps are considered “low value” in the business paradigm that came to dominate the American economy in the contemporary era. Yet, lithium batteries simply cannot come into existence without them.

As the U.S. has learned in other crucial industrial sectors, just because a particular item or material is more cheaply produced or extracted elsewhere, the necessity to have some level of domestic capacity is not eliminated.

Most Americans, for example, take this position on energy supplies. Aided by fracking innovation, we have robust oil and natural gas production in the United States. A similar mindset – followed by a comparable level of freedom, action, incentives, and investment – is required for battery materials and components.

In the upstream, we should boost responsible domestic mining of lithium, nickel, and other critical minerals. Countries such as Canada and Norway – with environmental standards as good, if not higher, than our own – do not confront the mining deadlock we have in the United States. In addition, more mining will be of little strategic avail if the capacity to turn those raw ores into usable battery material resides across the Pacific Ocean within the borders of America’s principal competitor.

Today, the battery cells that go into most of the batteries we use come from a supply chain that starts with the Chinese refining of minerals – a capacity that is virtually non-existent within the U.S. and among our closest allies. No substitution of Chinese battery

materials and components is possible unless the U.S. and our allies lift the self-imposed barriers to refining and adopt incentives that make American production economically viable against unfair Chinese trade practices.

Defense Requirements

The U.S. Department of Defense faces the same battery supply chain challenges and vulnerabilities as the private sector, but with added complications and concerns. Weapons have used batteries since the invention of stored electricity, but newer military systems and modes of operation have increased their significance to national defense.

In particular, the U.S. military's shift toward distributed operations, stealthier vehicles, survivable long-duration uncrewed systems, electronic warfare, and large constellations of small satellites have swelled the demand for advanced batteries. Yet, as with microelectronics, the U.S. military represents a small portion of the total battery market. The unique requirements of many military systems translate into low volume and thus high per-unit production costs, which disincentivize U.S. and allied commercial entrants into the defense battery segment.

The Way Ahead

Addressing the national battery problem, commercial and defense, requires speed and, above all, scale. Our situation calls for a wartime sense of urgency to fuel a do-what-it-takes approach seen in the Apollo space program and in Operation Warp Speed for the COVID-19 vaccine.

Congress has taken valuable first steps to reduce the benefits Chinese State-Owned and State-Influenced Enterprises might get indirectly from U.S. taxpayer dollars. Stricter export controls are in place, and today's CFIUS, due to Congressional action, now

regards Chinese-linked investments and mergers in key sectors like batteries with much greater skepticism than in the past.

The problem is that China has always found a way to co-opt, copy, buy, or steal the latest technology from the West despite sanctions and restrictions. Trying to block and protect will not suffice. It is a national imperative that we steadily shift production for the most important energy, transportation, and computing products away from China – or sources vulnerable to China – towards either the United States, our allies, or some other assured sources.

Today, it is astoundingly difficult for the United States and similar countries to break into the mineral processing sector – and even more difficult, near impossible, to compete solely on cost. Mineral processing is energy-intensive, uses strong chemicals and reagents, and potentially produces hazardous waste, even if contemporary production technologies are vastly cleaner than was possible in the past. Building a new environmentally clean processing facility from scratch costs several hundred million dollars and, in some cases, more than a billion dollars.

And that is if the construction is allowed to proceed at all. Tens, if not hundreds of billions, of appropriated dollars for alternative energy projects – wind and solar electricity generation and transmission, for instance – have stimulated substantially less new construction than expected despite strong environmentalist support for low-carbon energy. The challenges are even stiffer for projects connected to advanced batteries, mining and processing activities, which prompt knee-jerk opposition and litigation from various sources.

The permitting regulations associated with the National Environmental Policy Act (NEPA), which govern the building of anything of consequence in this country, effectively serve as an automatic brake (if not an immovable barrier) to building out a complete domestic supply chain for advanced batteries.

Noah Smith, a non-partisan economics analyst, describes the broader predicament in terms of a “build-nothing country.” As he puts it: “Money is not physical . . . if permitting holds up the process for years . . . then you still haven’t built a damn thing.”

RECOMMENDATIONS

Significantly larger tax incentives and market-shaping mechanisms are needed to level the competitive playing field with Chinese companies that their government heavily subsidizes and protects.

First, impose a much stiffer tariff on all Chinese batteries that also covers all battery components of ultimate Chinese origin imported for integration or use within the United States. And do that irrespective of the countries – including otherwise friendly trading partners – those components pass through in their journey here. We could waive the import tariff on other countries that impose similar tariffs on parts and materials exported from China. The ultimate purpose is to block content from China, not create more obstacles for U.S. allies and other trade partners. But that barrier only works if the third-country loophole is closed for battery components. In this respect, the tariff ideas of former U.S. Trade Representative Robert Lighthizer have immense merit, though the facts warrant even higher rates than proposed.

Second, provide extensive tax credits for capital expenditures that are required to process minerals and make battery components within this country.

Third, allow investors to channel unrealized capital gains (several trillion dollars’ worth in total) tax-free into domestic battery mineral processing and component making.

Tax incentives are a genuinely American response to the Chinese unfair trade challenge. Unlike direct subsidies, tax incentives keep pivotal decisions in the hands of entrepreneurs rather than government officials.

While these incentives are essential, they will have little impact without changes to the environmental permitting process.

My recommended permitting changes would:

- Speed up the years-long NEPA permitting process to 6 months and appeals to 3 months each.
- Curtail injunction abuse of the courts by ending private party lawsuits; suing power would remain with our elected representatives in the states and localities.

Most fears of pollution resulting from mineral processing – and thus opposition to permitting changes – are based on dated assumptions. While it was a dirty process decades ago in the United States, technology gains now make building “closed-loop” systems with minimum risk to ecosystems, wildlife, or people possible. For example, a semiconductor foundry is, in many ways, an advanced mineral processing plant, primarily of silicon origin. Yet, there is limited environmental and political opposition to semiconductor plants. Quite the opposite, as states and localities compete vigorously to become the site of microchip foundries. Modern refining of critical minerals for batteries is not necessarily any less “clean” than for semiconductors. It is all a matter of designing and engineering the facility right.

Accelerate the Department of Defense's move away from reliance on Chinese-based battery materials.

The Congress should mandate, through the next NDAA:

- A phased-in schedule to move sourcing of battery materials and components used for weapons and critical infrastructure exclusively towards supply chains secure from Chinese coercion or control.
- Issuance of Requests for Proposal (RFPs) with dollar targets and certain contracts awarded under the condition that Chinese battery components are not used.

Conclusion

Americans have seen a steadily declining return from our investments and technological achievements for too long. Whole industries have outsourced production overseas – first for basic goods, then for more advanced and higher-value items. Now, America relies on its principal global competitor and military pacing threat for materials and products essential to national security. It will take years to unwind these vulnerabilities in our battery supply chains. But that provides no excuse for failure to fast-track changes in tax incentives, tariffs, and laws. Quite to the contrary, it only increases our obligation to act now and, conversely, increases the deserved opprobrium of history for failure to act.

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