SAFE
1111 19TH STREET, NW
SUITE 406
WASHINGTON, DC 20036
TEL: 202-461-2360
FAX: 202-461-2379
SECUREENERGY.ORG

ADVANCING TRANSFORMATIVE TRANSPORTATION TECHNOLOGIES TO ENSURE OUR ENERGY SECURITY

Testimony Submitted on Behalf of Securing America's Future Energy (SAFE)
Submitted by Abigail Wulf
To the United States Senate
Committee on Energy and Natural Resources
31 March 2022

On behalf of **SAFE**, thank you for the opportunity to submit a written statement for the Full Committee Hearing on Domestic Critical Mineral Supply Chains for the Senate Energy and Natural Resources Committee.

SAFE is a non-partisan, non-profit organization that enhances America's energy security and supports its economic resurgence and resiliency by advancing transformative transportation and mobility technologies and ensuring that we secure key aspects of the technology supply chain to achieve and maintain our strategic advantage. SAFE is aided in our work by our Energy Security Leadership Council (ESLC), a group of non-partisan senior business executives and 4-star admirals and generals, who work to safeguard our energy security and related supply chains as a top economic and national security priority.

SAFE created the Ambassador Alfred Hoffman, Jr. Center for Critical Minerals Strategy within its Commanding Heights Initiative to ensure that rare earth and critical mineral supply chains needed for electrification and the current energy transition reflect our interests and values, continue to strengthen our economy, and do not create a new dependence on China.

Critical Minerals for the Economy and National Security

The world is transitioning to an increasingly electric, connected, and autonomous future. Countries and companies are committing to zero-emission vehicle targets heralding a sea-change in global transportation, energy, and manufacturing markets.[1]

Consequently, the 2020s will be a critical decade that will challenge the United States' ability to consistently and effectively project its political, military, and economic strength. During this time, the production of batteries, electric vehicles (EVs), semiconductors, and other advanced technologies will take on increased geopolitical importance. The nation that prevails in controlling the manufacturing and distribution of these key industries will lead the global transition to a new energy future and the next industrial revolution. **The United States is lagging behind, risking our position of global economic leadership, leaving us vulnerable to supply disruptions and dependent on nations that do not share our values.**

[1] See, e.g., Steven Mufson, "General Motors to eliminate gasoline and diesel light-duty cars and SUVs by 2035," The Washington Post, January 28, 2021.

Over the last several years, as a leading advocate for electrification as a critical component to ending the national and economic security risks of oil dependence, SAFE has grown increasingly concerned with China's rising dominance over key parts of the automotive and battery manufacturing supply chain, particularly their control over vital midstream components, including mineral processing and anode and cathode production. The automotive industry provides more than a trillion dollars to the U.S. economy every year and accounts for more than 5 percent of our GDP.[2] During World War II, the automotive industry was mobilized as our "Arsenal for Democracy," and during the Covid-19 pandemic it was mobilized as our "Arsenal for Health." We cannot risk the U.S. auto sector being hollowed out or made vulnerable due to supply chain vulnerabilities associated with the energy transition.

China exerts significant influence over key aspects of the automotive supply chain and uses its power not only to limit supplies, but also to lure foreign investment and advanced manufacturing to its shores. The United States must resist becoming just the 'assemblers' of next generation technology; we must act now to diversify and fortify our position in this emerging market. The United States cannot be put in a position where China has the ability to control the supply of these critical materials which can limit U.S. choice in foreign or military policy decisions and constrain our freedom and values.

The crisis in Ukraine underscores this reality and the urgency with which we must diversify and secure our transportation energy supply chains. The European Union's overreliance on Russian oil and gas is stymying its ability to forcefully respond to Russia's war on Ukraine.[3] As we shift to a future powered by batteries and built with critical minerals, it is important that the United States and its allies do not trade dependency on volatile oil markets for dependency on Chinese Communist Party-controlled critical minerals.

Despite these sobering realities, the United States, together with allies and friends, can still enact bold policies and take coordinated actions to reverse course and become a leader in responsible critical minerals extraction, processing, and recycling, thereby giving us reliable access to these materials so desperately needed by downstream industries.

The Need to Diversify Mineral Supply Chains

Batteries power everything from cars and clean energy to soldiers and satellites. While battery chemistries are rapidly changing, to meet the forecast demand we will need increased supply of lithium, nickel, cobalt, and manganese-based cathodes, graphite-based anodes, and copper-based current collectors. Additionally, most EV motors and wind turbines rely on permanent magnets, which are primarily made of neodymium, iron, and boron and draw their power from the unique chemical properties of rare earth elements.

---

[2] "Driving the U.S. Economy," The Alliance for Automotive Innovation, https://www.autosinnovate.org/initiatives/the-industry.

[3] See, e.g., Clifford Krauss, "Europe and the U.S. Make Ambitious Plans to Reduce Reliance on Russian Gas," The New York Times, March 25, 2022.

China is the world's largest processor of copper, nickel, cobalt, lithium, and rare earth elements.[4] It controls 75 percent of lithium-ion battery production, including 60 percent of the world's cathode production and 80 percent of the world's anode production – despite not having a geological advantage in the majority of these materials.[5,6] We, by contrast, possess less than 4 percent of all minerals processing, produce zero percent of cathodes and anodes, and are more than 50 percent import reliant on all of those minerals except for copper and lithium.[7,8] Even minerals produced here will likely be sent to China for processing into useable goods—this is a problem.

Dependence upon our 21st-century strategic competitor is a massive national and economic security threat that diminishes our ability to project soft power and lead the world into the next industrial revolution. Today, the world is looking to China to lead the way into the next industrial revolution due to their control over mineral supplies—not the United States. This not only limits our ability to manufacture the necessary goods for our economic security and national defense, it also limits our ability to respond appropriately when confronted with situations that go against our American ideals.

Prioritizing Transparency and High Standards with Allies will Ensure Supply Responsibly Meets Demand

According to estimates from both the World Bank Group and the International Energy Agency, the world will require large investments in new mineral resources to meet projected future energy needs, including almost 6 million more tons of aluminum, more than a million more tons of copper, and almost 500 percent increases in graphite, lithium, and cobalt through 2050 compared to 2018 levels.[9] While recycled materials will contribute to our supply, they alone cannot satisfy forecasted demand in the near term.

Domestic production alone will not be able to satisfy these needs, therefore the United States must work with allies and likeminded nations to ensure the materials that go into our tech-driven world are sourced using the highest environmental and labor standards, creating a new global race to the top.

---

[4] IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*, IEA, Paris https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

[5] SAFE (2021), *The Commanding Heights of Global Transportation* https://secureenergy.org/the-commanding-heights-of-global-transportation-2/; Data derived from Benchmark Mineral Intelligence

[6] USGS (2022), *USGS Mineral Commodity Summaries 2022* https://pubs.usgs.gov/periodicals/mcs2022/mcs2022.pdf

[7] Ibid.

[8] SAFE (2021), *The Commanding Heights of Global Transportation* https://secureenergy.org/the-commanding-heights-of-global-transportation-2/; Data derived from Benchmark Mineral Intelligence

[9] World Bank Group (2020), *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* *https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf*

China mines and processes minerals domestically and abroad with low regard for worker or environmental safety, allowing its citizens to carry the heavy burden of pollution.[10] Moreover, the current crisis over the use of forced Uyghur labor in Xinjiang to produce the high purity polysilicon needed for solar panels is just the latest example of human rights abuses tied to critical mineral resources. About 45 percent of the world's supply of polysilicon for solar panels comes from Xinjiang, where more than 1 million people are being detained in camps and forced to work.[11,12]

Disregard for the environmental and humanitarian impacts also ensures that it is more difficult and costly for other countries, including the United States and its allies, to compete, particularly when they depend on private capital and markets to build and operate mines and processing facilities.

If we wish to consume products produced to high ethical standards, we must work with our allies and other partners to enforce supply chain transparency and high environmental and labor standards to help track the provenance of mineral materials from mine to market.

- **Creating a new global race to top among allies and likeminded nations will help the United States and others who adhere to higher environmental and labor standards for mineral production to better compete in the global marketplace.** It is currently very difficult for good actors in stricter regulatory environments to compete on cost, making it difficult to diversify mineral supply chains. The United States and allies should commit to only sourcing the raw materials for their downstream industries from actors that adhere to high standards.

- **Establishing a minerals to market strategy that includes tracking and traceability of minerals from the mine to the motor and battery of electric vehicles, especially adding this information in the form of a battery label to the existing Monroney Label, will increase U.S. competitiveness and consumer choice.** The Monroney Label on vehicles should be amended in to include sourcing information for the raw materials in the vehicle's battery and motor.

Any new domestic production must be done to the highest environmental and labor standards, prioritize existing mine waste where possible, and also invest in R&D and recycling to reduce demand from new mines.

- **We support the Biden Administration's recently released Fundamental Principles for Domestic Mining Reform. We also see the need for permitting reform to allow industry to make better and more informed business decisions.**

---

[10] See, e.g., Jonathan Kaiman, "Rare Earth Mining in China: the Bleak Social and Environmental Costs," The Guardian, Guardian News and Media, March 20, 2014.

[11] See, e.g., Dan Murtaugh, "Why It's So Hard for the Solar Industry to Quit Xinjiang," Bloomberg, February 10, 2021.

[12] See, e.g., Aitor Hernandez-Morales et al., "Fears over China's Muslim forced labor loom over EU solar power," February 10, 2021.

- **We support the Bipartisan Infrastructure Law's renewed investment in the U.S. Geological Survey (USGS) Earth MRI program, which works side-by-side with State Geologists to understand our resource potential. Better geologic mapping will help inform better land-use planning decisions.** However, we also encourage the government to support no-match funding for the near-term, so that many of these amazing projects can go through.
- **We support the passage of the bipartisan legislation to remove hurdles for Good Samaritans to clean up abandoned hardrock mines introduced by Senators Risch and Heinrich.**
- **We support Chairman Manchin and Ranking Member Barrasso's bipartisan bill to grow the American mining workforce.**
- **The United States should also incentivize and prioritize mining projects that demonstrate full-value mining practices, whereby mining companies are responsible for extracting the maximum possible value from the resource(s) with which they have been entrusted. Full-value mining maximizes what is being taken from the ground while minimizing the environmental footprint of overall mining.**

The Importance of Investing in Mineral Processing

Because the United States is so deficient in mineral processing capacity, increasing domestic mining alone will have little effect on our economic and national security.

Mineral processing is the crucial midstream step needed to turn mined material into useable compounds. Before you can put lithium, nickel, or cobalt into a battery, you first need to crush and separate the ore that it comes from and then smelt and further refine it into precursor material. That precursor material is then made into the components that make up batteries: namely, cathodes, anodes, and electrolytes.[13]

- **To truly secure our critical mineral supply chains, the United States must simultaneously invest in critical mineral processing both at home and among our allies, while obtaining stable offtake agreements of raw materials with responsible mines that adhere to high environmental and labor standards to feed the new facilities.**
- **In parallel, we must also invest in downstream battery component production, so that any precursor material we do produce can be sold domestically or among allies to help diversify battery supply chains.**

With President Trump's 2017 E.O. 13817 on *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals* and President Biden's 2021 E.O. 14017 on *America's Supply Chains*, the Administration and Congress have begun taking steps to address this vulnerability in our

[13] See, e.g., "100-day-supply-chain-review-report.pdf (whitehouse.gov)," The White House, Page 155.

supply chain. The Bipartisan Infrastructure Law (BIL) provides $6 billion in new funding for battery material processing, manufacturing, and recycling, which will help companies build demonstration plants, retool existing facilities, and build entirely new facilities with federal grants. In addition, the Department of Energy's (DOE) Loan Guarantee Program also now extends loans to battery material processors, offering critical capital to this burgeoning sector.

- **We strongly support the battery material processing, manufacturing, and recycling provisions within the BIL and applaud the Committee's role in including this provision. We also strongly support the DOE's Loan Guarantee Program. However, additional incentives, such as production tax credits, could also help mineral processors and battery manufacturers that are further along in their development.**

Other places for improvement in shoring up our mineral processing capacity include investing in research and development to create advancements in mineral processing techniques and identifying ways to make U.S. and allied processing more cost competitive with China.

Today, it is incredibly difficult for the United States or other countries to break into the traditional mineral processing sector and compete solely on cost. Mineral processing is traditionally incredibly energy intensive, uses strong chemicals and reagents, and can potentially produce hazardous waste, depending on the ore.[14] Additionally, building a new processing facility from scratch can cost anywhere from hundreds of millions of dollars to over a billion dollars.[15,16]

To ensure any investment at this scale is protected from potential market manipulation by the Chinese Communist Party or others, the United States should consider funding mechanisms, including a mineral processing cooperative – which could insulate partner companies from any supply shocks or anti-competitive market practices, including others flooding the market with lower-cost goods – and investing in leapfrog technologies to make any U.S. processing faster, cleaner, and more cost efficient.

Historically in the United States, mineral processing facilities have been associated with specific mines due to the unique geochemistry of each ore deposit. However, modern approaches to mineral processing can be much more modular, allowing one facility to process ore from multiple deposits. This type of facility would greatly benefit the United States, as we could source raw material feedstock from around the country and the world.

- **A new consortium based at the Department of Energy's National Labs and in partnership with private industry could help support U.S. mineral processing by**

[14] See, e.g., Fathi Habashi, "Extractive Metallurgy," Science Direct.
[15] See, e.g., Andrew Topf, "Processing plant to cost $302 million – 1/3 of Avalon's rare earth project capex," Mining.com
[16] SAFE Center for Critical Minerals Strategy Roundtable Discussions on Minerals Processing, December 14, 2021 and February 17, 2022.

serving as an innovation hub to help mines develop methods that are cleaner, faster, and cheaper than traditional methods.

- **The United States should also leverage its more than 500,000 abandoned mine lands to reprocess existing mine waste, thereby limiting new disturbance from greenfield projects.**

Investing in critical minerals processing also helps to promote improvements in critical minerals recycling.[17] Mineral processing and mineral recycling are two sides of the same coin: both involve breaking down mineral material using hydrometallurgy or pyrometallurgy to extract valuable metals – one just breaks down rock, while the other breaks down spent batteries and electronics. As we increase EV adoption, we need additional support for critical minerals recycling. We applaud this Committee for taking a holistic look at the minerals value chain and including funding for minerals recycling within the BIL.

With these bold policy actions and the Committee's leadership, the United States and our allies can retake the commanding heights of global transportation, secure critical mineral supply chains, and lead the world into the next industrial revolution that is cleaner and more prosperous for all.

Thank you for this opportunity, and I look forward to discussing these solutions with you further.

Abigail Wulf
Vice President, Critical Minerals Strategy
Director, Ambassador Alfred Hoffman, Jr. Center for Critical Minerals Strategy
SAFE
1111 19th St. NW, Suite 406, Washington, DC 20036
awulf@secureenergy.org

[17] SAFE Center for Critical Minerals Strategy Roundtable Discussions on Minerals Processing, December 14, 2021 and February 17, 2022.