The Importance of Investing in Domestic Critical Mineral Resources

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ENGCMP 0600
Classical Argument Method

Critical Minerals Background

A critical mineral is defined as follows:

Any non-fuel mineral, element, substance, or material that the Secretary of Energy determines: (i) has a high risk of supply chain disruption; and (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy;

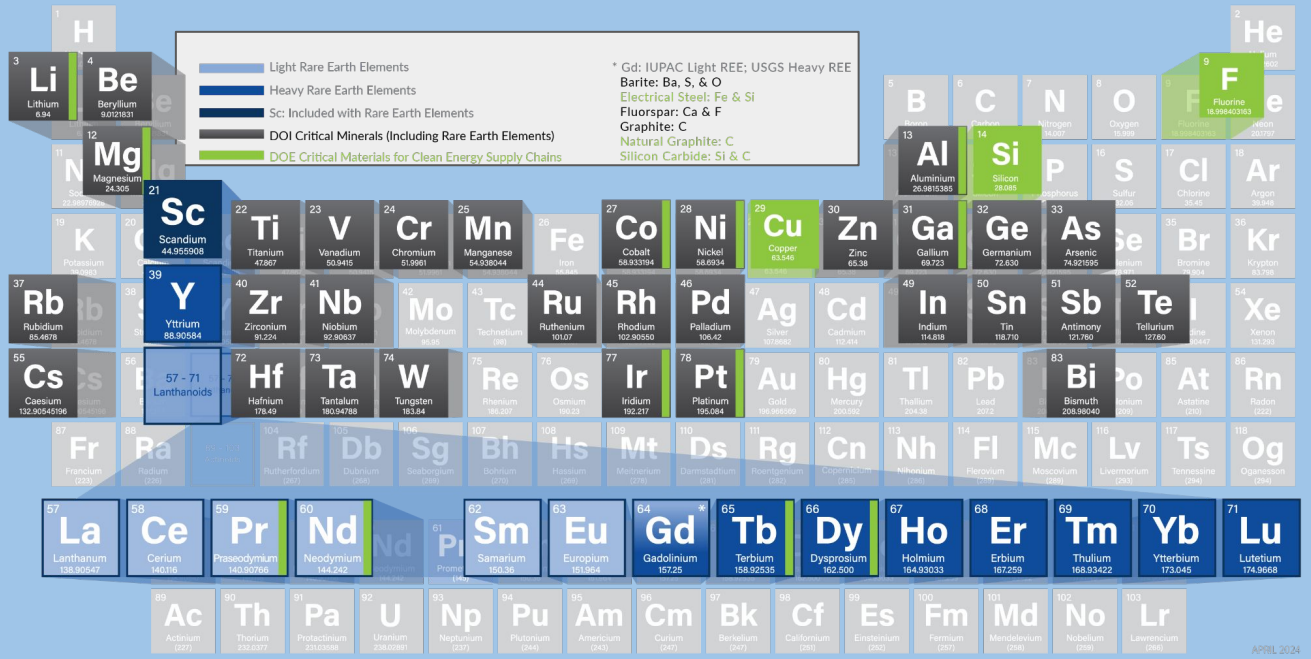
-Energy Act of 2020

A list of critical minerals is also defined by the Secretary of the Interior

Aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium, cesium, chromium, cobalt, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, graphite, hafnium, holmium, indium, iridium, lanthanum, lithium, lutetium, magnesium, manganese, neodymium, nickel, niobium, palladium, platinum, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, terbium, thulium, tin, titanium, tungsten, vanadium, ytterbium, yttrium, zinc, and zirconium.

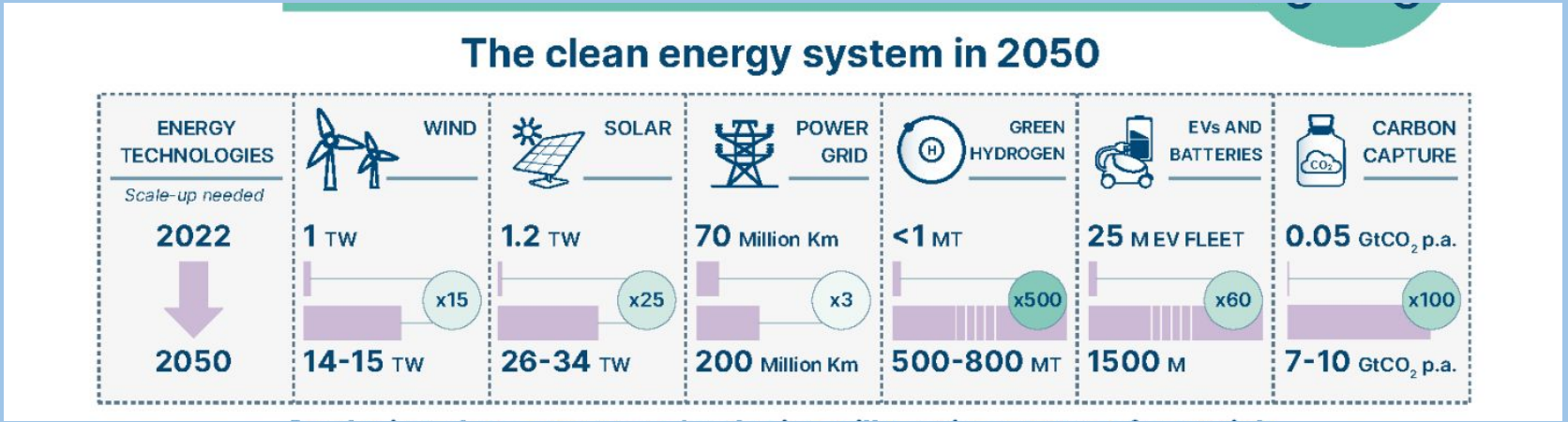
*Copper, electrical steel, fluorine, silicon, and silicon carbide are defined as a critical mineral for the Department of Energy, but not the Department of the Interior

One subsection of the critical minerals are Rare Earth Elements (REEs)



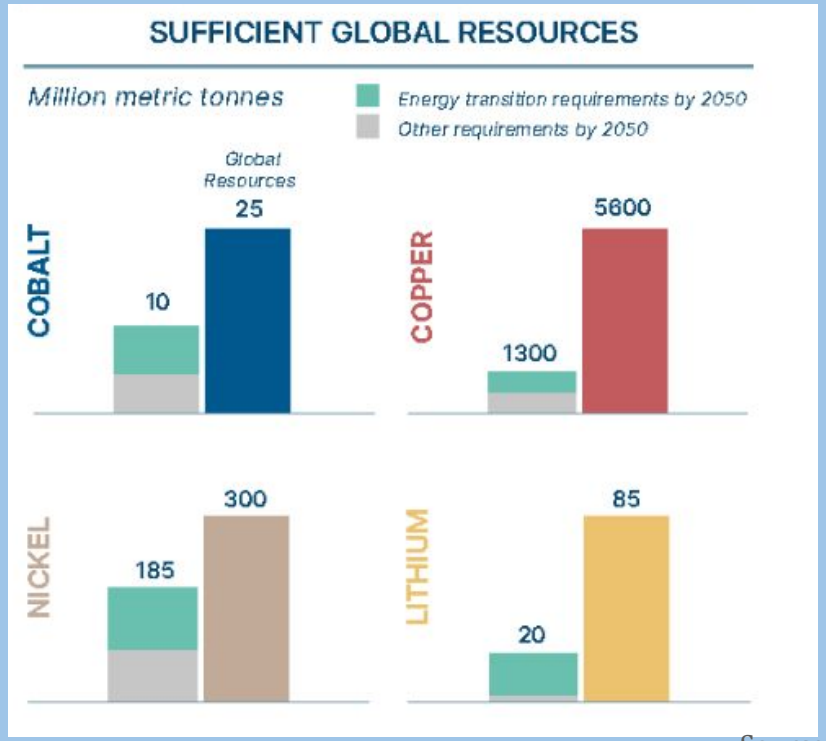
Source: National Energy Technology Laboratory (DOE, US)

In order to help combat carbon emissions, the world must invest into clean energy systems



Source: Energy Transitions Commission (Global)

These investments will require a large demand for critical minerals

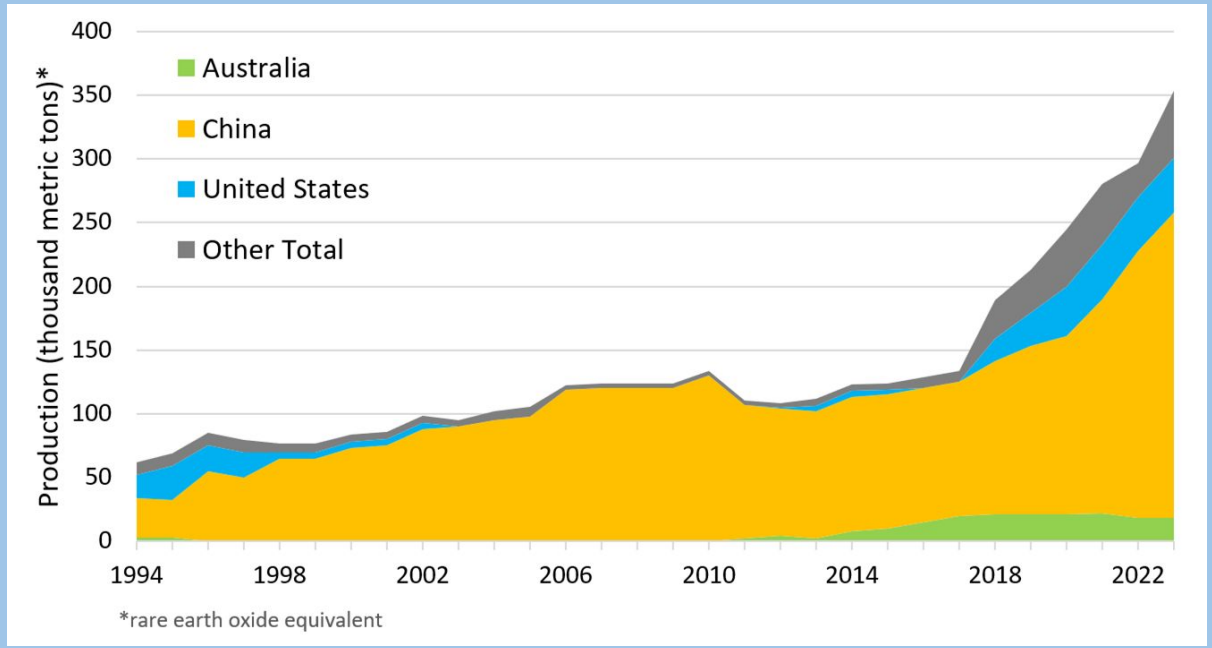


Source: Energy Transitions Commission (Global)

As technology grows, the demand for certain metals and minerals will change

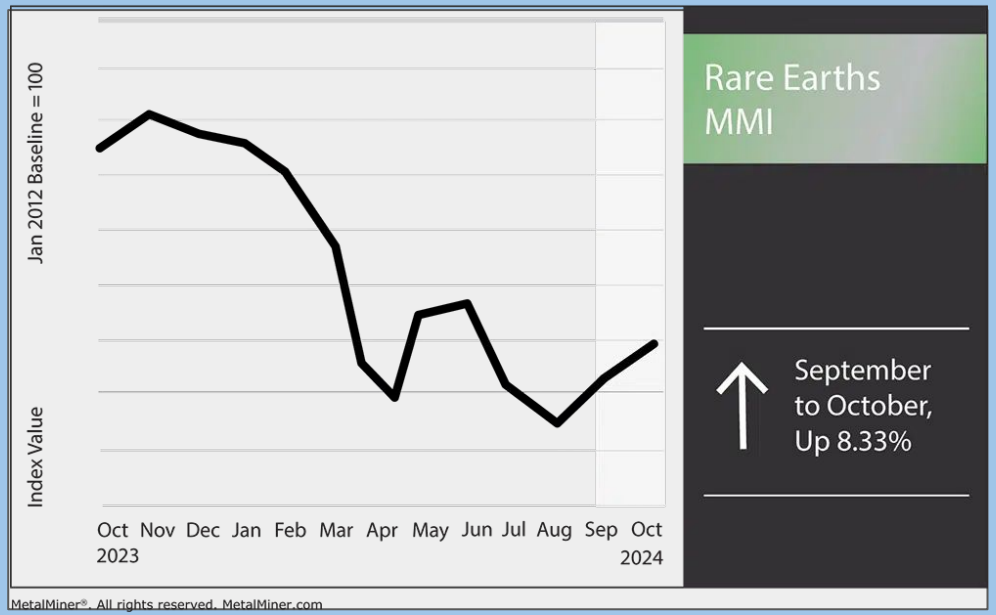
Source: Department of Energy (US)

The US was the leading producer of Rare Earth Elements until 1998

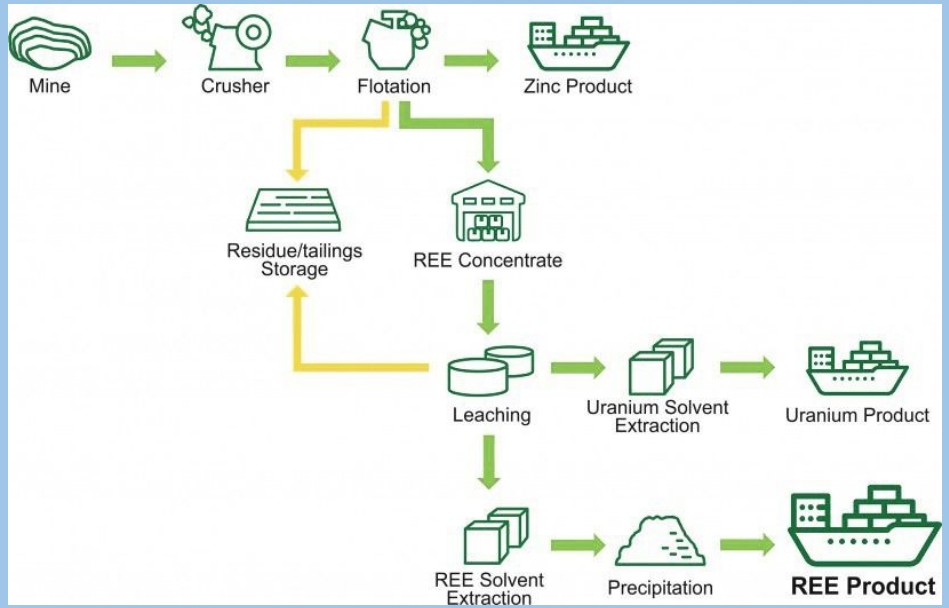


Source: National Energy Technology Laboratory (DOE, US)

In 2011 and then again in 2024, China decided to restrict Rare Earth Element exportation



In December 2023, China announced a ban on exporting critical mineral extraction technologies

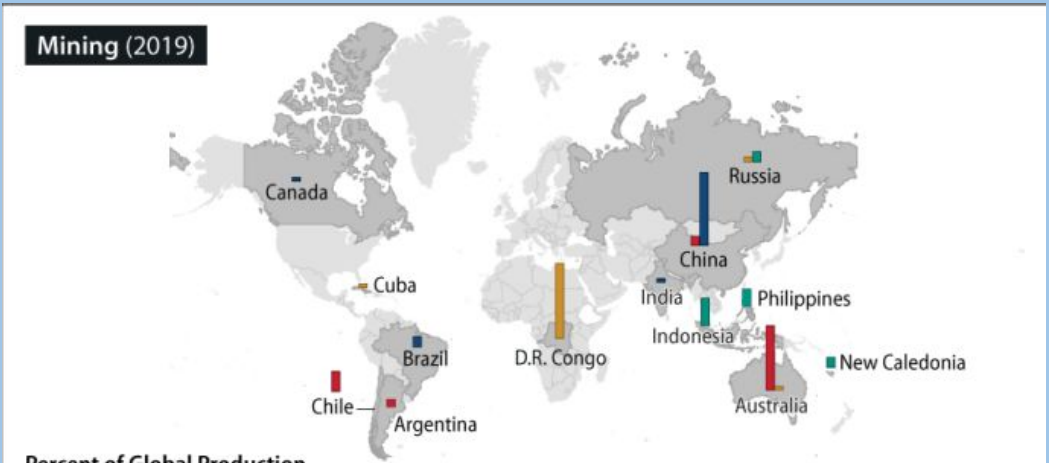


Source: AT Mineral Processing

Investing in the domestic critical mineral supplies can help alleviate reliance on foreign nations, invest in local economies, and push innovation in green energy

There have already been steps for investments, mainly with funding grants and tax breaks from these departments

One side of the critical minerals comes from actual natural resources, mainly found with mining

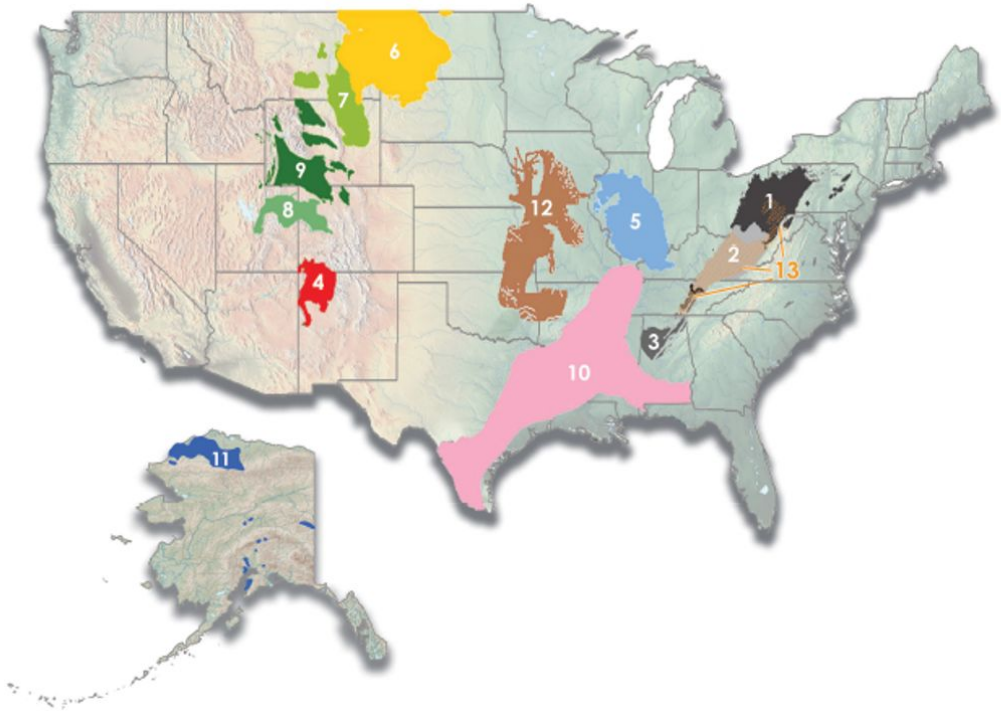


Percent of Global Production

	Lithium	Cobalt	Nickel	Graphite
	60% - Australia	70% - D.R. Congo	26% - Indonesia	68% - China
	19% - Chile	5% - Russia	16% - Philippines	10% - Brazil
	9% - China	4% - Cuba	10% - New Caledonia	4% - Canada
	7% - Argentina	4% - Australia	10% - Russia	4% - India
Total metric tons	**84,700**	**128,700**	**2,133,000**	**930,000**

Source: White House

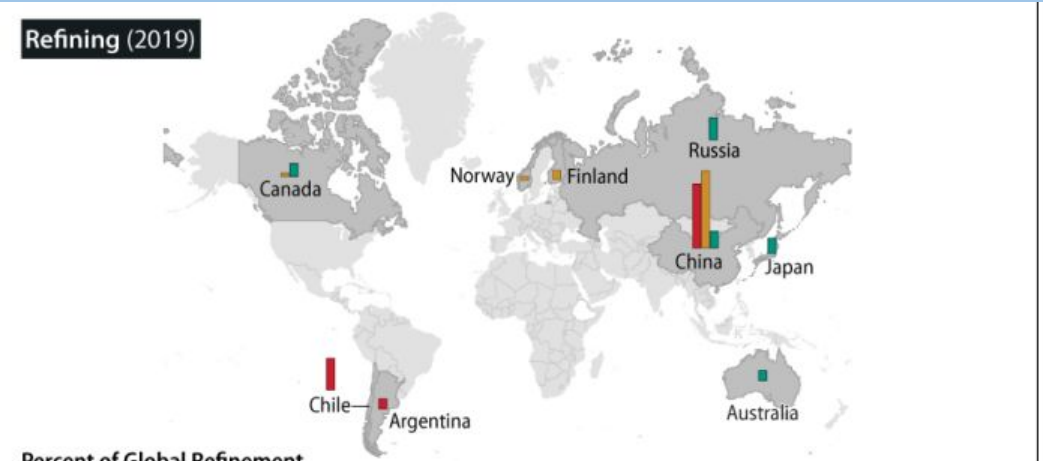
One exciting area of research comes from coal byproducts



U.S Basin Legend

- AOI 1: Appalachian Basin, North (MD, OH, PA, WV) — Pennsylvania State University
- AOI 2: Appalachian Basin, Central (KY, TN, VA, WV) — Virginia Tech
- AOI 3: Appalachian Basin, South (AL, GA, TN) — Collaborative Composite Solutions
- AOI 4: San Juan River-Raton Basin (CO, NM) — New Mexico Institute of Mining and Technology
- AOI 5: Illinois Basin (IL, IN, KY, TN) — University of Illinois
- AOI 6: Williston Basin (MT, ND, SD) — University of North Dakota
- AOI 7: Powder River Basin (MT, WY) — University of Wyoming
- AOI 8: Uinta Basin (CO, UT) — University of Utah
- AOI 9: Green River-Wind River Basin (CO, WY) — University of Wyoming
- AOI 10: Gulf Coast Basin (AL, AR, LA, MS, TX) — University of Texas Austin
- AOI 11: Alaska Basin (AK) — University of Alaska Fairbanks
- AOI 12: Other: Cherokee-Forest City Basin (IA, KS, MO, NE, OK, Osage Nation) — University of Kansas
- AOI 13: Other: Mid-Appalachian Basin (southwestern PA, WV, southwestern VA, eastern KY and eastern Tennessee) — West Virginia University

The second part of the supply chain for critical minerals is through refining

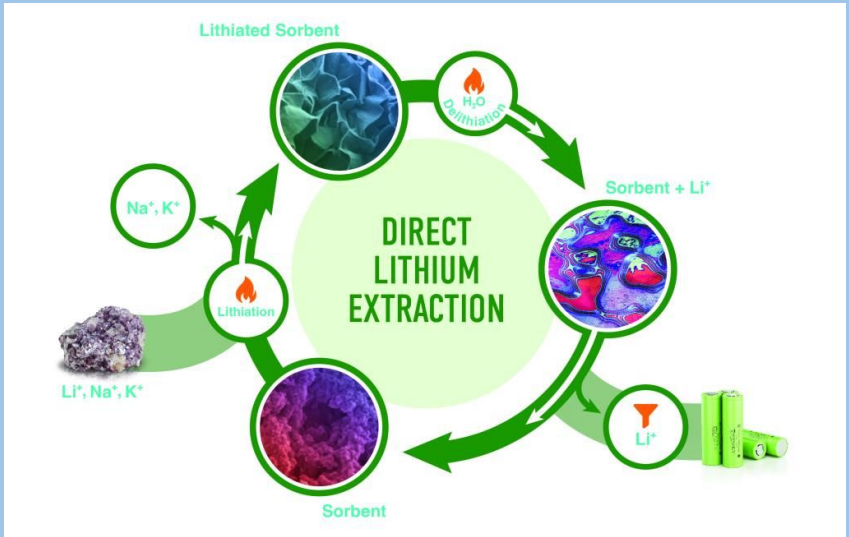


Percent of Global Refinement

	Lithium	Cobalt	Class 1 Nickel
	60% - China	72% - China	21% - Russia
	30% - Chile	9% - Finland	16% - China
	10% - Argentina	4% - Canada	15% - Japan
	—	4% - Norway	13% - Canada
Total metric tons	**66,100**	**162,900**	**1,171,300**

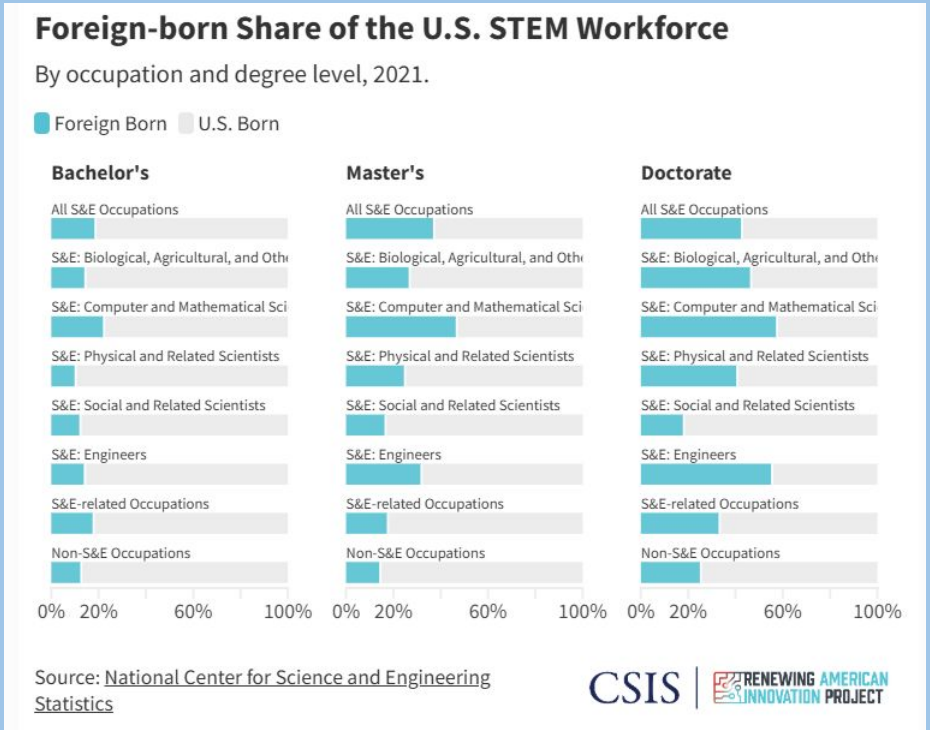
Source: White House

These advancements in processing are interdisciplinary, working with almost all areas of science, from chemistry, to biology, to material science

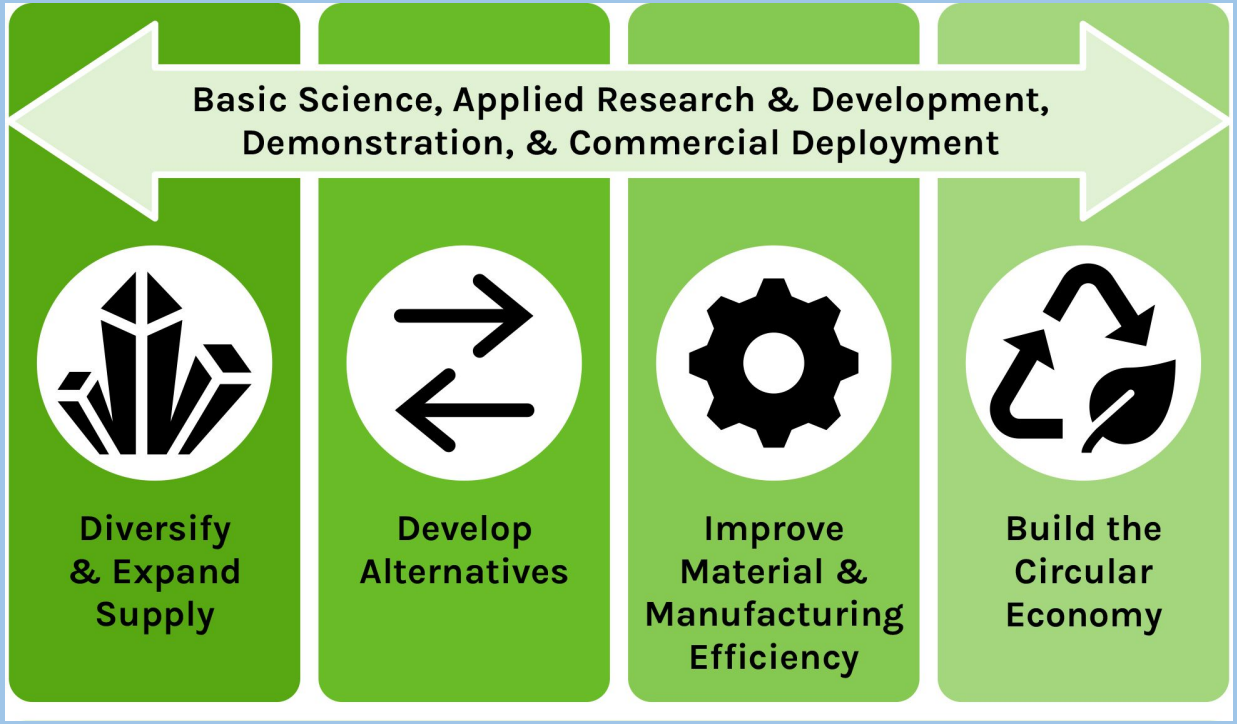


Source: Oak Ridge National Lab

Investing in creating new technologies attracts talented minds to the United States



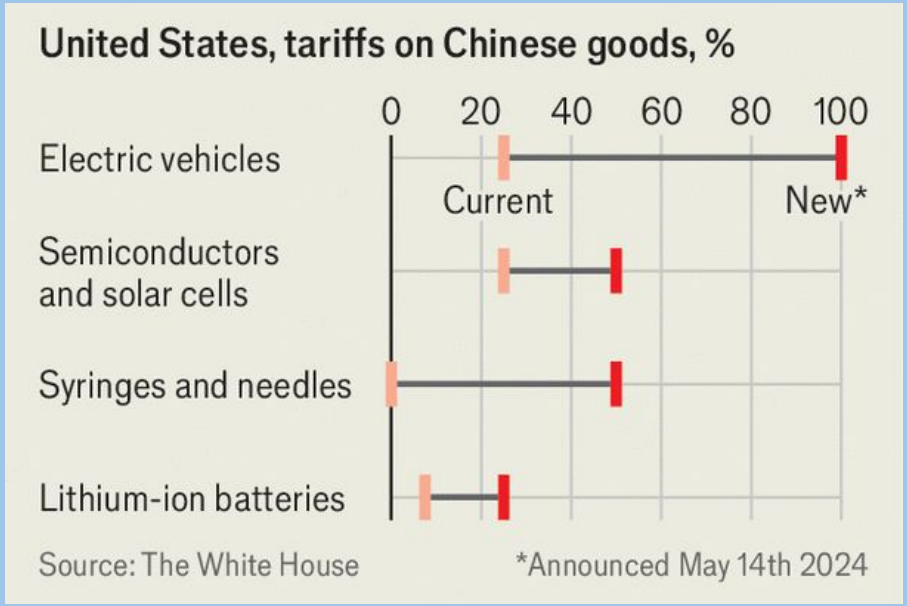
Through these steps, the United States can build more self reliance



Source: Department of Energy

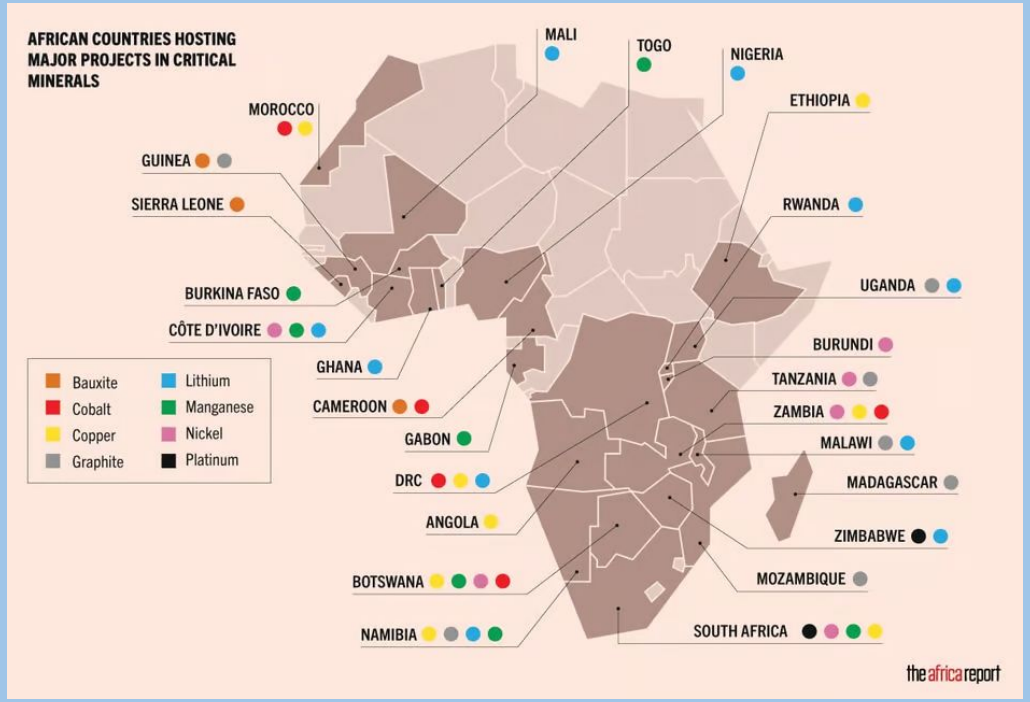
Other solutions/criticisms

One current approach to counter foreign domination of green products is tariffs, which ultimately harm the green energy sector



Source: The Economist

The US is also recommended to have a presence in other countries, especially in Africa, to stabilize the mineral sources



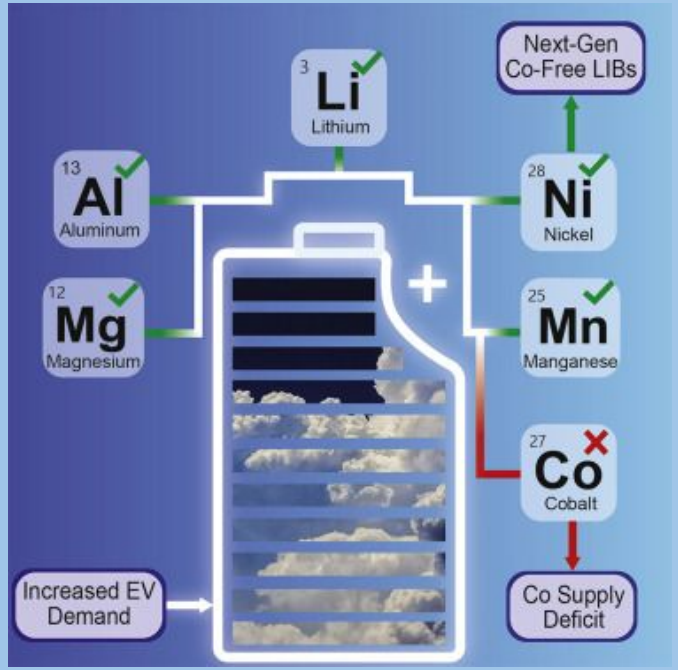
Source: The Africa Report

US based sources may be more expensive

The United States' only cobalt mine, located in Idaho, which closed before it started mining after cobalt prices fell from $40/pound to $15/pound

Source: NPR

One positive way to combat this crisis without direct investment in US mineral sources is through the development of cobalt free batteries



Source: Science Direct

Overall, investment in technologies and sources of Critical Minerals helps improve the US sovereignty and increases the number of scientific advances in our country

Sources

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