ZETA | ZERO EMISSION TRANSPORTATION ASSOCIATION

July 25, 2025

Response to DOE's Request for Information on the 2026 Critical Materials Assessment

The Zero Emission Transportation Association (ZETA) appreciates the opportunity to provide input in response to the U.S. Department of Energy's Request for Information (RFI) regarding the 2026 Critical Materials Assessment (the "Assessment"). ZETA is an industry coalition representing approximately 50 companies spanning the entire domestic electric vehicle (EV) supply chain, including raw and processed critical mineral and material producers.

I. Energy Technologies of Interest

As in the previous Assessment, electric vehicles and battery technologies should be considered. EVs are a rapidly growing sector of the global automotive market, and the expansion of the domestic EV sector creates vast economic opportunities for the United States (U.S.). Today, one-half of domestic vehicle shoppers are considering an EV purchase, and this number is projected to rise to 90 % by 2033.[1] EV sales are expected to make up about half of global vehicle sales by 2030, with higher market shares in the European Union and China compared to the U.S.[2] EVs currently consist of battery-electric vehicles and plug-in hybrid electric vehicles (PHEVs), but may soon also include extended-range electric vehicles (EREVs). Further DOE study of this key market is essential.

Equally as important is the continued review of EV batteries, including chemistries that currently exist or that may be a major part of the auto industry moving forward. The Assessment has previously looked at the nickel-maganese-cobalt (NMC) chemistry that is prevalent within North American EVs, as well as the growing lithium iron phosphate (LFP) chemistry that dominates the Chinese market. Both battery chemistry types continue to make up the vast majority of the global EV battery market.[3] The Assessment should consider emerging battery chemistries like lithium manganese-rich (LMR) that GM and Ford are investing in, as well as solid state battery technologies that both could offer U.S. automakers a competitive edge if successfully deployed.[4,5] Other transportation technologies that the Department of Energy has previously analyzed are worth continued consideration, including stationary storage and hydrogen fuel cell.

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[1] "Cox Automotive 2024 Path to EV Adoption Study," Cox Automotive, May 14, 2024. https://www.prnewswire.com/news-releases/cox-automotive-2024-path-to-ev-adoption-study-suggests-electric-vehicle-consideration-will-surge-in-second-half-of-decade-302145244.html

[2] "Global EV Data Explorer," International Energy Agency, July 16, 2025. https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer

[3] IEA Global EV Outlook 2025. May 14, 2025. https://www.iea.org/reports/global-ev-outlook-2025

[4] GM. "GM and LG Energy Solution to pioneer LMR battery cell technology." May 13, 2025. https://news.gm.com/home.detail.html/Pages/news/us/en/2025/may/0513-GM-LG-Energy-Solution-pioneer-LMR-battery-cell-technology.html

[5] Reuters. "Stellantis to launch fleet of EVs fitted with Factorial solid-state batteries." October 24, 2024. https://www.reuters.com/business/autos-transportation/stellantis-launch-fleet-evs-fitted-with-factorial-solid-state-batteries-2024-10-23/

II. Materials of Interest & Supply Chain Information

The ability of battery manufacturers to integrate an alternative material, including recycled material, into its supply chain for commercial production entails qualification timelines of varying length depending on the commodity. Today, future U.S. critical mineral processors and producers are undergoing qualification processes with domestic battery and vehicle manufacturers. Because specification requirements for battery materials—including processed minerals, cathode active material (CAM), and anode active material (AAM)—are highly specific, each unique formulation must go through a qualification process that lasts from 1–4 years. Automakers also typically require suppliers to complete a validation process, which can take 3–4 years, for even the most experienced suppliers.

Today, battery and vehicle manufacturers are engaged in a myriad of qualification partnerships, offtake agreements, and MOUs with potential alternative domestic suppliers. Supporting these partnerships is a national security imperative. Many U.S.-based suppliers do not yet have the capacity or experience to serve as immediate, commercially viable battery-grade materials alternatives for these inputs. The U.S. automotive battery landscape is evolving quickly, and additional time is required to adequately develop the U.S. supply base. ZETA urges the Trump Administration to invest aggressively in domestic capacity to process lithium, cobalt, nickel, manganese, pCAM, CAM, and AAM. Continued research & development and financial support of companies working to scale domestic recycled content at purities that meet battery manufacturer standards is a national security imperative.

Lithium: Lithium is a vital component for many EV battery technologies (LFP, NMC, LMR). Its density and reactivity allow for more energy-dense batteries and improved charging performance. The U.S. processes less than two percent of the world's lithium supply—critical domestic capacity is unlikely to enter production for at least two more years. Lithium carbonate and lithium hydroxide are the two major types of lithium compounds produced for use in batteries. Carbonate is ideal for use in LFP batteries, while hydroxide is preferable for NMC. The U.S. must continue to invest in the ability of U.S. lithium producers to economically extract and process lithium into carbonate and hydroxide. In addition, the Assessment should include lithium metal, given its potential use in key technologies like solid-state batteries and national defense.

Albemarle's Silver Peak mine in Nevada is the only operating lithium extraction and processing operation in the U.S. The Silver Peak project has the capability of producing 5,000 metric tons of technical and battery-grade lithium annually, with additional processing capabilities at Albemarle's Kings Mountain site in North Carolina.[6] Albemarle is also in the process of re-opening the Kings Mountain hard rock lithium mine, which is anticipated to supply approximately 420,000 tons of spodumene concentrate for lithium hydroxide conversion. In 2023, Albemarle planned to build the first lithium hydroxide processing plant in the U.S. in

[6] "Silver Peak, NV, USA." Albemarle Corp. https://www.albemarle.com/us/en/silver-peak.

Richburg, South Carolina, expected to reach 50,000–100,000 metric tons of battery-grade lithium hydroxide annually, but the plans for Richburg were delayed due to prevailing market conditions.

Lithium America's Thacker Pass lithium mine is expected to be the largest measurable lithium reserve in the U.S. and potentially North America.[7] The project includes onsite extraction and processing, which at peak production will produce 160,000 tons of battery-quality lithium carbonate annually, across four distinct phases. Thacker Pass is set to begin Phase 1 production in late 2027, at which point the mine would have a production capacity of 40,000 tons per year of lithium carbonate, with intentions of reaching full capacity in 2028.[8]

Another Nevada lithium project, Rhyolite Ridge, is being pursued by Ioneer for both mining and processing of lithium carbonate or lithium hydroxide. Rhyolite Ridge's first stage is projected to produce approximately 20,600 tonnes of lithium carbonate over its 26-year lifecycle, and support up to 400,000 EV batteries annually.[9] Over the course of the mine's lifetime, the mine's resource could support lithium production for a total of 75 million American-made EVs.[10] Given its expansion potential due to the size and characteristics of its lithium-boron mineralogy, Ioneer's Rhyolite Ridge project is projected to process enough lithium carbonate to meet 100% of U.S. domestic demand within 5 years. However, Ioneer's success at Rhyolite Ridge is dependent on incentives that drive private-sector demand to purchase processed lithium at prices that make cost-effective the capital investment required to begin and expand production capacity for processing lithium domestically.

TerraVolta's Resources' Liberty Owl Project is a key project within the prolific Smackover formation. The project, which was awarded $225 million from the DOE's Office of Manufacturing and Energy Supply Chains and selected by the Trump administration as a FAST-41 project for expedited permitting, will use direct lithium extraction (DLE) to extract lithium from Smackover brine. The initial facility, located in Texas, will produce 25,000 tonnes annually of domestic, battery-grade lithium carbonate annually with plans to add additional facilities to increase production.

In May 2024, Elevra Lithium received a finalized mining permit for its planned lithium hydroxide facility in North Carolina. The project aims to produce spodumene concentrate for lithium hydroxide conversion. The company has plans for another production site in Tennessee, but the project is also currently on hold due to price instability. In Texas, Tesla has been building out a $1 billion refining facility in Corpus Christi with the goal of producing battery-grade lithium hydroxide for North America beginning in 2025. The investment of more than aims to

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7 Thacker Pass Lithium Mine. 2025. https://ndep.nv.gov/land/thacker-pass-project.
8 "Lithium Americas Increases Mineral Resource and Reserve for Thacker Pass." 2025. https://lithiumamericas.com/news/news-details/2025/Lithium-Americas-Increases-Mineral-Resource-and-Reserve-for-Thacker-Pass/default.aspx.
9 "U.S. approves massive lithium mine in Nevada, overriding protests." October 24, 2024. https://www.washingtonpost.com/climate-environment/2024/10/24/lithium-mine-nevada-tiehms-buckwheat/.
10 Rhyolite Ride - Project Overview. 2025. https://www.ioneer.com/rhyolite-ridge-project/about-rhyolite-ridge/.

begin production in 2025,[11] While China refines 70% of global lithium chemicals, that percentage is significantly higher when only looking at hard rock resources, which currently represent about two thirds of global supply. 95% of hard rock spodumene concentrate processing takes place in China.[15] Without meaningful government support, domestic lithium hydroxide production will remain a critical gap for the U.S. supply chain.

Cobalt: Cobalt is a key battery component used to improve stability, energy density, and voltage advantages in charging. Cobalt is most commonly produced as a byproduct of nickel and copper production, from mines in majority controlled by China.[12] China refines three-quarters of the world's cobalt.[13]

Identified cobalt resources of the U.S. are estimated to be about 1 million tons across Minnesota, Alaska, California, Idaho, Michigan, Missouri, Montana, Oregon, and Pennsylvania.[14] In 2024, the only domestic producing cobalt site was Eagle Mine, Michigan. The mine produced 300 metric tons of cobalt-bearing nickel concentrate—about a 50% decrease from 2020 production levels.[15] Jervois invested approximately $155 million into mine construction at its Idaho Cobalt Operations from 2021. However, despite support from the Department of Defense (DOD) for mineral resource drilling, operations at the mine have been on standby as global cobalt prices remain unstable due to oversupply from Chinese controlled mines.[16] There is currently no cobalt refining in the U.S. The largest active, significant non-Chinese-owned cobalt refinery globally is located in Kokkola, Finland, run by Jervois, previously an Australian company, and recently taken private by its U.S. lending group.[17] Jervois recently completed a DoD-funded bankable feasibility study into a domestic greenfield cobalt refinery.

The U.S. has no significant domestic production or refining capacity, and all cobalt produced in 2024 was exported for refinement and processing out of necessity. Given persistent, steep competitive disadvantages compared to Chinese-owned mining and processing companies, domestic facilities will be unable to produce a meaningful quantity of cobalt without supportive policies from the U.S.[18]

Copper: Copper is a critical component of transportation electrification and is essential for EVs, electrical equipment, and battery applications. While copper use and demand have proven to be

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[11] Tesla Lithium Refinery Groundbreaking. May 8, 2023. https://www.tesla.com/blog/tesla-lithium-refinery-groundbreaking .
[12] Cobalt Mining. May 2025.
https://www.cobaltinstitute.org/about-cobalt/cobalt-life-cycle/cobalt-mining/#:~:text=Cobalt%20is%20mined%20across%20the,it%20into%20a%20usable%20form.
[13] IEA Global Critical Minerals Outlook. 2024, p. 155.
https://www.iea.org/reports/global-critical-minerals-outlook-2024/market-review
[14] USGS Mineral Commodity Study. 2025. https://pubs.usgs.gov/periodicals/mcs2025/mcs2025.pdf.
[15] USGS Mineral Commodity Summaries – Cobalt. 2025. https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-cobalt.pdf.
[16] "Financial troubles hit US-backed cobalt producer." January 06, 2025."https://www.eenews.net/articles/financial-troubles-hit-us-backed-cobalt-producer/.
[17] Jervois Finland Presentation. February 27, 2024.
https://jervoisglobal.com/wp-content/uploads/2024/02/240226-Jervois-Finland-presentation-MIRU-battery-summit.pdf.
[18] USGS Mineral Commodity Summaries – Cobalt. 2025. https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-cobalt.pdf.

necessary for many advanced technology applications, USGS does not currently consider copper a critical mineral. ZETA greatly appreciates the inclusion of copper on DOE's Critical Materials list in 2023,[19]and urges that its presence on the Critical Materials list be maintained. Announced copper projects are anticipated to meet only 70% of global demand requirements by 2035. U.S. copper refining capacity has decreased by 40% since 2000.[20] Out of the 1,100,000 metric tons of copper produced by U.S. mines in 2024, only 850,000 metric tons were refined at home. The recycling of scrap copper is a significant opportunity for the U.S. and is a substantial supply stream. In 2024, recycled copper from scrap accounted for about 35% of the U.S. copper supply. Not all recycled copper, however, is battery grade. Increasing demand for refined copper and the shortfall of refining capacity may exacerbate this trend in exports, unless more processing and refining capacity can come online domestically.

Nickel: The primary EV battery technologies, lithium-ion (Li-On), nickel-cobalt-aluminum (NCA), and NMC rely on refined nickel commodities for energy density, and this demand will only continue as adoption and use of EVs and batteries grows globally. The U.S. currently imports a majority of the resource consumed, with 65% of utilized nickel coming from Canada, Norway, and Australia.[21] U.S. mine production of nickel decreased by nearly half between 2023 and 2024. The U.S. currently has only one active nickel mining operation, the Eagle Mine in Michigan.[22] The mine is a nickel and copper mining co-operation. In 2024, all 8,000 tons of nickel concentrate produced was exported to refiners abroad. Given Eagle Mine's projected mine life coming to an end in approximately four years, the U.S. will soon have no active nickel extraction if new sites do not come online in the immediate future. In lieu of new production, the majority of domestic nickel consumption (54 percent, coming to about 90,000 tons) in 2024 came from secondary sources, mostly from domestic recycled stainless steel content.[23]

American-based NewRange Copper Nickel is heavily investing in mining revitalization in Minnesota. New Range expects the deposit to supply 95% , 88%, and 33% of America's nickel, cobalt, and copper.[24] The NewRange project has unfortunately been in the permitting process since 2005—one of many examples of the problematic nature of the American permitting review process hindering mineral development. The Trump Administration recently added New Range's NorthMet projects to the FAST-41 permitting transparency list.[25]

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[19] There are no special sourcing requirements or incentives for importing copper products into the US, beyond trade tariffs and sanctions in place. Nonetheless, 98% of copper imports to the US are from countries with which the US has an FTA. Almost two-thirds come from Chile alone. The US, then, is likely to remain reliant on external sources for copper for years to come. "Copper In The US: Opportunities and Challenges." Mohsen Bonakdarpour, Frank Hoffman, and Keerti Rajan. August 2024. https://view.highspot.com/viewer/f15367148e71dbfd68def7b8338645d2#1.
[20] IEA Global Critical Minerals Outlook 2024. p.7-8..
[21] USGS Mineral Commodity Summaries – Nickel. 2025. https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-nickel.pdf.
[22] Eagle Mine Operations. 2025. https://www.eaglemine.com/operations.
[23] USGS Mineral Commodity Summaries – Nickel. 2025. https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-nickel.pdf.
[24] Newrange Mining Projects Within the Duluth Complex. 2025. https://www.newrangecoppernickel.com/about/projects/.
[25] "Trump names NorthMet copper-nickel mine in Minnesota a federal priority." May 2, 2025 https://www.startribune.com/trump-names-northmet-copper-nickel-mine-in-minnesota-a-federal-priority/601343903.

Nickel processing capability in the U.S. is even more limited. NewRange is scaling a copper-nickel processing facility, however it is unclear when the project will reach commercial production.[26] In 2024, Talon Metals was in the early stages of permitting for its Tamarack project, which comprises an underground nickel-copper mine in Minnesota and a battery mineral processing facility in North Dakota. However, the facility in North Dakota will essentially do an initial processing step to prepare the material for refining. From there, it will have to be transported to a refinery. The company received a contract from the DOD to aid in the research and development and is working with Argonne National Laboratory to produce nickel for battery CAM as well as high-quality iron for LFP battery CAM.[27]

Graphite: Graphite is a necessary input for lithium-ion batteries used in EVs and is particularly important for anode production. Graphite constitutes the primary material of the battery and can make up nearly half of the components in an individual battery cell.[28] Graphite is often the greatest sourcing hurdle for many battery and EV manufacturers. It is the largest mineral component of a battery by weight, comprising over 145 pounds of the total 456 pounds of minerals in an EV battery.[29] China refines more than 80% of the world's graphite, producing 93% of the battery-grade supply.[30]

GraphiteOne is developing a large-scale natural graphite mining project in Alaska. This project will include the mine, a processing facility, and an anode manufacturing facility primarily to support batteries for EVs.[31] Having completed its feasibility study with the help of a $37.5 million U.S. DOD grant, mine construction will begin in 2029 with mining activities ramping up to full production in 2030. In 2024, Lucid Motors and GraphiteOne entered into the first offtake agreement between a domestic vehicle manufacturer and a domestic natural graphite producer.[32]

The U.S. also has experienced growing investment in synthetic graphite production. NOVONIX is an advanced battery materials and technology company planning to reach a synthetic graphite production capacity of 10,000 metric tons annually at its facility in Tennessee. The company plans to add an incremental 30,000 metric tons of production capacity by 2025 and reach

[26] NewRange Copper Nickel completes salvage and recycling project. December 18, 2024. https://www.businessnorth.com/daily_briefing/newrange-copper-nickel-completes-salvage-and-recycling-project/article_2ae00c28-bd8a-11ef-b359-d784acb844d7.html.
[27] "Talon Metals receives $2.47m funding for nickel extraction research." December 18, 2024. https://www.mining.com/talon-metals-receives-2-47m-us-funding-for-nickel-extraction-research/
[28] "Why graphite may hold the key in a new generation of energy markets." December 12, 2024. https://www.fastmarkets.com/insights/graphite-holds-key-new-generation-energy-markets/
[29] Critical Minerals and the Future of the U.S. Economy. February 2025. https://csis-website-prod.s3.amazonaws.com/s3fs-public/2025-02/250210_Baskaran_Critical_Minerals.pdf?VersionId=Tfu2TnNrQGlN7ol8HSCakMUT8HTwYukd.
[30] IEA Global Critical Minerals Outlook 2024, p.168.
[31] Graphite One Receives Indication for Up to $325 Million Financing From the U.S. Export-Import Bank for U.S. Based Advanced Graphite Material Supply Chain Project. October 18, 2024. https://www.graphiteoneinc.com/graphite-one-receives-indication-for-up-to-325-million-financing-from-the-u-s-export-import-bank-for-u-s-based-advanced-graphite-material-supply-chain-project/.
[32] Graphite One and Lucid Supply Agreement Announced at U.S. Capitol Briefing. July 29, 2024. http://www.graphiteoneinc.com/graphite-one-and-lucid-supply-agreement-announced-at-u-s-capitol-briefing/.

150,000 metric tons of total production capacity in North America by 2030. NOVONIX has partnerships with several downstream manufacturers, including LG, Panasonic, and Stellantis, which are invested in the potential of utilizing domestic synthetic graphite.

Manganese: EV batteries primarily use lithium, nickel, manganese, and cobalt-based (NMC) chemistries in their cathodes and graphite-based anodes. In Li-ion batteries, manganese acts as a stabilizer in CAM. Further, emerging battery technologies present an opportunity to replace some cobalt with manganese. Given the geopolitical and labor concerns associated with China's control over DRC cobalt mining, the potential to decrease the use of cobalt in EV batteries through manganese substitutions adds further importance to strong manganese supply chains.[33]

DOD announced a $20 million award to South32, an Australian-based metal and mining company, to accelerate the development of battery-grade manganese at the Hermosa Project in Arizona.[34] In 2023, General Motors and Element 25, an Australian-based mining company, entered into an agreement to bring manganese processing to Louisiana. GM will provide an $85 million investment to the joint venture to construct the facility, and Element 25 will supply 32,500 metric tons of manganese sulfate annually. Production is slated to begin in 2025, and the facility will provide enough battery-grade manganese to supply up to 1 million General Motors' EV batteries.[35]

Cathode Active Materials (CAM): CAM, made from an equally important precursor, pCAM mixed with the lithium products noted above, is one of two electrodes in a lithium-ion battery, and a critical part of producing an EV battery. CAM undergoes electrochemical reactions that enable the storage and release of electrons in a battery. CAM typically varies depending on the specific application or material used.[36] For EV batteries, two common types of CAM are NMC and LFP.[37] China currently controls almost 84% of CAM production.[38] North America produces less than 1% of CAM. As a result, almost all cathode materials are imported.[39] Aggressive action is needed now to avoid fundamental gaps in the midstream EV supply chain by increasing domestic mineral refining and production of CAM.

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[33] "A Global Race to the Top: Using Transparency to Secure Critical Mineral Supply Chains." March 2023. https://safe2020.wpenginepowered.com/wp-content/uploads/2023/03/SAF-_CritMinReport_v06.3_Spreads_Final.pdf.
[34] DOD Awards $20 Million to Enhance Domestic Manganese Supply Chain. May 17, 2024. https://www.defense.gov/News/Releases/Release/Article/3779115/dod-awards-20-million-to-enhance-domestic-manganese-supply-chain/.
[35] GM, Element 25 to Expand U.S. EV Supply Chain with Domestic Manganese Sulfate Production. June 29, 2023. https://www.manufacturing.net/supply-chain/news/22866185/gm-element-25-to-expand-us-ev-supply-chain-with-domestic-manganese-sulfate-production?__lt-lid=649da849e1dc7c71f1205c41&__lt-usr=8919J6517189C8C&utm_source=IMCD230623014&utm_medium=email&utm_campaig.
[36] Redwood Materials, 2024. https://www.redwoodmaterials.com/resources/cathode-and-anode/..
[37] "What Are Battery Anode and Cathode Materials?" AquaMetals, 2025. https://www.aquametals.com/recyclopedia/lithium-ion-anode-and-cathode-materials/.
[38] "Global EV Outlook 2025." IEA. Paris. 2025. https://www.iea.org/reports/global-ev-outlook-2025.
[39] McKinsey, 2024. "The battery cell component opportunity in Europe and North America." https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-battery-cell-component-opportunity-in-europe-and-north-america.

Clarity in market demand and government support will be essential for any of these projects to reach the market. In June 2024, Princeton NuEnergy broke ground on the nation's first commercial-scale lithium-ion battery direct recycling facility in South Carolina, where a black mass processing facility is currently being commissioned. Expansion to a full Cathode Manufacturing Center, producing wholly U.S-sourced CAM, is contingent on strong public private partnerships and financing. When complete, annual production will be more than 10,000 metric tons of battery-grade CAM, equivalent to producing more than 100,000 propulsion batteries.[40]

LG announced it signed an offtake agreement with GM for 500,000 tons of cathode materials out of a forthcoming facility in Tennessee.[41] The plant is expected to come online in 2026 and reach an annual production of 60,000 tons per year. GM's deal with LG lasts from 2026 to 2035 and will produce enough CAM to power 5 million EVs. Additionally, Redwood Materials aims to produce commercially viable CAM in Nevada, aiming to produce 20 GWh of CAM per year, before the company upgrades the facility to 100 GWh, or enough to power 1.3 million EVs per year. Redwood is working with companies including Panasonic, BMW of North America, Ultium Cells, Volkswagen, Volvo, Toyota, and Lyft.

Anode Active Material (AAM)*:* AAM is the other of the two electrodes in a lithium-ion battery, and a necessary part of producing an EV battery.[42] It is the negative electrode, where the loss of electrons occurs. Anodes are typically made from carbon-based materials like graphite or silicon.[43] The top six AAM producers are all Chinese and account for two-thirds of global production capacity. In 2025, China controls over 90% of AAM production capacity.[44] North American production of anode material represents about 5% of all global production.[45]

GraphiteOne's Ohio facility expects the first 48,000 tonnes per year of commercial AAM production to come online by 2028. By 2031, the company expects to produce 169,000 tpy of AAM.[46] Additionally, Syrah Resources, an Australian company, invested and completed construction of a graphite anode material facility in Louisiana. Syrah's Vidalia facility processes natural graphite imports and will produce about 11.25 kilotons of graphite anode material per

[40] "Princeton NuEnergy Launches Flagship Facility In South Carolina" 2024. https://pnecycle.com/062024-2/
[41] "GM, LG Chem ink $19B cathode material supply deal" 2024. https://www.automotivedive.com/news/gm-general-motors-lg-chem-15b-cathode-deal-EVs-Tennessee-plant/706851/.
[42] "Redwood Materials: About Us" https://www.redwoodmaterials.com/.
[43] Aqua Metals. 2025. https://www.aquametals.com/recyclopedia/lithium-ion-anode-and-cathode-materials/.
[44] "Global EV Outlook 2025." IEA. Paris. 2025. https://www.iea.org/reports/global-ev-outlook-2025.
[45] McKinsey, 2024. "The battery cell component opportunity in Europe and North America." https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-battery-cell-component-opportunity-in-europe-and-north-america.
[46] "Graphite One Advances its United States Graphite Supply Chain Solution with Completion of a Bankable Feasibility Study." April 23, 2025. https://www.graphiteoneinc.com/graphite-one-advances-its-united-states-graphite-supply-chain-solution-with-completion-of-a-bankable-feasibility-study/.

year.[47] NOVONIX has a partnership with LG Energy Solutions for AAM research and development, as well as a purchase agreement for 50,000 tons of artificial graphite anode should the R&D prove successful. NOVONIX and Panasonic Energy signed a binding off-take agreement for NOVONIX to supply synthetic graphite anode material, including a step-up pricing component to adjust the purchase price based on raw material cost changes.

Utilizing U.S.-based carbon black manufacturing capacity and a proprietary feedstock blend combined with U.S. oil, CarbonX is creating an AAM comparable to graphite in performance, at pricing comparable to pre-tariff Chinese graphite. DOE should research the potential of this new technology.

III. Market Dynamics by Material

EV sales and future demand for these vehicles are key factors that drive demand for the critical minerals and materials discussed above. National security applications of battery technology (e.g. drones) and consumer electronic demand are also important demand drivers. Related EV, battery, and mineral policies have the ability to increase or decrease supply and demand. For example, policies that encourage domestic production of derivative critical material products give domestic producers the necessary regulatory certainty to make significant investments in production facilities. These investments create a market for off-take agreements with manufacturers and mitigate price instability across markets. Historically, public policy has played a role in developing the market for EVs and batteries, including through incentives, targets, and fuel efficiency standards. In the longer term, most private market forecasts suggest that technological and economic fundamentals will boost EV and battery adoption both globally and in the United States.

IV. Challenges to Domestic Industry

Businesses continue to see challenges in developing their critical mineral supply chain, including (but not limited to) three key areas:

Potential demand challenges for downstream products: For a faster growth of the domestic critical minerals, demand from the downstream is a key factor. As noted previously, electric vehicles and the energy industry are primary drivers for critical material use. According to analysis by the Center for Strategic and International Studies, the global EV industry is the single biggest driver for the increased demand for rare earth and critical minerals. By 2050, EV demand alone is expected to account for over 130 million metric tonnes (90%) of minerals required for renewable energy technologies.[48] EV sales and battery demand may lessen as a result of

[47] "Syrah commences AAM production at its 11.25ktpa Vidalia facility in Louisiana, USA." https://www.syrahresources.com.au/news/syrah-commences-aam-production-at-its-11-25ktpa-vidalia-facility-in-louisiana-usa.
[48] Baskaran, Gracelin "Critical Minerals and the Future of the U.S. Economy" Center for Strategic and International Studies. https://www.csis.org/analysis/critical-minerals-and-future-us-economy

consumer preferences and market conditions, which in turn can challenge the viability of projects for miners that could otherwise also support non-EV end uses.

Red tape and cost of U.S. domestic production: Recent data indicates that it takes the U.S., on average, 29 years from first discovery to first production of a mine, longer than nearly any other country in the world.[49] Permitting needs to be far more efficient and predictable than it is under current policies. Long permitting lead times and high domestic production costs frustrate domestic producers' ability to compete with foreign actors, like China, in a vital industry.

China's dominance of key choke points in the critical minerals upstream and midstream: China's control over the extraction, processing, refining, and production of critical minerals imposes risks on the battery, EV, and electronics supply chains and the economy at large. China accounts for 85% of global rare earth and minerals refining and about 68%, 65%, and 60% of global cobalt, nickel, and lithium refining, respectively, exerting fragility over minerals supply chains.[50] Even as critical mineral production is set to increase domestically and outside of China, the lack of midstream production—including refining, cathode, and anode production—makes the supply chain heavily dependent on China.

V. DOE Critical Materials and DOI Critical Minerals Lists

To support investment and supply chain resilience, ZETA urges DOE and DOI to work toward harmonizing the criteria and definitions used in the USGS's list of "critical minerals" and the DOE's list of "critical materials." The current inconsistency between the two lists excludes important mineral commodities from the benefits offered exclusively to critical minerals. Maximizing responsible and timely production of the full range of mineral commodities will be key to meeting the growing demand for advanced technologies across sectors, including EVs, defense, healthcare, consumer electronics, and many other crucial applications.

ZETA urges DOE and DOI to retain all of the critical materials of interest listed above—including lithium, cobalt, nickel, graphite, manganese, pCAM, CAM, AAM in their respective critical materials and minerals lists. ZETA also requests copper be designated as both a critical material and critical mineral. Clear inclusion of these mineral commodities will provide certainty for investment and help prioritize federal investment in materials critical to the domestic supply chain.

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