To Make "Made in America" EVs a Reality, We Need to Address the Elephant in the Room: U.S. Critical Mineral Supply

Over the last decade, electric vehicles have moved from novelty and aspiration to dominating conversations at the intersection of transportation and policy. As auto manufacturers and unicorn start-ups invest billions of dollars into electric vehicle manufacturing platforms to meet projected consumer demand or emissions standards, public officials of both parties – particularly in the Western United States – are moving quickly to develop policies that address ambitious climate goals and are increasingly looking to EVs as part of a solution. This focus on EVs is only expected to intensify under a Biden administration.

However, as states like California, Colorado, and Nevada – and potentially the federal government – push mandates to put millions of EVs on the road within the next few decades, a major question remains unanswered: ***Will the United States have the reliable supply of critical minerals needed to meet proposed EV goals? Or will it have to rely on imports from competitor countries?***

Nearly all critical minerals, especially those used in electric vehicle batteries such as lithium, are currently mined and processed outside of the United States, creating a two-fold dilemma for American manufacturers. First, this opens them up to the threat of supply disruption – especially as many critical minerals are sourced from countries that are viewed as competitive adversaries to the United States (China) or politically unstable (the Democratic Republic of Congo). Second, despite the United States having sizable reserves of some resources and domestic mining of critical minerals enjoying rare bipartisan support, activist pushback on U.S. mining projects has so far stymied efforts to establish a domestic supply chain.

If policymakers are serious about achieving a competitive, domestic EV industry, decisive action to support U.S. critical mineral mining is necessary. Western states are already pushing for the type of reform that is needed across the United States – from the Colorado Electric Vehicle Plan 2020 to the California vehicle greenhouse gas standards to Nevada emissions testing requirements. While some action is being taken at the federal level – a recent Presidential executive order that seeks to limit U.S. vulnerability to supply disruptions, for example[1] – more needs to be done to create a reliable supply, as ensuring access to necessary resources will only become more pressing as EV mandates expand.

Critical Minerals and Applications

Simply put, critical minerals are a group of minerals that are vital to U.S. economic and national security. In 2018, the U.S. Geological Survey published a list of 35 minerals considered "critical," which includes more familiar minerals such as aluminum and tin, as well as the less commonly known such as beryllium, tellurium and so-called "rare earth" elements.[2]

Together, these minerals play a crucial role within the manufacturing, electronics, energy, and defense industries. With applications in metallurgy, computer circuitry, fiber optics and rechargeable batteries – just to name a few – the importance of these minerals has only grown over the last several years. Rare earth elements for example, a group of

17 elements that are used predominantly in electronics and batteries, saw a nearly 70 percent increase in global mine production between 2009[3] and 2019.[4]

For EVs, lithium ion batteries account for the majority of critical minerals use, requiring sizable amounts of resources like lithium, cobalt, nickel, copper, graphite and manganese compared to internal combustion engine passenger vehicles. A mid-size internal combustion engine vehicle, such as a BMW 3 Series, requires an estimated 40 pounds of copper. In comparison, a mid-size battery powered electric vehicle, such as a Tesla Model 3, requires approximately 140 pounds of lithium (for a 60-70 Kwh battery pack), 180 pounds of copper, 30 pounds of cobalt and 60 pounds of nickel.[5] As EVs become more ubiquitous and battery technologies advance, demand for these materials is therefore projected to increase significantly.

One study estimates a 300 percent jump in lithium-ion battery demand by 2030.[6] As a result, cobalt demand is also projected to reach up to 430 kilotons by the end of the decade.[7] For context, that represents about 280 percent of global refining capacity of the mineral in 2016. More significantly, lithium demand for electric vehicles is expected to increase over ten-fold over the same period, growing from around 140,000 tons per year in 2020 to nearly 1.69 million tons per year in 2030, according to analysis from FTI Consulting.

Considering this, producers have already started raising concern over the potential shortage of critical minerals – a problem exacerbated by a lack of domestic U.S. production of these resources. In 2019, Tesla's global supply manager for battery metals stated at an industry conference that the company expects global shortages of nickel, copper, lithium and other minerals needed for EV development.[8] The company echoed these concerns at its Battery Day in September, highlighting that it is planning for three terawatt-hours of battery-making capacity to supply its vehicles by 2030, which would require approximately three million tons of lithium to satisfy Tesla alone.[9,10]

Factors Driving EV Growth

At the start of the decade, there were less than 20,000 electric passenger vehicles[11] on the road globally – a number that reached 7.2 million worldwide by 2019.[12] In the United States, light passenger EV stock rose from 400,000 in 2015 to almost 1.5 million in 2019. But while accounting for only 2 percent of U.S. light passenger vehicle sales in 2019,[13] EVs have nonetheless gained an outsized role in consumer, political, and policy discussions.[14]

Increasingly viewed as a growing part of our transportation future, the valuations of electric car and truck companies continue to soar. For example, electric truck start-up Nikola attracted attention this summer when it announced it would be taking reservations for its planned pickup truck, sending its market capitalization higher than both Ford and Fiat Chrysler – despite the company having not yet sold a single vehicle.[15]

While some might consider this investor optimism particularly bullish, public officials have already jumped at the chance to leverage it to push ambitious EV mandates. In September, California Governor Gavin Newsom announced the state will require in-state sales of all new passenger vehicles to be zero-emission by 2035,[16] not an insignificant task considering California registered about 1.9 million light vehicles in 2019 or about 12 percent of the U.S. market.[17]

Considering 14 other states already follow California's lead on enacting vehicle emissions standards more stringent than federal regulations, it is likely other states will begin to implement similar zero-emission vehicle mandates necessitating the deployment of millions of new electric vehicles annually. In fact, some already have. In April, Colorado published its Colorado Electric Vehicle Plan 2020, which set a target of putting 940,000 EVs on the road in the state by 2030.[18] This target is part of the state's broader effort of "large-scale transition…to zero emissions vehicles," including a goal of 100 percent electrification of light vehicles.[19]

Importantly, electrification efforts haven't solely focused on light passenger vehicles. In terms of policy, 15 states and the District of Columbia signed a memorandum of understanding to support the deployment of medium- and heavy-duty zero emissions vehicles by 2050.[20] At the same time, U.S. blue chip corporations are already looking to build out their electric vehicle fleet. Amazon earlier this year announced a deal with electric truck maker Rivian, ordering 100,000 electric delivery vehicles that could hit the road as soon as 2021.[21] Amazon's announcement came just days after UPS invested in EV manufacturer Arrival, Ltd. in January, committing to purchase 10,000 electric delivery vehicles from the company.[22]

More broadly, policy discussions around combatting climate change at the state and federal level have involved

electrification of the economy and implementation of EVs are a core part of that policy. EVs will be utilized to help reduce emissions from the transportation sector, but they could also be used to store power at the local level.[23] Of course, increased load demand from EVs require more power generation and battery storage, which will have an impact on local distribution systems and the bulk power grid.[24]

With the combination of factors supporting EV adoption, it's no surprise that outlook for the technology is rosy. It's estimated that by 2025, 10 percent of cars globally will be electric – a figure projected to reach 58 percent by 2040.[25] This demand for EVs, coupled with the potential shortage of critical minerals outlined above, will necessitate action from public officials to ensure U.S. resource needs are met.

Risks to Meeting Critical Mineral Demand

Despite being integral to the U.S. economy and national defense, the majority of critical minerals – especially those used in EVs – are mined and processed outside of the United States. The production of lithium, the core mineral in EV and consumer electronics batteries, currently takes place at a large scale in only a handful of countries including Australia, Chile, Argentina and China.[26] While roughly 70 percent of the world's mined cobalt, a key component for lithium-ion batteries, is produced in the Democratic Republic of the Congo.[27] With relatively minimal domestic production, imports of lithium and cobalt accounted for over 25 percent and 78 percent of U.S. consumption of these materials in 2019, respectively.[28]

For some critical minerals, global processing and production is even more concentrated. The United States imported roughly 100 percent of the rare earth minerals it consumed in 2018, 80 percent of which was imported from China.[29] This exemplifies China's dominant position in the supply chain, as the country accounted for about 63 percent of global mined production of rare earth minerals in 2018, with its position as a key refiner of these minerals further boosting its role as a global supplier.[30]

As rare earth minerals are necessary for creating the permanent magnets used in everything from EVs to wind turbines, with such a concentration of supply stemming from a single country – and one with which the United States has a tenuous relationship – opens up the U.S. EV supply chain to potentially significant risk.

In addition to risk, importing critical minerals brings about ethical complications associated with where – and how - the minerals are sourced. In the Congo, human rights organizations have raised concern over the use of child labor in cobalt mining,[31] along with poor environmental and health safeguards.[32] Lithium mining in Argentina, Bolivia and Chile – a region that represents 60 percent of global reserves – is facing criticism over water use in development and treatment of indigenous peoples.[33]

Further complicating the issue are efforts to stop critical mineral mining in the United States. While there exists broad support for boosting American critical mineral production at a federal level, with a bipartisan caucus launched in the U.S. House and legislation put forward in both chambers of Congress,[34] activist campaigns aimed at shutting down mining operations remain largely unchecked.

In February, a federal judge ruled to overturn approval from the U.S. Fish and Wildlife Service on an Arizona copper mine after the anti-development group Center for Biological Diversity (CBD) sued to challenge the approval, claiming that the mine threatened endangered species in the region.[35] Notably, CBD's legal challenge to the $1.9 billion mine was brought despite the company receiving approval following 11 years of review across 17 agencies.[36] Having already invested $700 million into the project, legal challenges to the Rosemont Copper Mine are extremely costly to the mining company, Hudbay Minerals, as they have hindered its ability to begin production at the site and have driven up legal costs.[37]

But this is not the only instance of anti-development efforts threatening U.S. critical mineral operations. In Minnesota, environmental groups – including Center for Biological Diversity – challenged the water permit for PolyMet Mining Corporation's Northmet cooper-nickel mine. Despite "extensive collaboration" between state and federal agencies on the 479-page permit, CBD alleged that regulators sought to hide evidence and therefore the permit was invalid.[38] Ultimately a court rejected CBD's claims and upheld the permit, but it serves as yet another example of the lengthy and costly legal battle activist groups are leveling against critical mineral mine operators.

What Can Be Done

As the success of meeting EV mandates rests on the shoulders of lithium, nickel and copper miners among other mining operations, it is imperative that our public officials take action to limit America's dependence on foreign sources of critical minerals and support domestic development. To be effective, this action should be two-pronged: first, policymakers at the local and federal level should take

steps to mitigate efforts by anti-development groups to halt domestic production; second, officials need to promote U.S. critical mineral mining to both bolster supply and insulate domestic industries reliant on these resources from potential foreign supply shocks.

Cohesive action to address these two core challenges to U.S. mining operations will be especially important under the Biden administration, as the President-elect has already signaled efforts that could raise critical mineral demand considerably. Before the race was even called, Biden announced his intention to rejoin the Paris Climate Accord, a move certain to boost minerals necessary for EV battery development.[39] Further, Biden's climate plan includes proposals to support the deployment of 500,000 public charging stations by the end of the decades, as well as expand the electric vehicle tax credit.[40] Taken together, it is clear the new administration is intent on making EVs a key solution to meeting climate goals – a solution compounded by equally ambitious state-level goals.

Thankfully, the United States is well positioned to be a self-reliant producer of critical minerals to support broad EV adoption – the success of meeting this challenge, however, depends on achieving bipartisan support for mining. To that end, the possibility of Republicans maintaining control of the Senate favors achieving broad legislative support. With a split government, it's unlikely for a Biden administration to push a sweeping climate plan, but instead focus on issues with backers on both sides of the aisle. Critical mineral mining is just such an issue, as it facilitates EV adoption and renewable energy deployment while creating American jobs and limiting our foreign dependence on a critical supply chain.

To be effective, the most important hurdles that legislation needs to address are enabling the timely surveying of potential deposit-rich areas, streamlining permitting processes and limiting unnecessary permitting delays. In the United States it takes, on average, 7 - 10 years to secure the permits needed to even begin mining operations. For comparison, in Canada and Australia, countries with similarly stringent environmental regulations, it takes only two years on average.[41] Anti-development groups such as CBD have used the complex and lengthy permitting process to their advantage by filing lawsuits at every step, costing companies millions of dollars and further delaying operations.

Simply put, to be a self-sufficient producer of the critical minerals, the United States needs to streamline the regulatory process by strengthening coordination between state and federal agencies. Such coordination would limit redundancies, improve permitting timelines and lessen activists' ability to perpetually block development through frivolous lawsuits aimed at permitting discrepancies.

The strategic importance of domestic critical minerals production also requires commensurate appropriations. Our policymakers must demonstrate their commitment to the U.S. critical mineral mining industry – and their overarching climate goals – by incentivizing producers to move their projects forward. One such way is to take action to solidify regulatory certainty, thereby creating a clear pathway for producers to secure funds to support their research and development efforts.

Another is providing additional funding through the Department of Energy and Department of Defense to enable the necessary market signals and support, while also supporting further advancement in production technologies, innovation in the recycling of critical minerals throughout the supply chain, and improvement of technologies that help limit environmental impacts. DOE has recently taken steps toward this goal, issuing a guidance to boost critical mining project applications by giving them "preference" for funding opportunities, but more can still be done.[42]

It's necessary for policymakers to consider the implications of drafting infrastructure legislation without a robust domestic supply chain. Without taking steps to bolster U.S. critical mineral supply, legislation aimed at expanding renewable or EV deployment would effectively increase our reliance on countries like China to meet demand, putting the United States at an economic disadvantage and increasing the likelihood of supply risk.

The Importance of Effective Communications

In order to navigate these challenging political and policy winds, the critical mineral industry and its beneficiaries/ allies must educate key stakeholders and advocate for what is needed from the federal government. To do so successfully, the industry must partner with a team that has deep capabilities not only in the energy and natural resources sector, but experts in communications, stakeholder relations, and federal affairs. Experts that can guide the industry through the process of becoming a key component to our energy, automotive, and infrastructure policy in this country and one of the paths to combat climate change. Please reach out to any of our experts to discuss these ideas further.

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