# The Case for Building Domestic Supply Chains of 21st Century Critical Minerals in the USA

### Jesse R. Edmondson, PG

Founder and CEO, US Critical Minerals



#### CRITICAL RESOURCES Consulting



## What is a critical mineral?

- Material essential to the economic and national security of the United States
- A supply chain vulnerable to disruption
- Serves an essential function in the manufacturing of a product that we cannot live without





After U.S. Geological Survey (USGS) 2017 Mineral Commodity Summaries, U.S. Net Import Reliance; and Department of the Interior, February 15, 2017 Federal Register "Draft List of Critical Minerals



## Natural Flake Graphite.



## Spodumene.





## Modern Supply Chains Are Mineral Intensive

- The 21<sup>st</sup> century energy transition requires orders of magnitude more mining than fossil fuels
- Control over these supply chains will determine both economic strength and defense security
- The global lithium market has taken all of human history to produce 1 million tons LCE per year. The global market will require 2 million tons per year by 2030.



## Biggest Supporters of EVs are often anti-mining



In Thacker Pass in northern Nevada, plans for a massive lithium mine are drawing impassioned protest. (*Carolyn Cole* / *Los Angeles Times via Getty Images*)

ENVIRONMENTAL ACTIVISM ENERGY INDIGENOUS RIGHTS

#### The Battle for Thacker Pass

In Nevada's high desert, environmentalists, Indigenous organizers, and ranchers have locked arms to block a lithium mine.



Global long-term passenger vehicle sales by drivetrain

**Million vehicles** 



Source: BloombergNEF

 EVs are driving demand for lithium-ion batteries and the necessary raw materials





Lithium, Graphite, Cobalt, and Rare Earths are essential for electric vehicles.

## **Tesla Wants Sourced-In-USA Lithium**

"There is enough lithium in Nevada to power the entire US EV fleet"



TESLA TO BUILD LITHIUM HYDROXIDE REFINERY IN TEXAS TO FEED TERAFACTORY; FIRST AUTOMAKER TO ENTER LITHIUM (EXCLUSIVE)

28th September 2020 🖆 Spodumene, Tesla

Tesla will build a lithium hydroxide chemical plant in Texas in what is the first move by an automotive company into lithium chemical production, **Benchmark Mineral Intelligence** can confirm.

The EV maker will build a spodumene conversion facility adjacent to the Terafactory / Gigafactory 5 in Austin, Texas in what has a typically aggressive start up target of Q4 2022.

#### **Piedmont Lithium stock soars on confirmed Tesla deal**



Tesla's factory in Europe. (Photo: Jakob Härter | Flickr)

Shares in Australian junior Piedmont Lithium (ASX: PLL) surged almost 84% on Monday in Sydney after it <u>confirmed it had signed a sales agreement with Tesla</u> to supply the electric vehicle maker with high-purity lithium ore mineral for up





#### Mercedes to launch production of electric vehicles in Alabama in 2022

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#### Hyperdrive A Tesla Co-Founder Aims To Build an **Entire U.S. Battery Industry**

Redwood Materials, led by J.B. Straubel, is planning a massive new factory to move \$25 billion of the battery supply chain from Asia to the U.S.



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#### Ford and SK Innovation to spend \$11 billion, create 11,000 jobs on new U.S. **EV** and battery plants

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Michael Wayland MIKEWAYLAND

 The investment includes two lithium-ion battery plants in central Kentucky and a POINTS 3,600-acre campus in west Tennessee called Blue Oval City.

> The plans bolster President Joe Biden's call for companies to onshore supply chains amid a global shortage of semiconductor chips that has disrupted several industries, including automotive.



In Argen North a





#### EV supply chains are complicated and need \$bn of investment

\*Source: BENCHMARK MINERAL INTELLIGENCE

## U.S. CRITICAL MINERALS

#### China exerts vast control over every step in the supply chain



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MINERAL INTELLIGENCE

## **Bipartisan Support for Domestic Critical Minerals Policy**



#### Trump asks Pentagon to find new rare earth sources



The risks from China trade tensions to US access to rare earths Blue Line Corp. CEO Jon Blumenthal on the impact of U.S. trade tensions with China on the rare earth market.

> President Trump on Monday ordered the Department of Defense to find better ways to procure rare earth minerals – which are a crucial component in producing weapons, electronics and other goods – over fears that China could weaponize its dominance in the sector.

Trump said the U.S. does not have the necessary capacity to make samarium cobalt rare earth permanent magnets, according to <u>Reuters</u>, which are commonly found in precisionguided missiles, smart bombs and military jets. They are resistant to corrosion and can withstand high temperatures.

The order, which came in a letter to congressional leaders, falls under the Defense Production Act of 1950, a broad law that authorizes the president to allocate materials

## Biden-ordered review of supply chain to include electric car batteries, medical supplies and rare earth metals

Jenna McLaughlin 4 hrs ago

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WASHINGTON — President Biden will sign an executive order that will require the government to produce unclassified assessments of key industries and their supply chains, including semiconductor manufacturing, electric car batteries, medical supplies, and rare earth elements such as the ones used in iPhones and military systems.



Microsoft



## Why We Need Domestic Production of Critical Minerals..

- Energy and Defense Security
- Economic and Trade Security
- Lower Environmental Footprint stricter mining regulations, regional vs global shipping, relatively cleaner grid mix (some processing is energy intensive)
- Significant long-term opportunity for job and wealth creation (It is estimated that EV and battery industries will create ~\$24 trillion in wealth over next two decades)





## **Regional Aerospace and Defense Hub**



Also Potential for Regional Vertically-Integrated Aerospace and Defense Supply Chains



CONSULTING

# Steps to develop a new supply of battery-quality flake graphite



1.) Exploration: Geophysics, surface mapping, trenching, drilling

2.) Define Resource: resource modeling, define <u>quality</u> and quantity, mine planning

3.) Battery-Graphite R&D: develop battery products, test material in batteries

4.) Customer Evaluations: develop technical data sheets, build customer network, share small samples for testing

5.) Product Qualification: Onsite demo plants, 2-3 year process, secure sales contracts

6.) Bankable Feasibility



7.) Commercialization

## What Needs to Happen?

Political Unification to Enable Economic Realization Increased value placed on sustainable and secure sourcing of raw materials .

**Regional Supply Chains** 

Increased Government Industry Partnerships/Consortiums Federal Backstop to Ensure Offtakes (National Critical Mineral Reserve?)

Streamlined Permitting Process

Incentives for US investment into American Critical Mineral Projects Increased funding for R&D and commercial demonstration plants Federal subsidies, tax breaks when needed



## Contact

#### Jesse R. Edmondson, PG

Chief Executive Officer jesse@uscriticalminerals.com +1 479 459 4185

uscriticalminerals.com

#### **U.S. Critical Minerals, LLC**

124 North Broadway Ave. Sylacauga, Alabama 35150

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