FROM MINE TO MARKET: THE JOURNEY OF A BATTERY MINERAL

Minerals are essential building blocks of our economy, providing the foundation for infrastructure, technology, manufacturing, electric vehicles (EV) and future energy technologies. Unlike other extractive industries, the process to get minerals from the ground can take decades and more than \$2 billion in upfront investment before an investor sees a single dollar in profit.

THE TIME AND COST OF BRINGING MINERALS TO MARKET

It's a complex process to bring minerals to market and that means considerable amounts of time and investment to complete each step.

IT CAN TAKE ANYWHERE FROM SEVEN TO 20+ YEARS TO BRING NEW MINERALS TO MARKET



REQUIRING \$500 MILLION TO OVER \$2 BILLION IN CAPITAL INVESTMENT



\$500,000,000

China is the leading supplier for **16** "critical" minerals and **25** other minerals the U.S. depends on. Given our dangerous and unnecessary dependence on imported minerals, we need to do better to develop a strong domestic minerals supply chain and avoid future supply shortages.



\$2,000,000,000

TO BRING A MINERAL FROM MINE TO MARKET, THE FOLLOWING FIVE STEPS ARE NECESSARY BEFORE A MINERAL CAN BE USED IN ANY ENERGY OR CONSUMER PRODUCTS.



MINERAL PROSPECTING AND EXPLORATION

4-10 YFARS

\$50 MILLION -\$100 MILLION*

Locate a mining **claim** on lands that may have favorable geologic conditions for finding a mineral deposit.



GEOLOGISTS TEST AND REFINE MINERAL TARGETS; often expanding claims on additional lands to find favorable geologic makeup (a sizable deposit of minerals)



Defining a producible hardrock mineral deposit requires extensive exploration and some development drilling.



According to the National Academy of Sciences, on average **approximately 1,000** claims need to be identified to find one producible deposit.

5-18

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Because the exact location of hardrock mineral deposits is generally unknown, these deposits are difficult to find, and discovery typically takes 10 years or longer.



The development stage usually takes **5-18 years** to open a mineral deposit for production and may cost anywhere from **\$500 million** to over **\$2 billion** to complete depending on the type of mine.



Mine plans are developed to detail the mining process, civil engineering (roads and infrastructure), electrical engineering (power generation), water sources, environmental impact and reclamation plans, as well as the design of facilities for processing and disposal of waste material

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Permits must then be requested at the federal and state level

Minerals mining projects are subject to dozens of environmental laws and public engagement requirements, which can include the National Environmental Policy Act, the Clean Water Act, Clean Air Act, Endangered Species Act and Administrative Procedures Act, in addition to applicable state laws.

ONE OF THE LENGTHIEST PROCESSES FOR NEW MINE PERMITS IS THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PERMITTING PROCESS³

DATA COLLECTION AND ANALYSIS	Project development and prefeasibility screening (multiple years)	Environmental Impact Statement (EIS) pre-scoping	State/Federal consultation (6-8 months)
EIS scoping documents	Public notice and review (2-3 months)	Final scoping decision (45 days)	EIS preparation notice
Draft EIS presentation (1 - 2 Years)	Draft EIS public notice and review (45-90 days)	Draft EIS revisions (1 year)	Final EIS public notice and review (30 days)
Final EIS and	State permits	Federal permits	

Budget calculations and financial reports

PRE-DEVELOPMENT PLANNING INCLUDES: -



MINERAL EXTRACTION



\$50 MILLION -\$200 MILLION/YEAR*



In the extraction stage, the mineral is removed from the earth in large quantities as the mine begins producing.



The extraction stage can last anywhere from 5-30 years, although many mines have been open for more than 100 years and may cost anywhere from a few million dollars to hundreds of millions of dollars a year depending on the size of the mine and its location.



MINERAL PROCESSING









Most **mined materials** are not extracted from the ground in saleable form but need to go through stages of processing to produce a mineral in its useable state.



The **processing phase** takes the raw mineral and converts it into the refined materials needed for advanced energy technology.



Take **lithium** as an example. To make battery-quality lithium at Lithium Americas' Thacker Pass project, the following steps will be required:



Separating lithium clay from waste



Extracting lithium from clay into solution



Purifying solution to remove contaminants





The **total time** projected to manufacture batteryquality Li2CO3 from the ore is less than 24 hours. The overall recovery of lithium from the ore is 83% (based on a 2018 pre-feasibility study).The result of these steps is battery-grade lithium ready for a battery manufacturing plant.



China dominates global mineral processing.



The **U.S.** must prioritize the development of mineral processing capabilities and President Biden has directed federal agencies to prioritize the production and processing of minerals essential to EV batteries, semiconductor chips and more.⁶



INTEGRATION IN ADVANCED **ENERGY TECHNOLOGY**



TYPICALLY THE FIRST OPPORTUNITY FOR PROFIT



After minerals are processed, they're in a **saleable** form and can be used in a myriad of innovative technologies that make modern life possible.



Electric vehicles, smartphones and devices, solar panels, wind energy, and medical devices.



Without a sufficient supply of minerals, modern technology and our advanced energy future would grind to a halt.

Find out more about the benefits of domestic minerals mining at **MineralsMakeLife.org**.

* Estimates from mining companies that have been through every step of the mine-to-market operation

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