State Perspective on Critical Minerals for Clean Energy

NASEO Annual Meeting 10/13/22

Lorrie C. Skiffington

Overview

1. Who we are and what we do
2. Messaging- Critical Minerals
3. Relationships- Resources for States: AASG, Earth MRI
4. Partnerships- Unconventional Resources

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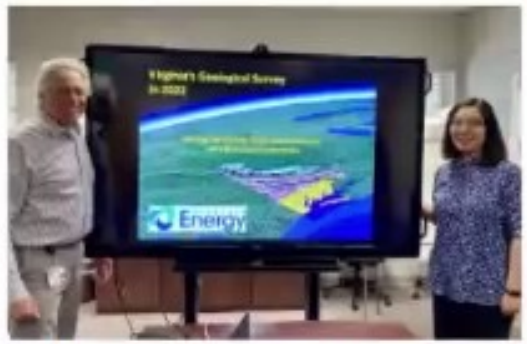
Who we are

What we do



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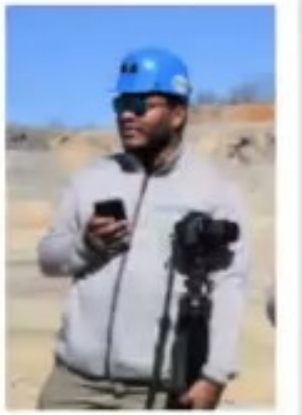
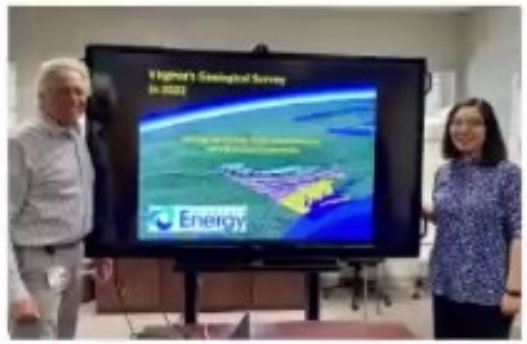
Geology 16

Energy 18

Number of Employees





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Geology

Energy

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Our Critical Minerals Page


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Virginia's Renewable Energy team serves as support for renewable energy deployment across the Commonwealth. Renewable energy programs focus on ease of deployment, equal access and contributions toward a carbon free electric grid.
Clean Energy Virginia
Expanding Access to Clean Energy and Growing the Clean Energy Jobs of the Future!
The Virginia Clean Economy Act of 2020 set several clean energy goals for the Commonwealth. The Clean Energy Virginia Dashboard was created as a way to measure that progress and make it available for anyone to view. This dashboard is a collaboration between the University of Virginia and Virginia Energy. Click below to learn more about these programs:
Clean Energy Virginia Dash Board
Lead By Example
Energy Workforce


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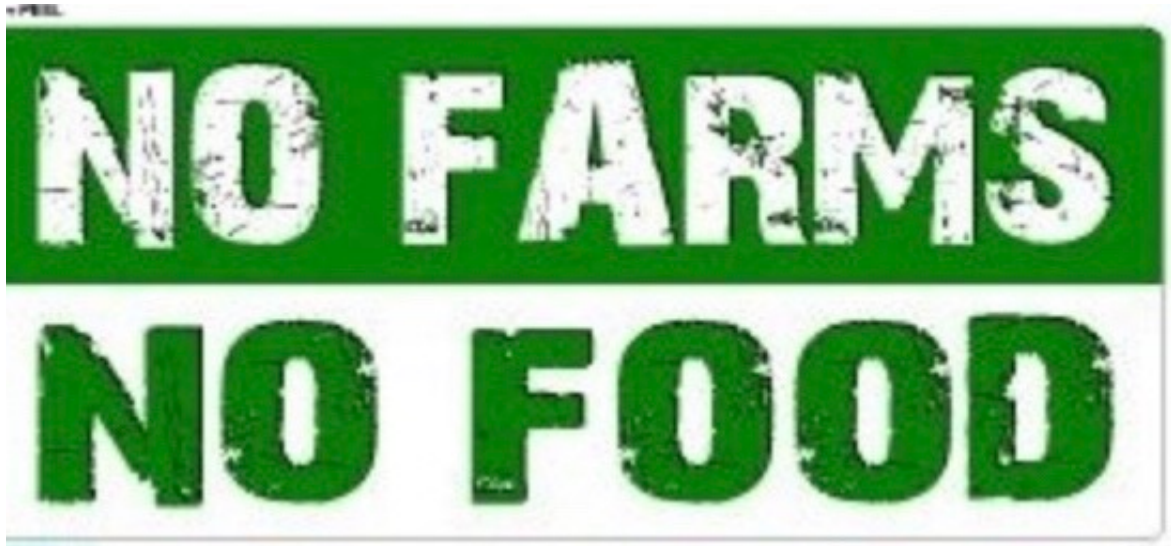

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Messaging

Critical materials are needed for:

cell phones
computers
computer chips
electric vehicle batteries
wind turbines
solar power panels

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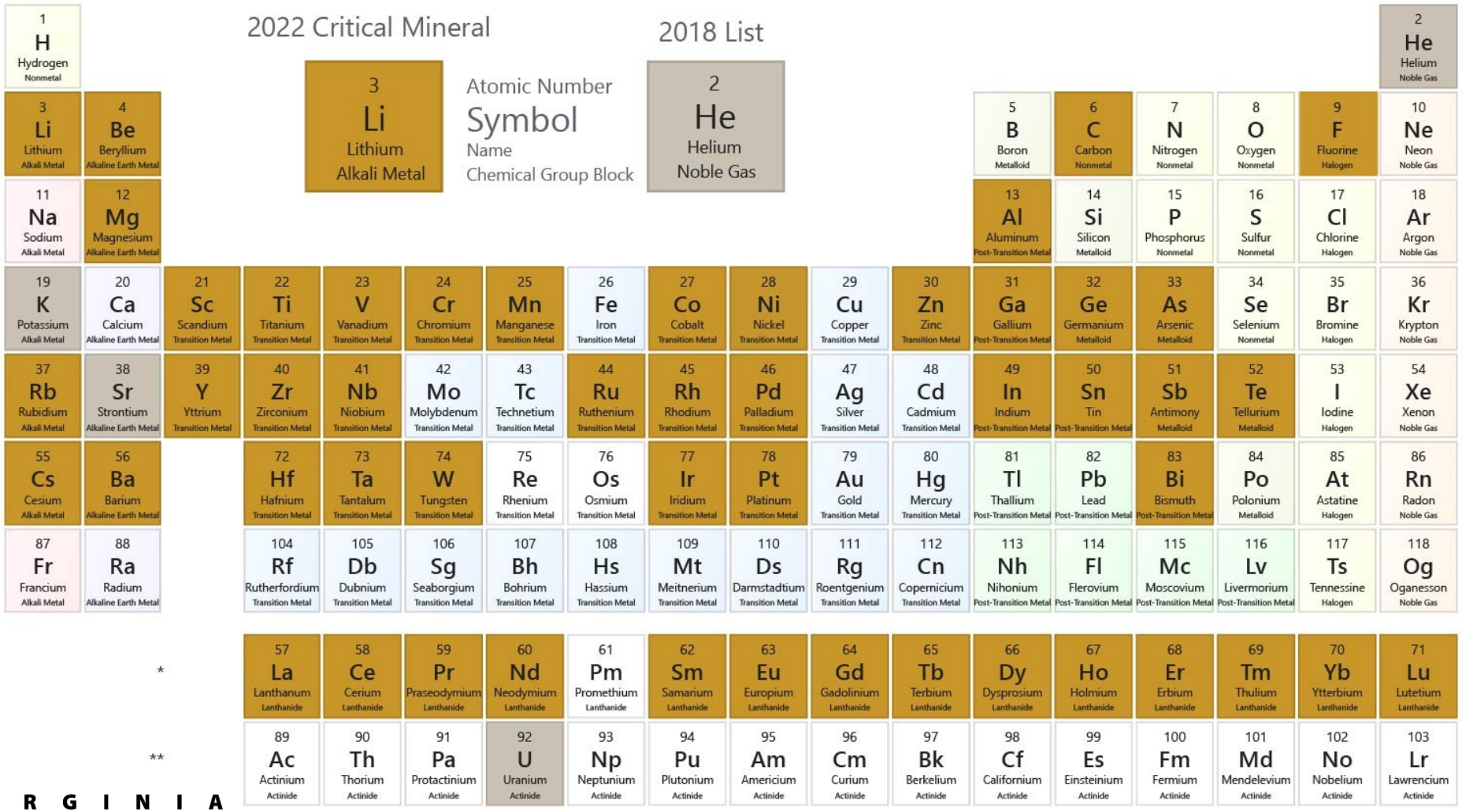
Periodic table of elements highlighting the “critical minerals”



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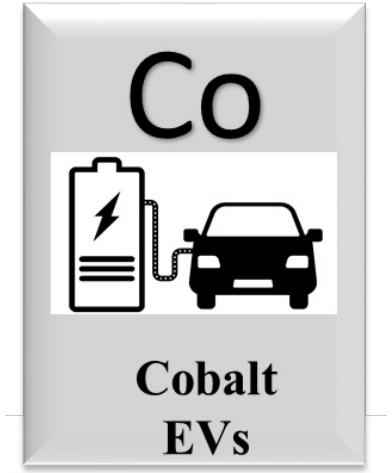
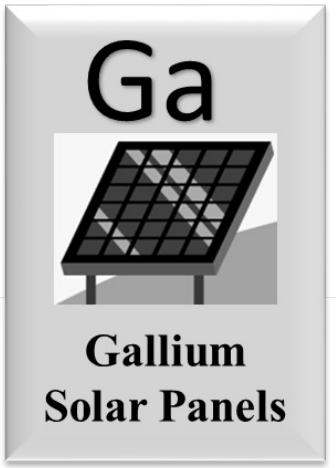
https://www.energy.virginia.gov/geology/criticalminerals.shtml

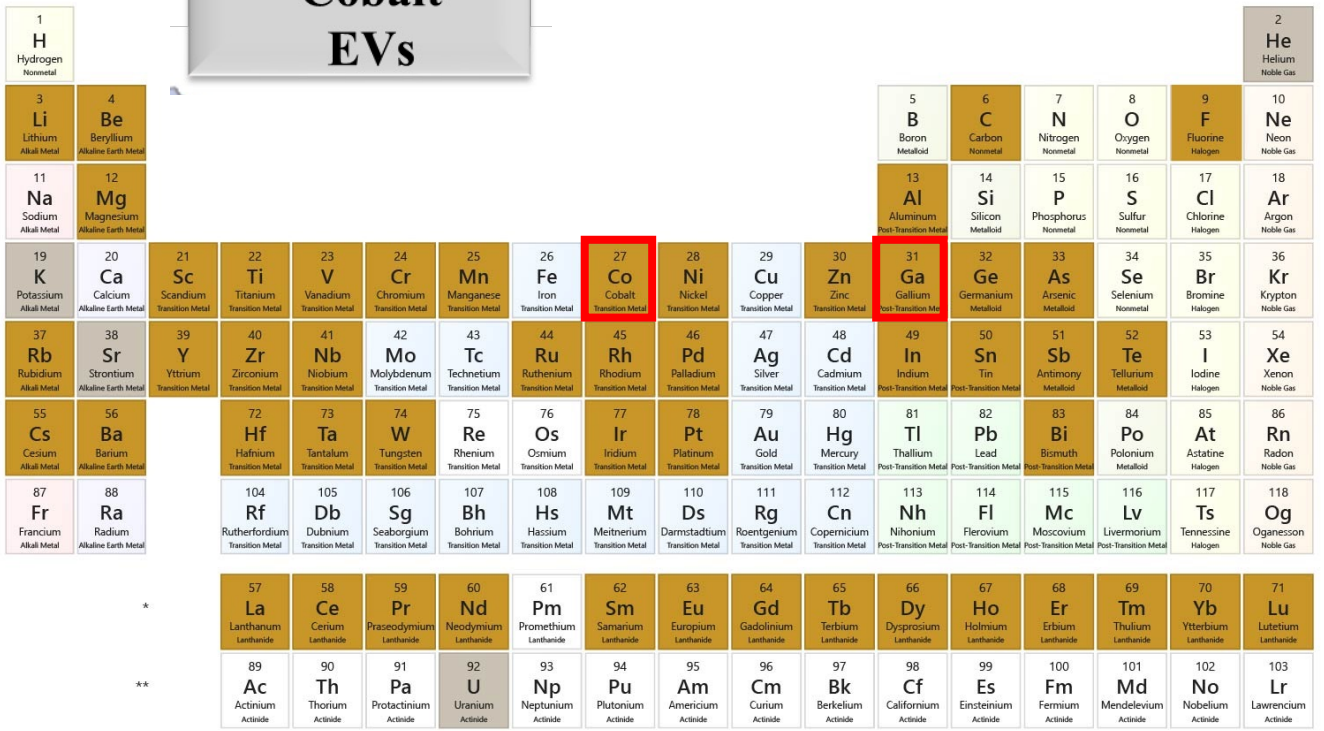
- Solar: Al, Ge, Ni, Te, Cd, In, Se, Sn, Cu, Fe, Si, Zn, Ga, Pb, Ag

- Wind: Al, Fe, Mo, Cr, Pb, REEs, Co, Mn, Zn, Cu

- eVs & Storage: Al, C, Li, REEs Co, Fe, Mn, Si, Cu, Pb, Ni, Ti







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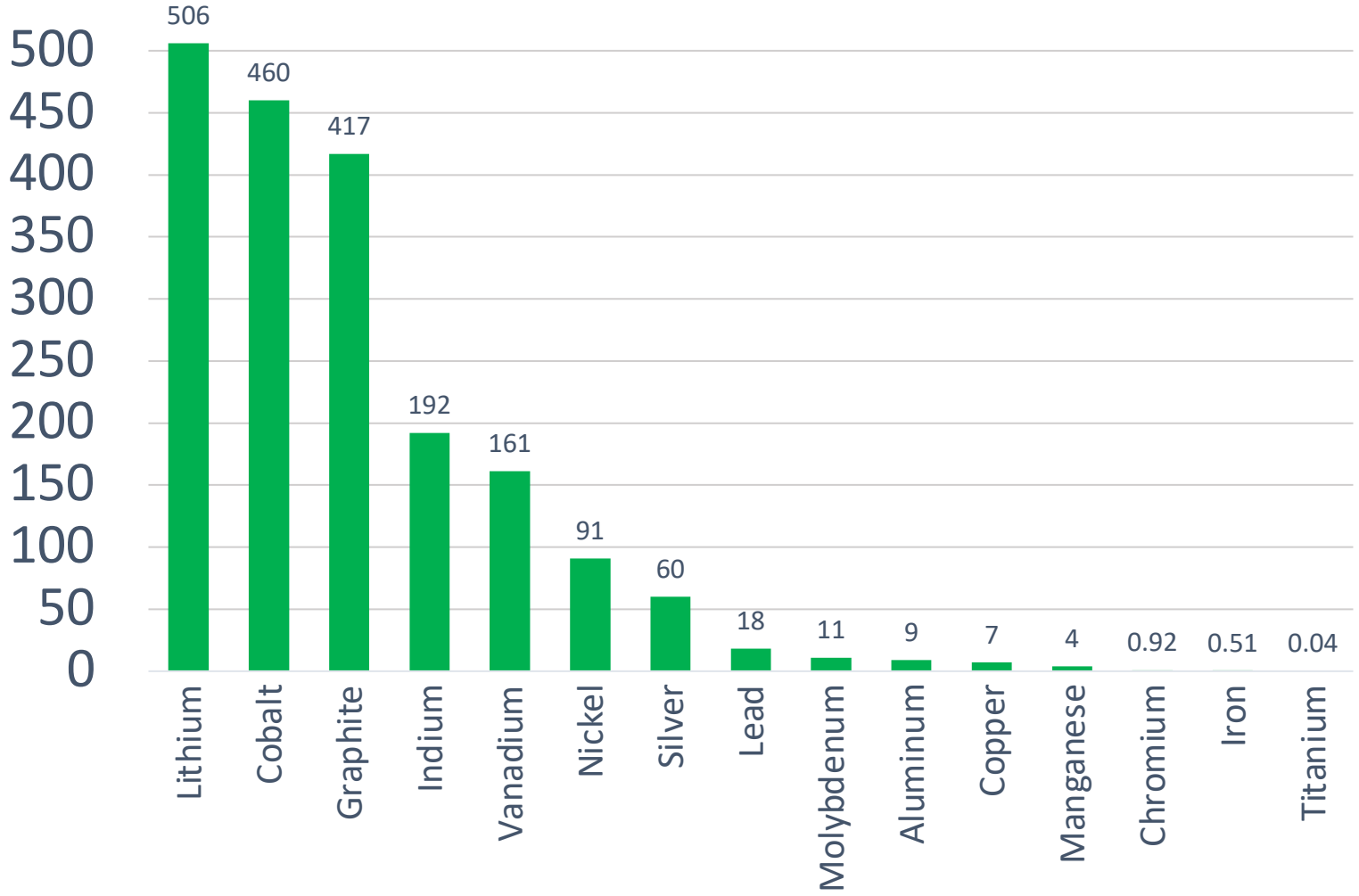
Projected Demand in 2050 for Critical Elements as % of 2020 Production



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Graph by L. Skiffington, 2022; 2050 demand projections based on IEA 2DS scenario (steel production excluded by World Bank)

Projected Demand in 2050 for Critical elements as % of 2020 Production

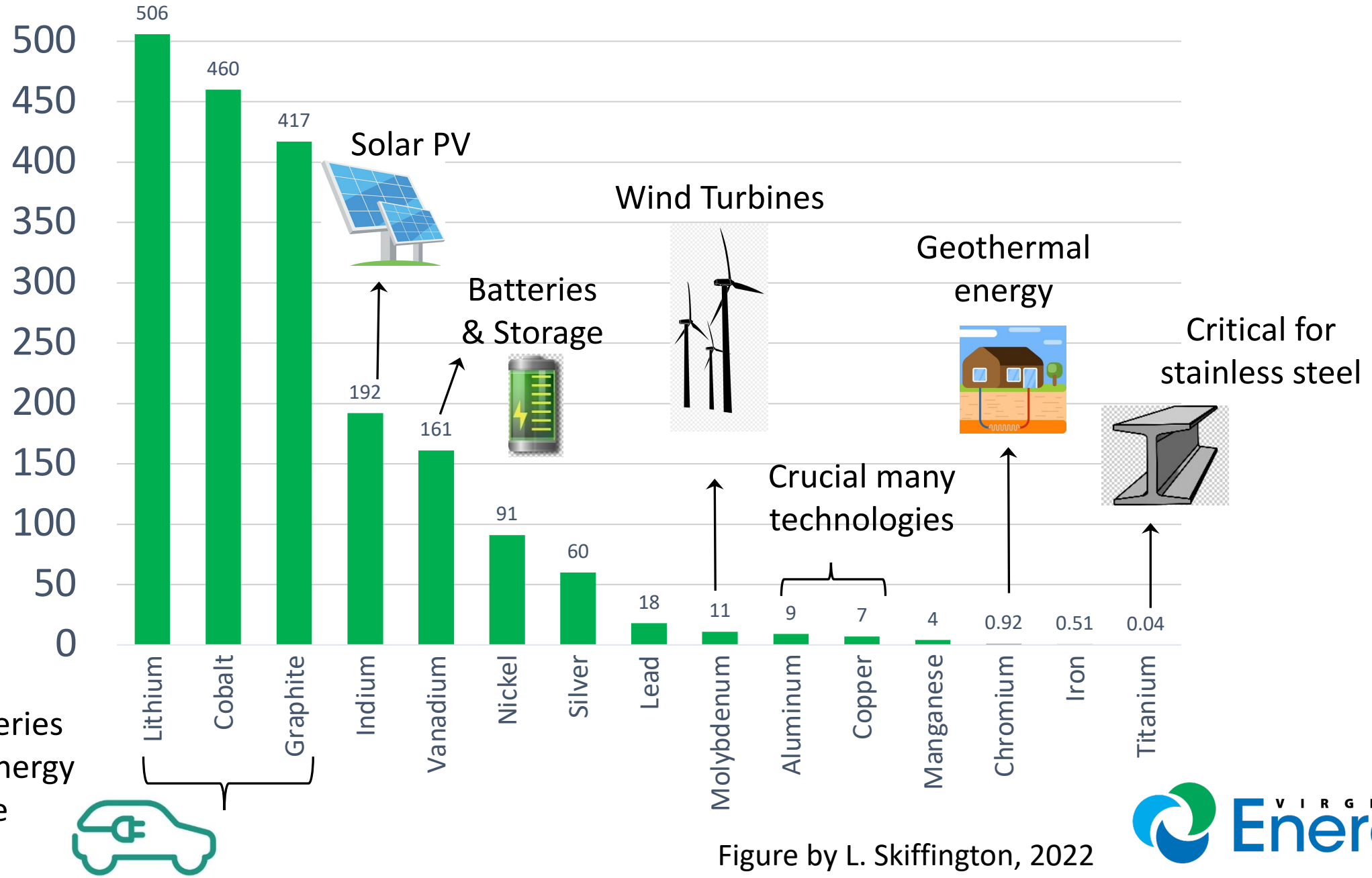

Figure by L. Skiffington, 2022

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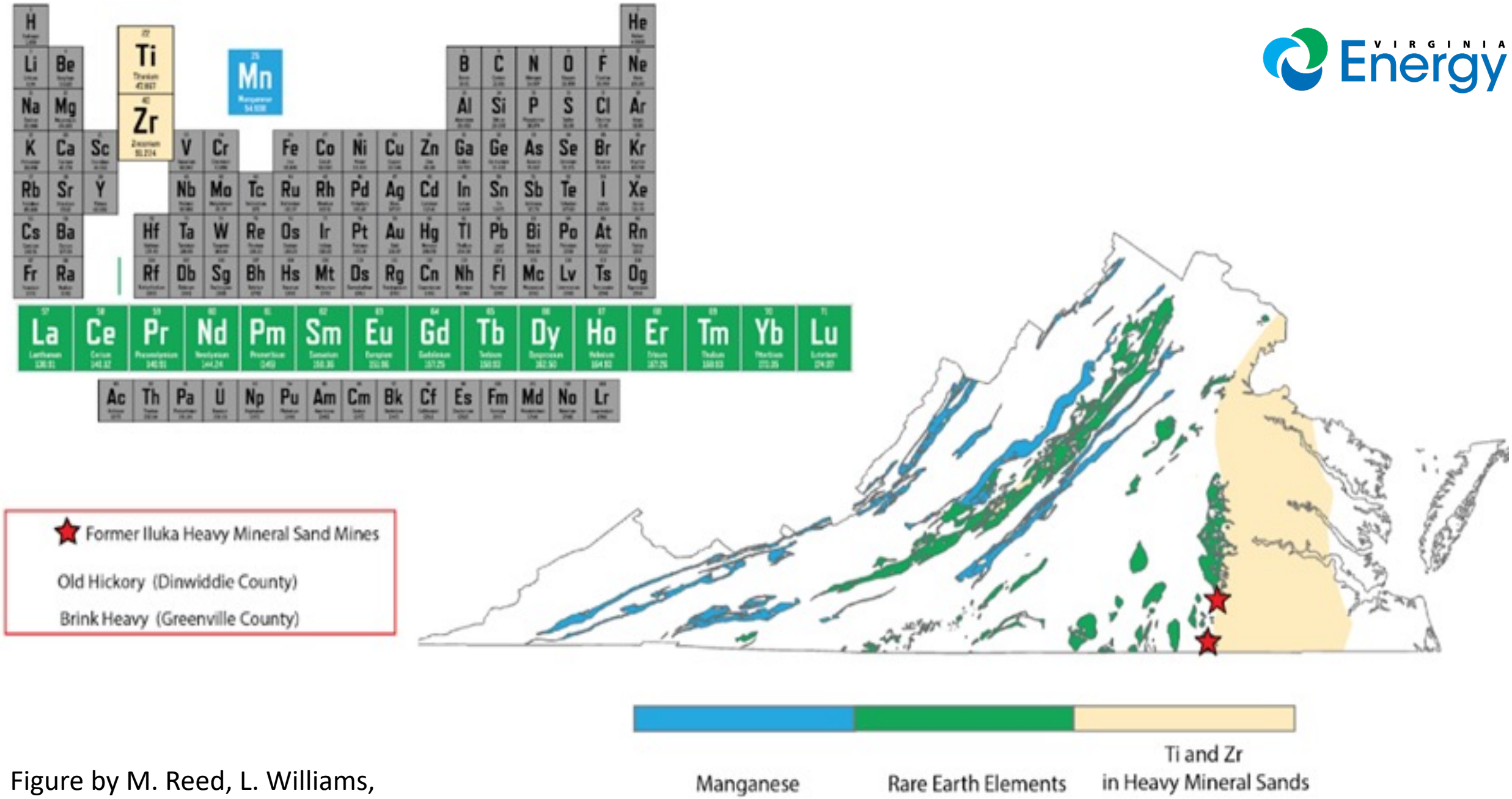

Figure by M. Reed, L. Williams,
L. Skiffington @ Virginia Energy- 2022

Our Geologists Harvest Heavy Minerals

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stategeologists.org/surveys

AASG
Association of American State Geologists

ABOUT AWARDS COMMITTEES FACT SHEETS IN REMEMBRANCE JOBS MEETINGS

STATE GEOLOGICAL SURVEYS

STATE GEOLOGICAL SURVEYS

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Search by State

SEARCH

Alabama
Geological Survey of Alabama - Alabama State Oil and Gas Board
PO Box 869999
Tuscaloosa, Alabama 35486-6999

Alaska
Division of Geological & Geophysical Surveys - Alaska Department of Natural Resources
3354 College Rd.

Arizona
Arizona Geological Survey
1955 East Sixth Street
PO Box 210184
Tucson, Arizona 85721

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stategeologists.org/committee/energy

AASG
Association of American State Geologists

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ENERGY

Mission

AASG standing committees maintain awareness and analysis of key topics; each year, a given committee may or may not be active, as priorities fluctuate, and as special projects arise; the Chair or Co-Chairs recruit committee members as needed

Responsibilities

The Committee: seeks to optimize the state geological survey role in this topic; monitors policy developments; works with Congressional members and staff; supports development of AASG Congressional Testimony as required; monitors and provides input into Federal legislation and regulations; ensures that AASG is represented on related federal advisory committees; monitors and advocates for the federal role, including external grants; facilitates collaboration with federal agencies; collaborates with partners organizations such as NGOs; assists in development and implementation of AASG positions and initiatives; shares pertinent information with the AASG community; updates the AASG Position Statement; helps with AASG annual meeting program planning when asked; and reports to the annual meeting

Current Committee Members

Nick (Berry) H. Tew, Chair
Scott W. Tinker, Chair

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U.S. Geological Survey's Earth MRI Program

Project Description

https://www.usgs.gov/special-topics/earth-mri

National Map Viewer

https://ngmdb.usgs.gov/emri/#3/40/-96

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Evolve Central Appalachia: Carbon Ore, Rare Earth and Critical Minerals (CORE-CM) Initiative for the Central Appalachia Basin (Evolve CAPP)

A pile of waste coal near Clinchco in Dickenson County.

Photo courtesy of Frank Kilgore from Cardinal News What to Do with Gob 11/9/21 Sarah Wade: https://cardinalnews.org/2021/11/09/what-to-do-with-gob/

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Evolve CAPP looks at coal waste (GOB) for strategic minerals supply

Dr. Karmis & Will Clear

Photo courtesy of Mark Still Mar 17, 2022

https://energy.vt.edu/research/evolve-capp/in-the-press/evolve-capp0.html

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Evolve CAPP

- Support from several energy companies, engineering firms, and public-private cooperation to evaluate what supplies of recoverable minerals and metals can be found in the region.
- The project will also evaluate and recommend technology and processes to recover materials in an economical and environmentally sound way.
- A coalition of two universities and four community and technical colleges in the region

https://energy.vt.edu/research/evolve-capp/in-the-press/evolve-capp0.html

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Evolve CAPP-Strengthen Domestic Supply Chain

- The Evolve Central Appalachia project is developing & implementing strategies that enable the region to realize its full economic potential for producing rare earth elements, critical minerals, & high-value, nonfuel, carbon-based products.
- Strategies will be presented to spur economic growth, close supply chain gaps, promote investment in the region, and address workforce education and training opportunities.
- The project aims to show how Southwest Virginia can become a link in federal efforts to strengthen domestic supply chains for rare earth elements and critical minerals for technology uses.

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Core CM Evolve CAPP

Project Objectives:

1. Determine the quantity & distribution of resources in the region
2. Formulate strategies to utilize coal waste streams to produce useful fuels & materials
3. Evaluate regional infrastructure & identify industries that may benefit from Rare Earth Element & Critical Mineral production
4. Develop strategies to encourage business development
5. Guide research & development of new technologies
6. Frame plans to establish technology innovation centers
7. Implement stakeholder outreach & education initiatives

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Evolve CAPP

- Evolve CAPP program concludes in September 2023
- The aim is not for Department of Energy to produce the material but instead to de-risk the technologies so private companies will have the motivation to license the new processes and produce goods through the commercial sector.
- we can come in and clean up these legacy wastes. And we can create … almost a new industry in those regions focused on rare earth production and manufacturing.
- You can meet a national security need, and you can supply jobs to regions that are in desperate need of jobs, and you have an opportunity to support better environmental outcomes.

https://cardinalnews.org/2022/09/14/tech-scientists-see-rare-opportunity-in-appalachia/

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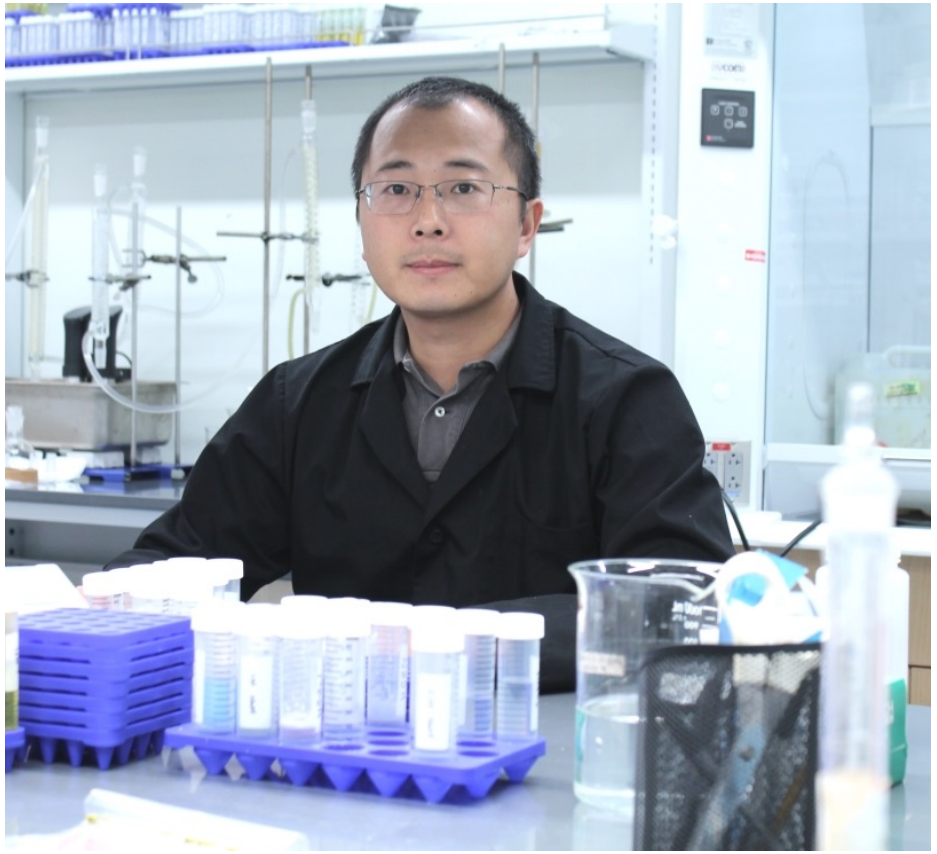
Critical Mineral Extraction



Wencai Zhang is working on the extraction of critical minerals from coal waste and other materials. Randy Walker photo.

https://cardinalnews.org/2022/09/14/tech-scientists-see-rare-opportunity-in-appalachia/

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IIJA

- The Act's funding provisions are aimed at increasing domestic production. First, the bill codifies and funds a US Geological Survey (USGS) effort to compile critical mineral resource location data in the United States. Section 40201 provides $320 million to the USGS to enhance the Earth Mapping Resources Initiative (Earth MRI), a program of above- and below-ground mapping of mineral resources across the United States. In what could be characterized as a "mining lifecycle approach," Section 40202 prioritizes the mapping of abandoned mine land and mine waste which could be potential sources of multiple critical minerals. The Earth MRI results will be publicly available.
- Second, Section 40204 of the IIJA allocates a $140 million grant to build a Rare Earth Demonstration Facility to develop the commercial feasibility of extracting rare earth elements from acid mine drainage, mine waste, and "other deleterious material," and to separate mixed rare earth oxides into pure oxides of each rare earth element.

https://www.arnoldporter.com/en/perspectives/blogs/environmental-edge/2021/12/domestic-production-of-critical-minerals?utm_source=Mondaq&utm_medium=syndication&utm_campaign=LinkedIn-integration

Questions to Ponder

•What are or can be roles for State Energy Offices or states generally to support and improve critical mineral supply chain? Are there roles and opportunities for states that may not the geologic resources within their boundaries?

•Mining and processing facilities can engender major concerns over potential adverse environmental and social impacts, including for vulnerable communities? What is or can be done to address such concerns and mitigate adverse impacts?

- How does potential supply of various critical minerals from unconventional resources, e.g., recovery from coal, byproducts, alternative sources, compare to conventional recovery? What are challenges, opportunities, tradeoffs?
- What is or will be roles and limitations for reuse and recycling in the shorter and longer term? And for alternatives/substitutes (e.g., battery component formulations)? [*Recycling question: I'm thinking about the timing aspect—at least for batteries, growing demand will far outstrip the supply of used/spent products for recycling but I'd think it important to design products, develop technologies, and plan infrastructure for ease of recycling – circular economy*.]

Thank You