



The Office of Fossil Energy and Carbon Management's [Division of Minerals Sustainability](#) is advancing a research, development, demonstration, and deployment portfolio geared toward increasing the domestic production of critical minerals (CMs) in the United States. These efforts support the Biden Administration's strategy on '[Securing a Made in America Supply Chain for Critical Minerals](#)' and have a central role in helping the nation build a clean energy economy and safeguard our national security.

## America's Need for and Potential to Supply Critical Minerals

CMs and rare earth elements (REEs) are key components of the clean energy technologies we need to achieve our national climate and economic goals. Demand for clean energy technologies, such as wind turbines and batteries for electric vehicles, has increased significantly as technology costs have plummeted over the last decade, and the global clean energy market is expected to grow exponentially. Yet currently, even when REEs are being mined within the United States, they are shipped overseas for processing before being sold back to the United States in more expensive products. Without new domestic raw materials production and manufacturing capacity, the United States will continue to rely on clean energy imports, exposing the nation to supply chain vulnerabilities while simultaneously losing out on the enormous job opportunities associated with the energy transition.

The United States has untapped potential to support greater domestic production. Across the nation, there are billions of tons of legacy wastes left behind by coal mining and related activities—such as coal waste and ash, acid mine drainage, and produced water—each of which contains a wide variety of valuable minerals and materials and offers a resource for producing a wealth of CMs.

Through these and other secondary and unconventional resources, there is an opportunity to boost America's manufacturing capabilities in order to build a secure, resilient, and diverse domestic energy sector industrial base that will establish America's role as a global leader in clean energy manufacturing and innovation.



## Accelerating the Domestic Production of Critical Minerals

The Office of Fossil Energy and Carbon Management's (FECM's) Division of Minerals Sustainability is focused on accelerating the production of CMs from unconventional and secondary sources. This includes legacy byproducts from fossil energy use (e.g., coal ash and refuse), acid mine drainage, and produced waters from oil and gas operations.

The Division supports the development of a domestic CM industry that will lead to:

- Clean energy deployment, including creating domestic manufacturing jobs;
- Secure, diverse, resilient, domestic CM supply chains; and
- Research and technology development that enables CM production while reclaiming waste streams to benefit the environment and communities.

The Division also works to engage industry, academia, technology developers, nongovernmental organizations, communities, and other stakeholders to further the development of domestic CM supply chains.

With this focus, the Division of Minerals Sustainability is implementing the mandate found in the U.S. Department of Energy’s [comprehensive supply chain assessment report](#) to “support innovation for environmentally sustainable and next-generation critical mineral and material extraction, processing, and refining activities.”

## Tapping into Unconventional and Secondary Sources

[Initial estimates](#) suggest that unconventional and secondary sources could provide significant amounts of the REEs and other CMs needed to reach the nation’s clean energy goals. For example, wastes and byproducts from fossil fuel and other industries—including mine tailings, refuse piles, acid mine drainage, fly ash, and water produced during oil and gas recovery—currently contain more than **10 million tons of REEs**, which is equivalent to a **1,000-year supply** at the current rate of U.S. consumption.

Since 2014, FECM has worked to develop and advance the technologies needed for an economically competitive and sustainable domestic supply of REEs, [expanding to incorporate all CMs in 2020](#). The Division’s focus is on addressing the feasibility of recovering, extracting, separating, and purifying these materials from coal-based resources, which involves demonstrating the production of high-purity REEs and CMs from bench-scale to large-scale pilot facilities.

Through these efforts, [several small-scale pilots](#) have been constructed to date to demonstrate that high-purity rare earth oxides can be produced from coal, coal waste, coal ash, and acid mine drainage. Feasibility studies have been developed for eight potential large-scale demonstrations that would take these and other unconventional and secondary sources of CMs and turn them into salable materials that would directly feed domestic

supply chains for magnets and batteries needed for electric vehicles, wind turbines, and more.

These advances in domestic CM production are encouraging, as the benefits go beyond bolstering the domestic CM supply. Helping develop the domestic CM supply from unconventional and secondary sources will promote environmental stewardship by incentivizing cleanup of existing and abandoned mine sites, along with the remediation of legacy fossil activities. It will also create and expand employment opportunities in regions that are traditionally home to coal and other mining and oil and gas production.

## Current and Future Research Activities

The Division of Minerals Sustainability’s current research, development, demonstration, and deployment portfolio includes improving our understanding of the available CM resources from unconventional and secondary sources, advancing the cost-effective and sustainable production of CMs towards demonstration and commercial scale, and engaging in international standards development for CM supply chain sustainability. Under the [Carbon Ore Rare Earth and Critical Minerals \(CORE-CM\) Initiative](#), 13 projects were recently [awarded \\$19 million](#) to perform regional assessments of CM and REE capacity across Appalachia, the Gulf Coast, Alaska, and various other basins. FECM is also advancing the design of a [first-of-a-kind facility to turn mine waste into CMs](#), supported by a \$140 million investment under the Bipartisan Infrastructure Law.

As the Division of Minerals Sustainability looks ahead, it will consider how the lifecycle of CMs and carbon ore can support other FECM technologies, giving special focus to approaches that can both produce CMs and reduce, capture, or remove carbon from the atmosphere.

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To learn more about the Division of Minerals Sustainability’s ongoing efforts, [visit FECM’s Office of Resource Sustainability website](#). You can also [sign up to receive news alerts](#) to learn about future FECM funding opportunity announcements and project selections.