



The Secretary of Energy

Washington, DC 20585

July 18, 2022

The Honorable Lisa Murkowski
United States Senate
Washington, DC 20510

Dear Senator Murkowski:

Thank you for your February 9 letter regarding seafloor mineral resources and supply chain issues related to critical minerals and materials for high-capacity batteries. The Department of Energy (DOE) shares your commitment to the research, development, demonstration, and deployment (RDD&D) of technologies to equitably transition America to net-zero greenhouse gas emissions economy-wide by 2050. The Department is working quickly and strategically to advance battery capabilities because they are poised to transform both the energy landscape and the transportation sector, and because DOE wants to ensure a strong domestic supply chain to create jobs and enable electric vehicle battery production in the United States.

To build resilient, diverse, and secure critical mineral and material supply chains for the U.S. industrial base, including energy and transportation, DOE pursues a strategy to diversify supply, develop substitutes, and drive reuse, recycling, and more efficient use of critical minerals and materials. DOE, along with interagency stakeholders, has identified import dependencies in satisfying end-use market demand in the United States for many critical minerals and materials. In addition, the United States has a large deficit in the materials-processing and other mid-stream segments of the supply chain. Addressing this mid-stream segment is critical to both economic development and supply chain security. Without this segment of the supply chain, it is expected that domestically extracted minerals would still be exported for foreign processing and manufacturing and recycled material would need to be exported as well. Specifically for batteries, these vulnerabilities will be addressed through multiple ongoing efforts that have been funded through the *Bipartisan Infrastructure Law*. For some critical minerals and materials, such as lithium and graphite, there is a strong potential for these funds to stimulate enough growth in the extraction and separation segments for the United States to establish a strong foothold in these areas.

In your letter, you had five specific questions related to polymetallic nodules. These questions are extremely important and relevant. Nodules occur throughout the world's oceans, although the richest known concentration is in the Pacific's Clarion-Clipperton Fracture Zone (CCFZ) at depths of 3,000 meters – 5,000 meters. The CCFZ sits about 500 miles south of Hawaii and is roughly as wide as the continental United States. There have been a few assessments of these resources over the years by industry parties, governments, and studies of the deep marine ecosystem in these regions. Below are the five specific questions that you asked in your letter, along with our response to each.

1. *In the June 2021 report, the Administration found at page 154 that, “Significant quantities of strategic and critical materials may be found on the seabed...providing not only potential supply benefit, but also dual-use technology development.” While the report cited the potential for “a significant future source of strategic and critical minerals,” the report nevertheless concluded “they are not covered by this report.” Given the sheer scale of the potential contribution, it would seem that any credible analysis of critical battery metal supply chains must include sea floor resources. Does DOE intend to undertake a strategic assessment of the role polymetallic nodules can play in addressing U.S. needs and shoring up our supply lines?*

The use of the clause “they are not covered by this report” in the aforementioned White House report (*Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-based Growth, 100-Day Reviews under Executive Order 14017, June 2021*) was not meant to underrate that potential. The potential sources for strategic and critical materials from the seabed may well be vast, but DOE did not have enough information (within the available timeframe) to go into it in any greater detail in the June 21 report.

At this time, DOE does not have its own strategic assessment studies to quantify the impact of possible contribution from polymetallic nodules on the sea floor. Studies of this nature (and any associated cost/benefit analyses) could be possible in the future as more information becomes available, but DOE has done relatively little direct research on marine minerals. The U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM) has a program on offshore critical minerals which is restricted to U.S. territorial waters and receives annual funding. The United States Geological Survey has a program through the Pacific Coastal and Marine Science Center which addresses global marine mineral resources.

Within DOE, the Advanced Research Projects Agency-Energy is doing research that would address the robotic, autonomous operations and AI requirements for low impact deep-sea mining (e.g., <https://arpa-e.energy.gov/technologies/projects/real-time-situ-sensing-sediment-properties-environmental-monitoring-deep-sea>). Finally, ongoing R&D on critical battery minerals processing through the DOE Office of Science and the Advanced Manufacturing Office is applicable to potential U.S. domestic processing and refining of metallic marine nodules.

It is true that deep-sea mining has not yet begun anywhere in the world, but many companies are prospecting the seabed for nodules and other forms of minerals to assess their size, composition, distribution, and economic value. In light of global demand for critical minerals, it is reasonable to expect that exploitation of these resources will at some point occur and the question is when, under what final authorities and provisions, and by whom. Presently, only one U.S. company, Lockheed Martin, holds active sea floor mineral leases (through United Kingdom (UK) Seabed Resources, a wholly owned subsidiary of Lockheed Martin UK) (<https://www.lockheedmartin.com/en-gb/products/uk-seabed-resources.html>) and has recently applied for an extension to those leases (<https://www.federalregister.gov/documents/2022/03/18/2022-05793/deep-seabed->

[hard-minerals-request-for-extension-of-exploration-licenses-comments-request](#)). DOE intends to continue to stay cognizant of this topic, to watch out for future developments, and to consider additional involvement in associated projects as warranted over time.

- 2. One of the key findings of the report is the singular importance of nickel in the supply chain that undergirds battery production. The report found that establishing domestic nickel refining capacity is among the highest strategic priorities. Does DOE view polymetallic nodules as a significant source of nickel?*

Nickel is certainly very important in the supply chain that undergirds battery production. For nickel and certain other minerals, such as manganese and cobalt, the presently known U.S. reserves and known resources fall short of satisfying projected domestic demand to meet decarbonization goals. For nickel specifically, Russia's footprint in the nickel market and the subsequent price spikes related to the Russia-Ukraine conflict have reinforced the importance of establishing a strong domestic supply, processing, and refining base for economic development and national security. This long-term strategic focus is critical to gain a stronger foothold in battery supply chains. There are efforts throughout the interagency stakeholders to develop mineral-specific strategies using a combination of mapping and characterization of conventional and unconventional resources; international engagement and partnership with allies; targeted R&D to increase the economic viability of identified resources; and grants, loans, and funded projects through a variety of financial mechanisms. In addition, we are encouraged by industry efforts to develop new domestic resources in Alaska, Minnesota, Idaho, and elsewhere in the United States.

- 3. Any form of resource extraction poses some environmental risk. What are the environmental effects from collection of these polymetallic nodules and how do they compare to alternative sources of these minerals?*

The topic of risks to deep-sea habitats and species due to deep-sea mining is complex and only a few studies exist that fully analyze mining process impacts on them. DOE does not have its own strategic assessment. Studies to quantify the impact of possible contribution from polymetallic nodules on sea floor (and any associated cost/benefit analyses) could be possible in the future as more information becomes available. DOE will continue to stay cognizant of this topic and consider additional involvement as warranted over time.

4. *How can the domestic production of polymetallic nodules from the Clarion-Clipperton Zone benefit the United States from an economic and strategic perspective?*

The significant need for battery minerals to achieve the administration's clean energy goals, coupled with the nature of the global supply chain for these minerals, has led to interagency discussions on the multiple and complicated issues related to marine mineral extraction. The Department has a significant role in any interagency processes to ensure that supply chain issues and considerations are fully represented and considered. DOE believes that the environmental, social, community, and national security issues pertaining to marine minerals need to be accurately compared to the impacts of onshore resource extraction, processing, and utilization throughout the world. Our goal is to ensure that the United States has a reliable and durable source of critical minerals to drive and ensure the clean energy transition.

5. *What role, if any, is the Administration's position on ratification of the Law of the Sea (LOS) Treaty playing in the overall strategic plan for critical minerals? As part of this process, is the Administration increasing the priority it places on LOS treaty ratification?*

Marine mineral resources are governed by a variety of agencies depending on location, varying from BOEM for mineral resources in U.S. outer continental shelf waters, to National Oceanic and Atmospheric Administration (NOAA) for U.S. activities in international waters. The United Nations Convention on the Law of the Sea (UNCLOS), created in 1982, which codifies long-standing rules of navigation, dispute resolutions, fisheries management, and territorial boundaries, also established the International Seabed Authority (ISA) which governs international marine mineral extraction. ISA also awards contracts to entities for exploration, delineation, and development activities. The United States has not ratified the UNCLOS, although in practice, the United States does follow the principles of UNCLOS and maintains observer status in ISA activities. However, this status prevents the United States from establishing exploration and development leases in the Clarion-Clipperton Zone and other international waters through ISA. A total of 167 countries plus the European Union have signed the UNCLOS. Many countries have established lease and licensing interests in the CCFZ through ISA, including Japan, France, Russia, Germany, UK, Korea, China, Belgium, Norway, Nauru, Tonga, and others. These countries have been conducting exploration and assessment of marine minerals for decades. While the United States' observer status prevents establishment of exploration and development leases, DOE is continuing to work with interagency partners to consider all potential sources of critical minerals for the supply chain including the role that seabed nodules could play in the future.

If you wish to discuss these issues further, please contact me or Ms. Rebecca Ward, Deputy Assistant Secretary for Senate Affairs, Office of Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Granholm', with a stylized, cursive script.

Jennifer Granholm