Hearing of the House Committee on Natural Resources, Oversight and Investigations Subcommittee — "Exploring the Potential of Deep-Sea Mining to Expand American Mineral Production" — April 29, 2025

Testimony of Oliver Gunasekara, CEO & Co-Founder, Impossible Metals

Introduction and Summary

My name is Oliver Gunasekara, and I am the CEO and Co-Founder of Impossible Metals. I came to this country 20 years ago and, as a proud naturalized citizen, have been inspired by the kind of innovation only possible in America. Thank you for the opportunity to testify today.

I am a three-time entrepreneur, having founded successful American companies in semiconductors, and now minerals technology. I founded Impossible Metals because I recognized that critical minerals have the same strategic importance as coal in the 19th century and oil in the 20th—essential resources that will determine America's prosperity, security, and leadership for this century.

At the same time, American advances in AI and robotics have reached the point where we can use innovation to solve the traditional problems of mining, creating a new, lower cost, and cleaner way of collecting these minerals from a vast untapped resource — the deep sea. Technology can meet the moment for our nation, enabling the United States to secure resources our global competitors want to deny us, and doing so more responsibly than most believed was possible even a few years ago.

Impossible Metals is a California headquartered, Delaware incorporated company that will responsibly harvest nickel, copper, cobalt, manganese, and rare earth elements from the deep sea.[1] These minerals are vital for America's national defense, infrastructure development, and energy production. Traditional land-based mining methods are often environmentally damaging and linked to human rights abuses, especially when controlled by foreign adversaries like China. Our groundbreaking technology changes this equation by using advanced underwater robotics and AI-driven selective harvesting. Our Autonomous Underwater Vehicles (AUVs) collect mineral-rich polymetallic nodules from the seabed without disruptive cutting, blasting, or tunneling, leaving approximately 60% of nodules untouched to preserve marine biodiversity.

Bringing a new land-based mine online in the U.S. takes 29 years. With supportive regulation, seabed mining could provide minerals to processing facilities at commercial scale within three years — 10x faster, 10x cheaper, and 10x lower impact than the alternatives, without relying on foreign adversaries.

Deep-sea mining is not just an option; it's the inevitable future of global mineral production. The critical questions we face today are about who will set the standards and how it will be conducted. America must lead to secure our economic and national security interests, ensure environmental stewardship, and protect human rights. We can do so because we are the technology leader and because we have a rich reserve of nodules in our domestic waters. We

[1] It remains to be seen whether the rare earths will be economic after processing.

have the chance to build a new American industry, leveraging American resources. This industry could generate $300 billion in domestic economic output over 10 years and create 100,000 jobs in shipbuilding, mineral processing, robot manufacturing, mining crews, and more.

The number one barrier is legacy regulation. Regulatory uncertainty has inhibited investment in the industry and slowed domestic production, but the government can unlock this industry. The Administration last week took bold action, and Congress should support and build on that by:

- **Unlocking Domestic Resources:** The Bureau of Ocean Energy Management has existing authority to offer leases in domestic waters, which are believed to contain over a billion tons of minerals. Impossible Metals has formally requested BOEM to swiftly initiate the leasing process for critical mineral exploration in the U.S. Exclusive Economic Zone, and they have said they will decide by May 23. Congress should support this effort, and consider reforms to streamline the current elaborate process.
- **Adding Nodules to the Defense Stockpiling:** Congress should direct the National Defense Stockpile to begin including deep sea nodules procured from American waters by American companies to secure our defense, incentivize nodule processing facilities to be constructed in the U.S., and stimulate demand for the nascent industry.
- **Establishing Domestic Mineral Processing Capabilities:** The United States currently has no domestic processing capabilities. Congress should support investments in new facilities through programs such as the Defense Production Act, innovation grants to developers of new approaches to processing that can efficiently refine the multiple metals found in seabed minerals, or critical minerals trade agreements with allies that possess relevant facilities.
- **Accelerating Exploration:** USGS and NOAA should prioritize mapping and exploration of these strategic deep-sea mineral resources.
- **Funding American Innovation:** DOE should invest in innovation in mineral collection, and work across agencies to coordinate commercially-relevant investments.

By acting decisively, America can ensure energy abundance, create thousands of quality jobs, and establish robust, responsible leadership in a critical global industry of the future.

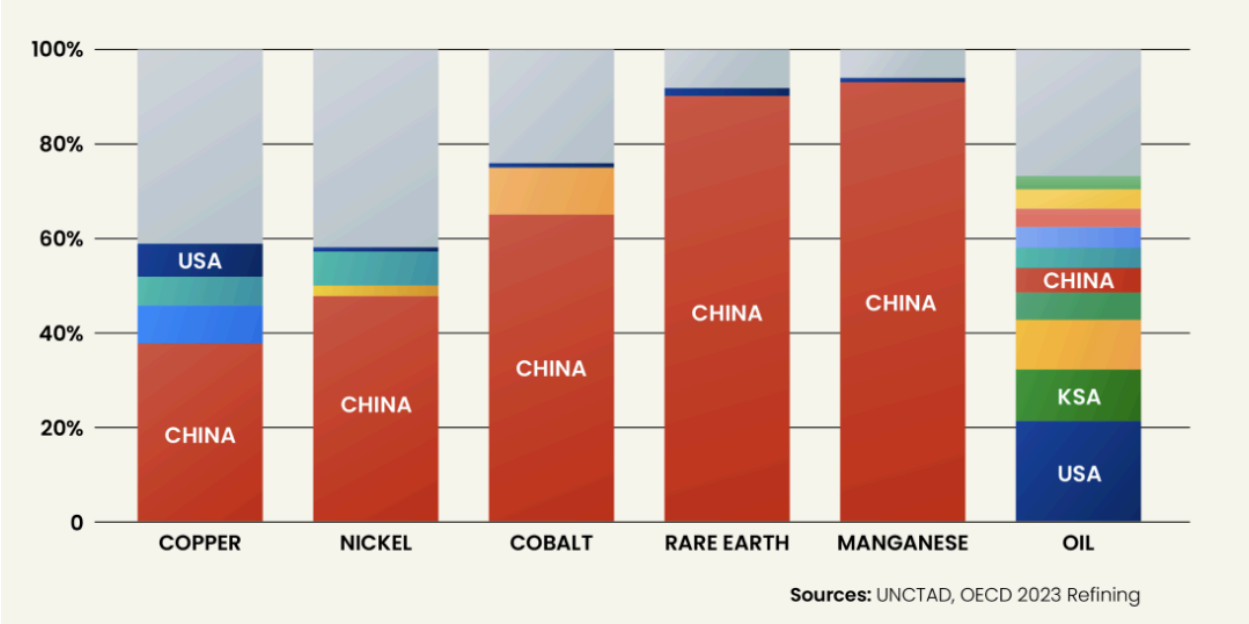
Critical Minerals are Essential to U.S. National Security and Economic Prosperity

Critical minerals are essential for a future of energy abundance and economic growth. They are essential for everything from batteries and magnets to submarine sonar and aircraft engines. We will need 330,000-420,000 tons of copper by 2030 for data centers[2]; nickel is used in military

[2] Andrea Hotter, "DeepSeek, data centers and copper demand," *Fastmarkets* (Feb. 6, 2025) (citing Macquarie estimates) https://www.fastmarkets.com/insights/deepseek-data-centers-copper-demand-andrea-hotter/.

plating, and cobalt is used in fighter jets and armor-penetrating munitions.[3] But today, America relies dangerously on foreign nations for critical minerals.

China dominates global rare earths and significant portions of critical metals such as cobalt, nickel, and copper, as shown in the image below on percentage of annual processed mineral production. They have proven they are willing to weaponize their control over these resources — just as they have our closest allies like Japan, and are now doing with us directly. In a world where the Chinese are even demanding that US allies like South Korea deny us access to anything containing their minerals, reliance on Beijing and the Chinese communist party is no longer tolerable for materials on which our economy relies.



Demand is rising rapidly for these minerals. The World Bank projects a 450% increase in demand for critical minerals like cobalt and nickel by 2050.[4] Benchmark Minerals Intelligence estimates that without seabed mining, over 300 new land-based mines would need to open by 2035 to meet global demand.[5] Recent U.S. mines have taken an average of 29 years to reach production[6]—China won't wait that long, and neither should we.

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[3] Jabbar, Silva, Kluwak, and McCaffrey, "Polymerallic Nodules and the Critical Minerals Supply Chain: A North American Approach," Wilson Center (2024) https://www.wilsoncenter.org/sites/default/files/media/uploads/documents/Polymetallic%20Nodules%20and%20The%20Critical%20Minerals%20Supply%20Chain.pdf.

[4] Kirsten Hund et al., "Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition," World Bank Group (2020), https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf.

[5] Benchmark Minerals Intelligence, "How many mines are needed for the energy transition?", *Benchmark Source*, Jan. 30, 2025, https://source.benchmarkminerals.com/article/how-many-mines-are-needed-for-the-energy-transition

[6] S&P Global, "Mine development times: The US in perspective," June 2024, https://cdn.ihsmarkit.com/www/pdf/0724/SPGlobal_NMA_DevelopmentTimesUSinPerspective_June_2024.pdf.

We cannot simply forgo these minerals without sacrificing economic prosperity, our national security, or the planet. These minerals are also vital to defense systems, all forms of energy generation, and electronics manufacturing.[7] These minerals will also power our economy through efficient batteries—including a resilient grid, tools for the warfighter, and transportation.

Alternatives to collecting new supplies of these minerals are insufficient. Recycling can be a part of the solution, but batteries from today's electric vehicles may not be available for 20 or 30 years because of the vehicles lifespan and second-life use cases like backing up intermittent renewables. The International Energy Agency forecasts that the secondary supply of batteries and the reuse of nickel will represent just 3% of total demand in 2030 and 10% in 2040.[8] Substituting current chemistries with alternatives like lithium iron phosphate batteries does not fit many use cases, such as personally-owned vehicles, because they are too heavy and lack range. This technology is also controlled by China.[9] De-growthers advocate for cutting demand for energy and minerals, but this just means shrinking our economy and eliminating jobs.

Seabed Mining is the Only Realistic Solution to Secure Critical Minerals

Seabed minerals offer the best opportunity to break our reliance on foreign nations for critical minerals without sacrificing our values or our prosperity. They offer major advantages: (1) the size of the resource, (2) outstanding economics, (3) lower social and environmental consequences, (4) independence from adversary control, and (5) speed to extract.

Resource Size: Most of the world's minerals are in the sea—an estimated $20 trillion reserve.[10] In fact, known deposits of cobalt in just a single area of the seabed are *triple* the total amount of cobalt known on land. We have mined on land since the Bronze Age, and oceans cover 71% of the world's surface, so they today contain significantly more mineral reserves.

Unrivaled Economics: Deep sea minerals offer the richest concentrations—up to 10 times richer than terrestrial mines—and have the lowest production costs, with no costly mine rehabilitation. Seabed mining does not require the same extensive new infrastructure as new land-based mines, which are typically in remote locations; we can reuse ships and ports, saving time and cost. New land mines also typically have lower grades, complex regulatory structures, and local affected residents, increasing costs. Land-based mines require specialized mining engineers that are in short supply in the United States; for seabed mining, the existing American maritime workforce can deploy Impossible Metals' technology, building on the American offshore oil and gas operations expertise.

Higher Environmental and Human Rights Standards: We have the opportunity to displace minerals from foreign mines that do not meet American environmental and human rights standards. ~75% of nickel comes from Indonesia, where the majority is controlled by

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[7] *See* World Economic Forum, https://www3.weforum.org/docs/WEF_Energy_Transition_and_Geopolitics_2024.pdf.
[8] International Energy Agency, "Nickel: Outlook for key energy transition minerals," *Global Critical Minerals Outlook 2024*, https://www.iea.org/reports/nickel.
[9] Impossible Metals, "Inconvenient Facts about LFP Batteries," Nov. 13, 2023, https://impossiblemetals.com/blog/inconvenient-facts-about-lfp-batteries/.
[10] Arthur Little

China—rainforests are destroyed, with massive loss of bio-diversity; people are forced off their land; and air and water are polluted. We see similar harms and appalling levels of child labor in the Democratic Republic of the Congo, where ~70% of cobalt comes from, with the majority of the resource controlled by China. Reducing demand for terrestrially mined minerals could reduce mineral conflicts and human rights abuses.[11]

Independence from Adversary Control: The United States has an estimated one billion tons of nodules in domestic waters, free of foreign interference.

Speed to Extract: It takes more than 29 years to bring a new land-based mine online in the U.S.[12] It simply is not economic in many cases. Fortunately, we can get these minerals much faster from the sea. Impossible Metals' technology will be ready for commercial production in 2027, leaving regulation and project financing as the only barriers to domestic production.

The truth is, if we want mines that uphold American values and are profitable, there are few viable alternatives to seabed mining.

Seabed Mining is Inevitable—The Real Question is Whether the US Leads or Lags

Seabed mining has been a theoretical opportunity for 60 years, but the world is today on the precipice of realizing it. There are 30 international exploration permits, three Cook Islands permits, plus Japan, India, and other nations are actively pursuing seabed mining in their own waters. The environmental impacts, uncertainties and risks associated with seabed mining are now understood, given the huge amount of scientific data that has been collected over the last 50 years.[13] The technology is reaching a new level.

The United States has the opportunity to set the rules—or accept them from other nations who do not have our interests in mind.

The International Seabed Authority (ISA) finalized its regulations for deep sea exploration in 2013, and has since issued 30 licenses, with China holding five—the most of any nation. They have been working for more than a decade on an exploitation mining code, but the U.S. does not sit on the ISA Council that will approve these regulations because it has not ratified the UN Convention on the Law of the Sea (UNCLOS).

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[11] *See e.g.* Siddharth Kara, *Cobalt Red: How the Blood of the Congo Powers Our Lives* (Macmillan, 2023) (explaining how a child dies daily mining for cobalt in the Democratic Republic of Congo for $1-$2 a day); Impossible Metals, *Labor Risks in Mineral Supply Chains*, Oct. 7, 2024, https://impossiblemetals.com/blog/labor-risks-in-mineral-supply-chains/; World Resources Institute, "Mining Is Increasingly Pushing into Critical Rainforests and Protected Areas," Oct. 23, 2024, https://www.wri.org/insights/how-mining-impacts-forests.

[12] S&P Global (2024).

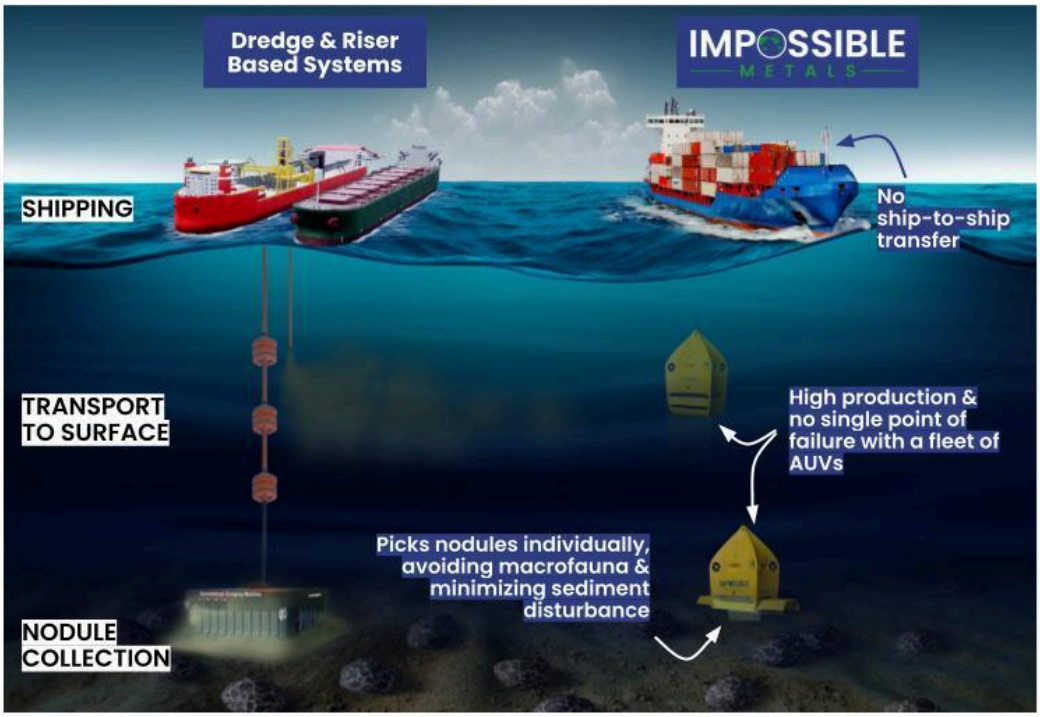
[13] For example, the Ocean Biodiversity System hosts open-access data on marine biodiversity, with more than 125 million observations on nearly 200,000 species; the ISA Deep Seabed and Ocean Database (DeepData) combines all of the baseline environmental data from 31 contractors with exploration activities in international waters, with over 10 terabytes of data that have been cited by more than 160 scientific publication; and each mining application typically requires a detailed Environmental Impact Assessment of that specific area. *See* Impossible Metals, "Data from the Deep Seabed: What Do We Know?", Feb. 19, 2024, https://impossiblemetals.com/blog/data-from-the-deep-seabed-what-do-we-know/.

China is seeking to lead in seabed minerals, which the CCP has characterized as “a new frontier for international competition.”[14] Instead, American leadership in seabed mining will ensure the industry grows responsibly, rather than being dominated by countries with lower environmental and human rights standards. New technology offers us the opportunity to play a leading role.

Impossible Metals Delivers a North American Solution to Outcompete China

We founded Impossible Metals to secure America’s critical mineral independence using homegrown, groundbreaking, selective harvesting technology, which allows us to compete globally without compromising environmental standards.

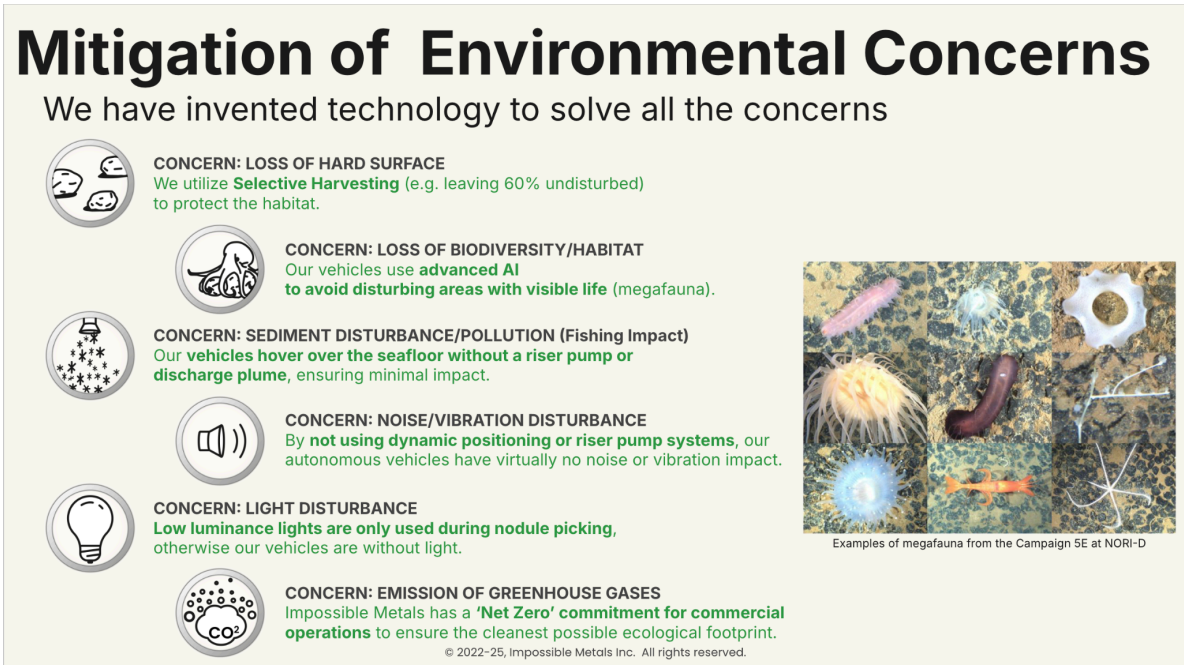
Our technology uses an Autonomous Underwater Vehicle (AUV) robotics fleet, which hovers over the seafloor without landing, using our patented buoyancy engine innovation,[15] and then uses AI-driven “pick and place” robotic arms to harvest nodules individually, minimizing disturbance of the sediment. Image sensing technology will identify megafauna present on the nodules and will leave those nodules untouched, allowing for the preservation of nodule-dependent fauna, along with a pattern of approximately 60% of total nodules. This will preserve marine biodiversity while maintaining profitability.



[14] “Lawmakers urge Department of Defense to address Chinese seabed mining,” Dec. 24, 2023, https://www.washingtonexaminer.com/policy/defense/2708100/lawmakers-urge-department-of-defense-to-address-chinese-seabed-mining/.
[15] Impossible Metals, “Impossible Metals Buoyancy Engines: A Revolution in Underwater Technology,” Apr. 22, 2025, https://impossiblemetals.com/blog/impossible-metals-buoyancy-engines-a-revolution-in-underwater-technology/

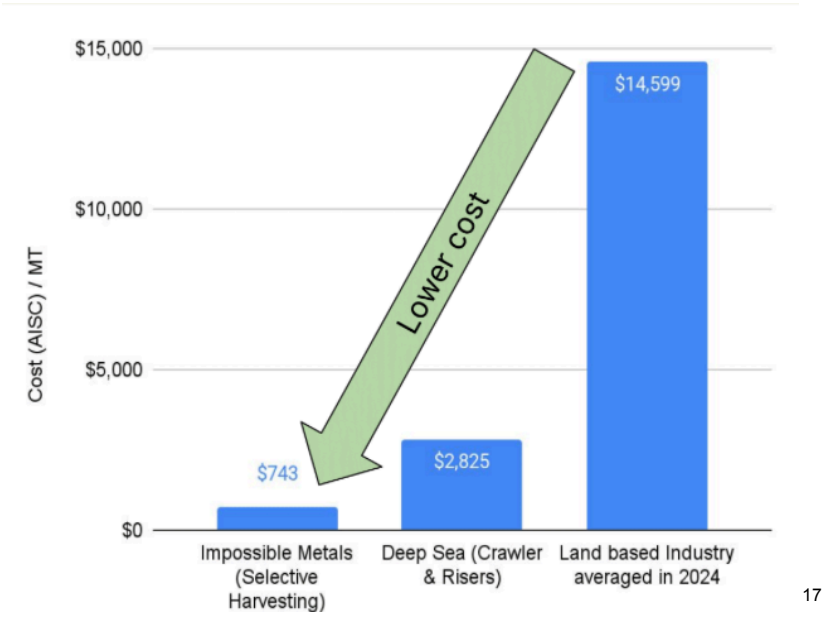
This technology has been tested in the ocean at a depth of over a mile, and we expect to be technologically ready for full scale production in 2027.

Impossible Metals' technology addresses each of the concerns of environmental advocates: it minimizes sediment disturbance and has no sediment plume because of the selective harvesting approach,[16] preserves megafauna with AI-driven algorithms, and limits noise and light pollution near the surface because there is no dedicated support ship.



Impossible Metals' technology also promises significantly lower costs—projected to be 10 times cheaper than the average new land-based nickel mine—ensuring China cannot undercut American industry with unethical labor practices or state subsidies.

[16] Independent modeling by DHI Water and Environment, a respected third-party firm, analyzed the expected sediment plume and sediment disturbance, along with related environmental impacts of Eureka III, to support an environmental impact statement for a planned trial of Eureka III, the production scale Impossible Metals device. This study concluded that the sediment discharge rate is expected to be approximately 46 kg/hour, with no sediment plume. This is substantially lower than alternatives. Impossible Metals is planning a live test to validate this preliminary modeling based on observational data. See "Environmental Impact Statement for small-scale testing of an AI-controlled nodule harvester in the eastern BGR contract area for the exploration of polymetallic nodules (Clarion-Clipperton Zone), "Appendix A," available at https://www.bgr.bund.de/EN/Themen/MarineRohstoffforschung/Downloads/2025_Manganknollen_241218_BGR_EIS.pdf?__blob=publicationFile&v=3.



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That cost advantage comes in part from the lower cost of the resource—nodules are high grade, have four metals, and have low infrastructure costs—and in part from our proprietary technology, which includes a fully automated AI robotic collection system that allows for reusing existing shipping transport vessels. No stationary support vessel or ship-to-ship transfers are required, and we can operate in a wide range of sea states, enabling high utilization.

Impossible Metals has published our full economic model online, which is now on its sixth iteration, allowing anyone to examine the validity of our estimates.

Opponents of deep sea mining ask us to choose between economic growth, preserving our environment, and securing our nation. Impossible Metals shows that American ingenuity is the solution to that impossible choice.

We Have an Opportunity to Build an American Industry, Leveraging American Resources

An American seabed minerals industry would include extraction from domestic sources, processing minerals, and offtake of nodules and materials. The Administration has estimated that the industry could generate $300 billion in American economic output over 10 years and create 100,000 domestic jobs.[18]

Extraction: The U.S. Exclusive Economic Zone (EEZ) is estimated to have 1 billion metric tons or more of nodules.[19] In particular, the area of the EEZ about 130-305 miles off the coast of American Samoa is believed to have extraordinarily rich deposits of critical minerals, potentially

[17] "Impossible Metals Concept Economics v6," March 2025, https://docs.google.com/presentation/d/13w_RYyhDZSGUjttbUrHBa3jvesm7ddvY-3DnAlfT72Q/edit#slide=id.g27f03fad5f7_0_0.

[18] https://www.reuters.com/business/energy/trump-expected-sign-deep-sea-mining-executive-order-thursday-sources-2025-04-24/

[19] *Id.*

making it one of the world's leading sources. The Cook Islands' EEZ, adjacent to this area, has an estimated ~12 billion tons of critical minerals,[20] and the seafloor geology, deep-sea currents, and sedimentation rate suggest that mineral-rich deposits will be found in the U.S. EEZ nearby.

American Samoa's deep-water port and industrial base positions it as an ideal hub for economic development, potentially creating over 1,000 local jobs directly and supporting related industries, such as servicing mining vessels operating in domestic waters and the neighboring Cook Islands, and potential processing facilities.

There is an existing, elaborate process for leasing of domestic mineral resources under the Outer Continental Shelf Lands Act.[21] The Bureau of Ocean Energy Management may, on its own initiative or in response to a request from an American person, offer areas of the U.S. EEZ for lease, including areas adjacent to U.S. territories such as American Samoa. The process under the current regulations is extensive, involving environmental review, at least four public comment periods, and engagement with the Governors of adjacent states before a competitive lease sale process commences. The lease agreements are expected to include a royalty and rental payment to the U.S. Treasury. The leaseholder has the right to explore, but additional approvals are required for test mining and commercial harvesting.

Since the law's enactment, BOEM has not yet exercised this authority for critical minerals.[22] Now is the time. Earlier this month, Impossible Metals submitted a formal request to BOEM to begin the leasing process. BOEM says they will decide by May 23 whether to proceed with a lease sale.[23] We urge them to proceed: companies need the regulatory certainty of a lease sale to invest the large sums required to conduct research and full scale exploration. If BOEM moves forward, Impossible Metals would engage in the public comment process with other stakeholders and participate in the bid process on the same terms as all bidders.

Processing: The U.S. totally lacks domestic processing facilities for critical minerals, and none of the critical smelting facilities are in North America. The U.S. has no processing capability, and Canada has 0% of processing capacity for rare earth elements, 3% for nickel, and 4% for cobalt, with the remainder entirely outside of North America. China, meanwhile, is the single largest processor for rare earth elements (90%) and cobalt (74%), while nickel processing isdominated by China, Japan, and Russia.[24] Without domestic facilities, adversaries can restrict our access, we forfeit jobs, and our industries pay higher transport costs.

In the near-term, polymetallic nodules can be processed in existing facilities in allied nations, such as Japan, Australia, or Canada. Existing facilities have proven capable of processing

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[20] Katy Watson, "Mining the Pacific—future proofing or fool's gold?", Dec. 9 2024, https://www.bbc.com/news/articles/c17d04ljzxko.
[21] 43 U.S.C. 1337(k); *see also* https://www.boem.gov/marine-minerals/obtaining-marine-minerals/competitive-leasing-ocs-marine-minerals# .
[22] It has been used for gold, sand, and gravel.
[23] https://www.metaltechnews.com/story/2025/04/23/mining-tech/deep-sea-mining-two-paths-one-goal/2247.html
[24] Wilson Center (2024).

nodules without requiring new capital expenditures. For the long-term, Impossible Metals supports government investment in creating domestic processing facilities for nodules.

Offtake: Signalling market demand for American nodules will strengthen the ability of innovators to finance projects. The growing U.S. manufacturing sector in areas like batteries presents an attractive market for nodule products, especially if logistics costs and risks can be reduced through U.S.-based processing, but the government can play a role in kickstarting this market by purchasing and stockpiling polymetallic nodules from US companies. This would provide a strategic reserve of critical metals, encourage construction of domestic nodule mineral processing facilities adjacent to the stockpiles, and generate a profit for the US taxpayer as the metal price will likely rise.

As the innovation leader in deep sea mining and with our rich supply, America has a golden opportunity to take the lead in deep sea mining and beat China in global markets. However, it will require bold policy action to deliver that promise.

Immediate Action is Needed from U.S. Policymakers to Unlock US Potential

Last week, President Trump's Executive Order on *Unleashing America's Offshore Critical Minerals and Resources* laid out a series of "immediate action[s] to accelerate the responsible development of seabed mineral resources. . . ." Congress must match that boldness by improving permitting, incorporating polymetallic nodules into the National Defense Stockpile, supporting the development of domestic mineral processing facilities, prioritizing federal exploration based on the availability of resources, and funding mining innovation.

<u>Expedite Permitting for Domestic Minerals</u>

Congress should support the President's direction to BOEM to expeditiously launch the process for reviewing and approving critical minerals permits within the U.S. EEZ.[25] Congress could also provide greater regulatory clarity to the leasing process by:

- *Provide a five-year outlook*: Providing a five-year outlook on the Marine Minerals Program, similar to the National OCS Oil and Gas Leasing Program, would inform prospecting activities. However, based on the experiences with the Oil and Gas Leasing Program and as a sub-regulatory guidance document that does not generate reliance interests, this should have far fewer formal requirements; in line with Executive Order 13891, a single comment period should be sufficient.

- *Specifying statutory timelines for each stage of the leasing process*: Most steps that involve BOEM's decisionmaking and analysis do not have a defined timeline. Setting such timelines, even generous ones, would provide greater predictability.

[25] *See* Executive Order on Unleashing America's Offshore Critical Minerals and Resources (Apr. 24, 2025), Sec. 3(b)(i) ("The Secretary of the Interior shall establish an expedited process for reviewing and approving permits for prospecting and granting leases for exploration, development, and production of seabed mineral resources . . . [that will] ensure efficiency, predictability, and competitiveness for American companies.").

- *Provide preference in a lease sale to companies that have completed prospecting activities in the area, on a pilot basis*: The international leasing system has shown that providing preference on exploitation leases to those who complete exploration provides a strong incentive to take risk in a nascent industry, while preserving the public interest in maximizing the likelihood of active use of national resources and the highest revenues to the Treasury. The U.S. could incorporate such a preference into its leasing program either by following the ISA approach (breaking the process into two separate lease stages but giving exploration lessees a right of first refusal if someone else seeks an exploitation lease before them), or by incorporating a right of first refusal into the competitive bid process (e.g., the right to match the highest value sealed bid).

  Once the industry is more mature, a pure competitive bid process similar to OCS oil and gas leasing may be the most efficient, but today greater incentive is needed to spur at-risk prospecting and exploration by the private sector. It is difficult for a company to estimate the royalty rates they should bid for an area that has not been explored and a product that has not previously been brought to market, and the lease sale process is uncertain. Therefore, it may make sense to implement a preference system on a pilot basis (e.g., for exploration leases offered in the next ten years), and then revert to a traditional sealed bid system once the industry is more mature.

- *Apply environmental permitting reforms to seabed mining*: As the Committee prepares to reconsider permitting reforms that preserve environmental protections but accelerate timelines, these improvements (which are needed for all energy projects) should also be applied to seabed mining permits.

- *Matching the minimum length of lease terms to the ISA's proposed length of 30 years*: The proposed primary exploitation contract length for ISA licenses will be 30 years, plus a further 30 year extension, compared to 20 years in the U.S. (which includes time spent on exploration and test mining, and starting exploitation). American companies in the U.S. EEZ should not be disadvantaged compared to foreign competitors operating in international waters; matching the lease term would address this disparity.

- *Prioritizing critical minerals in BOEM staffing for the near term*: President Biden's final budget request included two FTE at BOEM to cover critical minerals, despite the vast potential of the U.S. EEZ. While we understand the constrained budget environment, ramping up this new area of work may require additional staff time for the near term.

These improvements will increase the number of critical mineral offshore leases and generate incremental revenue for the taxpayer.

<u>Establish Mineral Processing Facilities in the US for Deep Sea Minerals</u>

Congress should direct the National Defense Stockpile to include deep sea nodules procured from American waters and nodule-drived minerals, to provide minerals in case of need for the national defense and to incentivize nodule processing facilities to be constructed in the US.

Congress should also support investments in new facilities directly through programs such as the Defense Production Act, innovation grants to developers of new approaches to processing that can efficiently refine the multiple metals found in seabed minerals, or critical minerals trade agreements with allies that possess relevant facilities.

Prioritize Exploration Based on Critical Minerals Resources

The nation's oceanic research agencies are seeking to map the deep waters of the U.S. EEZ by 2030. As of December 2024, only 52% of coastal, ocean, and Great Lakes waters have been mapped, and the agency says it is on track to miss its goal by eleven years, finishing only by 2041.[26] Prioritization and reform are needed.

Research agencies should prioritize areas with potential deep sea mineral resources for earlier mapping and nodule sampling. In fall 2024, as part of an existing planned NOAA mission in the EEZ near American Samoa, BOEM was able to complete four days of multibeam mapping and attempted nodule collection (from seamounts, but not the abyssal plain)—this opportunistic research was a great start, but more deliberate and comprehensive research is needed.

Funding Innovation

To ensure America leads the world in mineral innovation, the Department of Energy should increase its focus on innovation in mineral collection, and work with the Departments of Defense, Interior, and Transportation to coordinate investments and bring innovations to market. The Marine Minerals Resources Act also authorized Interior to support research on marine mineral technology; this program is dormant due to lack of funds, but should be resurrected.

In deep sea mining, there are R&D opportunities in next-generation mining AUVs, launch and recovery systems, and next-generation refining processes for nodules, and there are manufacturing opportunities to build mining AUVs in the U.S., complete vessel retrofitting with launch and recovery systems, and build new mineral processing facilities.

Conclusion

The United States stands at a pivotal moment, with an unprecedented opportunity to reclaim control over its critical mineral supply chains, safeguard national security, and drive sustained economic prosperity. The technology is ready, the resources are abundant, and the global demand for critical minerals will only accelerate. America cannot afford to lag behind.

By moving decisively, we can ensure that deep-sea mining develops according to American standards—protecting our values and fueling sustained economic prosperity.

[26] National Ocean Mapping, Exploration, and Characterization Council, "Implementation Plan Update for the National Strategy for Ocean Mapping, Exploring, and Characterizing the U.S. EEZ," Dec. 2024, https://www.noaa.gov/sites/default/files/2025-01/2024%20NOMEC%20Implementation%20Plan_FINAL.pdf.