The United States of America, House of Representatives
The House Natural Resources Committee
Subcommittee on Oversight and Investigations

Hearing titled "Unleashing American Energy Dominance and Exploring New Frontiers."
To be held on Wednesday, Dec. 3, 2025, at 2:00 p.m.
Room 1324 Longworth House Office Building.

Testimony
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Ladies and Gentlemen,

Thank you, Chair Paul Gosar, Vice Chair Lauren Boebert, and Ranking Member Maxine Dexter, and other members for the opportunity to present before the Natural Resources Oversight and Investigations Subcommittee.

Today, we stand at the threshold of a transformation as profound as the first Industrial Revolution. It is imperative that we explore how the United States can unleash American energy dominance and secure its leadership in the global economy.

My name is Nicholas Lugansky, and I serve as Head of Mining at SLB, formerly Schlumberger. At SLB, a company that for 100 years has been at the forefront of oil and gas exploration and production, we see tremendous opportunities to accelerate U.S. mining capabilities by transferring and adapting proven oil and gas technologies to the mining sector.

The world is witnessing a paradigm shift, an era where oil and gas, the backbone of the 20th-century economy, especially in the United States, are gradually being replaced by minerals essential to building an electrified and digital future.

As the global economy pivots from fossil fuels towards a foundation built on mining and metals, an industry that supplies critical materials to sustain our electrical grid, mobility, advanced technologies, and the defense industry. The question is how the United States can maintain its dominance, considering it is currently a net importer of most metals and minerals required for the this transition.

Before I answer this question, please consider this:

1) **The electrical grid transmission systems** require large amounts of copper, aluminum, nickel, steel, plus lithium and rare earth elements (REE) for battery storage for a more and more distributed grid.

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2) **The electric vehicles and e-mobility** rely on lithium, copper, cobalt, nickel, steel, aluminum, and minerals that go into the advanced electronics.
3) The **advanced electronics** need minerals such as lanthanum, cerium, neodymium, and europium for semiconductors; europium, terbium, and yttrium in LED displays used in phones, TVs, cars, etc.; and gadolinium and lutetium for medical equipment like MRI.
4) The US **defense industry** requires a long list of critical minerals to develop weapons that provide for our national security and military supremacy; these range from well-known elements such as copper, titanium, and aluminum to REEs such as promethium (used in nuclear batteries), neodymium, dysprosium, and terbium for military electronics; and praseodymium for magnets, one of the most critical components in defense and aviation systems.

Today, the world has several challenges:

First of all, there are not enough of these minerals mined to meet the growing demand spurred by the world's electrification.

To meet the projected demand, we need to open 293 new mines in the world by 2030, according to Benchmark Minerals, among them:

- 70 lithium mines
- 70 nickel mines
- 80 copper mines
- 30 cobalt mines
- And numerous small REE mines or recycling facilities.

Secondly, the mineral supply chains, particularly those related to lithium and rare earth elements, are largely dominated by China.

So what do we do:

- We need to bring technologies that will allow us to extract minerals faster, cheaper, and with a smaller environmental footprint.
- We need to support domestic production and especially expedite permitting for domestic producers.
- We need to foster a competitive domestic and partner mining and metals market.

Let me address these three themes:

1. *Mining and the adoption of the new technologies for faster, cheaper and more sustainable mineral extraction.*

Mining is one of the most capital-intensive and strategically vital industries in the global economy. From exploration to production, the development of a single mine can require many billions of dollars in upfront investment, which covers land acquisition, permitting, infrastructure, equipment, and processing facilities. For example, the capital expenditure (CAPEX) of the top 40 global mining

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companies reached $72 billion USD in 2021, underscoring the scale of financial commitment required to bring mineral resources to market.

This intensity is not limited to initial investment. Operating expenditure (OPEX), which includes labor, energy, maintenance, water management, and environmental compliance, can rival or exceed CAPEX over the life of a mine. Yet, despite its economic significance, mining remains under pressure to modernize.

Let me give you an example: developing a single copper mine can cost between $5 billion and $10 billion, with processing plants alone accounting for $3–$4 billion. Mining trucks can cost tens of millions, and operations are typically designed to last 20 to 40 years. These figures underscore the immense financial commitment required to bring a mine into production. With such high stakes, the industry has historically been cautious about adopting new technologies. Yet as global demand for critical minerals surges, supply constraints and environmental scrutiny intensify, the need for cost-saving, efficient, and sustainable solutions has never been more urgent.

At SLB, we led technological innovations for 100 years in the oil and gas industry, and we believe that the lessons we learned in one of the world's most capital-intensive extracting industries are directly applicable to the mining industry. Considering that there are similarities between the two industries, such as:

1) Both industries have **an upstream step**, where we prospect, explore, and define the mineral or hydrocarbon resource. In this stage, both industries rely heavily on subsurface imaging, geophysical data, and drilling technologies.
2) In **a midstream step**, both industries deal with early processing of ore or hydrocarbon into shippable commodities destined to smelters and refineries.
3) Finally, both industries have **a downstream step**, where the metals and petrochemical products are produced.

This means that as we opened many oil and gas reserves by smarter technologies, such as the Permian basin non-conventional oil and gas fields, we can mine smarter too. As such, we believe that collaboration between the oil and gas and mining industries is a must if we want to make a technological leap. Here are just a few areas where we believe this collaboration can yield significant value-added outcomes, especially from SLB’s perspective.

1) **Digitally assisted exploration**

   Advanced subsurface imaging: One of the most transferable technologies is advanced subsurface imaging. In the oil and gas industry, advanced geophysical techniques, such as 3D and 4D seismic surveys and magnetic resonance imaging, are used to map underground reservoirs with extraordinary precision.

   Advanced logging technologies are already playing a transformative role in how mining companies characterize subsurface environments. High-definition spectroscopy tools now enable detailed, quantitative mineral analysis directly from boreholes, significantly improving the accuracy of reserve estimation while reducing the need for extensive exploration drilling. These systems use pulsed neutron generators and precision gamma ray detectors to measure a

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wide range of elements, providing comprehensive lithological insights that support faster and more confident decision-making.

High-resolution micro-resistivity images that deliver core-like visuals of geological formations. These tools offer nearly full circumferential borehole coverage and precise dip measurements, which are essential for mapping complex geological structures and sedimentary features. Their versatility across different resistivity conditions makes them a practical and cost-effective alternative to conventional close-matrix coring. Together, these logging innovations enhance geological understanding, reduce uncertainty, and enable more efficient and cost-effective resource development in increasingly complex mining environments.

Real-time monitoring systems, including fiber-optic sensing and automated seismic detection, are widely used in oilfields to ensure safety and optimize production. In mining, these systems can be deployed to monitor ground stability, detect seismic activity, and manage blasting operations with greater precision.

Mobile field laboratories, a staple in oil and gas exploration, are compact, transportable units equipped with advanced analytical tools that deliver lab-grade results on-site. These labs allow geologists and engineers to analyze rock and fluid samples in real time, accelerating decision-making and reducing the need to send samples to distant laboratories

Digital integration platforms combine geological, operational, and environmental data into a unified model.

These same techniques can be adapted to mineral exploration and production, enabling mining companies to reduce reliance on costly and invasive drilling campaigns while improving the accuracy of resource models. As such, mining operations can benefit from similar systems to optimize mine planning, reduce downtime, and improve environmental compliance

2) Drilling and extraction techniques

Advanced drilling techniques: Horizontal drilling and well construction, another hallmark of the oil and gas industry, offer significant advantages for aqueous minerals mining (for lithium, boron, bromine, magnesium, manganese, etc.) and mine dewatering, where fluid quality and flow rates are key to efficiency. Instead of drilling dozens of vertical wells around a mine site, a minimal number of horizontal wells with specialized well completion solutions can intercept aquifers more efficiently, reduce surface disruption, and centralize water treatment, lowering both capital and operational costs.

In-situ mining: the advancement of well construction, micro-fracturing, electromagnets, and leaching chemistries is opening doors to consider non-invasive and cost-efficient extraction of minerals without building a huge mining pit or complex underground tunnels. The system allows to have just two wells to create a geological formation with fractures and then use leaching agents to take minerals out of the rock and extract them through a producer well.

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These technologies are not speculative. They are proven, scalable, and ready to be adapted to mining. The challenge lies not in inventing the technologies but in translating these innovations through establishing operational and cultural bridges between the two industries to unlock shared value. We strongly believe that the adoption of advanced technologies in mining delivers tangible benefits across the entire stakeholder spectrum from operators to investors, and, of course, to communities. According to McKinsey, digitization in mining can lead to a 10–30% increase in productivity, a 20–40% reduction in operating costs, and a 50% decrease in downtime.

Finally, these technologies have a measurable impact on social acceptance of mining. As representatives of your districts, you know firsthand that no one wants a mine in their backyard. However, by adopting technologies that foster resilience, inclusion, and environmental stewardship, we can develop mining resources in the United States. These new solutions allow us to protect water, reduce earth disturbance and subsidence, and provide high-paying jobs.

2. Support domestic production and especially expedite permitting for domestic producers.

The domestic supplier is facing two pressures: one is a long federal, state, and local permitting process, and the other is a commodity pricing uncertainty for capital-intensive projects. I am not going to dwell on these, as much of the industry has been discussing these concerns. I would just urge the committee to take decisive action that will help the domestic producers and allow to shorten the mining project development cycle from 15-20 years by 3-5 times.

3. Foster a competitive domestic and partner mining and metals market.

US industries grow the best if there is healthy competition. We thus need to ensure that regulators provide equal access to water, land, and mineral resources to all players and take appropriate action if some actors try to monopolize these resources.

In closing, I would like to thank the members of this committee for sharing ideas on how we can regain the leadership in mining through technological innovations and cross-industry collaboration.

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