FULL BLAST: CONTRASTING MOMENTUM IN THE SPACE MINING ECONOMY TO THE TERRESTRIAL MINING REGULATORY MORASS

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

OF THE

COMMITTEE ON NATURAL RESOURCES
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED NINETEENTH CONGRESS

FIRST SESSION

Tuesday, February 25, 2025

Serial No. 119–9

Printed for the use of the Committee on Natural Resources

Available via the World Wide Web: http://www.govinfo.gov
or
Committee address: http://naturalresources.house.gov

U.S. GOVERNMENT PUBLISHING OFFICE
59–390 PDF WASHINGTON : 2025

COMMITTEE ON NATURAL RESOURCES

BRUCE WESTERMAN, AR, *Chairman*
ROBERT J. WITTMAN, VA, *Vice Chairman*
JARED HUFFMAN, CA, *Ranking Member*

Robert J. Wittman, VA
Tom McClintock, CA
Paul Gosar, AZ
Aumua Amata C. Radewagen, AS
Doug LaMalfa, CA
Daniel Webster, FL
Russ Fulcher, ID
Pete Stauber, MN
Tom Tiffany, WI
Lauren Boebert, CO
Cliff Bentz, OR
Jen Kiggans, VA
Wesley P. Hunt, TX
Mike Collins, GA
Harriet M. Hageman, WY
Mark Amodei, NV
Tim Walberg, MI
Mike Ezell, MS
Celeste Maloy, UT
Addison McDowell, NC
Jeff Crank, CO
Nick Begich, AK
Jeff Hurd, CO
Mike Kennedy, UT

Raúl M. Grijalva, AZ
Joe Neguse, CO
Teresa Leger Fernández, NM
Melanie A. Stansbury, NM
Val T. Hoyle, OR
Seth Magaziner, RI
Jared Golden, ME
Dave Min, CA
Maxine Dexter, OR
Pablo José Hernández, PR
Emily Randall, WA
Yassamin Ansari, AZ
Sarah Elfreth, MD
Adam Gray, CA
Luz Rivas, CA
Nydia M. Velázquez, NY
Debbie Dingell, MI
Darren Soto, FL
Julia Brownley, CA

Vivian Moeglein, *Staff Director*
William David, *Chief Counsel*
Ana Unruh Cohen, *Democratic Staff Director*
http://naturalresources.house.gov

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

PAUL GOSAR, AZ, *Chairman*
LAUREN BOEBERT, CO, *Vice Chair*
MAXINE DEXTER, OR, *Ranking Member*

Lauren Boebert, CO
Mike Collins, GA
Mark Amodei, NV
Nick Begich, AK
Bruce Westerman, AR, *ex officio*

Yassamin Ansari, AZ
Pablo José Hernández, PR
Vacancy
Jared Huffman, CA, *ex officio*

CONTENTS

HOUSE COMMITTEE ON

NATURAL RESOURCES

CHAIRMAN BRUCE WESTERMAN

To: House Committee on Natural Resources Republican Members

From: Subcommittee on Oversight and Investigations Staff, Michelle Lane (Michelle.Lane@mail.house.gov) and Lucas Drill (Lucas.Drill@mail.house.gov) x52761

Date: February 24, 2025

Subject: Oversight Hearing titled *"Contrasting Momentum in the Space Mining Economy to the Terrestrial Mining Regulatory Morass"*

The Subcommittee on Oversight and Investigations will hold an oversight hearing titled *"Contrasting Momentum in the Space Mining Economy to the Terrestrial Mining Regulatory Morass"* on Tuesday, February 25, 2025, at 10:15 a.m. in 1324 Longworth House Office Building.

Member offices are requested to notify Cross Thompson (Cross.Thompson@mail.house.gov) by 4:30 p.m. on February 24 if their Member intends to participate in the hearing.

I. KEY MESSAGES

- Minerals, particularly critical minerals, are vital to life today, tomorrow, and into the future.
- Although the U.S. has countless mineral deposits within its borders, long permitting timelines and anti-mining policies advanced by progressive NGOs and previous administrations have stymied domestic mining activity.
- While timelines for developing domestic mining resources grow, foreign adversaries like China increase their foothold on the worldwide supply chain of production, processing, and refining of critical and hardrock minerals, making U.S. domestic supply chains increasingly vulnerable.
- American space mining companies are leading a technological revolution that may soon enable the financially viable mining of natural resources from celestial bodies.
- The time is now to embrace both permitting reform for domestic mining and new technologies that will ultimately benefit all forms of mining as the United States seeks to secure its domestic mineral supply chains.

II. WITNESSES

- **Mr. Misael Cabrera**, Director, Professor of Practice, School of Mining and Mineral Resources, The University of Arizona, Tucson, AZ
- **Mr. Steven Place**, Senior Policy Advisor, AstroForge, Washington, DC
- **Mr. Saurav Shroff**, CEO, Starpath, Hawthorne, CA
- **Mr. Richard Painter**, Professor of Corporate Law, University of Minnesota Law School, Minneapolis, MN (Minority witness)

III. BACKGROUND

Minerals are Vital to Modern Life

Minerals, particularly those listed as critical minerals by the Department of the Interior's U.S. Geological Survey (USGS), are integral to our modern way of life and will remain essential indefinitely. Critical and other hardrock minerals are used in countless applications, including consumer electronics, medical devices, satellites, and military technologies essential to national security. Minerals are also imperative to the development and use of alternative energy technologies, including batteries.

The global demand for minerals is expected to rise exponentially in the decades ahead. Notably, according to the World Bank, the growing demand for minerals will increase nearly 500% by 2050.[1] The growing demand for minerals strongly correlates to the growing demand for energy technologies such as EV batteries, solar photovoltaic (PV), wind, and geothermal energy, which are more mineral-intensive than fossil fuel technologies.[2] Climate goals further drive the demand for minerals. For instance, to achieve net-zero emissions globally by 2050, the world will require a sixfold increase in mining by 2040.[3] Moreover, as new technologies that are yet to be imagined materialize, the demand for mined minerals will only increase.

Yet, despite widespread acknowledgment of the importance of critical and other hardrock minerals to our future, as well as mapped mineral systems covering every state in the U.S.,[4] America's mineral supply chain is suffering. Due largely to permitting delays and legislative restrictions that discourage domestic investment and restrict long-term mineral supply, mineral extraction in the U.S. is nonsensically slow.[5] In fact, a 2024 study by S&P Global found that U.S. critical mineral projects take an average of 29 years from discovery to production—the second-longest in the world.[6] Only Zambia is less efficient in mining minerals within its own borders.[7] Worse yet, U.S.-based mining projects also lose over one-third of their value due to delays during the permitting process.[8] Because of these self-inflicted wounds, the United States is almost entirely reliant on foreign nations to feed its need for minerals.

Dependence on Foreign Nations for Minerals Presents Serious Economic, National Security, and Humanitarian Threats

The United States is alarmingly dependent on foreign nations to meet its mineral demand. Of the 50 minerals identified by the U.S. government as critical, America imports more than half of its supply for 29 of them and all of its supplies for 12 more.[9] Unfortunately, but unsurprisingly, China dominates the world market in both raw and refined products.[10]

Chinese mineral supply chains account for approximately 60% of worldwide production and 85% of processing and refining capacity.[11] The United States is import-reliant on China for 26 of the 50 minerals [12] designated as critical.[13] China also dominates mineral refining, accounting for 85–90% of global rare earth element mine-to-metal refining.[14] Notably, China refines 80% of the world's cobalt, 60% of the world's lithium,[15] and 65% of the world's nickel,[16] critical minerals that are integral for modern technology and electric vehicles.

Relying on foreign nations, particularly China, for minerals has clear economic, national security, and humanitarian implications. China has repeatedly used its mineral supply dominance to strategically flood markets, stifle foreign competition, and cripple industries through export bans. For example, in 2023, after new Chinese-backed production drove a steep decline in cobalt prices, Idaho Cobalt Operations (ICO), America's only cobalt mine, was forced to suspend construction mere weeks before it came online.[17] Additionally, Chinese export bans have pummeled U.S. mineral supply chains. In July 2023, China curbed gallium and germanium exports, followed by high-purity and high-quality graphite and rare earth elements mining, mineral processing, and smelting technology later in the year.[18] On August 14, 2024, China issued export restrictions on antimony, a mineral vital for the defense industry.[19] On December 3, 2024, China announced export bans on "dual-use" technologies explicitly targeted at the U.S. after the U.S. took steps to limit exports of semiconductor and artificial intelligence (AI) technologies to China.[20]

Furthermore, whereas U.S. labor and environmental protections are among the best in the world, China's and many other mineral-producing nations are among the worst. For example, China-backed operations in Congo have well-documented cases of forced and child labor in the mining sector, with labor practices often labeled "modern-day slavery."[21] Similarly, workers in China-financed industrial parks in Indonesia face abuses like unsafe conditions, deceptive requitement, unpaid wages, restricted movement, and even physical violence as a means of punishment.[22]

The United States cannot allow foreign governments to continue locking mineral supply chains in a stranglehold. Instead, the U.S. approach to mining ought to be two-fold: (1) streamline permitting and mining processes to expand domestic mineral extraction; and (2) embrace American companies investing in new technologies to expand American mineral production.

Space Mining

Definitionally, space mining refers to mining for resources on celestial bodies like moons, asteroids, and planets. Specifically, the term "space mining" refers to two categories of activities:

1. *Extractive Mining for Commercial Purposes:* The extraction of resources from asteroids, the Moon, Mars, or other celestial bodies and their return to the Earth for commercial purposes. Examples include mining asteroids for critical minerals and precious metals, such as lithium, platinum, and rhodium.
2. *In-Situ Resource Utilization (ISRU):* Resources are extracted from a celestial body to be used for other in-space activities.[23] An example includes mining for water on the Moon to make fuel for lunar activity or a permanent Moon presence.[24]

Domestic Governance Frameworks for Space Mining

51 U.S.C. § 51302 directs the federal government to facilitate and promote "commercial recovery of space resources" and to discourage government barriers to such activities. Per 51 U.S.C. § 51303, U.S. commercial entities are entitled to any space resources they obtain, including the use or sale of those resources.

USGS plays a key role in achieving 51 U.S.C. § 51302's goals. Foundationally, USGS is tasked with "examination of the geological structure, mineral resources, and products of the national domain."[25] In 1962, Congress extended USGS' jurisdiction to include resources "outside the national domain" if DOI determined that those resources were important to national interests.[26] One year later, USGS founded its Astrology Science Center, which researches planetary geology and maps celestial bodies.[27] In 2015, USGS explicitly applied its jurisdiction to space.[28]

Importantly, USGS actively analyzes natural resources on asteroids, the moon, and other celestial bodies to, among other things, help develop the domestic framework for space mining.[29]

Executive Order 13914, Encouraging International Support for the Recovery and Use of Space Resources, was issued in April 2020 and directed the Department of State, Department of Commerce, and National Aeronautics and Space Administration (NASA) to take appropriate actions to encourage international support for public and private recovery and use of space resources.[30] Other countries have also "enacted domestic legislation permitting and regulating space mining activities," such as Japan, Luxembourg, and the United Arab Emirates.[31]

International Governance Frameworks for Space Mining

There are three main international governance frameworks for space mining: the Outer Space Treaty, the Moon Agreement, and the Artemis Accords.[32]

1. *Outer Space Treaty:* The Outer Space Treaty, executed in 1967, is the foundational treaty governing space activities, with over 100 countries as signatories.[33] Articles I and II of the Outer Space Treaty pertain to space mining and ISRU. These Articles establish outer space as the "province of all mankind" and prevent claims of sovereignty in space.[34]
2. *Moon Agreement:* The Moon Agreement, signed in 1979 and executed in 1984, is a multilateral agreement with 11 signatories.[35] Article 11 of the Agreement states that the surface and subsurface of the Moon and its resources cannot become the property of any country, intergovernmental organization, or non-governmental entity.[36] The United States, Russia, and China have not signed the Moon Agreement.
3. *Artemis Accords:* The Artemis Accords, initiated in 2020, are a U.S.-led, nonbinding multilateral agreement among nations that establishes a set of principles and guidelines for space exploration.[37] Signing the Artemis Accords is a prerequisite for participation in NASA's Artemis program, a robotic and human lunar exploration program.[38] Section 10 of the Artemis Accords directs signatories to extract and utilize space resources in accordance with the Outer Space Treaty.[39]

Space Mining Has Almost Limitless Potential

Natural resources on the Moon, Mars, and asteroids may improve conditions on Earth and allow humanity to expand further into space.[40] Celestial bodies, such as moons and asteroids, contain potentially enormous amounts of metals and minerals. For example, the average geological concentration of certain metals is much higher in metallic asteroids than on Earth.[41] Researchers at the Colorado School of Mines and the International Monetary Fund found evidence that this is especially true for critical minerals such as cobalt, nickel, platinum, and other metals.[42] Notably, the

study found that metallic asteroids contain more than a thousand times as much nickel as the Earth's crust in terms of grams per metric ton.[43]

The density and abundance of minerals on celestial bodies makes the economic potential for space mining almost incomprehensible. Asterank, an asteroid database project that studies asteroid composition and measures the potential value of over 6,000 asteroids that NASA currently tracks, has determined that mining just the top 10 most cost-effective asteroids, those that are both closest to Earth and greatest in value, would produce a profit of around $1.5 trillion.[44]

Space Mining Supplements Mining on Earth

An emerging technology, mining minerals in space is currently not possible without crucial support from the domestic mining industry. For example, American space mining companies typically "rideshare" on commercial spaceflight operations, many of whom utilize a large quantity of stainless steel in building their rockets.[45] The mining companies themselves often build their own robotics systems, which use both "off the shelf" and proprietary components, some of which, like most modern communications systems, require critical and rare earth minerals.[46]

In due course, the resources extracted from celestial bodies may directly benefit domestic mining operations by increasing the availability of necessary minerals. While regulatory burdens continue to slow mining in the United States, foreign nations like China choke off exports, and existing domestic mineral supplies shrink, minerals mined in space could be used on Earth to build chips and machinery necessary to support terrestrial mining and other industries.

The technologies developed for mining in space can be used to advance domestic mining, improving operations. For example, advanced imaging systems used to identify celestial bodies ideal for mining can be used on Earth to more effectively identify the locations of natural resources beneath the Earth's surface.[47] Other technologies with potentially significant crossover include robotics for surface and subterranean exploration and material extraction, advanced navigation systems, life support systems and lasers to break up extracted materials.[48]

That advancements in space mining can and do benefit terrestrial mining operations can be seen by observing coordination between the domestic and space mining industries. Companies like Caterpillar and Rio Tinto have not only invested in applying their existing mining technologies to mining in space, but also in understanding how novel space mining technologies can be applied to projects on Earth in harsh conditions where modern machinery being used struggles to perform adequately.[49]

Space Mining is a Reality, not a Pipe Dream

In contrast to the federal regulatory morass that stymies domestic development of America's mineral resources, mineral extraction in space is moving rapidly. Though this may seem like a far-off concept, private industry in the U.S. has driven novel technological developments, increased manufacturing capacity for spacecraft, and implemented ride-share-like programs for rocket launches to reduce costs and timelines for space missions.[50] As a result of these developments, U.S. companies like AstroForge, Karman+, Black Moon Energy Corporation, and Starpath Robotics, are actively pursuing space mineral extraction and are creating supply chains in space, with several promising missions scheduled over the next few years.[51]

Not only can the minerals mined in space eventually be brought back to bolster supply chains in the United States, but the technologies developed for mining in harsh deep space conditions can be applied to modern mining projects on Earth to more easily access and process minerals.

In addition, mineral extraction in space also has the potential to provide minerals, fuels, and elements that are not readily accessible on earth, particularly Helium–3.[52] Helium–3 is a non-radioactive isotope that is identified as an "ideal fuel for the operation of a fusion reactor."[53] The significant presence of Helium–3 on the Moon was initially confirmed by "lunar samples brought back to Earth from the Apollo 11, 12, 14–17 missions and the Luna 16 and 20 missions."[54] The Black Moon Energy Corporation (BMEC) has estimated that the Helium–3 gross resource on the Moon is approximately 1.7 million metric tons.[55] BMEC has developed a plan to "delineate and retrieve the Helium–3 resource from the lunar surface and bring it to Earth" for use in fusion reactors.[56]

These efforts collectively represent a first step for the space mining industry and a giant leap for mankind's ability to use natural resources found in our universe effectively. As technology progresses at a rapid pace, costs are further reduced, and collaboration in the industry continues, the U.S. could not only develop the ability to harness vast space resources but also apply these technologies to mining operations on Earth to secure U.S. mineral supply chains.

Like most sectors, the mining industry has historically been driven by new and innovative technology. Today, promising new technologies in mapping, data, refining efficiencies, and more promise to upend the industry just as updates in machinery, robotics, and basic safety equipment did in years past.[57] The time is now to embrace both permitting reform for domestic mining and new technologies that will ultimately benefit all forms of mining as the United States seeks to secure its domestic supply chain. This is crucial not only for developing emerging technologies but also for ensuring national security.

---

[1] Climate Smart Mining Facility, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*, The World Bank (2020), https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf.
[2] *Id.*
[3] James Marshall, *Insufficient minerals threaten energy transition—report*, E&E News (May 5, 2021), https://www.eenews.net/greenwire/stories/1063731805.
[4] Mineral Resources Program, *Mineral Systems Map of the United States*, U.S. Geological Survey (Aug. 1, 2023), https://www.usgs.gov/media/images/mineral-systems-map-united-states.
[5] Wilson Center, Duncan Wood, *et al.*, *The Mosaic Approach: a Multidimensional Strategy for Strengthening America's Critical Minerals Supply Chain*, https://www.wilsoncenter.org/sites/default/files/media/uploads/documents/critical_minerals_supply_report.pdf.
[6] Bonakdarpour et al., *Mine development times: The US in perspective*, S&P Global (June 2024), https://cdn.ihsmarkit.com/www/pdf/0724/SPGlobal_NMA_DevelopmentTimesUSinPerspective_June_2024.pdf.
[7] *Id.*
[8] *Id.*
[9] *Mineral Commodity Summaries 2024*, USGS, https://pubs.usgs.gov/periodicals/mcs2024/mcs2024.pdf.
[10] Ernest Scheyder, *China set to control rare earth supply for years due to processing dominance*, Reuters (May 29, 2019), https://www.reuters.com/article/us-china-usa-rareearth-refining/china-set-to-control-rare-earth-supply-for-years-due-to-processing-dominance-idUSKCN1T004J.
[11] Bonnie S. Glaser & Abigail Wulf, *China's Role in Critical Mineral Supply Chains*, German Marshall Fund (Aug. 2, 2023), https://www.gmfus.org/news/chinas-role-critical-mineral-supply-chains.
[12] Zongyuan Zoe Liu, *How to Secure Critical Minerals for Clean Energy Without Alienating China*, Council on Foreign Relations (May 25, 2023), https://www.cfr.org/blog/how-secure-critical-minerals-clean-energy-without-alienating-china.
[13] U.S. Geological Survey, *2022 Final List of Critical Minerals*, 87 Fed. Reg. 10381, Dept. of the Interior (Feb. 24, 2022), https://www.federalregister.gov/documents/2022/02/24/2022-04027/2022-final-list-of-critical-minerals.
[14] Jared Cohen, *Resource realism: The geopolitics of critical mineral supply chains*, Goldman Sachs (Sep. 13, 2023), https://www.goldmansachs.com/intelligence/pages/resource-realism-the-geopolitics-of-critical-mineral-supply-chains.html.
[15] Steven P. Bucci, *America's National Security Is Dependent on Critical Rare Earth Minerals—and Worse, on China*, The Heritage Foundation (Nov. 8, 2022), https://www.heritage.org/defense/commentary/americas-national-security-dependent-critical-rare-earth-minerals-and-worse.
[16] Jared Cohen, *Resource realism: The geopolitics of critical mineral supply chains*, Goldman Sachs (Sep. 13, 2023), https://www.goldmansachs.com/intelligence/pages/resource-realism-the-geopolitics-of-critical-mineral-supply-chains.html.
[17] Ernest Scheyder and Pratima Desai, *Western miners push for higher metals prices to ward off Chinese rivals*, Reuters (July 22, 2024), https://www.reuters.com/markets/commodities/western-miners-push-higher-metals-prices-ward-off-chinese-rivals-2024-07-22/.
[18] Gracelin Baskaran and Meredith Schwartz, *China Imposes Its Most Stringent Critical Minerals Export Restrictions Yet Amidst Escalating U.S.-China Tech War*, Center for Strategic & International Studies (Dec. 4, 2024), https://www.csis.org/analysis/china-imposes-its-most-stringent-critical-minerals-export-restrictions-yet-amidst.
[19] *China will limit exports of antimony, a mineral used in products from batteries to weapons*, AP (Aug. 15, 2024), https://apnews.com/article/china-antimony-export-controls-critical-material-2fcfe08912d20996e9aa87d1fb97dd6a.
[20] *Id.*
[21] Terry Gross, *How 'modern-day slavery' in the Congo powers the rechargeable battery economy*, NPR (Feb. 1, 2023), https://www.npr.org/sections/goatsandsoda/2023/02/01/1152893248/red-cobalt-congo-drc-mining-siddharth-kara.
[22] *List of Goods Produced by Child Labor or Forced Labor*, Dept. of Labor, https://www.dol.gov/agencies/ilab/reports/child-labor/list-of-goods.
[23] *See Using Space-Based Resources for Deep Space Exploration*, NASA, https://www.nasa.gov/overview-in-situ-resource-utilization/.
[24] Nicholas James Bennett, et al., *Commercial viability of lunar In-Situ Resource Utilization (ISRU)*, 182 Planetary and Space Science (Mar. 2020), https://www.sciencedirect.com/science/article/abs/pii/S0032063319301163; Gerald Sanders, *In Situ Resource Utilization (ISRU) – Surface Excavation & Construction*, NASA (Jan. 21, 2021), https://www.nasa.gov/wp-content/uploads/2015/03/jsanders_lunar_isru_tagged_0.pdf.
[25] 43 U.S.C. §31(a); Rachel Lindbergh, *Space Resource Extraction: Overview and Issues for Congress*, Cong. Research Service (July 29, 2024), https://www.crs.gov/reports/pdf/R48144/R48144.pdf.
[26] P.L. 87-626; 43 U.S.C. §31(b); Rachel Lindbergh, *Space Resource Extraction: Overview and Issues for Congress*, Cong. Research Service (July 29, 2024), https://www.crs.gov/reports/pdf/R48144/R48144.pdf.
[27] Rachel Lindbergh, *Space Resource Extraction: Overview and Issues for Congress*, Cong. Research Service (July 29, 2024), https://www.crs.gov/reports/pdf/R48144/R48144.pdf.
[28] *Id.*
[29] *Id.*
[30] EXEC. ORDER NO. 13914, 85 Fed. Reg. 20381 (Apr. 6, 2020), https://www.federalregister.gov/documents/2020/04/10/2020-07800/encouraging-international-support-for-the-recovery-and-use-of-space-resources.

[31] Melissa de Zwart, et al., *Space resource activities and the evolution of international space law*, 211 Acta Astronautica, (Oct. 2023), https://www.sciencedirect.com/science/article/pii/S0094576523002977.
[32] *Id.*
[33] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, G.A. Res. 2222, (Jan. 27, 1967), https://treaties.un.org/doc/Publication/UNTS/Volume%20610/volume-610-I-8843-English.pdf.
[34] *Id.*
[35] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 34/68, A/RES/34/68 (Dec. 5, 1979), https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&clang=_en.
[36] *Id.*
[37] *Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes*, NASA & the U.S. Dept. of State (Oct. 13, 2020), https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf.
[38] Christian Davenport, *NASA unveils new principles for space exploration*, Wash. Post (May 15, 2020), https://www.washingtonpost.com/technology/2020/05/15/moon-rules-nasa-artemis/.
[39] *Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes*, NASA & the U.S. Dept. of State (Oct. 13, 2020), https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf.
[40] *See* Philip T. Metzger et al., *Affordable, Rapid Bootstrapping of the Space Industry and Solar System Civilization*, 26 Journal of Aerospace Engineering (Apr. 2, 2012), https://ascelibrary.org/doi/10.1061/%28ASCE%29AS.1943-5525.0000236.
[41] Kevin M. Cannon et al., *Precious and structural metals on asteroids*, 225 Planetary and Space Science (Jan. 2023), https://www.sciencedirect.com/science/article/pii/S0032063322001945#bib41.
[42] Max Fleming et al., *Mining in space could spur sustainable growth*, 120 Proceedings of the National Academy of Sciences, (Oct. 2023), https://www.pnas.org/doi/10.1073/pnas.2221345120.
[43] *Id.*
[44] *See* Shriya Yarlagadda, *Economics of the Stars: The Future of Asteroid Mining and the Global Economy*, Harvard International Review (Apr. 8, 2022), https://hir.harvard.edu/economics-of-the-stars/.
[45] *SpaceX Relies on Stainless-Steel for Starship Mars Rocket*, World Steel Association, https://worldsteel.org/media/steel-stories/innovation/spacex-relies-on-stainless-steel-for-starship-mars-rocket/.
[46] Douglas Gorman, *AstroForge Unveils New Spacecraft for Deep Space Mission*, Payload (July 31, 2024), https://payloadspace.com/astroforge-unveils-new-spacecraft-for-deep-space-mission/.
[47] *See* Esa Nurmi, *Technology from Space May Help Mining on Earth*, Thermo Fisher Scientific (Aug. 23, 2016), https://www.thermofisher.com/blog/mining/technology-from-space-may-help-mining-on-earth/.
[48] *Space Technology Goes Down to Earth to Support Mining*, The European Space Agency (Dec. 30, 2003), https://www.esa.int/About_Us/Business_with_ESA/Business_Opportunities/Space_technology_goes_down_to_Earth_to_support_mining.
[49] Luigi Scatteia and Yann Perrot, *Lunar Market Assessment: Market Trends and Challenges in the Development of a Lunar Economy*, PWC (Sept. 2021), https://www.pwc.com.au/industry/space-industry/lunar-market-assessment-2021.pdf; Rachel Lindbergh, *Space Resource Extraction: Overview and Issues for Congress*, Cong. Research Service (July 29, 2024), https://www.crs.gov/reports/pdf/R48144/R48144.pdf.
[50] Ibtisam Abbasi, *Mining Equipment in Space: The Future of Extraterrestrial Resource Extraction*, AZO Mining (Nov. 23, 2023), https://www.azomining.com/Article.aspx?ArticleID=1773.
[51] Even the U.S. government has been successful in exploring extraterrestrial bodies. In 1996, NASA launched a spacecraft, NEAR Shoemaker, that orbited and eventually landed on an asteroid in 2001. In 2016, NASA and the European Space Agency jointly launched a spacecraft, Rosetta Philae, that successfully landed on a comet. In 2023, NASA's OSIRIS-REx mission collected a physical sample from an asteroid and returned it back to Earth.
[52] Dana A. Shea & Daniel Morgan, *The Helium-3 Shortage: Supply, Demand, and Options for Congress* (R41419), Cong. Research Service (Dec. 22, 2010), https://sgp.fas.org/crs/misc/R41419.pdf.
[53] Florian Vidal, *Helium-3 from the lunar surface for nuclear fusion?*, Polytechnique insights (May 17, 2022), https://www.polytechnique-insights.com/en/braincamps/space/extraterrestrial-mining/helium-3-from-the-lunar-surface-for-nuclear-fusion/.
[54] Aaron D.S. Olson, *Lunar Helium-3: Mining Concepts, Extraction Research, and Potential ISRU Synergies*, NASA Kennedy Space Center (2021), https://ntrs.nasa.gov/api/citations/20210022801/downloads/AIAA%20ASCEND%202021%20Paper_211018.pdf.
[55] Black Moon Energy Corporation, Congressional Deck (February 2025). On file with Committee.
[56] Black Moon Energy Corporation, Elevator Pitch (April 21, 2024). On file with Committee.
[57] Miranda Barker, *Innovation Can Disrupt the Mining Industry. These Sustainable Start-Ups are Leading the Way*, World Economic Forum (Nov. 29, 2024), https://www.weforum.org/stories/2024/11/13-innovations-making-the-mining-and-metals-industry-more-sustainable/.

OVERSIGHT HEARING ON FULL BLAST: CONTRASTING MOMENTUM IN THE SPACE MINING ECONOMY TO THE TERRESTRIAL MINING REGULATORY MORASS

Tuesday, February 25, 2025
U.S. House of Representatives
Subcommittee on Oversight and Investigations
Committee on Natural Resources
Washington, D.C.

The Subcommittee met, pursuant to notice, at 10:18 a.m. in Room 1324, Longworth House Office Building, Hon. Paul Gosar [Chairman of the Subcommittee] presiding.

Present: Representatives Gosar, Collins, Begich; Dexter, Hernández, and Huffman.

Also present: Representative Stauber.

Dr. GOSAR. The Subcommittee on Oversight and Investigations will come to order.

Without objection, the Chair is authorized to declare a recess of the Subcommittee at any time.

The Subcommittee is meeting today to hear testimony on Full Blast: Contrasting Momentum in the Space Mining Economy to the Terrestrial Mining Regulatory Morass.

Under Committee Rule 4(f), any oral opening statements at the hearing are limited to the Chairman and the Ranking Member. Therefore, I ask unanimous consent that all other Members' statements be made part of the hearing record if they are submitted in accordance with Committee Rule 3(o).

Without objection, so ordered.

I ask unanimous consent that the following Members be allowed to sit and participate in today's hearing: the gentleman from Minnesota, Mr. Stauber.

Without objection, so ordered.

I now recognize myself for an opening statement.

STATEMENT OF THE HON. PAUL GOSAR, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ARIZONA

Dr. GOSAR. Good morning everyone, and thanks to all our witnesses who have traveled today to testify on this important issue, contrasting momentum in the space mining economy to the terrestrial mining regulatory morass. I would especially like to welcome Professor Cabrera, who traveled here from the University of Arizona. Thank you.

Last Congress the Committee held the first congressional hearing on the prospect of extracting resources, including critical minerals, in space. In the 119th Congress, with a new administration in place that prioritizes development of our Nation's resources, the time is ripe not only to revisit this conversation from the

perspective of both domestic and space mining. Earlier this year news reports suggested a slightly decent likelihood of an asteroid hurtling towards Earth until further analysis greatly diminished that possibility. But it could have been true. We could have been reliving, you know, that movie.

While that is certainly a relief, the 1998 movie Armageddon, which featured drilling on an asteroid, it no longer seems like that is something from science fiction. However, I am glad to say we were able to look at mining on asteroids as a potential supply chain issue and national security issue, rather than a last-minute need to save the Earth.

But back to our purpose today. On his first day in office President Trump, through several executive orders, declared a national energy emergency and directed the Federal Government to unleash our energy resources including critical minerals, and to restore America's energy dominance.

Under previous weak leadership and misguided policies, America ceded our ability to extract, refine, and process critical minerals that are necessary for a vast array of modern technologies. Filling this vacuum, China has risen to dominate critical minerals supply chains worldwide. Instead of investing in resource development to combat China, the feckless Biden administration chose to double down on their misguided climate policies, cancel or delay countless projects across the Nation, and further encumber the Federal permitting process.

Due to the burdens of Federal permitting process, companies that wish to extract minerals in the United States commonly face decades-long timelines that makes the development of natural resources nearly impossible to achieve. As American companies fight to break through the Federal regulatory morass that has held domestic resources development back for far too long, this Committee is committed to working with the Trump administration to knock down barriers and unleash our true potential.

President Trump has made that clear, that while we will unleash the golden era of American energy dominance, we must also look to humanity's future in the stars. In his inauguration address, President Trump stated that America will "pursue our manifest destiny into the stars, launching American astronauts to plant the Stars and Stripes on the planet Mars."

There is a reason China is so invested in space. It is estimated that mining just the top 10 most cost-effective asteroids, those that are both closest to the Earth and the greatest in value, could produce a profit of around $1.5 trillion. Celestial bodies such as moons and asteroids contain potentially enormous amounts of critical minerals, rare earths, metals, and game-changing elements like helium–3, which has the potential to power our future here on Earth through fusion technology.

What seems like a far-off concept is no longer so. Resource extraction in space is right around the corner, and America must seize on that issue. In contrast to the regulatory morass holding back our mining industry, a lighter regulatory footprint has allowed the space resource industry to set a rapid pace for development and innovation. Now our Nation is well poised to harness the vast resources of space.

Since our last hearing a bit over a year ago, the space resource extraction industry has made incredible progress with new technological developments, increased manufacturing capacity, and rideshare for launches, among other efforts leading to reduced costs and shortened timelines for space missions that will represent the first steps in establishing mineral extraction and supply chains in space.

As we speak, American space mining companies are aggressively pursuing the establishment of the first mineral supply chain in space through the vast helium–3 reserves found on the moon before China can do so. I challenge my colleagues in this room to think about the powerful economic and national security implications of these missions and profound duty to ensure that both the domestic and space mining industries are supported as they seek permitting reform as well as innovation in their fields.

As we work to continue to unleash America's dominant domestic resource development, we also work to keep government out of the way in order to encourage the innovation and progress that is needed. I look forward to this conversation today.

And with that I recognize the Ranking Member for her opening statement.

Doctor.

STATEMENT OF THE HON. MAXINE DEXTER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Dr. DEXTER. Thank you, Mr. Chairman, and thank you to our witnesses for joining us today.

There is a debate to be had about whether space mining is legal. We could discuss whether it is technologically feasible, economical, within our jurisdiction, or if it is even safe. But the key question for today is whether investing in such an expensive venture at this time is necessary to meet our critical mineral needs. The answer to that question is decidedly no.

There have been dozens of hearings about how to meet our critical and mineral needs in this Committee. Our side has shown repeatedly that, through a whole supply chain approach including recycling, a circular economy, product redesign, treaties with other countries that have critical minerals, and, yes, prudent and regulated new mines in the U.S., we have the resources we need. The Government Accountability Office has reached the same conclusion.

The Biden administration was taking numerous steps in the right direction on all these fronts. The Infrastructure Investment and Jobs Act provided vital investment funds to make these advancements possible. My colleagues opposed both the infrastructure bill and the Biden administration actions. In fact, they are now actively working to tear them down, setting back our country's efforts to secure critical minerals.

Now the majority is inviting companies to this Committee with hat in hand, asking for billions and billions of tax dollars, taxpayer dollars for an endeavor that is not necessary to meet our critical mineral needs. They are pursuing these unnecessary and expensive endeavors at a time when Elon Musk is cutting billions of dollars and thousands of staff from our government, cuts that represent

actual threats to our economy, national security, ability to address the climate crisis, and our basic humanity.

If Musk thinks government spending is so out of control, surely he would think space mining funding to be frivolous, too, and cut Federal funding to the public and private sector for it. But this is where the conflicts of interest truly shine through. It turns out that being the leader of the so-called Department of Government Efficiency, or DOGE, could prove very beneficial for Elon Musk and his companies, even as it devastates working families all over this country.

While Musk has been firing tens of thousands of our hard-working public servants, he also has had over a dozen open investigations into unsafe and unfair labor practices at both Tesla and SpaceX. He has severed funding and is shuttering our government agencies, even as he continues to add to his own fortune of Federal Government contracts, contracts that now total well over $20 billion. He demands total access to the confidential databases of Federal agencies, including the IRS, even as he was investigated for having covert meetings with Putin and the Chinese Communist Party. He has $1.4 billion in loans with the Chinese Government. He sends out emails demanding employees justify their jobs in five bullet points, creating a climate of fear and intimidation in the very agencies charged with enforcing safety, health, and consumer protections against his companies. Already, investigations into his companies are starting to disappear.

Behind me, articles from the New York Times tell the story nicely.

[Slide.]

Dr. DEXTER. This one tells where his investments and the money is coming from.

[Slide.]

Dr. DEXTER. And the other is where Musk conflicts may be lying. Sorry, I am trying to point and read at the same time. The web of conflicts is far more extensive than I could explain in only 5 minutes.

How does getting access to every American's tax information help Musk increase government efficiency?

How does Musk getting access to the confidential business information of his competitors lower the price of groceries for Americans?

How does canceling investigations into Musk's companies advance the priorities and dreams of the American people?

There are laws and even an agency, the Office of Government Ethics, to deal with conflicts of interest like some of these and many others. Typically, a government official with the authority Musk has been given would be required to undergo a process to ensure his investments are not clouding his judgment. But so far he has provided no evidence that his conflicts of interest are being investigated or supervised. He hasn't faced questions from the nomination and Senate confirmation process. He hasn't divested from his companies. He hasn't even disclosed his holdings.

The White House press secretary indicated he would be deciding whether and when to take action about his conflicts. I suspect he will do nothing at all.

The damage he is wreaking on our working families has already been incalculable. It will get worse over time, even if stopped today. Are we to believe this is what the American people voted for? I don't think so, and the polls confirm it. Musk should divest or depart.

I yield back, Mr. Chair.

Dr. GOSAR. I thank the gentlewoman. The gentleman from California, the Ranking Member of the Full Committee, is now recognized for his 5 minutes.

STATEMENT OF THE HON. JARED HUFFMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. HUFFMAN. Thank you, Mr. Chairman.

Greetings, Earthlings. For those who have been longing for a sequel to the movie Spaceballs, this is your lucky day. For everyone else, we can marvel at just how incredibly tone deaf House Republicans are.

Here on Earth, Starman Musk's directives are doing real harm to working families. Non-profits that provide food and services to veterans, rural health clinics, food banks, many others are laying off staff and suspending programs. The National Park Service is trying to figure out how to run our national parks this summer during tourist season with rangers and biologists cleaning toilets. Fire safety projects are suspended all over the West. We can't hire Federal firefighters. We are on the verge of heading into fire season woefully under-prepared and under-staffed.

This is a moment that screams out for congressional oversight. We don't have inspectors general anymore because Donald Trump fired them illegally. So if ever there was a moment when Congress should be looking for waste, fraud, and abuse, real waste, fraud, and abuse, and asking hard questions, this is it. But instead we get Spaceballs 2. Not only a waste of this Committee's time, but a tortured stretch of jurisdiction.

The Natural Resources Committee has no jurisdiction over space. But Republicans today are going to use it as an excuse to pivot back to their favorite subject: attacking environmental laws, claiming that regulations are bad because when your only tool is that particular hammer, absolutely everything looks like a nail, including space, apparently.

Why are we here? Why are we giving a national platform to the AstroForge Corporation to make a pitch to venture capitalists to raise money and to ask for Federal Government subsidies, which is right here in Mr. Place's testimonies? Let's see, underwrite a price floor, expand the energy loan program for space mining. I mean, it does take some space balls in this moment to come in and ask for Federal money, but that is what we have got.

You know, it is getting hard to raise money, I think, for space mining these days. Google and others are pulling back. They are tired of lighting their money on fire. So what better way to please Elon, who makes some of his money from AstroForge, than to have a hearing like this to make it look like space mining is a real thing, and to give them a platform to pitch to the VCs? Get in on the ground floor.

No coincidence that this week one of Musk's SpaceX rockets will launch a spacecraft developed by a mining startup, AstroForge, as it turns out. They are seeking to make asteroid mining a thing. Musk's companies, of course, reap immense profits from taxpayer-funded contracts. SpaceX alone has secured about $15 billion in NASA contracts, making it the agency's largest private contractor. The Department of Defense already relies heavily on SpaceX to launch satellites. In total, Musk's 7 companies have received at least $20 billion in government contracts and subsidies.

But despite all of this dependency and largesse for Mr. Musk, he constantly works to weaken regulatory oversight to his own financial benefit while simultaneously undermining the various agencies tasked with holding him accountable. And now, worse, inserting himself into these agencies, plundering the data, feeding it into his AI model so that Grok can someday replace many of these Federal employees. That is the conflict of interest raging before our eyes, and our Republican colleagues are whistling past the ethical graveyard.

Meanwhile, Mr. Musk, as he works to perfect this Grok AI model, has been granted insane and illegal access to Federal data and sensitive information. DOGE officials reportedly have unrestricted access to NASA's personnel and contracting files. This raises the disturbing possibility that SpaceX and other Musk companies could gather proprietary information to give themselves an advantage over competitors. This is a moment that really does scream out for real oversight instead of Spaceballs.

But at least we can say this about this brave, new dystopic world that Elon Musk is bringing us. Clearly, we now have a virtual Congress completely uninterested in fulfilling its Article I responsibilities.

I yield back.

Dr. GOSAR. I thank the gentleman. I thought this hearing was about mining. Wasn't it that? Not Elon Musk.

I am now going to introduce our witnesses.

Mr. Misael Cabrera, Director and Professor of School of Mining and Mineral Resources at the University of Arizona, Tucson, Arizona. Thank you.

Mr. Steven Place, Senior Policy Advisor, AstroForge, Washington, D.C. I am sure you are going to be getting some questions.

And then Mr. Richard Painter, Professor of Corporate Law, University of Minnesota Law School, Minneapolis, Minnesota. Good seeing you again, Mr. Painter.

And Mr. Saurav Shroff, CEO, Starpath, Hawthorne, California. Did I say that right?

Mr. SHROFF. You did.

Dr. GOSAR. Let me remind the witnesses that under our Committee Rules we limit your oral statement to 5 minutes, but your entire statement will be placed in the record.

When you start your testimony, you will see a little green light as it goes. Then, about a minute out, you will see it turn yellow. When you see it red, kind of wrap it up. If you could do that, we would appreciate that.

I am going to now recognize Mr. Cabrera for his first 5 minutes. Thank you.

STATEMENT OF MISAEL CABRERA, DIRECTOR AND PROFESSOR OF PRACTICE, SCHOOL OF MINING AND MINERAL RESOURCES, THE UNIVERSITY OF ARIZONA

Mr. CABRERA. Chairman Gosar, Ranking Member Dexter, and members of the Subcommittee, thank you for inviting me to this hearing. It is an honor.

Today I am not speaking on behalf of the university, but as a private citizen who understands the necessity for abundant economic minerals for our country's and our planet's future.

Space mining is not the final frontier. Instead, it is the first way station for deep space exploration and off-planet minerals. Space mining presents an exciting alternative to the regulatory and social challenges faced by the mining sector on Earth.

Given the unprecedented global demand for the U.S.'s dangerous over-reliance on foreign minerals, exploring space mining is not just exciting, but wise. The University of Arizona is well positioned to respond to the emerging space mining landscape. The university houses innovation hubs like the Lunar and Planetary Laboratory, or LPL; the Arizona Space Institute; the Space Systems Engineering Laboratory; and the School of Mining and Mineral Resources.

For example, the LPL led the historic OSIRIS-REx Mission that launched a rocket into space, navigated to the asteroid Bennu, collected a sample, and brought it back to Earth. The mission had little to do with space mining, but demonstrated that foundational activities for mining asteroids are plausible, if not yet economic. Analysis of asteroid Bennu samples found cobalt, nickel, platinum, iridium, and other metals at an extrapolated value of over $500 billion for the whole asteroid. However, recovering just 121 grams of material cost roughly $1.2 billion, an enormously negative return on investment from a mineral economic standpoint.

Thus, maintaining a robust mineral supply requires that Earth mining innovate simultaneously, if not ahead of its celestial counterpart. Break-throughs in remote operations, automation, AI, renewable energy sources for mining equipment, water management, and responsible mineral extraction, all crucial for mining and harsh, water-scarce environments, are equally applicable to both space and Earth mining.

Further, terrestrial mineral supply undergirds all, yes, all, technological advancement, including space mining. Thus, domestic terrestrial mining must undergo dramatic innovation. This call to action captures the scope and vision of the Sustainable Mining Innovation and Lifestyle Enrichment Initiative led by the University of Arizona and 18 educational, governmental, community, and industrial partners.

However, technological innovation alone cannot unleash domestic mineral supply. A key factor is streamlining the Federal permitting process. The infographic I provided shows that mines on Federal lands may have to adhere to over 50 regulatory requirements and decades-long delays before producing a single ton of metal.

Another key factor in supply of terrestrial domestic minerals is judicial reform. A USGS report on rare earth elements indicates

that 47 percent of the mines studied experienced delays related to court challenges, and that 71 percent of the mines that had not yet achieved production were involved in litigation. Ensuring that citizens retain the right to challenge government decisions while eliminating incentives for abuse and unnecessary delays is long overdue.

As global demand for minerals intensifies, space mining faces significant cost and technological challenges, while Earth mining deals with a cumbersome regulatory framework. Strategic foresight, investment, regulatory modernization, and scientific advancements are essential for both areas. Institutions like the University of Arizona are prepared to be dynamic catalysts, promoting the interdisciplinary solutions needed to tackle these complex issues. Success depends on balancing Earth's resources with the potential for space, guiding humanity towards a future rich in resources and exploration.

And I am happy to address any questions that you may have. Thank you so much.

[The prepared statement of Mr. Cabrera follows:]

PREPARED STATEMENT OF MISAEL CABRERA, PE

Chairman Gosar, Ranking Member Dexter, and Members of the Subcommittee, thank you for inviting me to this hearing. My name is Misael Cabrera, and I serve as the Director of the School of Mining & Mineral Resources at the University of Arizona. The school was established to meet the urgent need for responsibly sourced mineral supplies for future generations. We do this through industry-advancing research, and by developing the interdisciplinary mining and minerals workforce of tomorrow. Today, I am not speaking on behalf of the university but as a private citizen who understands the necessity for abundant, economic minerals for our country's and our planet's future.

Space mining is not the final frontier; instead, it is the first way station in revolutionizing deep space exploration and providing off-world sources of minerals for the human species. Space mining presents an exciting alternative to the regulatory and social challenges faced by the mining sector on Earth. Given the unprecedented global demand for minerals required to support population growth, and technological advancements in medicine, artificial intelligence (AI) computing, defense, transportation, and renewable energy, exploring space mining is not only exciting but also wise. This alternative could fundamentally change how humanity utilizes resources on and beyond our planet, especially as mining grapples with increasing environmental and bureaucratic complexities on Earth. Here in the U.S., the potential for space mining is further fueled by a growing awareness of our dangerous over-reliance on foreign sources of critical minerals and the recent technological advancements in space flight.

In stark contrast to the burgeoning potential of space mining, Earth extraction is hindered by lengthy permitting delays and court challenges—especially in the U.S. The exhaustive regulatory regime means that obtaining approvals for mining operations can span years, if not decades, severely throttling the introduction of new supply streams into the global market and domestic supply. Attachment 1 presents the rigorous regulatory journey for hard rock mines. Mining operations on federal lands may have to adhere to over 50 regulatory requirements before producing a single ton of metal. These requirements, coupled with unimproved administrative processes that implement them, create decades-long delays that strain the supply chains, making the possibility of off-world alternatives attractive to both investors and start-ups.

The regulatory landscape for space mining remains markedly less developed than its terrestrial counterpart. While providing a foundational legal framework, the Outer Space Treaty of 1967 posits outer space as the province of all humankind (UNOOSA, 1967). This treaty offers limited guidance regarding the proprietorship of celestial resources. A subsequent Moon Treaty sought to prevent ownership claims over celestial bodies but has received limited ratification globally, resulting in ambiguous regulatory interpretations (UNOOSA, 1984). The absence of international regulatory consensus has opened the doors to legislation in individual countries. For example, the U.S. Space Launch Competitiveness Act of 2015 empow-

ers American enterprises in space resource acquisition, fostering a more structured regulatory trajectory for such operations (U.S. Congress, 2015). Other countries like Luxenberg (Luxembourg Space Agency, 2017) and Japan (Library of Congress, 2021) have passed similar laws.

Federal and private-sector investments in space exploration further buoy the current momentum. These investments manifest in billions of dollars allocated to developing technologies and infrastructures necessary for successful space mining initiatives (Space Foundation, 2024). This is coupled with many start-ups eager to capitalize on the emerging space economy's opportunities (Sriram & Singh, 2024).

The state of Arizona and its land grant institution, the University of Arizona, are well-positioned to respond to the emerging space mining landscape. The university houses innovation platforms like the Lunar and Planetary Laboratory, the Arizona Space Institute, the Space Systems Engineering Laboratory, and the School of Mining & Mineral Resources. With a long history of space exploration, the university has contributed to key achievements, from helping Americans reach the moon in 1969 to developing the first spacecraft to orbit close to the sun in 2018 (Jones, 2021). Additionally, the university participates in the Arizona Space Commission, established through Arizona House Bill 2254, which aims to promote research and development in space exploration (Arizona State Legislature, 2023).

For example, the Lunar and Planetary Laboratory partnered with NASA to lead the historic OSIRIS-REx [1] Mission that launched a rocket into space, navigated to the asteroid Bennu, collected a sample, and safely brought it back to Earth. The mission aimed to better understand the early solar system and the origins of life on Earth (Lauretta et al., 2017), and key insights and discoveries are already being published (McCoy et al., 2025). An added benefit of the mission is that the OSIRIS-REx team demonstrated that all the foundational activities for space mining are plausible, if not yet economic.

Preliminary analysis of asteroid Bennu samples indicates the presence of iron, cobalt, nickel, platinum, and iridium, among other metals. Extrapolating the concentrations of the known elements to the asteroid as a whole and assuming current market prices for metals suggests that the value of the asteroid Bennu could reach upwards of $500 billion (Lauretta, personal communication, February 18, 2025). As exciting as that sounds, the cost to recover just 121 grams of material from Bennu was roughly $1.2 billion (Fishman, 2023)—millions of dollars per gram, far greater than the market value of even the most precious of metals. From a mineral economics perspective, that is an enormously negative return on investment. The cost of developing infrastructure conducive to mining in space represents a formidable obstacle yet to be surmounted. Therefore, ongoing innovation, research, and investment, especially in cost-effective propulsion and mining in harsh, waterless environments, remain crucial to transitioning from plausibility to economic applicability.

History teaches us that economics is as essential as technology in free societies. For instance, the Detroit Electric sedan, despite having Clara Ford—wife of the founder of the Ford Motor Company—among its customers, could not compete with the economy of the Ford Model T after 1939 (Sadler, 2022). Only recently—roughly four decades later—have electric vehicles been able to compete with traditional internal combustion automobiles in the global marketplace. Unfortunately, our domestic mineral supply cannot wait that long.

Thus, domestic Earth mining must innovate simultaneously, if not ahead of its celestial counterpart. Breakthroughs in remote operations, automation, AI, renewable energy sources for mining equipment, water management, and responsible mineral extraction—all crucial for mining in harsh, water-scarce environments—are equally applicable to both space and Earth mining. However, dramatically reducing propulsion costs, a monumental technological challenge, is uniquely essential to make space mining economically viable.

Further, an abundant, economic, terrestrial mineral supply must undergird every technological advancement, including space mining, until it becomes self-sustaining. Domestic mining can undergo a revolution by leveraging automation and AI, energy efficiency, green leaching technologies, waste valorization, reuse, and management, creating a flywheel of multi-sector benefits for the host communities. This captures the scope and vision of the Sustainable Mining Innovation and Lifestyle Enrichment (SMILE) initiative, led by the University of Arizona in partnership with 18 educational, governmental, and industrial organizations.

Mining technology innovation alone will not unleash domestic terrestrial mineral supply—especially in the U.S. A key factor in developing a reliable domestic minerals supply chain is streamlining the Federal Government's permitting process.

---

[1] Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS Rex)

With layers of regulatory oversight from local, state, and federal levels, it is imperative to identify and eliminate duplication and waste from mine permitting without reducing opportunities for public input or limiting the comprehensiveness of environmental reviews. Real-world experience at the Arizona Department of Environmental Quality demonstrates that up to 90% of the total elapsed time associated with state permitting is waiting and that permitting time frames for even the most complex permit can be reduced by 60% or more (ADEQ, 2021).

Similar thought leadership is at the root of the U.S. Federal Permitting Improvement Steering Council's FAST–41[2] process. FAST–41 for Infrastructure Permitting is a "coordinated framework for improving the federal environmental review and authorization process," and on May 8, 2023, the South32 Hermosa project was the first mining initiative to gain FAST–41 coverage (Permitting Dashboard, 2023). I recommend that this process be applied to new major mining and processing projects that will produce any critical mineral or material.

Another key factor in the supply of terrestrial domestic minerals is judicial reform. Ensuring citizens retain the right to challenge government decisions while eliminating incentives for abuse and unnecessary delays is long overdue. In 2010, the USGS published a report on rare earth elements indicating that 47% of the mines experience delays related to court challenges and that 71% of the mines that had "not yet achieved" production were involved in litigation (Long et al., 2010). Legislative proposals like the 118th Congress's HR 1 aimed to balance these needs, and I encourage this Congress to continue developing these concepts.

As global demand for minerals intensifies, space mining faces significant cost and technological challenges, while Earth mining deals with a cumbersome regulatory framework. Strategic foresight, investment, regulatory modernization, and scientific advancements are essential for both areas. Institutions like the University of Arizona are prepared to be dynamic catalysts, promoting the interdisciplinary solutions needed to tackle these complex issues. Success depends on balancing Earth's resources with the potential of space, guiding humanity toward a future rich in resources and exploration.

References Cited

Arizona Department of Environmental Quality. (2021). ADEQ 8-year continuation fact sheet. Arizona Department of Environmental Quality. https://static.azdeq.gov/about/adeq_8yr_continuation_fs.pdf

Arizona State Legislature. (2025). H.B. 2254, 56th Legislature, 2nd Regular Session. Relating to the Arizona Space Commission. https://www.azleg.gov/legtext/56leg/2r/bills/hb2254h.htm

Fishman, C. (2023, September 23). How NASA's mission to the Bennu asteroid happened—and what's next. Fast Company. Retrieved from https://www.fastcompany.com/90956530/nasa-osiris-rex-bennu-asteroid-space-mission

H.R. 2262—114th Congress (2015–2016): U.S. Commercial Space Launch Competitiveness Act. (2015, November 25). https://www.congress.gov/bill/114th-congress/house-bill/2262/text

Jones, S. (2021, May 12). I need space: The history of the university's involvement in NASA missions. The Daily Wildcat. https://wildcat.arizona.edu/133857/news/i-need-space-the-history-of-the-universitys-involvement-in-nasa-missions/

Lauretta, D. S., et al. OSIRIS-REx: sample return from asteroid (101955) Bennu. Space Science Reviews 212 (2017): 925–984.

Library of Congress. (2021, September 15). Japan: Space Resources Act enacted. Library of Congress. https://www.loc.gov/item/global-legal-monitor/2021-09-15/japan-space-resources-act-enacted/

Long, K.R., Van Gosen, B.S., Foley, N.K., & Cordier, D. (2010). The principal rare earth elements deposits of the United States—A summary of domestic deposits and a global perspective. U.S. Geological Survey Scientific Investigations Report 2010-5220, 96 p. http://pubs.usgs.gov/sir/2010/5220/

Luxembourg Space Agency. (2017, July 20). Law of July 20th, 2017 on the exploration and use of space resources. Luxembourg Space Agency. https://space-agency.public.lu/en/agency/legal-framework/law-space_resources_english_translation.html

McCoy, T.J., Russell, S.S., Zega, T.J., et al. (2025). An evaporite sequence from ancient brine recorded in Bennu samples. Nature, 637, 1072–1077. https://doi.org/10.1038/s41586-024-08495-6

Permitting Dashboard, Federal Infrastructure Projects. (2023, July 10). Accessed July 10, 2023. https://www.permits.performance.gov/fpisc-content/permitting-council-announces-first-ever-critical-minerals-mining-project-gain-fast-41

[2] Title 41 of the Fixing America's Surface Transportation Act (FAST–41)

Sadler, B. (2022, January 26). The Detroit Electric and its place in automotive history. MotorCities National Heritage Area*. https://www.motorcities.org/story-of-the-week/2022/the-detroit-electric-and-its-place-in-automotive-history

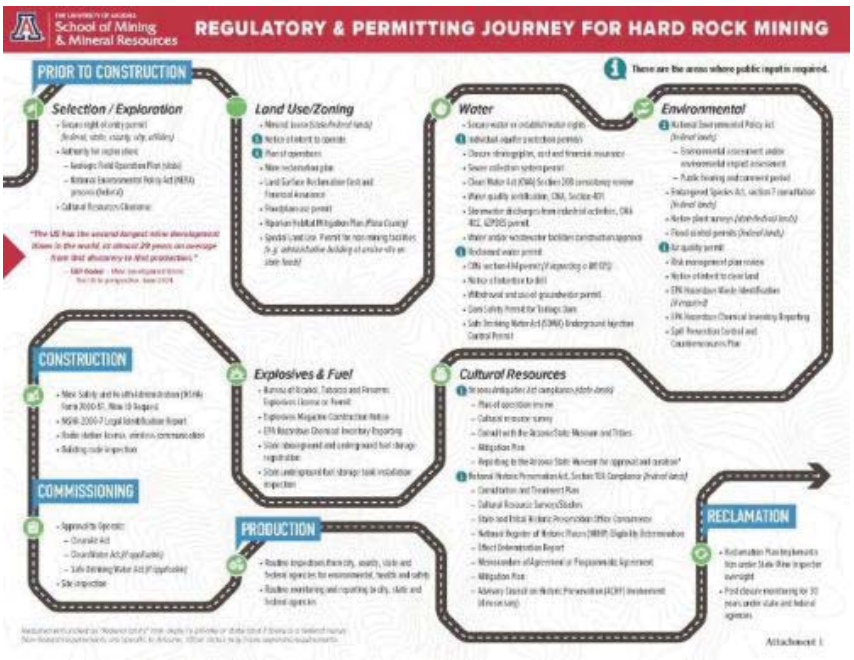
Space Foundation. (2024, July 18). The Space Report 2024 Q2. https://www.spacefoundation.org/2024/07/18/the-space-report-2024-q2/

Sriram, A., & Singh, J. (2024, April 11). Space startups see funding surge as government spending remains high, report says. *Reuters*. https://www.reuters.com/technology/space/space-startups-see-funding-surge-government-spending-remains-high-report-says-2024-04-11/

United Nations Office for Outer Space Affairs (UNOOSA). (1967). Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies. United Nations. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html

United Nations Office for Outer Space Affairs. (1984). Agreement governing the activities of states on the moon and other celestial bodies. United Nations. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html

---



Dr. GOSAR. I recognize Mr. Place for 5 minutes.

I didn't even follow my own rules.

STATEMENT OF STEVEN PLACE, SENIOR POLICY ADVISOR, ASTROFORGE

Mr. PLACE. Thank you. Good morning. Thank you, Chairman Gosar, Ranking Member Dexter, Mr. Huffman, and the rest of the Committee. My name is Steve Place, and I am the Senior Policy Advisor for AstroForge, an American asteroid mining company based in Seal Beach, California.

Tomorrow at 7:15 p.m. Eastern AstroForge will launch the first privately-funded deep space mission in history. This mission brings AstroForge one step closer to our goal of securing critical resources for America. This mission exemplifies what a small group of dedicated Americans can achieve when they set out to explore what is possible in space to improve life here on Earth.

As members of this Committee, you recognize that America's leadership in manufacturing, energy, and defense requires a reliable supply of resources. We are here today to urge this Committee to recognize that asteroid mining must be part of America's mining future.

Right now 96 percent of platinum group metals comes from China, Russia, and South Africa. Our modern lives rely on these critical resources. Smart phones, cars, computers all require platinum group metals. Our supply is rapidly dwindling, and we will run out if something does not change. We currently have no viable alternative to this problem, other than going off world and looking to space for a solution, and we think America should lead the way.

The good news is Earth is surrounded by ore-rich bodies known as metallic asteroids. They contain an almost unlimited supply of platinum group metals. We know this because our planet is impacted by thousands of these asteroids every year. We just call them meteorites. This is not a secret. Our adversaries are well aware that the future of mineral security on Earth depends on the ability to secure these resources from space. We must be the first to develop this technology so our Nation can lead what will be the most significant shift in raw material sourcing in human history.

Here is AstroForge's roadmap to make sure that the United States leads the way. Our first mission in 2023 tested an early version of our refining technology in low Earth orbit. Tomorrow our second mission will fly to an asteroid and confirm its metallic makeup. Our third mission, planned for 2026, just next year, will land on an asteroid and directly measure its ore concentration. Once we complete these missions, AstroForge will manufacture a fleet of small autonomous spacecraft, each about 200 kilograms in size, that can be launched on any available rocket. These spacecraft will travel to asteroids, land on them, and will mine and refine the platinum group metals on the surface of the asteroid itself. We will then transport these refined materials back to Earth to be sold.

We have five recommendations for this Committee to champion, recognizing that some of them will require collaboration with other committees and regulatory bodies.

No. 1, create a space resource consortium to establish a center of gravity for investment in innovation.

No. 2, underwrite a price floor for off-take agreements or become the off-taker of last resort for space resource companies to provide pricing stability. At the end of the day, both terrestrial and space miners are competing against a State-backed monopoly like China that dominate and manipulate spot-driven markets.

No. 3, expand the Department of Energy's loan program to include space-based critical mineral projects.

No. 4, empower NASA to collaborate with commercial space companies on deep space missions. The success of NASA's CLPS mission shows that commercial partnerships work. AstroForge

could enable NASA to do more deep space missions at a much lower cost.

And finally, No. 5, allow commercial deep space companies to easily access NASA's Deep Space Network, or DSN. Communicating with spacecraft at long distances is very difficult using commercial technology, and making the DSN more accessible would drive innovation.

We look forward to discussing these recommendations with you.

I will leave you with this. Future generations will look back on this moment as an inflection point where America established its mineral independence. This Subcommittee has the chance to be remembered as the leaders who saw a glimpse of the future and decided to help forge it.

Thank you for your time.

[The prepared statement of Mr. Place follows:]

PREPARED STATEMENT OF STEVEN PLACE, SENIOR POLICY ADVISOR, ASTROFORGE, INC.

Tomorrow, at 7:15 p.m. Eastern time, AstroForge will launch the first privately funded deep space mission in history. This mission brings AstroForge one step closer to our goal of securing critical resources for America. This mission signifies what a small group of dedicated Americans can achieve when they set out to explore what's possible to improve the quality of life here on Earth.

As members of this Committee, you recognize that America's leadership in manufacturing, energy, and defense requires a reliable supply of raw resources. **We are here today to urge this Committee to recognize that asteroid mining must be part of America's mining future**.

Right now, 96% of Platinum Group Metals come from China, Russia, and South Africa.[1] Our daily modern lives rely on the capabilities enabled from these critical resources—smartphones, cars, and computers, all require Platinum Group Metals—and our supply is rapidly dwindling.[2] **We will run out if something does not change**. We currently have no viable solution to this problem other than going off world and looking to space for the solution. America should lead the way.

The good news? Earth is surrounded by ore-rich bodies, known as metallic asteroids. They contain an almost unlimited supply of the Platinum Group Metals. We know this because our planet is impacted by thousands of these asteroids every year, we just refer to them as meteorites. They contain the highest ore grades ever discovered, and the leading theory suggests that all known platinum group metal mines on Earth originated from ancient asteroid impacts.

This is not a secret. Our adversaries are well aware that the future of mineral security on Earth depends on the ability to secure these resources from space.[3] We must be the first to develop this technology and give our nation a lead in what will be the most significant shift in raw material sourcing in human history.

AstroForge's roadmap to make sure the United States leads the way is as follows: Our first mission in 2023 tested an early version of our refining technology in Low Earth Orbit.

Tomorrow, our second mission will fly to a near-Earth asteroid and confirm the asteroid's metallic makeup.[4] Our third mission, planned for 2026, will land on an asteroid and directly measure its ore concentration.

Upon completion of these three missions, AstroForge will manufacture a fleet of small autonomous spacecraft, each 200 kg in size, that can be launched on any available rocket. These spacecraft will travel to targeted asteroids, land on them, and will mine and refine the Platinum Group Metals on the surface of the asteroid.

---

[1] Cohen. A. (2022, January 13). China And Russia Make Critical Mineral Grabs in Africa While the U.S. Snoozes. Forbes. https://www.forbes.com/sites/arielcohen/2022/01/13/china-and-russia-make-critical-mineral-grabs-in-africa-while-the-us-snoozes/?sh=55c9cacd6dc4

[2] Schulte, R.F. (2024). Mineral Commodity Summaries, January 2024. USGS. https://pubs.usgs.gov/periodicals/mcs2024/mcs2024-platinum-group.pdf

[3] Aedan Yohannan, "China's Space Strategy Dwarfs U.S. Ambitions," American Foreign Policy Council, March 11, 2024 https://www.afpc.org/publications/articles/chinas-space-strategy-dwarfs-u.s-ambitions

[4] See Appendix.

We will then transport these refined materials back to Earth to supply these necessary materials to drive our nation's industry and commerce.

Our five requests for this Committee to champion are as follows, recognizing that some of these will require collaboration with other Committees and regulatory bodies:

1. **Create a space resource consortium** to align private and public efforts and create a center of gravity to drive innovation and investment for space resources.

2. **Underwrite a price floor for offtake agreements** or become the offtaker of last resort for space resource companies to de-risk investments and provide pricing stability, as has been recommended for the terrestrial mining market.[5] This is important, because at the end of the day we are competing against state-backed monopolies like China that dominate and manipulate spot-driven markets.

3. **Expand the Department of Energy's Loan Program** to include space-based critical mineral projects. The funding exists but currently applies only to terrestrial projects. A simple rule change could unlock breakthroughs and new sources of capital.

4. **Empower NASA to collaborate with commercial companies** on deep space missions. The success of NASA's CLPS missions show that commercial partnerships work. AstroForge could enable NASA to do more deep space missions at a much lower cost.

5. **Allow Commercial Deep Space companies to easily access NASA's Deep Space Network (DSN)**, communicating to spacecraft at long distances is very difficult using commercial technology, making the DSN more accessible would unlock a huge bottleneck.

Future generations will look back on this moment as an inflection point for America's mineral independence. And this subcommittee has the chance to be remembered as the leaders who saw a glimpse of the future and decided to help forge it.

APPENDIX

Odin, lower right, attached to a Falcon 9 rocket on Intuitive Machines #2, for February 26, 2025, launch.

[5] Ashley Zumwalt-Forbes, "Mining Financing Post," LinkedIn, February 15, 2025 https://www.linkedin.com/posts/ashleyzumwalt_mining-financing-infographic-activity-7295092955868999680-Q5e?utm_source=share&utm_medium=member_ios&rcm=ACoAAALITNoBvvIQW1Ka-BqZj_VlInvhGwZe-kc

Dr. GOSAR. Thank you, Mr. Place. I now recognize Mr. Painter for 5 minutes.

STATEMENT OF RICHARD PAINTER, PROFESSOR OF CORPORATE LAW, UNIVERSITY OF MINNESOTA LAW SCHOOL

Mr. PAINTER. Mr. Chairman Gosar and Ranking Member Dexter, members of the Committee, especially The Honorable Pete Stauber of the great State of Minnesota, I am very, very pleased to appear before you today.

I am not an expert on space mining. I have done a lot of work in corporate finance and corporate law over the years, and these are intriguing ideas that could yield great economic benefit and, if pursued at risk, and great risk to investors in the private sector, the return should go to the investors in the private sector. If space mining is pursued at the expense of the taxpayers and at the risk of the U.S. Government, the taxpayers should receive their due return.

So those who bear the risk should receive the return. And if there is a joint venture between the corporate world and the U.S. Government, it is absolutely essential that the bargaining with respect to risk and return be arm's length bargaining, and that the U.S. Government officials who are involved with this process, making decisions about what to do with our money, with taxpayer money, be free of conflict of interest. That is what is essential.

I am a government ethics lawyer. I served as the chief ethics lawyer for the George W. Bush administration. I have taught law at the University of Minnesota, government ethics, and corporate law now for almost 18 years. I am not here, of course, to speak on behalf of the State of Minnesota, my employer, but to speak out as a citizen about my concern that taxpayer money be spent on projects that benefit the taxpayer, and that our government officials be free of conflicts of interest.

In my written testimony I summarized some of the critically important rules, the most important of which is the criminal conflict of interest statute, 18 United States Code 208. I explained to incoming cabinet officials and White House officials in the Bush administration it is a criminal offense for a U.S. Government official to participate in a particular matter that has a direct and predictable effect on their own financial interests, including a company they own stock in.

And it is critically important that that rule be enforced not only by the Justice Department, but proactively by the executive branch. The Office of Government Ethics plays a critical role, and I was disappointed to see that the Director of the Office of Government Ethics was fired a very short time ago.

The U.S. Congress plays a critical role, as well. Oversight, that is the role of this Committee and other committees of both houses, to make sure that criminal conflicts of interest do not exist in our government, and that every U.S. Government employee, including special government employees, complies with the statute.

And second, there are financial disclosure rules that have been in place since 1978, in the Ethics in Government Act of 1978. Public financial disclosure is required in all three branches of government. Members of this Committee file a public financial

disclosure form. The top 100 commissioned officers in the White House fill out a publicly-available financial disclosure form. And, of course, the judges and justices of our courts. It is essential that the most important officials in all three branches of government disclose their finances.

It is inappropriate for the government in the executive branch or in any branch to appoint someone as a special government employee, say, well, they are only serving part time, and therefore we are going to hide the financial disclosure report if that person is performing functions where there is a decision-making role in the U.S. Government or an advisory role to the President of the United States at the highest levels.

And we need to make sure that the public has access to information about financial conflicts of interest of government officials who are involved in space mining or in any other decisions that affect the American taxpayer. We are paying for this government with very high rates of taxation in this country, and now with cutting back many essential services across the board in our country. And we have a massive Federal Government deficit, and it is our right as citizens to know what the financial conflicts of interest are of the people who are making decisions on behalf of our government, whether it is about space mining or any other subject matter.

[The prepared statement of Mr. Painter follows:]

PREPARED STATEMENT OF RICHARD W. PAINTER

Mr. Chairman, Ranking Member, and Members of the Committee: Thank you for inviting me to testify today.

I am a law professor at the University of Minnesota, and I was the chief White House ethics lawyer for President George W. Bush from 2005 to 2007. I specialize in corporate law, securities regulation, lawyers' ethics, and government ethics. I am also the Associate Reporter for the American Law Institute's *Principles of Government Ethics* which will be published later this year.

I do not appear before you to advocate for or against space mining. Mining here on earth is important to our economy and national security, although some proposed projects involve unacceptable environmental risks. Arne Carlson, a former Republican Governor of Minnesota, and I have expressed concern about proposals by foreign billionaires to open sulfide mines near the Boundary Waters.[1] If space mining is an alternative that will increase supply of precious metals at reasonable cost, it is a concept worth exploring.

Space mining could yield minerals worth billions, even trillions of dollars.[2]

But who should pay for space mining, and who should reap the rewards? A space mining project funded by the government should return profits to taxpayers. A space mining project funded by private enterprise should return profits to the owners of that enterprise. A space mining project funded both by the government and by private enterprise should distribute cost, risk and return equitably between taxpayers and private companies that pay for it. Negotiations between the government and companies in space mining projects must be at arm's length and free of financial conflicts of interest.

This is where federal conflict of interest statutes and financial disclosure requirements are critically important. Federal officers are prohibited from participating in government matters that affect their financial interests. Senior federal officers also

[1] Colleen Connolly, Former Gov. Arne Carlson is 88 and battling a massive mining conglomerate, Minnesota Reformer, June 8, 2023, https://minnesotareformer.com/2023/06/08/former-gov-arne-carlson-is-88-and-battling-a-massive-mining-conglomerate/

[2] Andrew Wong, Space mining could become a real thing—and it could be worth trillions, CNBC, May 15, 2018, https://www.cnbc.com/2018/05/15/mining-asteroids-could-be-worth-trillions-of-dollars.html ("Noted astrophysicist Neil deGrasse Tyson, among others, have claimed that the world's first trillionaire will make his or her fortune in space minerals. According to NASA, the minerals that lie in the belt of asteroids between Mars and Jupiter hold wealth equivalent to a staggering $100 billion for every person on Earth.").

are required to publicly disclose their assets, liabilities, income and other financial information so the public can know whether they are complying with conflict-of-interest rules. Federal officers involved with a space mining program will need to comply with these rules to assure there is not a massive waste of taxpayer money. I discuss those rules in more detail below.

Elon Musk, Space X and Space Mining

Since the beginning of the 20th Century, presidents have brought successful businesspeople into their administrations to advise on operation of the United States Government. The Government spent $6.75 trillion in 2024, and the total Government debt is now about $36 trillion. Something needs to be done, and a business expert like Elon Musk can bring new ideas that will help.

Space exploration and space mining are among Mr. Musk's many intellectual interests. Space mining is also one of his many financial interests. Space X is forming partnerships with asteroid-mining companies. As reported last month in Space.com:

> "A U.S. asteroid-mining company has announced the target space rock for its upcoming test mission. California-based AstroForge has identified asteroid 2022 OB5 as the destination for its Mission 2 spacecraft, named Odin, which is set to launch next month, SpaceNews reports. The Odin spacecraft will be flying as a secondary payload aboard a SpaceX Falcon 9 rocket, which will send Intuitive Machines' IM–2 lander toward the moon."[3]

Five years ago in 2020, Mr. Musk's likelihood of success in space mining was sufficiently serious that some financial experts believed he would increase gold supply and drive down the price of gold and other precious metals.[4]

Mr. Musk can bring useful ideas to the Trump Administration, including in space mining.

We must recognize two caveats, however.

First, the aim of government is fundamentally different from a for-profit corporation. Government exists to serve the people, to provide essential services while minimizing tax burdens on the middle class and curtailing deficits that shift costs to future generations. For profit companies by contrast focus primarily on profits, although some business leaders also are aware of their fiduciary obligations to the public.[5] Because of the fundamentally different objectives in the private and public sector, some ideas from business will work in government, and others not.

Second, the laws that Mr. Musk and everyone else in the Administration must comply with include conflict-of-interest statutes and regulations, financial disclosure statutes and regulations and other ethics rules intended to safeguard the integrity and efficiency of the United States Government, and our national security. As a federal employee Mr. Musk will work for the benefit of the United States, not himself.

The conflict-of-interest statute

The conflict-of-interest statute imposes criminal penalties on any executive branch officer or employee (except the president and vice president)[6] who:

> "participates personally and substantially as a Government officer or employee, through decision, approval, disapproval, recommendation, the rendering of advice, investigation, or otherwise, in a judicial or other proceeding, application, request for a ruling or other determination, contract, claim, controversy, charge, accusation, arrest, or other particular matter in which, to his knowledge, he, his spouse, minor child, general partner, organization in which he is serving as officer, director, trustee, general partner or employee, or any person or organization with whom he is negotiating or has any arrangement concerning prospective employment, has a financial interest." 18 U.S.C. Section § 208(a).

---

[3] Andrew Jones, Space mining company AstroForge identifies asteroid target for Odin launch next month, Space.com, January 31, 2025, https://www.space.com/space-exploration/tech/space-mining-company-astroforge-identifies-asteroid-target-for-odin-launch-next-month;

[4] Billy Bambrough, Winklevoss Twins Tell Barstool's Dave Portnoy To Pick Bitcoin Over Gold Due To Elon Musk's 'Space Mining', August 14, 2020, https://www.forbes.com/sites/billybambrough/2020/08/14/winklevoss-twins-tell-bar-stools-dave-portnoy-to-pick-bitcoin-over-gold-due-to-elon-musks-space-mining/

[5] Richard W. Painter, *The Conservative Case for ESG*, 9 University of Pennsylvania Journal of Law & Public Affairs 151 (2024)

[6] I believe this conflict-of-interest prohibition also should apply to the President, Vice President, and Members of Congress. See Getting the Government America Deserves; How Ethics Reform Can Make a Difference, Chapter 2 (Oxford University Press 2009).

This statute applies not just to matters in which there are identifiable parties but to any "particular matter." A particular matter may involve specific parties (for example a government contract, permit or case) or a particular matter of general applicability focused on the interests of a discrete and identifiable class of persons (for example an industry such as space exploration or space mining)[7] A particular matter will have a direct effect on a financial interest if there is a close causal link between a government decision or action in the matter and any expected effect of the matter on the financial interest.[8]

Some federal employees are part time special government employees (SGEs) who work with or without compensation.[9] This statute applies to SGEs as well as full time officers and employees with very narrow exceptions. A SGE serving on a committee governed by the Federal Advisory Committee Act may participate in particular matters of general applicability where the disqualifying financial interest arises from the SGE's non-Federal employment. However, the matter may not have a "special or distinct effect" on either the SGE or the SGE's non-Federal employer, other than as part of a class, and this exception does **not** cover interests arising from the SGE's ownership of stock or other financial interests in the employer.[10]

Here are some examples:

A full-time federal employee or SGE may not advise NASA or the White House on NASA's budget for space mining if the employee owns stock in a company that will financially benefit from NASA spending money on space mining.

A full-time federal employee or SGE may not advise NASA or the White House on regulatory matters pertaining to space mining if the employee owns stock in a company that will be affected financially by NASA's regulation of space mining.

A SGE serving on a federal advisory committee who is an employee of a company that has a financial interest in space mining, *but who does not own stock in the company*, might be permitted to participate in the above matters provided the matter does not have "special or distinct effect" on the company that is his employer.

---

[7] "The term particular matter encompasses only matters that involve deliberation, decision, or action that is focused upon the interests of specific persons, or a discrete and identifiable class of persons. Such a matter is covered by this subpart even if it does not involve formal parties and may include governmental action such as legislation or policy-making that is narrowly focused on the interests of such a discrete and identifiable class of persons. The term particular matter, however, does not extend to the consideration or adoption of broad policy options that are directed to the interests of a large and diverse group of persons." 5 C.F.R. §2635.402 (b)(3) https://www.ecfr.gov/current/title-5/chapter-XVI/subchapter-B/part-2635/subpart-D/section-2635.402

[8] "(i) A particular matter will have a direct effect on a financial interest if there is a close causal link between any decision or action to be taken in the matter and any expected effect of the matter on the financial interest. An effect may be direct even though it does not occur immediately. A particular matter will not have a direct effect on a financial interest, however, if the chain of causation is attenuated or is contingent upon the occurrence of events that are speculative or that are independent of, and unrelated to, the matter. A particular matter that has an effect on a financial interest only as a consequence of its effects on the general economy does not have a direct effect within the meaning of this subpart. (ii) A particular matter will have a predictable effect if there is a real, as opposed to a speculative possibility that the matter will affect the financial interest. It is not necessary, however, that the magnitude of the gain or loss be known, and the dollar amount of the gain or loss is immaterial." 5 C.F.R. §2635.402 (b)(1).

[9] A "special Government employee" is defined as an employee "who is retained, designated, appointed, or employed to perform, with or without compensation, for not to exceed one hundred and thirty days during any period of three hundred and sixty-five consecutive days," 18 U.S. Code § 202(a).

[10] "A special Government employee serving on an advisory committee within the meaning of the Federal Advisory Committee Act (5 U.S.C. app.) may participate in any particular matter of general applicability where the disqualifying financial interest arises from his non-Federal employment or non-Federal prospective employment, *provided* that the matter will not have a special or distinct effect on the employee or employer other than as part of a class. For purposes of this paragraph, "disqualifying financial interest" arising from non-Federal employment does not include the interests of a special Government employee arising from the ownership of stock in his employer or prospective employer." 5 C.F.R. 2640.203(g), https://www.ecfr.gov/current/title-5/chapter-XVI/subchapter-B/part-2640#2640.203

Financial Disclosure

Under the Ethics in Government Act of 1978 [11] and federal regulations thereunder senior government officials holding "covered positions" [12] must file public financial disclosure Form 278. [13] This includes "civilian employees in the Executive Office of the President (other than special Government employees) who hold commissions of appointment from the President." [14] There are approximately one hundred commissioned officers in the White House (Assistants to the President, Deputy Assistants to the President, and Special Assistants to the President), and all file a public financial disclosure form 278.

A SGE in the White House does not have to file the Form 278 but instead files a private financial disclosure Form 450. During my time in the Bush White House the only SGEs I encountered served on boards and commissions appointed by the President, for example the President's Foreign Intelligence Advisory Board. The President did not for any significant time frame appoint a SGE "part time" to perform the functions of a senior White House official such as an Assistant to the President. Using the SGE designation in this manner would be an obvious and inappropriate circumvention of the requirement that senior White House officials publicly disclose their finances.

I am aware of only one exception to this prior to 2025; it was wrong; and I said it was wrong. Antia Dunn took a temporary role on President Biden's staff as a "special government employee" which, pursuant to 3 U.S.C. 101(f)(8) exempted her from the public financial disclosure requirement (Form 278) that is required for all senior advisors to the President and other senior employees of the Executive Office of the President. [15] After I and other ethics lawyers publicly objected to this arrangement, in August 2022 Ms. Dunn reversed course and became a full time White House employee, filling a financial disclosure Form 278.[16] Ms. Dunn had significant assets the public had a right to know about, but she was no billionaire. She certainly was no Elon Musk.

Applying the Conflict-of-Interest rules and Disclosure rules to Mr. Musk

Mr. Musk as a federal employee may not participate in a government matter that affects his financial interest. [17] He has a control interest in Space X which is poised

---

[11] See 5 U.S.C. §§ 13101-13111: Financial Disclosure Requirements of Federal Personnel.

[12] These "covered positions" include the President and the Vice President; officers and employees (including special Government employees, as defined in 18 U.S.C. § 202) in positions that (1) are paid under a system other than the General Schedule (e.g., Senior Executive Service) and (2) have a rate of basic pay equal to or greater than 120% of the minimum rate of basic pay for GS–15 of the General Schedule; members of the uniformed services whose pay grade is O–7 or above; and officers or employees in any other positions determined by the Director of the Office of Government Ethics to be of equal classification; administrative law judges; employees in positions which are excepted from the competitive service because of their confidential or policy-making character, unless the position has been excluded from the public financial disclosure requirements by the Director of the Office of Government Ethics; the Postmaster General, the Deputy Postmaster General, each Governor of the Board of Governors of the U.S. Postal Service, and officers or employees of the U.S. Postal Service or Postal Regulatory Commission in positions for which the rate of basic pay is equal to or greater than 120% of the minimum rate of basic pay for GS–15 of the General Schedule; the Director of the Office of Government Ethics and each designated agency ethics official; *and civilian employees in the Executive Office of the President (other than special Government employees) who hold commissions of appointment from the President*." U.S. Office of Government Ethics, Public Financial Disclosure Guide, Appendix A, Definitions. (emphasis added) https://www.oge.gov/web/278eGuide.nsf/Definitions

[13] The OGE Form 278e has nine substantive Parts: Part 1—Filer's Positions Held Outside United States Government; Part 2—Filer's Employment Assets & Income and Retirement Accounts; Part 3—Filer's Employment Agreements and Arrangements; Part 4—Filer's Sources of Compensation Exceeding $5,000 in a Year; Part 5—Spouse's Employment Assets & Income and Retirement Accounts; Part—Other Assets and Income; Part 7—Transactions; Part 8—Liabilities; Part 9—Gifts and Travel Reimbursements.

[14] U.S. Office of Government Ethics, Public Financial Disclosure Guide, Appendix A, supra.

[15] Haisten Willis, Anita Dunn courts controversy while taking charge in Biden White House, Washington Examiner, September 20, 2023, https://www.washingtonexaminer.com/news/2586994/anita-dunn-courts-controversy-while-taking-charge-in-biden-white-house/

[16] Caitlin Oprysko, Anita Dunn finally discloses her corporate clients, POLITICO, August 12, 2022 ("Richard Painter, the chief White House ethics lawyer in the George W. Bush administration, said that Dunn and her husband's extensive investment portfolio raised another set of conflicts") https://www.politico.com/newsletters/politico-influence/2022/08/12/anita-dunn-discloses-corporate-clients-00051541

[17] Another area of concern is Mr. Musk's financial conflicts of interest in the efforts of DOGE to dramatically scale back or close the Consumer Financial Protection Bureau (CFPB). Richard W. Painter, *So Elon Musk works for the government. That comes with obligations. As a "special*

Continued

to lead the way in space mining, potentially earning Mr. Musk billions of dollars if projections about the value of minerals in space are correct. He has every right to pursue this as a private venture, but as a federal employee he cannot legally at the same time advise the Government on space mining or make decisions for Government agencies that affect space mining. Like countless other successful business leaders before him who entered public service, he must either divest his financial interest in space mining or recuse from government matters that affect space mining.

The Administration perhaps could have hired Mr. Musk as a government contractor, like a defense contractor, but then other rules would apply, such as competitive bidding for most contracts. Regardless, he is not a government contractor. Mr. Musk is a government employee. He is bound by the conflict-of-interest statute.

Mr. Musk's companies are government contractors, however, and hence the conflict of interest for him as a government employee. In fact, his companies have about $22 billion in government contracts, $15 billion with NASA and billions more with the Department of Defense.[18] If he were to participate in government matters affecting these contracts, he would stand on both sides of transactions potentially worth billions of dollars, and likely would violate the conflict-of-interest statute.

Mr. Musk also should publicly disclose his financial information like every other senior official in the White House. Calling him a SGE to avoid the disclosure requirement of OGE Form 278 is a charade. Mr. Musk's duties in the Trump Administration in the past four weeks have already far exceeded the duties of any SGE who has ever served in the Executive Branch. The impact of Mr. Musk's decisions and recommendations on the Government also has far exceeded that of any SGE who has ever served. Once he exceeds the 130-day limit on government work of a SGE the inappropriateness of his SGE designation will be even more obvious. Disclosure law avoidance at some point becomes disclosure law evasion, which like tax evasion is illegal. At best Musk, if he does not disclose his finances, is in an in-between area of law "avoision" a practice popularized in both tax loophole literature[19] and even on T.V. by Bart Simpson ("Krusty the Clown goes to jail for tax avoision!").[20] Such circumvention of the law is fundamentally dishonest and would be entirely inappropriate for a public servant.

Finally, space exploration and space mining involve matters important to our national security. Laws protecting national security—including laws requiring government contractors with access to classified information to report their contacts with foreign nationals[21]—must be obeyed.[22]

---

government employee," he must abide by conflict-of-interest laws and the Emoluments Clause, Minnesota Star Tribune, February 17, 2025. Tesla like other car manufactures, finances consumer car loans that are regulated by CFPB. Musk is also enhancing X with a new digital payment platform, a consumer finance vehicle also regulated by CFPB. On February 6, Musk's employees—presumably DOGE employees—reportedly entered CFPB headquarters seeking access to sensitive CFPB information, including staff records, industry data, and personally identifiable consumer information. Bobby Allyn, Laurel Wamsley, and Chris Arnold, Musk's team takes control of key systems at Consumer Financial Protection Bureau, NPR, February 7, 2025, https://www.npr.org/2025/02/07/g-s1-47322/musks-team-takes-control-of-key-systems-at-consumer-financial-protection-bureau The next day, Mr. Musk tweeted "CFPB RIP." https://x.com/elonmusk/status/1887979940269666769?s=46&mx=2. DOGE also is gaining access to confidential corporate data of X's competitors that the CFPB obtained from Amazon, Apple, Facebook, Google, and others. *CFPB Orders Tech Giants to Turn Over Information on their Payment System Plans Orders will help CFPB monitor for data surveillance, access restrictions, and other consumer protection risks as payments technologies and markets evolve*, Consumer Financial Protection Bureau, October 21, 2021, HTTPS://WWW.CONSUMERFINANCE.GOV/ABOUT-US/NEWSROOM/CFPB-ORDERS-TECH-GIANTS-TO-TURN-OVER-INFORMATION-ON-THEIR-PAYMENT-SYSTEM-PLANS/.

[18] See Elon Musk's US Department of Defense contracts, Reuters, February 11, 2025 ("SpaceX's CEO Gwynne Shotwell has said the company has about $22 billion in government contracts. The vast majority of that, about $15 billion, is derived from NASA."), https://www.reuters.com/world/us/elon-musks-us-department-defense-contracts-2025-02-11/

[19] ARTHUR SELDON ET AL. TAX AVOISION (London School of Economics 1979).

[20] *I Don't Say Evasion, I Say Avoision (The Simpsons)*, YOUTUBE (Jan. 30, 2016), https://www.youtube.com/watch?v=wpEaFmK3lrY.

[21] National Industrial Security Program Operating Manual (NISPOM), 32 CFR Part 117.

[22] Kirsten Grind, Eric Lipton and Sheera Frenkel, *Elon Musk and Space X Face Federal Reviews After Violations of Security Reporting Rules*, New York Times, December 17, 2024 ("Elon Musk and his rocket company, SpaceX, have repeatedly failed to comply with federal reporting protocols aimed at protecting state secrets, including by not providing some details of his meetings with foreign leaders, according to people with knowledge of the company and internal documents."), https://www.nytimes.com/2024/12/17/technology/elon-musk-spacex-national-security-reporting.html

Conclusion

The Executive power is vested in the President,[23] but he is not a king who can empower a vassal to do anything he wants to do. The President must take care that the laws of the United States are faithfully executed,[24] and he must obey the orders of the judicial branch.[25] Commissioned officers, both civilian and military, swear an oath of allegiance to the Constitution, not to the President.[26] The Supremacy Clause is clear that the Constitution and laws of the United States are the supreme law of the land.[27] Among these laws are those that pertain to financial conflicts of interest, financial disclosure and national security. These laws are not optional; they must be obeyed.[28]

Presidential power comes with responsibility, and it is the duty of Congress to assure that the Executive Branch is held accountable.[29]

Mr. Musk brings promise to the Trump Administration, but also a serious risk unless the President, Mr. Musk, and their advisors assure that the affairs of the United States Government are carried out free of conflict of interest. Space exploration and space mining, where enormous wealth is potentially at stake but also national security, is one of the most critical areas where Government employees must comply with the law.

QUESTIONS SUBMITTED FOR THE RECORD TO RICHARD W. PAINTER, PROFESSOR OF CORPORATE LAW, UNIVERSITY OF MINNESOTA LAW SCHOOL

Mr. Painter did not submit responses to the Committee by the appropriate deadline for inclusion in the printed record.

Questions Submitted by Representative Dexter

Question 1. In July 2023, before SpaceX launched its Falcon Heavy rocket from Kennedy Space Center in Florida, the Federal Aviation Administration (FAA) informed the company that a new facility it had built to fill rocket engines with fuel had not yet passed the required safety checks. SpaceX launched anyway, so the FAA fined the company. Now the FAA is facing significant staffing cuts and restructuring under the directives of the Department of Government Efficiency (DOGE). Both SpaceX and DOGE are led by Elon Musk.

Is it legal to allow someone with direct financial and operational stakes in aerospace regulation to oversee the agency's downsizing?

Question 2. The Environmental Protection Agency (EPA) notified SpaceX on March 13, 2024, that its deployment of its launchpad deluge system was in violation of the Clean Water Act. SpaceX ignored the warning and operated the system again on March 14. In fact, SpaceX deployed the system multiple times before eventually applying for a permit on July 1. In a separate case, EPA fined SpaceX $148,378 for

---

[23] U.S. Constitution, Article II, Section 1, Clause 1.

[24] U.S. Constitution, Article II, Section 3.

[25] Marbury v. Madison, 5 U.S. 137 (1803) ("It is emphatically the duty of the Judicial Department to say what the law is."). Fringe legal scholars of the left and right occasionally urge liberal or conservative presidents respectively to disobey orders of the Supreme Court. See e.g. Ryan D. Doerfler and Samuel Moyn, The Constitution Is Broken and Should Not Be Reclaimed, New York Times, Aug. 19, 2022 (stating that Congress should rewrite the Constitution without going through the Amendment process and that "Congress would be pretty openly defying the Constitution to get to a more democratic order—and for that reason would need to insulate the law from judicial review." No Congress and no president in the 20th or 21st Century has done that.

[26] "I, do solemnly swear (or affirm) that I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same." Officer's oath. 5 U.S. Code 3331. As an Associate Counsel to the President appointed by George W. Bush, I took that oath in 2005, swearing allegiance to the Constitution of the United States. I did not swear allegiance to any person, even the President.

[27] U.S. Constitution, Article VI, Clause 2.

[28] I discuss the importance of ethics statutes and rules for the efficiency and integrity of government in my book Getting the Government America Deserves; How Ethics Reform Can Make a Difference (Oxford University Press 2009).

[29] I discuss the extent and limits on presidential power in a wide range of areas, including appointment of White House staff in a forthcoming book co-authored with E. Thomas Sullivan, The Presidency: Power, Responsibility and Accountability (Cambridge University Press 2025).

releasing liquid oxygen and tens of thousands of gallons of water into wetlands bordering the Boca Chica launch site on several occasions without a permit.

Who is responsible for ensuring Musk is recused if EPA were to pursue regulatory actions and fines against SpaceX?

How can Congress and federal agencies ensure that Musk does not use his role to expedite permits, reduce fines, or otherwise weaken environmental enforcement in ways that directly benefit his companies?

What safeguards, if any, are in place to prevent Musk from using his position to weaken or delay environmental regulations that could hold SpaceX accountable for violations?

Question 3. X (formerly Twitter) made a deal with Visa to offer a mobile payments service similar to Venmo or PayPal. The service would be directly regulated by the Consumer Financial Protection Bureau (CFPB), which has a track record of bringing cases against payment companies. But DOGE aims to eradicate the CFPB. Elon Musk recently wrote "CFPB RIP" on X.

In your legal opinion, does Musk's attempt to dismantle the CFPB while it is responsible for regulating a service provided by his company represent a conflict of interest? If so, why should the American public be concerned?

How does Musk's public stance to dismantle the CFPB, combined with his business interests, impact the credibility of DOGE's mission and decisions regarding financial regulation?

Question 4. SpaceX, which runs the Starlink service, secured a 1.8 billion dollar classified contract in 2021 and serves as the Pentagon and NASA's primary rocket provider. The Pentagon also pays Starlink millions to supply Ukraine with internet access. However, Elon Musk was being investigated for his secret meetings with Vladimir Putin that were revealed by the Wall Street Journal. The full extent of Musk's defense contracts is unknown since many of them are classified.

Who is responsible for ensuring Musk is recused if he were to encounter a potential conflict of interest regarding his federal defense contracts while he is leading DOGE?

Without assurances that President Trump is going to enforce any mitigation of Musk's conflicts of interest, how can the public be assured that the Department of Government Efficiency isn't directing more taxpayer money into Musk's ventures?

Question 5. Through DOGE, Musk has gained access to agency data systems and sensitive information. For example, it has been reported that DOGE associates have been granted unrestricted access to NASA's personnel and contracting files. This access could provide SpaceX with insider information, potentially giving it an unfair advantage over competitors by accessing their proprietary information.

Considering Musk's direct ties to SpaceX, would you consider his role overseeing NASA's data systems an example of a conflict of interest?

Why is it a problem that Musk has access to sensitive information from NASA while simultaneously running a private space company?

Question 6. The sweeping funding cuts and mass layoffs implemented by DOGE under Musk's leadership have had devastating effects on working families who depend on stable employment and public services. Among those abruptly let go without cause are single parents, veteran employees, and public servants who dedicated years to improving their communities—only to find themselves jobless overnight. Meanwhile, Musk continues to secure new multi-billion-dollar government contracts for his private ventures, funneling taxpayer money into his corporate empire while slashing jobs and gutting public services.

Do you consider it a problem that the federal government is rewarding this behavior by continuing to provide Musk with lucrative contracts?

Dr. GOSAR. Thank you, Mr. Painter. And now, Mr. Shroff, you are up to 5 minutes. Thank you.

STATEMENT OF SAURAV SHROFF, CEO, STARPATH

Mr. SHROFF. Chairman Gosar and members of the Subcommittee, I am grateful to testify on behalf of Starpath about the exciting opportunities developing in space mining.

Right now the United States has a historic opportunity to develop low-cost travel to the moon and Mars. Soon it will be possible to use a rocket to fly to a moon base, much like we use airliners to fly to airports like JFK today. Building this future will be exciting, unlike anything you and I have ever seen, blending the patriotic unity of the Apollo program from the 1960s with the economic stimulus of the Union Pacific Railroad.

This future is closer than you might think. To enable low cost access to the moon and Mars, you need two main components.

First, you need a fully and rapidly reusable rocket. Thankfully, SpaceX is solving this with its new Starship rocket. Starship is the most powerful rocket ever made by the human species. By conducting seven, and counting, orbital test flights, SpaceX has demonstrated many, if not most, of the technologies required for full and rapid reuse. These are incredible feats of American engineering, and we should be proud.

The second element may be less discernible to those unfamiliar with our industry. To unlock low-cost access to the moon and Mars requires a rocket propellant mine and refinery on the moon and Mars, in layman's terms, a gas station. Broadly speaking, it is impossible to operate a mission to and from the moon or Mars without refueling.

Fortunately, Starpath, the company I am proud to represent today, has built the world's most advanced system for mining on the moon and Mars. In a few short days this system will be operational at our headquarters in Los Angeles, and we invite members of the Committee to come visit. By mid next year we will be ready to ship a refinery for the surface of the moon that is twice as powerful as the most powerful satellite ever made, the International Space Station, at a fraction of the cost. The following year our capacity will reach 20 times that of the ISS, and the following year 200 times. In less than 4 years the system will be large enough to support a city of 10,000 inhabitants on Mars. That is pretty cool. In doing so, we will put the United States at the top of a global leaderboard.

Space mining can drive down space transport costs by over 10 or 100 times, unlocking immense economic potential. Meanwhile, China is aggressively advancing. Last year the Chinese sent a mission to collect and return samples from a natural resource-rich area of the moon. This was the same year we canceled our VIPER moon mission which cost the taxpayer $800 million. If they win, they will control land and resources on the moon and Mars and, worse, be viewed by the rest of the world as the leader at the frontier. That is unacceptable. The United States invented this game with Apollo in the 1960s, and we intend to win. In order to do so we believe that the government needs to excel in three areas.

First, we need to launch rockets fast. Right now the FAA and groups like the U.S. Fish and Wildlife Service, and I am pro-fish, by the way, have an approval cadence that is slower than rocket launches themselves. This delays critical timelines for Starpath and for NASA.

Second, congressional funding for NASA must align with this administration's goals to stay competitive in the global race for space resources. NASA has outlined a plan for a space mining contract

called Lift–1. The contract would provide the necessary financial kickstart for a space resources-driven economy, and will return more to the taxpayer in reduced cost of access to space than its own line item cost. So to repeat, will return more to the taxpayer in reduced cost of access to space than its own line item cost. Moreover, Lift–1, the way we envision it, will put the United States at the uncontested front of this global race now. Lift–1 needs to happen.

Third, we need to modernize planetary protection rules. In the 1960s we signed the Outer Space Treaty, which describes planetary protection, a well-intentioned rule set designed to protect planetary science. As it stands today, planetary protection is in direct conflict with NASA and the President's stated objectives to put humans on Mars. If unchanged, they may be the reason we lose on the global stage. They deserve examination and a modern refresh.

Taking it easy has never been the American way. My parents moved here in the 1980s for a country that strives to be the best, and that drive is what keeps me here. The choice is clear: either America paves the way in the new space race and American companies own the market for space resources, or we cede leadership to China. What future do we want?

Thank you.

[The prepared statement of Mr. Shroff follows:]

PREPARED STATEMENT OF SAURAV SHROFF, CEO, STARPATH ROBOTICS INC.

Chairman Gosar and members of the subcommittee, Starpath appreciates the opportunity to testify about the exciting opportunities developing in space mining. This timely hearing indicates the Committee's recognition of the importance of America staying on t he forefront of this emerging industry.

Starpath is building a rocket propellant mine and refinery for the Moon and Mars at mega scale. This means that Starpath designs and builds three main categories of equipment as part of a vertically integrated system. The first is equipment that can mine and transport huge amounts of raw resources on the surface of the Moon and Mars. The second is equipment that can process those resources into highly valuable commercially salable products including rocket propellant, water, and eventually exportable goods like Helium–3, which is an important natural resource that can only effectively be sourced from the Moon. The final category is equipment to cheaply generate huge amounts of power for both aforementioned components. Starpath will be an important part of the United States' domination of our adversaries in the new space race and it won't even be close.

Right now, the United States has the opportunity to develop low cost travel to the Moon and Mars. Soon, it may be possible to use a rocket to fly to a Moon base much like we use airliners to fly to airports like JFK today. Building this future could combine the inspiring and patriotic unifying effects of the Apollo program from the 1960s with the stimulating economic activity of the construction of the Union Pacific railroad in the 1860s.

This future is closer than you might think. Enabling low cost access to the Moon and Mars requires two main components.

The first is a fully and rapidly reusable rocket. Amazingly, SpaceX, an American company, is expeditiously developing its new Starship rocket, which will be exactly that. Starship is the most powerful and largest flying object ever made by the human species. SpaceX has successfully flown and publicized seven orbital test flights, and demonstrated many if not most of the technologies required for full and rapid reuse. These technologies include catching their booster stage out of mid air with giant mechanical arms, and high velocity reentry of their upper stage into the Earth's atmosphere. These are incredible feats of American engineering, and we should be proud.

The second element may be less discernible to those unfamiliar with our industry. To unlock low cost access to the Moon and Mars requires a rocket propellant mine and refinery on the Moon and on Mars; essentially, a gas station. Broadly speaking, the laws of physics limit the operation of a mission to and from the Moon or Mars

without refueling. Fortunately, Starpath, the company I am proud to represent today, has built, in America, the world's most advanced system for mining on the Moon and Mars. Starpath is excited to announce that this month, that system will be operational in a fully integrated state at our headquarters in Los Angeles—we invite members of the committee to come visit! This outcome to the credit of the incredible Starpath team. The Starpath team is currently working tirelessly to bring our first system to flight readiness, and to put ourselves, our partners, and the United States at the top of a global leaderboard of space-faring countries. Our mindset is that there is no prize for second place. By mid next year, we will be ready to ship a mine and refinery for the surface of the Moon that is twice as powerful as the most powerful man-made satellite ever made, the International Space Station. The following year, Starpath's capacity will reach 20 times that of the ISS, and the following year, 200 times. In less than four years, the system will be large enough to support a city of 10,000 inhabitants on Mars. These mines will extract resources and produce commodities to support billions of dollars of commercial activity each year, and yet will cost less than $100 million to produce. These aren't just the most powerful systems of their class, they are the most powerful space systems ever made.

Space mining has the potential to unlock costs of space transport hundreds or even thousands of times lower than what we see today, and correspondingly, to drive immense, unprecedented commercial activity. China also has plans to go to the Moon and Mars, and they have demonstrated an ambitious attempt to equal and exceed U.S. efforts in tapping space resources. Last year, the Chinese launched a mission specifically to collect and return samples of natural-resource rich land on the Moon. This was in the same year NASA canceled its flagship VIPER mission to map valuable resources on the Moon. If China succeeds in its goal of exceeding U.S. presence and capacity in space, they will control land and resources on the Moon and Mars. Perhaps more importantly, China will be viewed by the rest of the world as the country pushing the edge of the frontier. We refuse to let that happen. Americans invented this game in the 1960s with Apollo, and this is still our game to win.

In order to do so, we believe that the government needs to do an excellent job in three areas. The status quo in these areas is commendable, but there remains some room for improvement.

First, aerospace companies in the U.S. need to launch rockets frequently in order to accelerate the inevitable cost reductions of access to space. Right now, the Federal Aviation Administration and various government environmental groups, such as the US Fish and Wildlife Service, have an approval rate slower than the cadence of the rocket launches themselves.

These delays limit our ability to engineer, and tangibly push back crucial timelines for businesses like Starpath.

Second, congressional funding for NASA must align with this Administration's goals to stay competitive in the global race for space resources. NASA has outlined a plan for a space mining contract called LIFT-1. The contract will provide the necessary financial kick-start for an economy driven by space resources, and will return more to the taxpayer in reduced cost of access to space than its line item value. Moreover, LIFT-1 will give the U.S. an edge in establishing dominance in the emerging space resource s economy.

Third, we need to revisit rules designed to protect the ability to conduct scientific research in space. In the 1960s, we signed the Outer Space Treaty. The Outer Space Treaty describes "planetary protection," which is a well-intentioned ruleset designed to protect other planets from our own biological contamination. As it stands today, planetary protection rules are actually in direct conflict with NASA and the President's stated objectives to put humans on Mars. The ability to run frequent, low-cost missions to the Moon and Mars—an ability which is unlocked by space mining and efficient utilization of space resources—will be a boon to scientific research. If left unchanged, the Outer Space Treaty may be the reason the U.S. loses ground against competing countries in space research. The treaty deserves careful examination and a modern refresh.

Starpath is grateful to the Committee's attention to this exciting area of untapped economic potential and technological innovation. The future we envision is a future where America dominates the new space race, where American companies own the market for space resources, and where America cements its position as the dominant technological force of planet Earth. To make this future a reality will depend on the support of Congress, and on establishing the crucial public-private partnerships that have driven some of the most ground-breaking innovations in this country's history. Starpath thanks the Committee for convening this hearing, and looks forward to providing its honorable members with any further information.

Please contact *saurav@starpath.space* with any questions or if we can provide any additional information.

Dr. GOSAR. Thank you. I thank the witnesses for the testimony. Now we are going to go to the Members for their questions. The first Member up is Mr. Collins from Georgia.

Mr. COLLINS. Thank you, Mr. Chairman. You know, as a fellow small businessman and entrepreneur, it is incredible that we have hearings like this to talk about the future of things, especially critical minerals, which are the future especially for mining and what we need. But it is nice to see that we are highlighting some small businesses that are out there taking a chance on doing something. I want to focus on one particular area.

Mr. Painter, surveying your career, the courses that you teach, the publications that you publish out there indicate that you specialize in corporate law, securities, and ethics issues. However, the purpose of this hearing is to highlight America's needs for minerals and explore modern solutions. So yes or no, do you have any technical expertise on modern mining practices and technologies?

Mr. PAINTER. No, I do not. I do not. My expertise is also on government ethics.

Mr. COLLINS. Thank you.

Mr. PAINTER. As the chief ethics lawyer for President Bush——

Mr. COLLINS. Let me ask you this. And yes or no, when you work at the University of Minnesota Law School do you teach courses on mining law or policy?

Mr. PAINTER. I just answered that question. The answer is no. I teach courses on ethics.

Mr. COLLINS. Thank you.

Mr. PAINTER. And if you don't care about ethics, then you shouldn't have invited me to the hearing.

Mr. COLLINS. So yes or no, in the past you have run for political office and publicly expressed opposition for hardrock mining projects in your home State there in Minnesota, while touting your experience as an ethics attorney.

Mr. PAINTER. Some of the hardrock mining projects, I believe, are dangerous and they were conducted by companies funded by foreign billionaires who weren't willing to put their guarantee on the table that if they created a mess they would clean it up.

Mr. COLLINS. So yes or no, you have also at the same time publicly expressed support for growing the solar industry in the United States. Correct?

Mr. PAINTER. Well, that is one way to create energy, yes.

Mr. COLLINS. But Mr. Painter, don't you understand that solar energy requires critical minerals and other hardrock minerals?

Mr. PAINTER. I do.

Mr. COLLINS. Do you suggest that America is better off sourcing these materials from abroad?

Mr. PAINTER. Certainly not. I just simply said that the people who have opened up mines be willing to clean it up if they make a mess.

Mr. COLLINS. Do you deny that labor and environmental standards in the United States are among some of the strongest in the world?

Mr. PAINTER. Some of them are and some of them are not, depending on who is administering the Environmental Protection Agency and who is conducting oversight. I am here——

Mr. COLLINS. "Depends" is a big word.

Mr. PAINTER [continuing]. As an ethics lawyer, not as a mining expert.

Mr. COLLINS. Sir, are you aware that China dominates global mineral supply chains and backs mining operations using forced and child labor?

Mr. PAINTER. I am sure they do, and the Chinese are taking advantage of the fact that we just have partisan fights——

Mr. COLLINS. Do you know——

Mr. PAINTER [continuing]. Back and forth all the time and make a bunch of false——

Mr. COLLINS. Mr. Painter——

Mr. PAINTER [continuing]. Accusations against each other instead of focusing on the issue at hand.

Mr. COLLINS. Here is what is troubling to me, Mr. Painter. It is troubling to me that, despite dedicating your career to ethics issues, you have no problem championing a radical, anti-mining agenda that is unsupported by science and is advanced by dark money and Chinese-funded non-profit organizations.

Mr. PAINTER. I support mining. That is just simply not true.

Mr. COLLINS. No——

Mr. PAINTER. I support mining, I support safe mining.

Mr. COLLINS. Mr. Chairman, it is obvious that critical hardrock mining and critical minerals, they are essential for our future. And there are two things which are a common theme that I see up here time after time. That is, No. 1, that there is an over-reaching, out-of-control Federal agency that is stymieing and controlling every bit of this mining industry, also the frivolous and non-ending lawsuits that are out there. And the other thing is just the willingness, like Mr. Painter said, to allow China, which provides the majority of our critical minerals that are processed right now, because we have to send them over to China to get them processed, they are over there mining with forced and child labor.

You know, it is time to unleash the American entrepreneurial spirit and make sure that we are and remain the best country in the world and America first. And with that, Mr. Chairman, I yield back.

Dr. GOSAR. Will the gentleman yield?

[No response.]

Dr. GOSAR. Will the gentleman yield?

Mr. COLLINS. Yes, sir. I would yield.

Dr. GOSAR. Because you have a good couple seconds.

Mr. Painter, you said you would support mining. Give me some examples of those mines.

Mr. PAINTER. I support mining. In Minnesota, we have had mining for iron for many years, and the iron mining industry has been successful in creating jobs in Minnesota. It has been very

successful and is well regulated and complies with environmental regulations.

With sulfide mining we could do it, but we need to do it with companies that are willing to step to the plate and promise to clean up if they make a mess. Glencore in the PolyMet mine was refusing to guarantee cleanup. We have a company run by billionaires in Europe doing deals with the Russians, and they refuse to guarantee the PolyMet mine. I oppose that.

Dr. GOSAR. Hold on a second. So you don't bond your hardrock mining?

Mr. PAINTER. Hardrock mining can be accomplished and can be safe.

Dr. GOSAR. Oh, I understand, but you are supposed to bond it. That is where your cleanup comes. And you should be very much aware of now these microprocessors, that they are very green, they have very little water use, and you are getting everything out of this ore. So you have got to be really careful here.

So I stole his time, so I am going to get back.

Mr. PAINTER. You are right Mr. Chairman. You do need to be careful, and the people who do the mining need to be willing to guarantee to clean it up, and Glencore wasn't willing to do that in Minnesota. And former Governor Arne Carlson, a Republican, and I opposed that project for that reason.

Dr. GOSAR. I yield back.

Mr. COLLINS. With that, Mr. Chairman, I yield back.

Dr. GOSAR. I yield back. The gentlewoman from Oregon, I had to think about this because I said it wrong last time, Ms. Dexter.

Dr. DEXTER. All right. All right, so thank you, Mr. Chair.

So SpaceX is part of at least three Federal reviews for its failure to comply with national security protocols, including by failing to disclose details of Musk's meetings with foreign leaders. For example, The New York Times reported that Musk had meetings with Vladimir Putin during which they discussed space, and Putin allegedly asked Musk to do a political favor for China's President Xi Jinping.

Mr. Painter, if these findings were to be confirmed, why is that a problem for the American people?

Mr. PAINTER. I gave the ethics lectures for the White House under President Bush at the President's direction on use and misuse of classified information. And one thing that is absolutely critical is when government contractors are entrusted with classified information they must report to the U.S. Government specific information about their dealings with foreign countries, and those reports are mandatory, must be filed, and they cannot be misleading.

A material misstatement of the U.S. Government is a felony under 18 United States Code 1001. I don't know what happened in this specific case, but I will emphasize that those who are entrusted with classified information must file those reports. It is absolutely critical. We can't have our classified information in the hands of the Russians or the Chinese.

Dr. DEXTER. Great, thank you. And under normal circumstances, how might the Office of Government Ethics advise Musk to deal with a conflict of interest like this? What are some of his options?

Mr. PAINTER. Well, if Mr. Musk is going to make any decisions involving recommendations involving space mining, for example, he would need to divest from SpaceX. There is just too close a connection. There is no way that you can get involved in space mining and have a financial interest in SpaceX without violating the criminal conflict of interest statute.

So divest is the best option. Recuse and have nothing to do with the matter is the second best option.

Dr. DEXTER. Great. And under current arrangements, with Musk as a special government employee, who is responsible for ensuring Mr. Musk is recused or divested of his conflicts of interest?

Mr. PAINTER. The appointing officer is responsible at first instance, and that is the President of the United States.

I should emphasize that Mr. Musk is performing functions well beyond the functions that are ordinarily performed by a special government employee. In fact, he is performing functions that are performed by an employee who is appointed and confirmed by the U.S. Senate, a principal officer of the U.S. Government. And so there does need to be an additional appointment made with a confirmation hearing if he is going to continue doing what he is doing.

Dr. DEXTER. OK. And what safeguards are in place to prevent Musk from using his leadership at DOGE to obstruct or delay these inquiries by cutting staff, cutting funding, or killing investigations directly?

Mr. PAINTER. The first safeguard is the Office of the President of the United States, the Executive Office of the President, and I would entrust that President Trump would make sure that everyone he appoints is complying with the government ethics rules, including the criminal conflict of interest statute.

Second is Congress and the oversight obligations of both houses of Congress, including this Committee, to call witnesses to gather information and, most important, to get Mr. Musk's financial disclosure form, which should be available to the public, certainly should be available to the members of this Committee.

Dr. DEXTER. Thank you. Pivoting, the FAA, or Federal Aviation Administration, which regulates aerospace operations, has investigated and fined SpaceX multiple times, including for safety violations. Now the FAA is facing significant staffing cuts and restructuring under DOGE's direction, and a team from SpaceX has been brought in to assist with overhauling the FAA's air traffic control system.

Mr. Painter, what is the risk of allowing SpaceX personnel to influence FAA restructuring?

And would this situation fit the legal definition of a conflict of interest?

Mr. PAINTER. Mr. Musk retains a financial interest in SpaceX. He should recuse from most all government matters pertaining to the Federal Aviation Administration while the Federal Aviation Administration is regulating and in these controversies with SpaceX. You either divest or recuse. That is what is required under criminal conflict of interest statute.

Dr. DEXTER. Thank you. And as you know, Trump fired at least 18 inspectors general, including the one at the FAA. Given that the traditional independent oversight mechanisms have been

weakened, how can we be certain that Musk won't use his influence to undermine FAA regulations that could negatively impact SpaceX's bottom line?

Mr. PAINTER. I would strongly urge that the President rehire the inspectors general. There is no reason to fire the inspectors general unless they are derelict in their duty in office. We need inspectors general to make sure there is no waste, fraud, or abuse in the Federal Government. And once again, it is the obligation of the House and Senate to exercise oversight, as well.

Dr. DEXTER. Great. Thank you, Mr. Chair. I yield back.

Dr. GOSAR. You are welcome. The gentleman from Alaska, Mr. Begich, is recognized for 5 minutes.

Mr. BEGICH. Thank you, Mr. Chairman.

Question for you, Mr. Painter. You have stated that the U.S. taxpayer should have a return, and I agree. The taxpayer should have a return when making investments in public-private opportunities. Given your background in corporate finance, what structure would you recommend would be best for investments in space mining?

Are we talking about direct equity participation, debt, debt with long-term warrant coverage, or some other structure that would allow the U.S. taxpayer to achieve participatory returns?

Mr. PAINTER. Well, first and foremost, it is absolutely critical whoever is negotiating on behalf of the U.S. Government and getting involved in any of these issues involving space mining not have financial conflicts of interest, not be involved in companies like SpaceX.

Now, once you have somebody in place who has financial expertise and does not have financial conflicts of interest, you can consider the various options. Given the enormous risk involved, I would think that some sort of equity participation might be ideal because debt participation, if you have a company that launches a space mission, the government lends them a lot of money and it goes belly up, well, you are not going to get repaid. So you may need some sort of equity participation through the U.S. Government.

There are a lot of different arrangements we can look into, but the key is when government and private enterprise are working together they do not become crony capitalism, the kind of thing that our founders rebelled against and that Adam Smith wrote against.

Mr. BEGICH. OK, I appreciate that. Thank you for your feedback. My time is limited, so I am going to move on to Mr. Place.

Mr. Place, for AstroForge I think some of the technology you are describing is very exciting: autonomous mining capabilities that would return raw materials to Earth. You mentioned that they would then later be for sale. Would you imagine that these raw materials would remain in orbit, in a geostationary orbit of some kind so they could be later used for zero-G construction? Would they be returned to Earth's surface?

Mr. PLACE. Great question. Short answer, that is possible. But our bread and butter is the refinery itself. So the physics behind getting to and from asteroids is pretty settled. What our core technology does is basically mine and refine the asteroid in situ, so right on the surface.

So we have a few options. We can bring that refined material, about a metric ton of platinum group metal, back and de-orbit that, or it is definitely possible we can use that for in-space manufacturing.

Mr. BEGICH. Thank you. And then a final question for Mr. Shroff.

Aside from moving at a rapid pace, how do we achieve an enduring competitive advantage versus China or other nations in terms of space mining?

Mr. SHROFF. Thank you for the question. That is a great question, and it is actually a bit of a tough one to answer because I think that you actually hit the nail on the head.

Moving at a rapid pace is what gives you an enduring advantage. Innovating faster than your competitor is the definition of an enduring advantage. There is simply no world where you innovate slower than your competitor and expect to be better than them for any duration of time. That philosophy guides development at Starpath. That philosophy, in my opinion, should guide development at really any competitive private company.

If your question is referring to what the government can do, I outlined some of the things in my testimony that I think the government can do to support industries like ours, many of which are free. And, you know, so I will stop there and I will just say, you know, going fast is really everything when it comes to competing, and anything the government can do to make sure that industry isn't slowed down, which right now we think that the government is doing a fantastic job at in our industry, is two thumbs up from us, and really supported.

Mr. BEGICH. One additional question, Mr. Shroff. Do you imagine a scenario in which you would be working with AstroForge in order to achieve some of the mission that has been laid out by your company?

Mr. SHROFF. Yes. It is a bit of a long answer, and I will do my best to keep it short.

The short summary is that the product we build, which produces rocket propellant in space, makes it easier to do in-space transportation. So if AstroForge was, for example, interested in—you know, I will try to keep this simple—moving their mined material from a highly energetic lunar orbit to a less energetic Earth orbit where it would be, you know, more easy to sell or closer to the point of being sold, our technology and our product could make that cheaper.

Mr. BEGICH. Thank you. I think that highlights just how important it is for us to ensure that we are building all components of the space ecosystem in order to achieve actual mission success.

Thank you, and I yield back.

Dr. GOSAR. I thank the gentleman. The gentleman from Puerto Rico, Mr. Hernández, is recognized for his first 5 minutes.

Mr. HERNÁNDEZ. Thank you, Chair Gosar and Ranking Member Dexter, and thank you to all the witnesses for being here today.

My question is for Mr. Painter. As you know, fFinancial conflicts of interests in the Federal Government can have serious consequences for Americans. When public officials prioritize personal or financial interests over the public good, it can lead to mismanagement of resources, inefficiencies, and even corruption. This

not only wastes taxpayer dollars, but also undermines public trust in the government. For Puerto Ricans who I represent and who already face unique challenges in accessing Federal support and resources, these conflicts could disproportionately affect our community's ability to benefit from government programs and policies.

Mr. Painter, can you tell us why the average American should care about the potential financial conflicts of interest of those working in the Federal Government?

Mr. PAINTER. Because our money is at stake here. We pay taxes, and tax rates are quite high for many Americans. We pay taxes. We should expect a return on our investment in essential services from the U.S. Government. And if there is extra money, they shouldn't be taxing us so much.

They also should be paying down this enormous deficit, which is going to have to be paid off by our children if that isn't taken care of.

And the problem when we get into these ventures like space mining, if there is going to be government investment as well as corporate investment side by side, is that if you don't have arm's length negotiations and you have conflicts of interest, then you get into the crony capitalism which is exactly what our founders rebelled against, the crony capitalism of the East India Company who was bribing the members of parliament and trying to force us to drink their tea.

You know, and this is what is going to be going on here if we are going to be dumping a lot of taxpayer money into a project and then private companies get the return. That is crony capitalism. That is what Adam Smith objected to, what Edmund Burke objected to.

I believe in free enterprise, where private money is invested in projects and there is a private return. If there is going to be government involvement, I want to make doggone sure that this government is represented by officials who do not have their own financial conflicts of interest. And we are not going to have crony capitalism in the United States if we want to succeed as a country.

Mr. HERNÁNDEZ. And for the benefit of Americans, are there any historical precedents of conflicts of interest harming the American people in projects like these?

Mr. PAINTER. We have had historical precedents of conflicts of interest ever since the founding of our country, where government officials have allowed their own financial conflicts of interest and their businesses to interfere with their decisions in government, whether it was large plantation owners who obstructed efforts to abolish slavery in the early years of our country's history running up to the present, where we now have billionaires entering the U.S. Government and the executive branch with conflicts of interest.

It is OK to have successful business people in our government, but they must, one, file a publicly-available financial disclosure form so we can find out what they own and what the conflicts of interest are. The public has the right to that information.

And second, they must comply with the criminal conflict of interest statute at 18 United States Code 208. And that is what I am asking Mr. Musk to do and all the other officials in the executive branch, just as I did during the Biden administration and during

the Bush administration when I was in the White House under President Bush.

Mr. HERNÁNDEZ. Thank you, Mr. Painter, and I agree of the importance of transparency, accountability, and preventing conflicts of interest at the Federal level, at the State level, at the local level, at all levels of government.

With that I yield back the remainder of my time.

Dr. GOSAR. I thank the gentleman. I will recognize myself for the next 5 minutes.

So Mr. Shroff, you have employees, don't you?

Mr. SHROFF. We do.

Dr. GOSAR. Do you ever evaluate your employees from time to time?

Mr. SHROFF. We do.

Dr. GOSAR. Do you ask them to show what they are doing?

Mr. SHROFF. We absolutely do.

Dr. GOSAR. Why is that important?

Mr. SHROFF. At risk of stating the obvious, it is important because high-performing employees should be encouraged to keep performing highly and equipped with the resources to keep doing so. Low-performing employees, there should be a careful look taken to make sure that they have all the resources they need to succeed and if they are not in the right position to make the necessary changes.

So without stating the obvious, because, you know, we want to run efficiently as a private company.

Dr. GOSAR. Well, I tell you what. Captain Obvious should be here for that very statement.

Now, Mr. Place, how about you? Do you have employees?

Mr. PLACE. I am not the CEO, so no, sir.

Dr. GOSAR. You don't have any employees?

Mr. PLACE. Employees at AstroForge, yes.

Dr. GOSAR. OK. Now, Professor Cabrera, you have got students, you have got probably a number of people answering to you. Do you have some constant oversight of those students?

Mr. CABRERA. Yes.

Dr. GOSAR. I mean, I was once a GA. So did you actually try to improve on how they were going to do things?

Mr. CABRERA. Yes.

Dr. GOSAR. And if they don't show up, what is their battle axe?

Mr. CABRERA. In every sector, private, government, and academic, when people don't perform they should be released.

Dr. GOSAR. That is what I thought. I was a business owner, too, so I just thought that was pretty obvious. I am waiting for Captain Obvious to show up again. Still here.

So now, this whole thing is about mining. So I want to get back to you, Dr. Cabrera. Is Resolution Copper one of those places where you can actually look at some of those mining techniques that you will be using in space?

Mr. CABRERA. Yes.

Dr. GOSAR. Why?

Mr. CABRERA. They are looking to do mining in harsh underground environments.

Dr. GOSAR. At what depth?

Mr. CABRERA. I believe it is 8,000 feet.

Dr. GOSAR. Yes. We did a hearing out there in the Western Caucus, and we called it the journey to the center of the Earth. It was really interesting.

So now, we are going to develop these miners of the future, let's just call them that. Because of the intense pressures down below there that is hot, it is probably not the best if you have a cave-in, because they are going to do some modified mining. What do you expect from them to do, and where would this be first tested, these robots?

Mr. CABRERA. All of the technology necessary for space mining is necessarily going to be tested right here on Earth, innovating in the mineral supply that we have on the planet.

Dr. GOSAR. Our environment in space is as valuable as it is down here, right? So we don't want to contaminate anything, right? The gentleman said it, Mr. Place said it. They are going to use concentrators up there, right? And so you are not going to bring a bunch of ore down. You are going to bring the real product. That is because it is so expensive.

So how do you go about those concentrators, do you look at those here in real life? And I understand that you have to prove your process, that it works. Then you have to look there is no contamination for any environmental aspects. And then third, can you do it to scale, right? So that is the three parameters.

OK. Well, won't those be tested here?

Mr. CABRERA. Yes.

Dr. GOSAR. What are you going to test them on? What mine? I am trying to figure this out because we have had people over and over come here saying, "Not this mine, not this mine."

I had the Good Earth Guardians over here just a couple of years ago saying, "Listen," I have been down to Resolution Copper. When I started asking them questions, they would recant that. But they would never give me a mine that would work.

Now, Mr. Painter, what if I told you that the Twin Metals mine actually has a higher standard than any other mine, period? Do you know why? You should know this one.

Mr. PAINTER. Well, you can——

Dr. GOSAR. Congress came in there and did a different area. They gave the area of the mine site, and then they did a whole area so that you couldn't mine in that outlying area. So they actually looked at it, did they not? And if you are not actually having a bond aspect, that is your problem because that is required by law, a bond, and they have to remediate that.

So you know, we are going to do a second round, but I have much more to talk to you, and you will be able to answer that one. OK?

I yield back.

Mr. PAINTER. That is a question?

Dr. GOSAR. No. The gentleman from Georgia is recognized.

Mr. COLLINS. Thank you, Mr. Chairman.

Mr. Shroff, I want to delve into Starpath here for a minute, because——

Mr. SHROFF. Sure.

Mr. COLLINS [continuing]. I find this pretty fascinating and incredible. So you all are going to mine rocket propellant on the moon?

Mr. SHROFF. That is correct.

Mr. COLLINS. OK. All right, so you are an actual mining company.

And I want to pick up on what you all are talking about with the rapidly progressing nature of this mining opportunity. What factors have led to the acceleration of prospects for mineral extraction in space?

Mr. SHROFF. I would say at the absolute top of the list is the cost and access of launch to space.

You know, I am generally not a political guy, and I know this is a politically sensitive topic with Elon being in the government, and that is not my domain, but SpaceX you know, roughly holds a 90 percent market share on launch market. And if it wasn't for SpaceX, the U.S. actually would not even be a competitive country in the space industry at all. And we are the leader. And the fact that SpaceX has brought online such an immense, unprecedented capability to launch payload to space and are actually increasing it by an order of magnitude with their new rocket Starship has completely changed the game for businesses like Starpath.

Mr. COLLINS. Would you——

Mr. SHROFF. I should say, go on.

Mr. COLLINS. Would you say SpaceX is a success?

Mr. SHROFF. Again, at risk of stating the obvious, I would say yes.

Mr. COLLINS. Yes.

Mr. SHROFF. And it is totally not a political statement. It is just based on the fact that SpaceX has enabled businesses like AstroForge, like Starlink which connects millions of people around the world which, SpaceX's own, and countless other businesses that service a whole boatload of interests on Earth.

Mr. COLLINS. So let me——

Mr. SHROFF. So yes, I would say——

Mr. COLLINS. Let me ask you this, then. So when you hear about all these extensive timelines that we have for mining projects here, and what we have been talking about just around the country, and the Federal regulatory burden that hinders progress in this field, have you got any concerns for further regulations affecting the space mining industry?

Mr. SHROFF. So, first of all, I will say I am not an expert in terrestrial mining, so I don't know what the regulatory process looks like. But I am learning as we go and understanding that it is burdensome.

And yes, we have some concerns, although not that many. And I described a number of them in my opening testimony——

Mr. COLLINS. You did.

Mr. SHROFF [continuing]. That, you know, basically we should regulate, we should make sure that the public is safe for sure, there should be no compromises with respect to public safety. But regulation, particularly related to protecting science, shouldn't slow down, and I know this is going to sound ironic, technologies like Starpath, which will advance science.

Mr. COLLINS. Right. So and also you described in your testimony that Starpath is seeking to resolve one of the biggest barriers to regulate space travel and resource, the extraction in space. So currently, how does the inability for spacecraft to refuel in space set limitations on missions and what is compromised?

Mr. SHROFF. Yes, that is a phenomenal question.

So the Apollo era is a perfect example of a time when we didn't have access to refueling in space. And the way we overcame that problem is by throwing away 99 percent of our rocket. So we launched a rocket into space, it did a thing that we call staging, which means that, you know, a portion of the rocket separates and gets discarded and the rest continues to fly, and we did that five or six times from launching on Earth to getting astronauts to the moon and back. And I think Apollo is great, but that came at a really high unit cost, a unit cost of roughly, inflation-adjusted, $10 billion per astronaut per trip. And that is not a unit cost that any sort of commercial business model can support.

Mr. COLLINS. Right.

Mr. SHROFF. But with refueling and with Starship and other fully and rapidly reusable vehicles, that $10 billion per person can be like $200,000.

And I am totally serious when I say that you could have, like, a multi-order of magnitude improvement in cost. And when you have that multi-order of magnitude improvement in cost, you open up possibility for all sorts of commercial business models, including mining helium–3 on the moon, mining platinum group metals from asteroids, and tourism to exist completely not publicly funded and completely funded only by private companies that are buying the end products.

Mr. COLLINS. Let me ask you one last thing, because we are getting short on time now. So when do you think this capability is going to be established?

Mr. SHROFF. Starpath, if everything goes to plan and all of the timelines with launch vehicles stay on track, plans to establish its first mine on the moon at the end of 2026, and our intent is only to scale exponentially from there.

So I would say for a customer that is interested in the commercial product, between 2026 and 2028, which is, you know——

Mr. COLLINS. Around the corner.

Mr. SHROFF [continuing]. Two to 4 years from today.

Mr. COLLINS. Yes, yes. All right.

Thank you, Mr. Chairman, I yield back.

Dr. GOSAR. I thank the gentleman from Georgia. The gentleman from Alaska, Mr. Begich, is recognized for 5 minutes.

Mr. BEGICH. Thank you, Mr. Chairman. First question for Mr. Painter, picking up where we left off previously.

Let's say that we have equity participation in some of these programs, where the U.S. taxpayer is contributing to advancing them. Where do you think that equity should be parked? Do you think it should be parked in this proposed new sovereign wealth fund?

Mr. PAINTER. It could be. It could be parked in a separate or governmental entity or semi-governmental entity set up for that purpose.

The government has gone into various businesses such as mortgage lending, Fannie Mae, and student loan lending, although we see there is a lot of abuse in these governmental entities that have combined public sector and private sector work. There is great risk here, and you would need corporate finance experts and investment bankers to look at how to structure this in the best interest of the U.S. Government. Because if our taxpayer money is being used for these projects, we get our fair share.

And so I am not the banker or the finance expert who is going to come in and tell you exactly how to structure it. My role is to make absolutely sure, and that is what I did in the Bush administration, make absolutely sure that the government officials who do have that expertise——

Mr. BEGICH. Understood, understood, yes.

Mr. PAINTER [continuing]. Have no conflicts of interest.

Mr. BEGICH. OK, I appreciate that context. So the sovereign wealth fund may be an area that this equity could be positioned if an equity position were taken.

Mr. PAINTER. We could do that.

Mr. BEGICH. OK.

Mr. PAINTER. But it is somewhat ironic for a government——

Mr. BEGICH. Thank you.

Mr. PAINTER [continuing]. With such a massive government deficit to be talking about a sovereign wealth fund.

Mr. BEGICH. No, I appreciate that. I come from a State where we have been able to utilize a sovereign wealth-like fund, and it has been very successful. It is the Alaska Permanent Fund, and it has allowed us to dramatically reduce the pressure of taxation in my State, and it has been a great program.

But moving on to Mr. Shroff, let me just say I appreciate that you are here with us, as well as Mr. Place.

Mr. SHROFF. Thank you.

Mr. BEGICH. And I would suggest that you continue to be involved because much of what has occurred in this Committee, and a number of other Committees in Congress, is that we are constantly dealing with a Federal Government that has grown beyond its original intent and scope. And as bizarre as this may sound to you at the moment, don't be surprised if we end up having conversations in this body talking about an EPA-like agency in space. It seems ridiculous, but I guarantee you there are colleagues in this body that will propose it at some point, and maybe not in the far-distant future. And so your involvement here is very important to make sure that people remain engaged and involved, and that you assure that the regulatory environment does not prevent you from actually being able to advance in the areas that you would like to advance in.

One question for you, Mr. Shroff. Can you describe the risks of letting China surpass us in what many are calling the new space race for extracting resources?

And a follow-up to that: how does harnessing lunar materials help the United States?

Mr. SHROFF. Two great questions. I will answer the first, you know, I am not a political expert, so, you know, you guys are going to be experts in this domain, but it would be the same risks as

letting any foreign adversary take, you know, take strides past us in any emerging industry.

If we were developing AI, which we are, and, you know, I am not involved in the development of AI, and it was only, for example. I am just going to pick a random country, France that was developing AI, we would be looking at each other thinking, how can we get involved? Why aren't we the leaders? America has been for so long the technological leader across so many technologies.

So it is the exact same risks that you see in any emerging industry, so nothing special. And you guys are the experts in evaluating where we want the United States to be the best. And it is just my personal opinion, as an American that loves to be in America, that we should be the best in everything we can. And this is an area where we definitely can.

Mr. BEGICH. Thank you.

Mr. SHROFF. Your second question, and I will try to be fast, I know we are short on time, is how can harnessing lunar resources benefit the American people? Two ways.

First, if you produce propellant on the surface of the moon, you can drastically reduce the cost of moon missions, many of which are sort of, of the class that we have already spent billions of taxpayer dollars on. So the Artemis missions, for example, you know, I support and I think are incredible, cost a lot, you know, over $2 billion per launch for the SLS rocket, which is the rocket that was designed for Artemis. Those figures could be 100 or maybe even 200 times lower in a future where you have access to lunar resources.

And the second, I know we are running out of time, the moon has an abundant supply of a resource called helium–3. Helium–3 is likely to be one of the highest unit cost materials we ever use, ever. And it is likely to be the case, in my opinion, that in the near future probably all of our helium–3 supply, practically speaking, will be sourced from the moon.

Mr. BEGICH. Thank you. My time is expired, I yield back.

Dr. GOSAR. I thank the gentleman from Alaska. The gentleman from Minnesota, Mr. Stauber, is recognized for his 5 minutes.

Mr. STAUBER. Thank you, Mr. Chair. I want to first thank you for convening today's hearing as we take a wide look at the future of our Nation's critical mineral supply chains as demand for these minerals grows at a rapid pace.

That said, while I believe it is important that we take this wide view, Mr. Chair, I cannot help but reflect on how we have gotten here. Why is it that we are literally looking to outer space for these minerals, minerals we are blessed with right here in the United States of America? The regulatory and permitting frameworks that govern our domestic mining industry are making it damn near impossible to responsibly develop the minerals we are blessed with here in the United States, including the Duluth Complex in northern Minnesota, the biggest untapped copper nickel find in the world. Think about it, Mr. Chairman. Our regulatory and permitting system is so difficult and costly, so broken, that we are looking at outer space as a reasonable alternative.

Mr. Cabrera, it is great to see you again, and thanks for being here. In your written testimony you note it would take $1.2 billion

to recover just 121 grams of material from the asteroid Bennu. Can you provide a ballpark of how much it would cost to recover those similar minerals right here domestically in the United States?

Mr. CABRERA. I can't, frankly, do that math in my head. But what I would say is that, I want to distinguish between the regulations themselves and the delays associated with how they are implemented, those are very different things. But short of the delays, it should be much more inexpensive to derive those minerals from Earth.

Mr. STAUBER. So it is safe to say Americans will face lower costs if we responsibly mine here in the United States of America. Is that correct?

Mr. CABRERA. Yes.

Mr. STAUBER. What kind of impact would this have on our local communities and our national security if we domestically mine in the United States?

Mr. CABRERA. The benefits are untold. The mining industry of today understands how important it is to be responsible not just for the environment, but for the host communities.

In addition, mining companies are increasingly deriving co-products from their primary metals, and often those co-products are the rare earth elements or, let's say, not economically viable elements that our defense system needs.

Mr. STAUBER. Right. And I will never use the term again "waste pile rock," because as the technology gets better that waste pile rock in the 1950s and 1960s is now valuable because of the technology. You look at the Eagle Mine in the Upper Peninsula of Michigan. Right now they are looking at mining the ore out of the tailings because of technology.

Mr. Painter, thank you for being here today. It is great to see a fellow Minnesotan before the Committee. In response to questions for Mr. Collins you suggested that you support mining if there is proper reclamation and cleanup work, and I agree with that. Do you know where the cleanest drinking water can be found in the State of Minnesota?

Mr. PAINTER. No, you should tell me. I am sure it is in your district.

[Laughter.]

Mr. PAINTER. It is not in the Twin Cities, I can assure you that.

[Laughter.]

Mr. STAUBER. Mr. Painter, you are exactly right. It is in the heart of mining country in Buhl, Minnesota. This is thanks to proper reclamation and cleanup work that is being conducted every single day by our modern domestic mining industry.

And you also noted the use of child and forced slave labor by the Chinese in their mineral supply chains. Mr. Painter, are you aware of any domestic mining projects that utilize or propose to utilize child slave labor?

Mr. PAINTER. No, I don't know of any domestic mining projects owned by Americans. I mean, my concern is foreign billionaires trying to come in and mine northern Minnesota. I want to have American-owned mines where Americans are responsible and responsible for the cleanup.

Mr. STAUBER. And you support union jobs?

Mr. PAINTER. I absolutely support union jobs.

Mr. STAUBER. We have been mining in northern Minnesota for 145 years. Can you tell us an instance where ever child slave labor was forced upon that mining industry in Minnesota?

Mr. PAINTER. Well, if it has happened, it has been a long time because we have child labor laws in the United States. And once again, the mines in Minnesota, they have such a fabulous history, are owned by Americans, controlled by Americans who are willing to clean up after themselves——

Mr. STAUBER. And you have——

Mr. PAINTER [continuing]. If they make a mess.

Mr. STAUBER. You have seen you have seen reclaimed mines in northern Minnesota, haven't you?

Mr. PAINTER. Yes.

Mr. STAUBER. They are beautiful, aren't they?

Mr. PAINTER. I am sure they are.

Mr. STAUBER. They are beautiful.

Mr. PAINTER. I usually go to the Boundary Waters to go canoeing, but visit some mines, too.

Mr. STAUBER. If you would indulge me, we have bike paths, recreational swimming, diving in mine pits. We farm hay on reclaimed mines. We have birds, bees, we deer hunt on reclaimed mines. So we do it right.

And you noted your support for mining. Where would you like to see mining take place, in the United States of America or foreign countries that are adversarial to us?

Mr. PAINTER. I would like to see mining take place in the United States with mines owned by Americans who are willing to clean up after themselves as we have had in Minnesota for many years. We have a proud tradition of iron mining in the most beautiful part of the country, which is your congressional district.

But I am not going to stand for foreign billionaires coming into this country with companies like Glencore, founded by Marc Rich, who was pardoned by President Clinton for tax fraud. They have a terrible record all over the world and setting up some company to try and operate in northern Minnesota. I want mines owned by Americans.

Mr. STAUBER. That is why we have laws. They are going to follow our rules, our regulations, our EPA, clean water, clean air standards, and our labor standards.

Mr. Chair, I yield back. Thank you.

Dr. GOSAR. I thank the gentleman. The gentlewoman, the Ranking Member, Ms. Dexter, is recognized for her 5 minutes.

Dr. DEXTER. Thank you, Mr. Chair.

Mr. Shroff, I really appreciated your testimony and giving the United States two thumbs up on our innovation and our investment in space exploration and mining. I wonder if suddenly that investment was to stop, what would the impact be on your company and, you think, that rapid innovation that we have been successful in attaining so far?

Mr. SHROFF. Well, for my company specifically, and I can't speak for all companies, we would figure it out. And the reason why we would figure it out is because our business is built around a commercial-first approach. In the long term we want to have, you

know, the smallest possible percentage of our revenue coming from Federal dollars and the largest possible percentage of our revenue coming from customers who are getting a product that they want, whether it be helium–3, tourist services to the moon, or something even crazier.

And I suppose this isn't exactly an answer to your question, but one of the things that I will say is that a lot of really promising commercial businesses come out of public-private partnerships. Falcon 9, the rocket that services about 90 percent of Earth's payload to orbit, not America's payload to orbit, but Earth's payload to orbit, was actually developed through a public-private partnership between NASA and SpaceX. And I think that is amazing because Falcon 9 now exists and serves all sorts of commercial-first companies like AstroForge and like countless others.

Dr. DEXTER. Right.

Mr. SHROFF. So the real answer that I feel to your question of what would happen is we would lose out on the other Falcon 9s, right, the other things that we may create that have worldwide massive impact to their industry through public-private partnerships.

So would the world collapse if the government were to, you know, suddenly cut things off? No. Would Starpath fail? No. But do I think it would be a missed opportunity? Yes, and I think that that part is definitely obvious. And, you know, it is up to you to figure out how much you are willing to spend, and how valuable you think that is.

Dr. DEXTER. I appreciate——thank you so much. So Falcon 9's success is benefiting the American taxpayer directly, then, somehow?

Mr. SHROFF. Yes, absolutely. So, I mean, first of all, I will make a disclaimer here that says, you know, I don't speak for SpaceX at all, and I can only talk about——

Dr. DEXTER. I appreciate that.

Mr. SHROFF [continuing]. You know, publicly available information.

But if you look at Starlink, which I think is the case example, because Starlink is the plurality of Falcon 9 missions, Starlink connects millions of Americans across the country, where actually, Starlink outperforms otherwise taxpayer-funded Internet services. So——

Dr. DEXTER. But I want to be clear about the question. Sorry, I might have not been clear. Is there direct equity in that success coming back to the American people from that investment?

Mr. SHROFF. While I don't know the internal workings of SpaceX.

Dr. DEXTER. I am——

Mr. SHROFF [continuing]. I believe the answer to your question is actually a resounding yes.

Dr. DEXTER. OK.

Mr. SHROFF. And that is because NASA is a big customer of Falcon 9, and NASA is able to buy Falcon 9 launches for a cheaper price than what they would have to pay if Falcon 9 didn't exist.

Dr. DEXTER. So I am just going to pivot to Mr. Painter.

We have talked about equity funds and different ways to share equity in investments that the American taxpayers are funding.

Would you agree that the American taxpayers, the money that they have invested in these explorations, are directly benefiting back to their pocketbooks?

Mr. PAINTER. Well, yes. I feel like I am appearing on the show Shark Tank.

[Laughter.]

Mr. PAINTER. We are making a proposal, and you are deciding whether to invest in it while sitting on a $36 trillion Federal debt.

You know, I wonder whether we even have the money in the U.S. Government to invest. But if we do, I hope that those of you who are investing on behalf of the taxpayers are free of financial conflicts of interest, and at least I have your financial disclosure form.

Dr. DEXTER. OK. And so, when we talk about things like a sovereign wealth fund or other ways to invest, my understanding is that we have a deficit and we don't have liquid assets that we can just readily do that. I am understanding that we may be looking at liquidating public lands and investing dollars in exploration activities at the risk of really harming our current Federal public lands. Do you have concerns about such an investment strategy?

Mr. PAINTER. I have a lot of concerns about the idea of the government throwing money into more projects when we are running these enormous deficits and we can't seem to manage our budget.

But I want to insist that those who are representing the government in this type of venture have to be free of conflicts of interest. Mr. Musk can't be involved with SpaceX and have anything to do with space mining in the U.S. Government. That would just be flat-out corrupt.

Dr. DEXTER. OK. And my last question is pivoting towards SpaceX again. SpaceX is NASA's largest private contractor, receiving about $15 billion in contracts. And since running DOGE, Musk has received even more contracts. So SpaceX recently obtained another $7.5 million supplemental research and development contract with NASA, bringing their total deal with Musk's firm to $38 million in taxpayer money.

Mr. Painter, how can the public be assured of impartial government contracting when Musk, as head of DOGE, oversees cuts that could impact agencies like NASA while SpaceX receives billions in Federal contracts?

Mr. PAINTER. Mr. Musk cannot have anything to do with overseeing NASA while he has a financial interest in SpaceX which has contracts with NASA. So it is one or the other. He divests from SpaceX and then he can get involved in matters involving NASA or he completely recuses. He has to. It is required under the criminal conflict of interest statute, and I would trust that the President of the United States would insist on that. And if the President doesn't do that, the Congress must insist through oversight.

And this is a criminal statute, so it could have very serious consequences for everyone if it is violated.

Dr. DEXTER. Thank you, Mr. Painter.

I yield back, Mr. Chair.

Dr. GOSAR. The gentlelady yields back.

So Dr. Cabrera, you know, you are pretty familiar, with being in Arizona, with Resolution Copper. How much did they spend to remediate that site?

Mr. CABRERA. I am not exactly sure, but it is in the tens of millions of dollars for the cleanup.

Dr. GOSAR. It is approaching two billion. How many corporations do you know in America that can afford that $2 billion before you get an ounce of copper?

Mr. CABRERA. Not many.

Dr. GOSAR. Not many. That is right.

So Mr. Painter, why I brought this up was because you made the comment you want all Americans to do the mining here in America. Well, tell me one of these all-American mining companies. Resolution Copper is going on its 33rd year, 33 years to get a permit. That is unacceptable. Now I am going to come back to you, but I got to ask a couple more questions here.

Mr. Cabrera, are you familiar with these micro smelters?

Mr. CABRERA. Say again, sir.

Dr. GOSAR. Micro smelters. They are the concentrators.

Mr. CABRERA. Yes.

Dr. GOSAR. So what they are doing is they are looking at this retrieving of metals that uses typically acids, right? And they are making very small, very efficient, and they are getting everything off. They will get gold, silver, titanium. They will get all that based on their atomic weight, all the little surfactants, all those little different things. Wouldn't that make a big detail for you, depending on the size of your mine, you would be using a couple of these or three or four of those. Doesn't that make more sense?

Mr. CABRERA. When the technology is fully proven out at scale, yes.

Dr. GOSAR. OK. Well, it is really at scale now.

So what I was trying to get back at, Mr. Painter, was there is a buffer area up in Minnesota. And because Congress dictated that buffer area it has got more processing ability. Now, just north of us, north of that mine is also some sulfuric mining, right, in Canada?

Mr. PAINTER. Yes.

Dr. GOSAR. Do they have any examination there?

Mr. PAINTER. I don't know what the regulations are in Canada.

Dr. GOSAR. No, they don't because they just have not had any problems there. So I have a little more faith in aspects of that.

Now I am going to ask you a couple more questions. You keep bringing up the American people. Would you support a law that requires that if any business is deemed a national security interest or an energy interest, that everybody on the operating and oversight boards be required to have either a green card or be a citizen?

Mr. PAINTER. That might make sense, but I would insist that there be a security clearance. I mean, that is what is critical——

Dr. GOSAR. Oh, I agree.

Mr. PAINTER [continuing]. That there be a security clearance, because there are a lot of Americans I wouldn't want on those boards.

Dr. GOSAR. Oh, I agree with you, and where I was getting at is if a green card or a citizen, if they do something wrong you can hold them to treason, right?

Mr. PAINTER. Well, yes, but there are a lot of people who have a green card or American citizens who I don't want anywhere near those boards because they are a national security risk.

Dr. GOSAR. I agree. So I would take that as a benefit.

Now, you also bring up the public. What if we did this? What if we took our public lands, like the last administration tried to amortize our public lands and put them on the stock exchange, the New York Stock Exchange. Now, that wasn't a good idea and they scrambled it. But what if we did this in a law, where we actually put some of the holdings or money that we get off of public lands and put it in the Social Security trust fund? That sounds to me like it would be something up your alley, would it not?

Mr. PAINTER. Well, if the U.S. Government gets money, and they should, from the public lands, get its fair share, the Social Security Trust Fund would be a very good place to put it. I would appreciate getting that check when I retire.

Dr. GOSAR. Oh, I am loving where we are going with this one, because I actually have a bill like that. It is called the LASSO bill, OK? And it does exactly that. And what is going to happen now is that the American public is going to look at this and say, you know, we got all these public lands. Some are off topic. You know, we have monuments, we have parks. But there is a whole heck of a lot of other land, and they are not really generating much. So mining would be energy. And under FLPMA you must energy, and must minerals, and you must forest, and you must improve your leasing, grazing leasing.

So it sounds to me like, how important Social Security was in the last election, I am not going to trust a bureaucrat. I want to see that tangible asset.

So Mr. Begich, the gentleman from Alaska, brought up, this fund that would help generate some of this stuff. I think that would be something that the American public would just gravitate to. I am also a businessman. So when I have an asset at $2.91 trillion, OK, going against my liability, and I can transfer it where they are going to gain all that money and then some, and they are going to monitor the whole fund, doesn't that help us on our budget?

Mr. PAINTER. It might or might not. I haven't looked at the details of your bill and what the proposal is. The problem is that for 100 years, and I mentioned this last year when I testified with the Interior Department, since the Teapot Dome scandal we have had private interests who, by greasing the palm of somebody here in Washington, D.C. manages to get a benefit that other people can't get.

And my focus is the corruption, and to make absolutely sure we don't have corruption in the relationship between the U.S. Government and the private companies that are engaging in mining on Federal land. Otherwise, if we don't have the corruption and we make sure we address those problems and confront those problems, we can make use of Federal lands, whether they use the money for Social Security or pay down the Federal debt or for whatever other purpose.

Dr. GOSAR. Well, so I have to pay Social Security because it is the people's money, right? We took their money and we are supposed to be holding it, which we are not.

But anyway, I have one more last question. In your testimony you said that government exists to serve the people, right?

Mr. PAINTER. Yes, it does.

Dr. GOSAR. Bureaucrats not chosen, failed to serve the people. Ezekiel Emanuel would be one of those who helped draft the Affordable Care Act is an example of that. Is that not true?

Mr. PAINTER. That the Affordable Care Act serves the American people?

Dr. GOSAR. Mm-hmm.

Mr. PAINTER. Well, parts of it do. Yes, I mean, that is a policy debate we can have.

Dr. GOSAR. Well, I would think that, that is the biggest information, is about our genetics, our health care, being healthy and wealthy and wise. So Emanuel is not a lawmaker, was he?

Mr. PAINTER. No, but——

Dr. GOSAR. He was a private-sector doctor, right?

Mr. PAINTER. Well, yes, and we rely——

Dr. GOSAR. What did he disclose? He didn't disclose anything. He shouldn't have been part of the crafting of that health care model.

Mr. PAINTER. But he wasn't sending emails to Federal employees telling them to report back to him with what they did last week or he is going to get them fired.

Dr. GOSAR. Whoa, whoa, whoa. How do you know that? How do you know that? You made a blanket statement. You have no idea.

Mr. PAINTER. I just said he wasn't doing that.

Dr. GOSAR. You don't know that. You don't know that at all. But I would tell you, as much inferences and input he had in there, he did. I will bet you he sent a number of emails. But it is only hypothetical.

In your line of work, as an ethics person, you have to say that has to be that way, right?

Mr. PAINTER. Special government employees serve on boards and commissions and advise the President. I worked with them in the Bush White House. Special government employees don't do what Mr. Musk is doing. Mr. Musk can be appointed and confirmed by the Senate. And with a Republican-controlled Senate, I am sure it would go very, very smoothly. He divests from his conflicts of interest, submits a financial disclosure form, and everything is going to work out fine. We just need to go through the process.

Dr. GOSAR. I just presented you one that didn't, and that worked just fine.

So from that standpoint, we are going to end this, but I wanted to say thank you very much.

The Members may have additional questions for you to answer, and we ask that you respond to these in writing. Under Committee Rule 3, members of the Committee must submit these questions to the Subcommittee Clerk by 5 p.m. on Friday, February 29. The hearing record will be held open for 10 business days for these responses.

If there is no further business, the Subcommittee stands adjourned.

[Whereupon, at 11:53 a.m., the Subcommittee was adjourned.]

[ADDITIONAL MATERIALS SUBMITTED FOR THE RECORD]

Submissions for the Record by Rep. Gosar

Black Moon Energy Corporation
Houston, Texas

February 26, 2025

House Natural Resources Committee
1324 Longworth House Office Building
Washington, DC 20515

Dear Chairman Gosar and Ranking Member Dexter:

On February 25, 2025, the House Committee on Natural Resources Subcommittee on Oversight and Investigations held a hearing entitled: "Full Blast: Contrasting Momentum in the Space Mining Economy to the Terrestrial Mining Regulatory Morass." I write to you on behalf of Black Moon Energy Corporation, a U.S. company headquartered in Houston, Texas, and request this letter be included in the hearing record.

Black Moon Energy Corporation (BMEC) is a privately funded venture. Our purpose is to advance energy security and sustainability by providing an abundant and reliable supply of Helium–3 for terrestrial fusion energy production reactors. While some companies may do so, BMEC does not seek any government subsidies or grants. In fact, our business model intentionally does not seek out or require any government contracts or government funding. Our only request of the government is a regulatory regime that facilitates, discourages barriers to, and promotes commercial celestial resource extraction and recovery. The law as it is today does that.

Fusion energy—the energy that powers the sun and stars—can produce an essentially unlimited amount of electricity on a footprint thousands of times smaller than renewables. Even better, electricity generated by fusion fueled with Helium–3 supports a massive CO_2 reduction, is totally clean—no greenhouse gases, no carbon emissions, no radioactive waste—and will be cheaper for the consumer. Helium–3 exists in quantity only on the moon, where there is enough to satisfy Earth's energy needs for over 10,000 years. While many companies are engaged in perfecting commercial fusion reactors, Black Moon Energy has developed a profitable plan to delineate and retrieve Helium–3 resources from the lunar surface and bring it to Earth, where it can be sold to replace and supplement fossil fuels used to generate electricity—particularly important as electricity demand is forecast to double in the next 25 years.

In the hearing, questions were raised about the legality of conducting celestial resource extraction and recovery. It is our understanding, consistent with over fifty years of legal interpretation from the U.S. State Department Legal Advisor, across Administrations of both parties, that international law permits commercial exploitation of celestial resources. Furthermore, 51 U.S.C. Chapter 513 explicitly recognizes the property rights of U.S. citizens over any celestial resource recovered and directs the President to remove regulatory barriers and encourage private sector exploitation of celestial resources. Finally, the Artemis Accords recognize that commercial extraction, recovery, and use of lunar resources is consistent with international law, including the Outer Space Treaty. The Artemis Accords also provide for the notification and establishment of "safety zones" around commercial lunar operations, providing protection for personnel, equipment, and operations from harmful interference.

In the hearing, competition with China in commercial celestial resource activities was raised. Ever since Apollo 11, the U.S. has prided itself on unmatched leadership in space exploration and utilization. As it stands today, China has recently extracted samples of Helium–3 from the lunar surface and is simultaneously investing heavily in its fusion energy infrastructure. As adversarial nations like China continue to expand their space operations, maintaining U.S. superiority in the stars has never been more essential. Strategic advantages, national security interests, and legitimacy in international affairs all lay in the balance of maintaining competitiveness in the future of the space race: resource extraction. Pursuing the American extraction of lunar Helium–3 to keep pace with our competitors is thus not an "if" or "when," but a "now."

In closing, I highlight for the Committee that supporting the U.S. commercial space industry has historically been a bipartisan Congressional endeavor, including in the 2015 Commercial Space Launch Competitiveness Act, the Act that codifies U.S. citizen property rights over any celestial resources recovered. I encourage the Committee to continue to support the U.S. space industry with law and policy that encourages investment and removes obstacles to commercial recovery of space resources.

Thank you for your interest in U.S. commercial extraction and recovery of space resources.

Sincerely,

DAVID WARDEN
CEO