Statement of Mr. Luka Erceg
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Subcommittee on Energy and the Environment
Committee on Science, Space, and Technology
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on
"Energy Critical Elements: Identifying Research Needs and Strategic Priorities"

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Chairman Harris, Ranking Member Miller, and Members of the Subcommittee, my name is Luka Erceg, and I am the President and CEO of Simbol Materials. Thank you for the opportunity to testify today about research needs and priorities related to critical materials.

Simbol is commercializing innovative, sustainable processes for the domestic production of lithium (Li), manganese (Mn) and zinc (Zn). We currently operate a demonstration plant in the Salton Sea region of California, where we co-produce minerals from geothermal brines at an existing geothermal power plant. Following power production, we "borrow" the brine for about 90 minutes to selectively extract the targeted minerals. The brine is then re-injected into the ground. This process has a smaller environmental footprint and cost profile than any other method for producing these materials.

We anticipate groundbreaking of our initial commercial lithium plant in the spring of 2012. Each full-scale lithium facility will produce approximately 16,000 tons per year of lithium carbonate equivalent, and 19,000 tons per year of manganese metal. Each of Simbol's lithium plants will increase global supply by approximately 10-15% over today's production volumes. There is sufficient capacity in the Salton Sea region to construct several facilities.

A domestic supply chain for critical materials will spur domestic manufacturing and innovation

While the development of a domestic supply chain for critical materials will reduce the risk of supply disruption and mitigate exposure to price spikes, the greatest benefit of developing a domestic supply chain is bolstering our nation's competitive position in innovative industrial sectors.

At every point in a supply chain, manufacturing drives innovation. As a supply chain lengthens, each step is strengthened through industry collaboration – which creates a more competitive overall domestic industry. In the case of electric vehicles and grid storage applications, critical materials are the cornerstone of the supply chain. It is important to realize that production processes to convert raw materials to usable products for downstream markets are highly technology-intensive. At Simbol, we have approximately 9 PhDs and 4 MS degrees on staff (representing ~25% of our current workforce) – all with backgrounds in chemical engineering, electrochemistry and chemistry. Our growth to date and future hiring is almost exclusively in the areas of skilled trades and technical functions. Our scientists and engineers are consistently finding innovative ways to improve the quality of materials and to develop the next generation of products.

We believe that further domestic innovation in critical materials will drive workforce growth throughout our entire industry. Because domestic production of these materials largely ended in the 1970s, today it is inordinately difficult to hire individuals with experience in Mn and Li processing. In fact, it is taking us

up to 9 months to find qualified candidates for key positions at Simbol. This is a direct result of the absence of university programs: no U.S. universities offer geothermal energy degrees. While DOE has been making targeted investments in university coursework, in order to jump-start significant growth in this sector, strong university programs are an imperative. We believe that market growth in the production and processing of critical materials will lead to increased training of students in these fields, and subsequent technology advancements through our university system.

Federal research and development funding drives private sector investment in critical materials

We strongly support legislative initiatives to develop research, development and deployment activities for critical materials. These programs will jump-start the development of a domestic supply chain for clean energy, defense and other strategic sectors in the face of aggressive policy and financial support for entrenched foreign producers.

The establishment of a new industry is inherently risky, and requires a concerted effort by both the public and private sectors. We believe that federal support for basic research remains essential to advancing America's position in the clean energy economy. The Advanced Research Project Agency – Energy (ARPA-E) plays a critical role in driving cutting-edge, game-changing technologies. The Department of Energy (DOE) and other federal agencies play an important function in supporting R&D efforts to develop and demonstrate technologies that lower operating costs, allow access to new resources, and improve quality and environmental performance.

Federal R&D support that assists the private sector – including small businesses like Simbol Materials – in de-risking innovative technologies, when coupled with commercial sector investments, send loud signals to the market that encourage follow-on investment. In the critical materials space, these federal R&D commitments are power drivers of private investment, and directly support the development of a competitive domestic supply chain for next generation energy and defense technologies.

For example, in 2009, DOE's Geothermal Technologies Program (GTP) announced its intent to award Simbol a $3 million grant to demonstrate its processes for the competitive production of lithium, manganese and zinc chemicals for energy storage applications. Since being awarded the grant, we have grown our workforce from 16 to 62, and will reach approximately 80 by the end of next year. We also have leveraged those federal funds to raise approximately $43 million in further capital. The majority of these funds were committed prior to the actual delivery of the first grant dollar, demonstrating the investment signal provided by the government's technology validation.

Financing risk remains the greatest barrier to commercialization of critical materials production and processing facilities

While basic R&D support is essential to restoring U.S. leadership in mineral production technology, the federal government also has a critical role in helping overcome commercialization risk. While Simbol has been highly successful in raising private capital, the investment required for a full-scale plant is significant. Private investors require a demonstrated market for our product, but the reality is that – at least here in the U.S. – we are selling into a nascent industry. While growth projections for advanced batteries (and associated Li and Mn consumption) are high, investors continue to hold back, awaiting the emergence of downstream industry consumption for electric vehicles and grid storage. Furthermore, the absence of a federal strategy for the development of supply chains to support priority policy areas causes confusion in the marketplace regarding the importance of critical materials.

Federal support for commercialization will help us bridge this so-called "valley of death." In the same way that our GTP grant attracted an initial round of private capital, we anticipate that federal commercialization assistance would stimulate private investment for the full-scale production facility. It is important to note that mineral production facilities do not qualify for assistance under existing commercialization programs. For example, neither the Section 1703 loan guarantee program nor the Section 48(c) advanced energy manufacturing tax credit reaches sufficiently far back in the supply chain to support mineral production or processing activities. Current legislative proposals would be strengthened by adding provisions to expand eligibility.

Absence of policy clarity stunts private investment in critical materials.

The United States does not have a national policy on critical materials. Even the R&D investments we are discussing today are not explicitly focused on critical materials. Instead, nascent critical materials policies and investments are packaged in disparate programs and agencies based on end use technology. Let me give you two examples. First, Simbol received our DOE grant – not because we are helping build a domestic critical materials supply chain – but because we offer benefits to geothermal power production. On the other hand, we were excluded from consideration for a loan under the DOE Advanced Technology Vehicle Manufacturing Program because we could not prove that our lithium would be used only for electric vehicle batteries. This stove-piped focus on end use technology conceals the important critical materials policy efforts being undertaken in different parts of the DOE.

This issue magnifies itself across the federal agencies. Different agencies approach critical materials from different end use perspectives, often resulting in divergent perspectives on criticality.

Let me give you an example from Simbol's vantage point. By any objective measure, both Li and Mn should be considered "critical." As is the case with rare earth metals, this designation is not due to scarcity in global supply, but rather due to the lack of U.S. production. Li is an essential component of advanced batteries for electric vehicle and grid storage applications. The U.S. is approximately 76% import dependent on Li, with most global production from salt flat evaporation in South America and growing supply in China. While some government studies – including the Department of Energy's 2010 critical materials strategy – have labeled lithium as "critical," other assessments have not included it.

Electrolytic manganese metal (EMM) is a fundamental input for specialty steels for defense and commercial applications, and Mn dioxide increasingly is emerging as one of the leading metal components for electric vehicle battery cathode powders. The U.S. is 100% import dependent on foreign sources of manganese ore, as well as electrolytic manganese metal – 95% of which is produced in China. Signaling U.S. concern with foreign production and trade patterns, the U.S. issued anti-dumping orders penalizing Chinese and Australian Mn producers. Despite this, Mn was not included in DOE's 2010 strategy, although in April of this year the Defense Logistics Agency identified it as one of the Department of Defense's top ten shortfall materials.

These examples are not intended to serve as a criticism, but rather as a demonstration of the need for clarity across the U.S. government in defining what makes a material "critical."

This lack of consistency and policy clarity has stunted private sector investment. In the absence of a clear, consistent signal that the U.S. government is committed to developing domestic critical materials resources, private investors place their money elsewhere. On November 21, *Reuters* reported that

Beijing plans to dedicate $1.7 trillion to "strategic sectors" over the next five years. This builds on the $500 billion in Chinese public and private investment in lithium production since 2000. Similarly, South Korea announced approximately $300 million in public dollars for lithium production, and the Japanese government has been providing substantial public dollars through various loan guarantee and grant programs for lithium and other critical materials. In every instance, government involvement has led to substantial investment by private industry in the critical materials sector.

A coordinated critical materials effort is needed across the Executive Branch.

We recognize and applaud the Obama Administration for taking a focused approach to critical materials issues. The interagency working group led by the Office of Science and Technology Policy has been effective in bringing diverse agencies together to consider these issues. Efforts like the "Materials Genome Initiative" have placed high-level attention on materials science. Important activities are taking place at individual agencies, including DOE, where Mr. Sandalow's team is doing excellent work in developing and updating a critical materials strategy for energy production. But these efforts should be coordinated through federal policies and programs that are responsive to market conditions and support domestic critical materials production regardless of end use.

Critical materials policy recommendations

We applaud Representative Hultgren and other members of this Committee for introducing legislation focused on the development of critical materials. Given the urgent need for clear policy signals, and the commitment to this issue on both sides of the aisle and the Capitol, it is our hope that critical materials legislation can be advanced this Congress. As the various proposals continue to move through the legislative process, I urge you to consider the following policy recommendations:

- *Establish whole-of-government critical materials policy*: Current initiatives are scattered at various agencies and masked within programs focused on end-use technologies. It is essential to formalize and improve coordination efforts to create a whole-of-government critical materials policy agenda.

- *Utilize self-classifying definitions:* Rather than stipulating a list of qualifying materials or delegating broadly to federal agencies, we recommend a self-classifying definition, which could be based on 1) use of specific materials in industries that support strategic or policy priorities and 2) the level of U.S. production and processing. Such a definition should apply across the entire federal government. This will ensure that the government is not picking winners and losers at a given moment in time, but rather structuring programs based on the realities of the rapidly changing global marketplace. A straightforward, clear definition will immediately communicate to the market that designated materials are critical to U.S. policy goals. This will rapidly drive private investment to strategic federal priorities.

- *Invest in materials science going back to the beginning of the supply chain.* At every point in the supply chain, manufacturing drives innovation. Developing a domestic supply chain for critical materials will bolster our nation's competitive position in innovative and industrial sectors. This also will serve as a force for rebuilding our university programs in materials science and engineering, which have languished since the 1970s, following the downturn in U.S. critical materials production.

- *Streamline methods for licensing technology from national laboratories.* We recognize that there have been a broad set of efforts to create a more consistent licensing process for technology commercialization from our national laboratories. However, there remains substantial variance within the laboratory system. We need to advance a more effective process that gets technology out of the labs and into the commercial sector, in order to drive technology growth and create opportunities for further innovative research.

- *Small-dollar government investments in research yield significant returns.* Small businesses employ approximately 50% of the private sector workforce in the U.S., and they are able to move technology along the S-curve of innovation faster than other entities. In this time of downward pressure on federal budgets, it is essential to continue to support the small companies and innovative technologies that drive growth throughout our economy. We believe that the federal government will be best served by diversifying its investments and providing small research grants to a wide variety of promising technologies in strategic sectors. This limits the government's exposure and enables it to serve as a catalyst for growth industries. In Simbol's case, a $3 million federal investment leveraged approximately $43 million in private sector financing.

Thank you for the opportunity to testify, and I look forward to your questions.