Statement of
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Committee on Science, Space, and Technology
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"Critical Elements: Identifying Research Needs and Strategic Priorities"

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Chairman Harris, Ranking Member Miller, and Members of the Subcommittee, thank you for the opportunity to testify today. The Administration is currently reviewing H.R. 2090 and has no specific comments on it at this time, but I would like to take this opportunity to speak about the critical minerals that underpin the transition to a clean energy economy and the Department of Energy's (DOE) ongoing work on this topic.

Earlier this year I visited the Mountain Pass Mine in southern California. I was impressed by the facility and its potential to provide a domestic source of rare earth metals. According to the owners, the mine will have a production capacity of about 19,000 tons of rare earths by end of 2012 and 40,000 tons by early 2014, using modern technologies at a globally competitive cost. That's an important step in the right direction.

The issue of critical minerals is important and needs priority attention in the months and years ahead. The Department shares the goal of establishing a stable, sustainable and domestic supply of critical minerals, and we look forward to discussions with the Congress on ways to address this issue as we move forward.

GLOBAL CLEAN ENERGY ECONOMY

The world is on the cusp of a clean energy revolution. Here in the United States, we are making historic investments in clean energy. The American Recovery and Reinvestment Act was the largest one-time investment in clean energy in our nation's history – more than $90 billion. At DOE, we're investing $35 billion in Recovery funds in electric vehicles; batteries and advanced energy storage; a smarter and more reliable electric grid; and wind and solar technologies, among many other areas. We are aiming to double our renewable energy generation and manufacturing capacities from 2008 to 2012. We are working to deploy hundreds of thousands of electric vehicles and charging infrastructure to power them, weatherize a million homes, and help modernize our grid.

Other countries are also seizing this opportunity, and the market for clean energy technologies is growing rapidly all over the world. For example, over $50 billion was invested in China in clean energy last year. They are launching programs to deploy electric cars in over 25 major cities; connecting urban centers with high-speed rail; and building huge wind farms, ultrasupercritical advanced coal plants and ultra-high-voltage long-distance transmission lines. India has launched an ambitious National Solar Mission, with the goal of reaching 20 gigawatts of installed solar capacity by 2020. And Japan is introducing feed-in tariffs to support the scale-up of electricity from renewable sources.

In Europe, strong public policies are driving sustained investments in clean energy. Denmark earns more than $10 billion each year in the wind energy sector. Germany and Italy are the world's top installers of solar photovoltaic panels, accounting for nearly three-quarters of a global market worth $82 billion in 2010. Around the world, investments in clean energy technologies are growing, helping create jobs, promote economic growth and fight climate change. These technologies will be a key part of the transition to a clean energy future and a pillar of global economic growth.

DOE STRATEGY

Last year, DOE released its first Critical Materials Strategy. The report found that four clean energy technologies—wind turbines, electric vehicles, photovoltaic cells and fluorescent lighting—use materials at risk of supply disruptions in the next five years. In the report, five rare earth elements (dysprosium, neodymium, terbium, europium and yttrium), as well as indium, were assessed as most critical in the short term. For this purpose, "criticality" was a measure that combined importance to the clean energy economy and the risk of supply disruption.

The 2010 Critical Materials Strategy highlighted three pillars to address the challenges associated with critical materials in the clean energy economy. First, substitutes must be developed. Research and entrepreneurial activity leading to material and technology substitutes improves flexibility to meet the material demands of the clean energy economy. Second, recycling, reuse and more efficient use can significantly lower global demand for newly extracted materials. Research into recycling processes coupled with well-designed policies will help make recycling economically viable over time. Finally, diversified global supply chains are essential. To manage supply risk, multiple sources of material are required. This means encouraging other nations to expedite alternative supplies and exploring other potential sources of material in addition to facilitating environmentally sound extraction and processing here in the

United States. With all three of these approaches, we must consider all stages of the supply chain: from environmentally-sound material extraction to purification and processing, the manufacture of chemicals and components, and ultimately end uses.

DOE's research and development (R&D) with respect to critical materials is aligned to the three pillars of the DOE strategy: diversifying supply, developing substitutes and improving recycling. R&D is not the primary mechanism to encourage supply diversification. However, environmentally sound separation and processing innovations will require research and development. R&D plays a more central role in developing substitutes, which represents a large share of the current critical materials R&D portfolio. R&D challenges can also help to improve recycling and reuse. Across the three pillars, there is also the need for fundamental research – developing the modeling, measurement and characterization capability that is the basis for future innovations. Systems level engineering approaches – which would help inform R&D priorities - apply throughout the supply chain. As DOE is ramping up its work in this area, critical materials R&D is integrated with other research objectives that are focused on clean-energy technologies or fundamentals. DOE's R&D plan is informing an interagency R&D roadmapping effort led by OSTP.

In the past year, the Department has increased its R&D investment in magnet, motor and generator substitutes, focused on reducing the rare earth usage in these applications. In September of this year, the Department's Advanced Research Projects Agency – Energy (ARPA-E) announced funding in a 36-month program for 14 early-stage technology alternatives that reduce or eliminate the dependence on rare earth materials by developing substitutes in two key areas: electric vehicle motors and wind generators. DOE’s Vehicle Technologies and Wind Energy Programs have also issued relevant Funding Opportunity Announcements this year.

In batteries and photovoltaic materials, DOE has historically supported broad technology portfolios including those that incorporate abundant materials. Investments in these core competency areas have continued. This diversity of materials makes over-reliance on particular materials less likely.

Moving forward, additional R&D opportunities are present in: separations and processing; substitution for critical materials in phosphors for lighting; and recycling. DOE is already taking the first steps in this direction. The FY 2012 DOE Small Business Innovation Research (SBIR) solicitation has several topics relevant to Rare Earth Elements (REE) – specifically improving separation and processing. Anticipated R&D could support the first steps toward improving separation and processing technologies.

These activities build on DOE's longstanding expertise on these topics. For example, the Office of Basic Energy Sciences (BES) has funded research at Ames Laboratory on the production of high quality rare earth magnets, magnetic technologies, synthesis technologies and superconductors for a number of years. The Office of Energy Efficiency and Renewable Energy (EERE) has funded several projects at Ames Laboratory and Oak Ridge National Laboratory addressing alternate magnet and motor designs.

R&D is also an excellent route toward developing the next generation of human capital and technical knowledge required for a sustainable rare earth supply chain. Developing expertise in these areas depends, in part, on private- and public-sector research support. The research programs supported by DOE and other organizations provide valuable opportunities for post-doctoral researchers and graduate students. They can also incentivize mid-career scientists in related disciplines to develop research programs which are relevant to critical materials. R&D funding not only supports innovation in clean energy technology, it also enables the development of the next generation of scientists and engineers.

DOE will issue its 2011 Critical Materials Strategy this month. In that report, DOE will update its analysis in light of rapidly-changing market conditions. DOE will also report on the results of our analysis on rare earth elements in petroleum refineries and other applications not addressed in last year's report. The 2011 Critical Materials Strategy will include updated criticality assessments and market analyses to assist in addressing critical materials challenges. It will also include the R&D plan described above.

In support of this year's analysis, DOE issued a Request for Information that focused on critical material content of certain technologies, supply chains, research, education and workforce training, emerging technologies, recycling opportunities, and mine permitting. We received nearly 500 pages of responses from 30 organizations, including manufacturers, miners, universities, and national laboratories. Many organizations shared proprietary data on material usage that will help us develop a clearer picture of current and future market conditions.

Managing supply chain risks is by no means simple. At DOE, we focus on the research and development angle. From our perspective, we must think broadly about addressing the supply chain in our R&D investments, from extraction of materials through product manufacture and eventual recycling. It is also important to think about multiple technology options, rather than picking winners and losers. We work with other Federal agencies to address other issues, such as trade, labor and workforce, and environmental impacts. The White House Office of Science and Technology Policy has been convening an interagency effort on critical materials and their supply chains.

The Administration is currently reviewing H.R. 2090, and the DOE has no comments on the specific content of this bill at this time. We share the goal of improving assessments and supporting a research agenda for materials critical to our future energy economy. We look forward to discussions with the Congress on ways to address any issues as we move forward.

CONCLUSION

One lesson we have learned through experience is that supply constraints aren't static. As a society, we have dealt with these types of issues before, mainly through smart policy and R&D investments that reinforced efficient market mechanisms. We can and will do so again. Strategies for addressing shortages of strategic resources are available, if we act wisely. Not every one of these strategies will work every time. But taken together, they offer a set of approaches we should consider, as appropriate, whenever potential shortages of natural resources loom on the horizon.

So in conclusion, there's no reason to panic but every reason to be smart and serious as we plan for growing global demand for products that contain critical minerals. The United States intends to be a world leader in clean energy technologies. Toward that end, we are shaping the policies and approaches to help prevent disruptions in supply of the materials needed for those technologies. This will involve careful and collaborative policy development. We will rely on the creative genius and entrepreneurial ingenuity of the business community to meet an emerging market demand in a competitive fashion. With focused attention, working together we can meet these challenges.