

Energy Critical Elements: Identifying Research Needs and Strategic Priorities

Witnesses

The Honorable David Sandalow

Assistant Secretary for Policy and International Affairs, Department of Energy

Derek Scissors

Research Fellow, Heritage Foundation

Robert Jaffe

Jane and Otto Morningstar Professor of Physics, Massachusetts Institute of Technology

Karl Gschneidner

Senior Materials Scientist, Ames National Laboratory

Luka Erceg

President and CEO, Simbol Materials

Subcommittee Members Present

Andy Harris, Chair (R-MD)

Brad Miller, Ranking Member (D-NC)

Judy Biggert (R-IL)

Paul Tonko (D-NY)

Dana Rohrabacher (R-CA)

Jerry McNerney (D-CA)

Zoe Lofgren (D-CA)

Full Committee Members Present

Randy Hultgren (R-IL)

On December 7, 2011, the House Committee on Science, Space, and Technology Subcommittee on Energy and Environment held a hearing to receive testimony on research needs and priorities relating to energy critical elements (ECE) and examine The Energy Critical Elements Advancement Act of 2011 (H.R. 2090). H.R. 2090 was introduced by Representative Randy Hultgren (R-IL) on June 2 and directs the Department of the Interior and the Department of Energy (DOE) to improve ECE resource assessments through direct coordination. The bill also designates the U.S. Geological Survey as the Principal Statistical Agency to gather ECE resource information. H.R. 2090 authorizes a DOE research program requires the Office of Science and Technology and Policy to produce a report for Congress on recycling of energy critical elements.

According to the American Physical Society and the Materials Research Society (MRS), who together published an *Energy Critical Elements* report, ECEs encompass rare earth elements, the platinum group elements in the center of the periodic table including platinum and iridium, and some other photovoltaic elements including tellurium, gallium, and germanium. Representative Brad Miller has sponsored H.R. 952, the Energy Critical Elements Renewal Act of 2011 which establishes in the Department of Energy (DOE) a research, development, and commercial application program dedicated to assuring the long-term, secure, and sustainable supply of energy critical elements in the U.S.

Chairman Andy Harris opened the hearing by introducing the burgeoning global demand for rare earth elements “amidst a volatile market,” in which China produces 97 percent of the global supply. He listed the need for ECEs for high performance magnets, photovoltaic solar cells, fuel cells, next generation batteries, electronics, and defense purposes. He spoke of the negative results of China’s stronghold on the rare earth market while suggesting that the private sector is responding effectively to the monopoly, and urged the federal government to aid in rebalancing the market. Harris expressed his support of Hultgren’s ECE bill. Ranking Member Brad Miller (D-NC) spoke further about China’s intentions to manipulate the ECE market, and stressed the need to “keep watch” on these elements and to foresee future problems. He urged the House to move forward on his bill, H.R. 952, in time for Senate action to be taken on this issue.

David Sandalow of DOE told the committee that his agency has deemed solar photovoltaic cells, wind turbines, electric vehicles, and fluorescent lighting at risk of supply disruptions in the next five years. Sandalow listed DOE's three pillar-strategy to increase the U.S. domestic market of ECEs: development of substitute elements, an increase in the use of recycled electronics, and the creation of a diversified global supply chain. According to MolyCorp, Inc. of Mountain Pass Mine in southern California, the mine will have a production capacity of 19,000 tons of rare earths by the end of 2012 and 40,000 tons by early 2014, which Sandalow said is "an important step in the right direction." He mentioned the administration is currently evaluating H.R. 2090 but has no specific comments yet.

Derek Scissors of the Heritage Foundation said that he agreed and disagreed with comments from Representative Miller's opening statement, and announced that he would speak in response to Miller rather than reading from his written testimony. While he agreed with Miller that the Chinese are a predatory presence in the critical materials market, he also believed that the Chinese market power is temporary. Scissors corrected Harris, saying that China actually only monopolizes 90 percent of the market, as production is slowly branching out into other countries. He added that Chinese "holding" amounts of critical materials are lower than their production rates, thus their domestic market is not sustainable. Scissors warned that government intervention in the market, in the form of loan guarantees, is a "terrible idea." He asked, "What should the government do, then?" and listed supporting basic research, providing information in a rapidly changing market, creating a long term process for ECE production, and possibly opening federal land to ECE exploration.

Robert Jaffe of the Massachusetts Institute of Technology (MIT) believes that the U.S. is not going to run out of any ECEs in the near future, but if appropriate steps are not taken, the country will face disruptive short-term constraints on the supply of "potentially game-changing energy technologies." Jaffe listed three approaches that MIT has recommended for the U.S.: the government should gather and disseminate all information about the availability of ECEs, the government should promote fundamental research aimed at increasing supplies and decreasing dependence on foreign ECEs, and the country needs more recycling efforts for used electronics.

Karl Gschneidner of Ames National Laboratory told the committee that both the Office of Energy Efficiency and Renewable Energy (EERE) and Advanced Research Projects Agency-Energy (ARPA-E) at DOE do research through Ames Laboratory on these issues, and he described a few current initiatives. He expressed the imperativeness to educate and train the next generation of engineers.

Luka Erceg of Simbol Materials stated that ECEs are the "backbone to US innovation." He told the committee that Simbol Materials is commercializing sustainable production of lithium, manganese, and zinc. Erceg mentioned that manganese has not been listed as an important element in the proposed legislation, even though the Defense Logistics Agency (DLA) and Department of Commerce (DOC) have both expressed how critical manganese is. He believes the U.S. needs clearer definitions and policies about ECEs, a domestic supply chain for those critical materials, and federal support for research and development (R&D) of ECEs.

During the question and answer period, Harris asked Sandalow how the government would be best positioned with regards to rare earths. Sandalow emphasized the need for government support for research, without discerning between basic and applied, and enhanced agency coordination. Erceg agreed with the need for more coordinated agency action. He added that this is a great opportunity to put agency coordination in law, as he sees more similarities than differences in the proposed legislation. Miller asked if there is a useful distinction between basic and applied research. Jaffe responded that time scale is the discerning factor, since private enterprise shies away from making investments on long time scales. Scissors argued that the concept of basic versus applied research is a market view, not a true science perspective.

Judy Biggert (R-IL) asked the panel to characterize the importance of critical elements related to batteries. Sandalow told the congresswoman that battery materials like lithium are critically important to reduce the nation's dependence on oil. Erceg added that the nation is not running out of these materials; rather, the U.S. lacks a highly trained workforce to produce and process the materials. Jerry McNerney (D-CA) asked Erceg about DOE's other work in California. Erceg replied that DOE has given \$3 million to geothermal research in California.

Rohrabacher told the panel that the "regulatory" nature of the government cannot impede the nation's ECE production. Erceg said that he "respects regulations" because it has shown to foster more innovation, create more sustainable lithium production and a competition with the lowest-cost producers. Scissors noted that there is a benefit to opening up federal lands for development.

Paul Tonko (D-NY) asked if DOE's efforts are linked with a broader strategy to encourage domestic manufacturing, to which Sandalow replied in the positive. Tonko inquired about electronic waste processes, and Jaffe told the congressman that the U.S. needs future research for materials currently lacking recycling programs, which would be a "great investment in the longest term." Randy Hultgren asked Scissors his opinion on the three key points from the DOE strategy. Scissors noted that they are all good options, and material substitution and global supply chain diversification are already underway. He stressed the importance of

government role in recycling efforts. Erceg explained that the three prongs of the DOE approach all fuel each other in a circle, and he believes they will work well together.

During a second round of questioning, Harris expressed his desire to prevent “another Solyndra” occurrence, in which a now bankrupt solar company received a \$535 million loan guarantee, and asked how the government can prevent it. Scissors told the congressman that the government should not involve particular companies, because it sets up a “giant target” for competitors to destroy. Multiple companies and multiple technologies, Scissors believes, are the best route for government support.

Tonko opened up discussion on DOE methods, to which Sandalow mentioned that DOE looks to multiple technologies when responding to particular needs. Scissors told the committee that this market is very sensitive to vulnerabilities, but Erceg argued that it suffers from a lack of transparency.

Full witness testimonies, the majority opening statement, and a hearing webcast can be found on the House Committee on Science, Space, and Technology web site.
