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# Testimony

**of Dr. Steve Duclos**

Chief Scientist and Manager of Material Sustainability

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*on behalf of* National Association of Manufacturers

*before the* Energy and Mineral Resources Subcommittee

*on* H.R. 2011 the “National Strategic and Critical Minerals Policy Act”  
and H.R. 1414 the “Resource Assessment of Rare Earths Act”

June 3, 2011



**COMMENTS OF THE NATIONAL ASSOCIATION OF MANUFACTURERS  
BEFORE THE**

**Energy and Mineral Resources Subcommittee**

**JUNE 3, 2011**

Chairman Lamborn, Ranking Member Holt and members of the Subcommittee on Energy and Mineral Resources, thank you for the opportunity to testify before you today about rare earth and critical minerals.

My name is Dr. Steven Duclos, and I am the Chief Scientist and Manager of Material Sustainability at General Electric Global Research. At GE, we have more than 35,000 scientists and engineers working in the US and around the globe, with extensive expertise in materials development, system design, and manufacturing. As Chief Scientist and Manager of Material Sustainability at GE Global Research, it's my job to understand the latest trends in materials and to help identify and support new R&D projects with our businesses to manage our needs in a sustainable way.

GE is a diversified global infrastructure, finance, and media company that provides a wide array of products to meet the world's essential needs. From energy and water to transportation and healthcare, we are driving advanced technology and product solutions in key industries central to providing a cleaner, more sustainable future for our nation and the world.

GE is also a board member of the National Association of Manufacturers (NAM) and is pleased to testify on their behalf today. The NAM is the nation's largest manufacturing trade association, representing manufacturers in every industrial sector and in all 50 states. Manufacturing has a presence in every single congressional district

providing good, high-paying jobs. The United States is the world's manufacturing economy. It produces \$1.6 trillion in value each year or 11.2 percent of GDP, and employs nearly 12 million Americans working directly in manufacturing.

Manufacturers use minerals, in some cases, rare earth minerals, to create a number of products. For instance, GE uses the following rare earth minerals in production of the following products:

- A) GE Lighting utilizes Cerium, Terbium, and Europium in synthesizing efficient phosphors for fluorescent lamp products, which are critical in the Department of Energy's transition from inefficient incandescent lamps.
- B) GE Energy uses Neodymium, Samarium, Dysprosium, and Terbium in permanent magnets for compact and efficient generators in GE's most advanced 2.5 MW wind turbines.
- C) GE also uses permanent magnets in technology prototypes for traction motors for our hybrid locomotives, high-speed motors and generators for aviation applications, high speed motors for turbo-expanders, high power density motors for PHEVs and EVs, ultra high-efficiency industrial motors, as well as compressor motors for GE Oil and Gas business.
- D) GE Healthcare uses rare earth materials for scintillators in both Computed Tomography (CT scan) and Positron Emission Tomography (PET scan) health imaging technologies.
- E) GE Aviation uses small quantities of rare earth permanent magnet materials for defense technologies in guidance systems.
- F) Small amounts of rare earths are used in materials and coatings in aircraft engines and power generation turbines.

Minerals play an essential part in manufacturing. As an example, GE uses at least 70 of the first 83 elements listed in the Periodic Table of Elements. GE also spends \$40 billion annually on materials, with 10% devoted to direct purchase of metals and alloys. Because materials are so fundamental to everything manufacturers do, we are constantly watching, evaluating and anticipating supply changes with respect to materials that are vital to the manufacturing process.

Chairman Lamborn, I commend you for convening this hearing today to discuss the issue of rare earth and other critical minerals. What I would like to do now is to share with you the NAM's policy in regards to rare earth minerals, as well as outline a series of recommendations for how the federal government can strengthen its support of the industry in this area.

The NAM's core policy is that U.S. manufacturers require access to basic inputs to the manufacturing process in order to become and remain competitive in the global economy. The NAM opposes government policies and practices that unfairly limit the availability and raise the cost of such inputs, thereby reducing the competitiveness of U.S. manufacturers. With that said, the NAM believes that first and foremost, any solution needs to be comprehensive and to take into consideration the multiple efforts that are necessary to resolve the shortage of these minerals in the manufacturing supply chain.

As you know, the United States was at one point a global leader in providing rare earth minerals. However, as the mining and processing of these minerals were economically intensive, U.S. mining and processing has ceased. However, over the past years demand for some of these minerals has continued to increase. Current mining and processing will not be able to keep up with this demand. In addition, a shortage of these minerals can increase the cost of energy for manufacturers as they are used in refining

petroleum as well as in renewable energy products. Therefore, the U.S. should resume its mining and processing of these minerals.

### **Strengthening Domestic Supply Chain and Workforce**

First, the federal government should play a vital role in strengthening the domestic rare earth minerals supply chain. By strengthening our domestic supplies we will have a more diversified supply chain for these minerals and this will help make U.S. manufacturers stronger and more competitive. Manufacturers are supportive of legislation that increases domestic supply. For example, legislation that re-opens mines and processing plants in the United States would be an excellent first step.

Second, there needs to be support for a workforce that can carry out mining and processing. Therefore, a legislative effort should include workforce assessment, curriculum development and worker training. This is a vital element for re-opening mining and processing of any critical minerals, including rare earth minerals. Without the necessary workforce, the U.S. will not be able to mine these minerals in a safe and environmentally sound manner. Therefore, in order to truly secure manufacturers' access to these vital minerals, the U.S. needs to provide a domestic source of mining and processing of these minerals.

### **Alternative Technologies**

Furthermore, comprehensive legislation needs to address the issue of heavy rare earth elements. These elements cannot currently be mined in sufficient abundance domestically to meet manufacturers' growing demands. An important solution for the shortage of these heavy rare earth minerals, in those particular cases where affordable alternative materials may be available, is to provide manufacturers incentives to develop technology that either reduces or eliminates the use of these elements. This includes the voluntary development of manufacturing technologies that more efficiently use these materials.

While there are cases where the properties imparted by the element are uniquely suitable to a particular application, there are examples where a manufacturer is able to invent alternative materials or use already existing alternate materials to minimize mineral shortage risks. Manufacturers may be able to overcome the shortage of these minerals by using alternatives that will provide them more flexibility in designing their products. However, pursuing this path is not easy and presents significant challenges that need to be addressed. As such, the federal government can help by enabling public-private collaborations that provide both the materials understanding and the resources to attempt higher risk approaches. Both are required to increase manufacturers' chances of success in minimizing the use of those heavy rare earth elements.

### **Recycling Efforts**

Another approach to minimizing the use of at-risk elements over the long term is to develop recycling technologies that extract these elements from both end-of-life products and manufacturing yield loss. This includes developing technologies that assure that parts and systems that contain these minerals have as long a life as possible. For instance, designing a product that can be serviced will reduce the need for replacing parts that will use additional materials. The basic understanding of those practices and designs that limit the life of products can be critical to extending the useful life of parts, particularly those exposed to extreme conditions. It is these parts that tend to be made of the most sophisticated materials, oftentimes containing scarce raw materials.

Mr. Chairman, these are the basic principles which we, the NAM, believe are necessary to address the shortage of rare earth minerals and other critical elements. However, it is imperative to note that each element is different and some problems are easier to solve than others – typically a unique solution will be needed for each element and each use of that element. Therefore, a comprehensive legislation must also take

into consideration the varying degrees of manufacturing, and propose solutions that are applicable to real-life manufacturing and system design.

**Comments on HR 1314 and HR 2011**

In regards to HR 2011 and HR 1314, we thank you for your efforts in introducing these measures. As per my testimony today, manufacturers rely on these minerals for the creation of a number of products and sources of energy. Therefore, we welcome Congressional actions that not just draw attention to the issue, but attempt to resolve it was well.

We believe that it is important to have some form of legislation by Congress that mandates a solution that is comprehensive and incorporates those solutions highlighted above. It is only through a comprehensive solution that takes into account: (1) the domestic mining and processing of these minerals; (2) strengthening of the workforce; (3) government incentives for creating alternative manufacturing and materials technologies; and (4) recycling of these minerals that we can truly address this current problem with rare earth minerals.