

What is the Energy Innovation Hub for Critical Materials?

Created by the U.S. Department of Energy, the Energy Innovation Hub will operate under the name, the Critical Materials Institute (CMI). The CMI will be led by the DOE's Ames Laboratory and bring together the expertise of four DOE national laboratories, seven universities and seven industry partners to eliminate materials criticality as an impediment to the commercialization of clean energy technologies for today and tomorrow.

What are "critical" and "near critical" materials?

Certain substances provide essential capabilities, such as light emission, magnetism or others, and when the supply of one of these substances is at risk, it becomes a "critical" material. The Department of Energy has identified five rare-earth materials – neodymium, europium, terbium, dysprosium and yttrium—as critical materials, materials essential for America's transition to clean-energy technologies. The DOE has identified two additional elements, lithium and tellurium, as "near-critical" materials. These non-rare-earth materials play an indispensable role in emerging energy storage and battery technologies, such as hybrid and electric vehicles, wind turbines, and photovoltaic thin films.

Why is the Critical Materials Institute important?

Economic projections are that valuable critical materials could experience worldwide supply deficits of up to 30 percent by 2016. The CMI is the nation's premier research, development and deployment institute for critical materials, their alloys and oxides. Driven by a "think-tank" philosophy, the CMI consists of a team of multi-disciplinary, world-class researchers who, together with industry, are dedicated to finding innovative solutions and carving creative, transformational paths to eliminating the criticality of rare-earth and other materials. This will be achieved through the diversification of supplies, development of substitutes, and the improvement of usage efficiency, reuse and recycling.

In the short term, scientists will work to design separations agents to improve the production efficiency and economic viability of new rare-earth mines, thereby promoting the diversity of supply of critical rare earths. They will also work to improve the utilization of critical rare earths in manufacturing. Intermediate goals include developing and delivering transformative and environmentally benign technologies that increase the supplies of critical rare earths, enhancing efficient reuse and recycling of feedstocks that will further diversify the global supply chain of critical materials, and designing new chemical extractants that will transform the recovery of lithium from highly concentrated brines. The long-term goal of the CMI is to invent and qualify new materials for use in existing products and to redesign products to accommodate new materials.

Who are the members of the Critical Materials Institute?

In addition to the Ames Laboratory, the CMI consists of representatives from three other DOE national laboratories: Idaho National Laboratory, Lawrence Livermore National Laboratory and Oak Ridge National Laboratory. There are seven member universities: Brown University; Colorado School of Mines; Florida Industrial and Phosphate Research Institute of Florida Polytechnic University; Iowa State University; Purdue University; Rutgers, The State University of New Jersey; and the University of California at Davis. Seven industrial partners round out the team. They include Advanced Recovery, Cytec Industries, GE, Molycorp (chair of CMI's industrial council), OLI Systems, Simbol Materials and Spin-Tek Filtration.

Why is the Ames Laboratory leading the Critical Materials Institute?

The Ames Laboratory is a national resource in rare-earth and other materials science and technology. The Laboratory has been a world leader in rare-earth science for most of its history. It has delivered a steady stream of discoveries, ranging from superconducting compounds to alloys with special magnetic and mechanical properties. The Lab's Materials Preparation Center has established itself as the preferred source of certified, research-grade, high-purity rare-earth samples to researchers around the world.

The Ames Laboratory will provide the central physical location for the hub. The Colorado School of Mines, with the nation's leading programs in mineral economics and in mineral processing and extractive metallurgy, will occupy the second spot in the chain of command and work side by side with Ames to support the overarching mission of the Institute.

How did the Energy Innovation Hub proposal originate?

The Ames Laboratory award is in response to the Critical Materials Strategy the DOE released in December of 2011. That report examined the role rare-earth materials and other materials play in clean energy technologies, such as wind turbines, electric vehicles, solar cells and energy efficient lighting. The report found that several clean energy technologies use materials, particularly the rare earths dysprosium, neodymium, terbium, europium and yttrium, which are at risk of supply disruptions in the short term, perhaps as early as 2016. The DOE listed these materials as "critical" materials. Two other materials, lithium and cerium, were identified as being "near critical" materials.

How will projects be approached by CMI's partners?

The CMI has formed teams from among its members, which can be enhanced by adding outside expertise as needed, to carry out an array of projects with specific timelines and goals. In some cases, CMI may support multiple projects aimed at solving a single problem.

CMI will also work closely with industrial partners across the materials supply chain, from mines to manufactured products, to focus the nation's world-leading research tools and talent on some of the most pressing challenges facing today's technology-focused economies.

To learn more about the Critical Material Institute, the Energy Innovation Hub and the DOE's Critical Materials Strategy, go to:

DOE CMS: <http://energy.gov/pi/office-policy-and-international-affairs/downloads/2011-critical-materials-strategy>

The Ames Laboratory is a U.S. Department of Energy Office of Science national laboratory operated by Iowa State University. The Ames Laboratory creates innovative materials, technologies and energy solutions. We use our expertise, unique capabilities and interdisciplinary collaborations to solve global problems.

