February 18, 2011

Scientists Call for New Sources of Critical Elements

By MATTHEW L. WALD

WASHINGTON — Technologies for green or renewable-energy devices like batteries, solar cells and advanced electric motors are dependent on critical metals and other elements that are threatened by major shortages, two influential American scientific groups said in a report Friday.

And China's chokehold on the chemical elements known as rare earths is just one example, the groups said. The report called for the United States government to research and develop new sources for a broad range of critical materials and to more closely monitor the supply of and demand for them.

The study's release follows the recent introduction of a Senate bill, consistent with the report's recommendations, meant to ensure that the United States can globally compete in emerging energy industries. That bill, by Senator Mark Udall, Democrat of Colorado, also calls for federal money to train people to work in the advanced materials field.

Late last year, the United States Department of Energy filed a report sounding similar warnings.

Many of the materials in question are now traded in relatively small volumes, but are becoming increasingly critical to the production of clean energy technologies, according to the report by the American Physical Society and the Materials Research Society.

The materials in question, with names like indium, gallium and tellurium, until a few years ago were mainly "laboratory curiosities," Thomas E. Graedel, a Yale professor and a member of the report committee, said Friday. But shortages of those and other elements could slow the deployment of green technologies, he said.

The threat to supplies comes not only from geopolitics, as with China's restricting exports of rare earth elements, the report said. More fundamentally, it said, global production of many vital materials is simply not keeping pace with demand.

For example, tellurium, now obtained as a byproduct of copper mining, is useful in producing a certain kind of thin-film solar cell. But the amount of tellurium required for one gigawatt of solar cells — about equal to the power output of a single large nuclear plant — would be approximately twice the entire world's production of that element in recent years, the report said

Because the copper business on which tellurium is piggybacked was about $80 billion in 2009, while the tellurium market was but a tiny fraction of that — close to $30 million — it is unlikely that producers will expand copper mines simply to yield more tellurium, the report said. But copper producers might be open to changing the processing system over time, to get higher tellurium yields, the report said, if the scientific techniques were developed for doing so.

Gallium, indium and germanium are other elements for which demand is now low but might grow far faster than production could be increased, the report said, leading to big price swings.

“The world, despite occasional headlines, is not going to run out of any of these materials any time soon,” said Robert L. Jaffe, a physics professor at the Massachusetts Institute of Technology and the chairman of the study committee. But “the problems of energy-critical elements are very real and serious,” he said.

Production of those materials today is generally a byproduct of something else, and not a result of primary production of the elements themselves. So investors may not want to build mines or processing plants just for those elements, the study said.

The report put lithium in this category. It is important to batteries, but substitutes might be found, and that means that exploration and development of new lithium resources “remains in limbo.”

And no one is sure about how fast production of these “energy critical elements” could be increased, the study said, noting that the process of developing and opening a new mine can take decades.

Another complication is that mining many of the materials also brings to the surface uranium and thorium, which are radioactive. The uranium and thorium often occur in concentrations too low to be commercially attractive, so they are cast aside as byproducts, creating environmental problems.

The report said the White House Office of Science and Technology Policy should create a committee to examine the production and use of these energy-critical elements, and aim to enhance their production or find substitutes. Recycling would help, too, it said.