Research Question-

With new and expanding energy technologies that utilize rare earth elements, such as permanent magnets for wind turbines and electric vehicles, what are the potential impacts on U.S. rare earth imports and global rare earth markets?

Context and Background

More than 90% of the world’s rare earth elements are mined in China. Many of these are then exported, as raw materials or embedded in finished goods, throughout the world. They are present in many end-use products, including light-emitting diodes (LED), nickel metal hydride (NiMh) batteries, permanent magnets, fuel catalysts, glass polishing powders, ceramic capacitors, phosphors, and other end uses, such as polyvinyl chloride (PVC) stabilizers. However, there is little public information on the amount and type of rare earth minerals contained in these products. The U.S. imports rare earth elements as raw materials for manufacturing, while also importing millions of finished goods containing these elements. It is not well understood how dependent the U.S. economy is on the Chinese supply of rare earths, once imports of finished goods are taken into account. This is especially a concern for the energy industry, as the continued growth of wind energy and electric vehicles in particular depend on a stable supply of rare earths.

Research Results

Using data from several sources, including market reports and publicly available trade data, our research indicates that the U.S. imports significantly more rare earth elements contained within finished goods than it imports as a raw material. The quantitative objective of this study was to determine the U.S. import volumes (and import dependence) of REE in components and/or finished products. This was accomplished by matching compositional data of these components and finished products with data on imports.

Our research highlights the imported energy technologies that contain rare earth elements. In particular, the demand for rare earths for the batteries and magnets used in electric vehicles and for magnets used in wind generation is expected to grow. LEDs will also be a source of demand for rare earth elements, although they are displacing compact fluorescent lamp (CFL) and linear fluorescent lamp (LFL) bulbs that use rare earths in greater concentration.

Conclusions

We conclude that the U.S. economy is more dependent on a stable supply of rare earths than is widely acknowledged. Rare earth supply is a potential pinch point in the growth of new energy technologies, and supply disruption could significantly affect the continued market growth of electric vehicles and wind generation. Further research into the supply chain security of rare earths should be pursued.