A CRITICAL LOOK AT RESOURCE CRITICALITY ASSESSMENTS

Komal Habib

Many reputable organizations, including the U.S. Department of Energy, have predicted a shortage of certain rare earth elements (REEs) — a shortage they suggest could endanger direct-drive wind turbines, electric vehicles and other clean energy technologies.

Don't panic, says Waterloo researcher Komal Habib.

Habib and her Danish colleague Henrik Wenzel reviewed the "resource criticality" assessments that underpin these predictions and found some crucial shortcomings.

Standard resource criticality assessments determine the risk of shortages based on current geological and geopolitical factors. However, these factors change over time. Moreover, an increase in demand or the development of new technology can drive the exploitation of reserves that are currently untapped.

Habib and Wenzel analyze the example of direct-drive wind turbines, which use two key REEs, namely neodymium and dysprosium, containing magnets in their generators. Based on four different future scenarios modelled, the researchers predict turbine manufacturing will account for just 2 to 10 per cent of the global demand of these rare earth elements in 2050, despite an increase in turbine manufacturing. If global supplies grow, as more countries begin exploiting untapped reserves, the estimated current supply risk will be even smaller.

Resource criticality assessments also examine the impact a shortage would create. In most cases, that simply means evaluating whether substitutes are available for the material in short supply. Yet technology can often be redesigned to avoid the need for that particular material.

Using design tree analysis, Habib and Wenzel identify several ways to construct direct-drive wind turbines that don't rely on neodymium and dysprosium (albeit with some efficiency trade-offs).

Based on these results, turbine manufacturers can sleep a little more soundly.

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