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European Commission

Science for Environment Policy

Chinese supply of critical raw materials could pose long-term risks to European wind- and solar-energy industries

A recent study has analysed risks to European renewable industries from the Chinese supply of critical raw materials. The offshore wind sector was found to be the most vulnerable of the renewable industries to supply risks. EU and industry strategies should be able to deal with these supply risks in the short term, but there are potential long-term risks to solar and wind sectors. The development of alternative technologies less reliant on these raw materials, and methods to recycle these materials is, therefore, a priority.

By 2030 the EU aims to generate 27% of its energy from renewable sources. However, the renewable-energy sector in Europe is heavily reliant on China for the supply of raw materials critical for the development of technology such as solar cells and wind turbines. These raw materials have contributed to a rapid development in renewable-energy technologies. The EU has identified certain 'critical raw materials' as having both economic importance and supply risks.

In recent years, the Chinese government has moved towards greater state control of critical raw materials. The researchers say this is partly due to the environmental and health problems associated with extracting these materials, but also to ensure a domestic supply for its own, growing renewable-energy industries. China is also concerned by the low prices they receive for these materials and has a desire to improve the competitiveness of its own renewable sectors. Consequent policies, such as the introduction of export licenses in 2015, are likely to increase the costs of raw materials for EU companies.

This study examined the supply of five critical raw materials: tellurium, gallium and indium (used in making solar cells), neodymium and dysprosium (used in manufacturing offshore wind turbines), all identified as at high risk for future supply due to supply being concentrated in only a few countries as well as likely increases in demand from renewable sectors. The researchers also assessed the strategies of the European Commission and renewable-energy companies to deal with potential supply risks. The study used 14 semi-structured interviews with representatives of European solar and wind companies, research institutes and European government agencies. Interviews were supplemented with an analysis of EC documents, media reports, journal articles and information published on company websites. Chinese government reports and reports from the Chinese media were also consulted.

The EU depends least on the Chinese supply of tellurium — 20% of which is sourced from China — followed by indium (58%), gallium (69%), neodymium (90%) and dysprosium (99%). Solar companies, therefore, have lower potential supply risks, as there are alternative supply sources of tellurium, indium and gallium (tellurium from Japan, Belgium and Sweden; small quantities of indium from Belgium, Germany, Italy, the Netherlands and the UK; while gallium production facilities are currently being built in France) and prices for these materials are currently low. In contrast, the European wind-energy sector is dependent on the continued supply of neodymium and dysprosium — 90% and 99% imported from China respectively.

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Chinese supply of critical raw materials could pose long-term risks to European wind- and solar-energy industries *(continued)*

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The EC expects demand for tellurium, gallium and indium to peak around 2020, when alternative silicon cells are likely to become more widely used in solar technology. Future efficiencies in solar-cell technology should also mean less tellurium, gallium and indium is needed in the production of solar cells. EU demand for neodymium and dysprosium is expected to rise by 2020 (to 845 tons of neodymium and 58 tons of dysprosium) and 2030 (to 1 222 tons of neodymium and 84 tons of dysprosium), respectively, due to investments in wind energy, particularly offshore wind installations. Offshore wind energy is expected to account for 30–40% of all wind energy in the EU within ten years.

As well as continued dialogue with China, the EU (along with Japan and the USA) has charged China with trade violations, through the World Trade Organisation (WTO), in relation to previous export quotas on rare earth materials[1]. The WTO ruled that the quotas violated international law, as they were "*designed to achieve industrial policy goals rather than conservation*". European solar and wind firms have also attempted to establish a local presence in China (i.e. by shifting production to China or signing joint supply contracts with Chinese companies) to improve access to raw materials. But the researchers describe these strategies as short-term measures, which do not reduce the dependence on Chinese supply.

In the long term, the most effective strategies to deal with uncertain supply from China are to look for alternative supply chains and to reduce the need for critical materials in renewable technologies. The EU is promoting research (e.g. Replacement and Original Magnet Engineering Options (ROMEO), Suprapower project, INNWIND.EU and EcoSwing) to develop renewable-energy technologies that do not depend on critical raw materials.

Recycling, in the long term, may also be a potential way to reduce mineral shortages. Recycling is currently more promising for indium and gallium than for tellurium and is currently not feasible for neodymium and dysprosium. Further R&D in recycling and alternative technologies to reduce dependence on these materials should, therefore, be a continued priority. The researchers say the study highlights the importance of looking at the renewable-energy sectors and technologies separately, as well as considering Chinese state policies, in order to understand potential supply risks of critical raw materials.

1. In July 2016, following successful legal actions in 2012 and 2014, the EU focused on Chinese export restrictions (including export duties and export quotas that limit access to these products for companies outside China) concerning graphite, cobalt, copper, lead, chromium, magnesia, alcum, tantalum, tin, antimony and indium. See: http://europa.eu/rapid/press-release_IP-16-2581_en.htm