

Mineral requirements for electricity generation

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ABSTRACT

Beyond actual fuels, recent studies have focused on the mineral requirements for building different kinds of generating capacity. This translates readily to the requirements for actual electricity delivered. Corresponding analysis looks at the implications of moving to cars and trucks driven by batteries or fuel cells.

A new International Energy Agency (IEA) report explores the implications of energy policies driven by reducing CO2 emissions for the materials requirements in generating capacity and also some applications such as electric vehicles. 'Critical minerals' in this study exclude concrete, iron and aluminium.

Since 2010, the average amount of critical minerals needed for a new unit of generation capacity has increased by 50% as the share of intermittent renewables in electricity supply has risen. This is set for a further sixfold increase if renewables and EVs remain the focus of investment.

The IEA shows that "Lithium, nickel, cobalt, manganese and graphite are crucial to battery performance, longevity and energy density. Rare earth elements are essential for permanent magnets that are vital for wind turbines and EV motors. ... The shift to a clean energy system is set to drive a huge increase in the requirements for these minerals, meaning that the energy sector is emerging as a major force in mineral markets." Nuclear power is shown to need mainly copper, nickel and chromium.

An offshore wind plant needs 13 times more critical minerals per unit of capacity than a gas-fired plant, and if the comparison is on MWh output, that would be up to 40 times more. Of the low-carbon technologies, nuclear power is shown as half the critical minerals intensity of onshore wind and one third of offshore wind. In terms of MWh output wind requires six to eight times as much as nuclear.