Until the mid-2010s, the energy sector represented a small part of total demand for most minerals. However, as energy transitions gather pace, clean energy technologies are becoming the fastest-growing segment of demand.

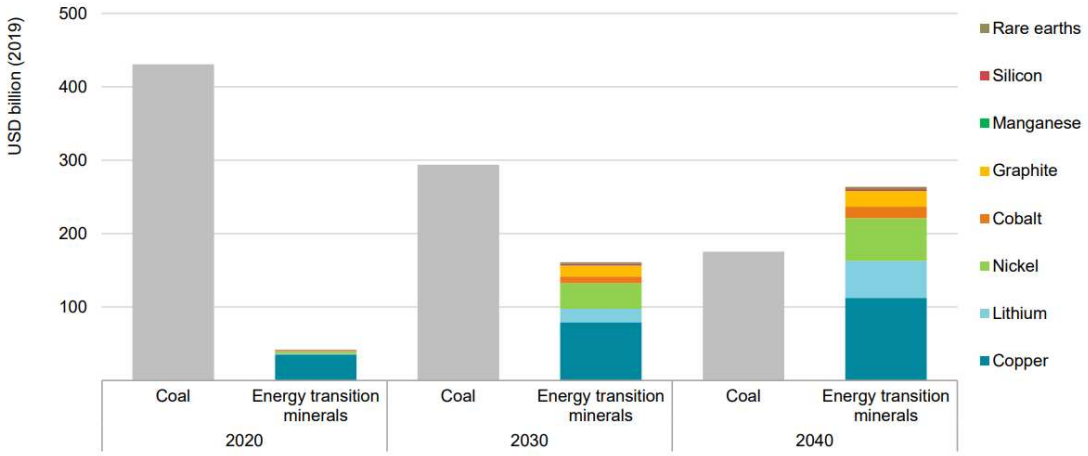
Worldwide efforts to address climate change are leading to the need to generate as much energy as possible from renewable sources.

The result is a dramatic transformation of power systems globally. Even more so is the dramatic transformation of the dependency for certain key minerals– where coal has previously been the leader, copper, lithium, and others have jumped in the way and created a shift in the entire supply chain.

Managing the changes and the shifts in supply and demand becomes more difficult to navigate if you are not keeping your finger on the pulse.

In this series of articles, we will provide you with an overview of the key trends and changes as well as the challenges and opportunities that are being faced in the Mining industry, empowering you with the information you need to ensure your business will adapt through the changes into the Future of Mining.

The Future of Mining: Coal vs energy transition minerals and revenue generated



THE ENERGY SYSTEM AND THE EVOLUTION OF MINERALS IN THE ELECTRICITY SPACE

While base and precious metals mining are mature markets, we are witnessing the start of a new era for lithium, copper and cobalt production as demand for these materials undergoes exponential growth from lithium-ion batteries.

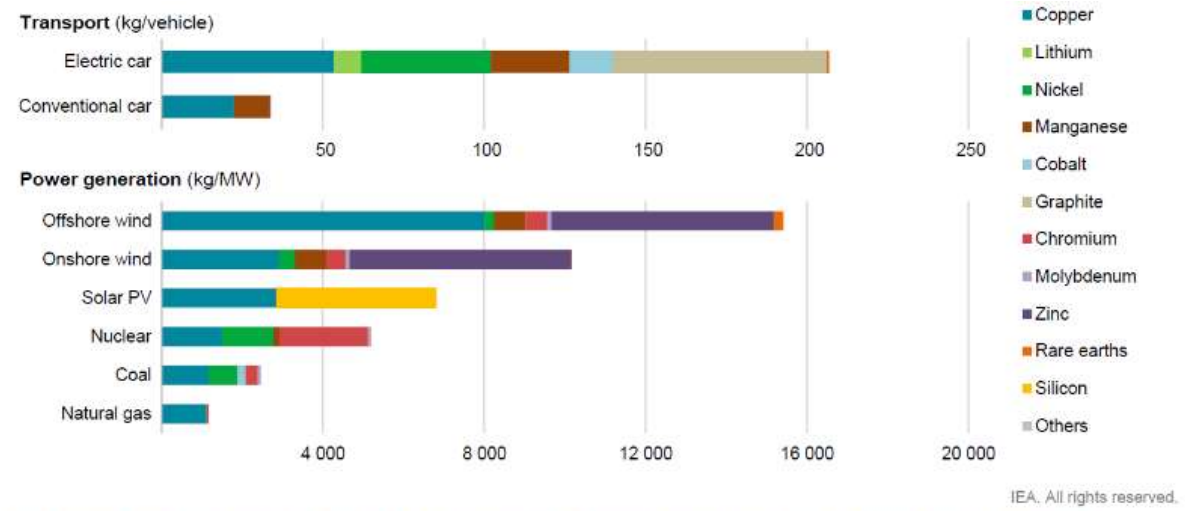
The compound annual growth rate for electric vehicles (EVs) uptake over the next decade is expected to be around 27%, but already growth rates are much higher than this.

In 2021 H2, 84,600 tonnes of nickel were deployed onto roads globally in the batteries of all newly sold passenger EVs combined, **59%** more than in 2020 H2. Moreover, another 107,200 tonnes of lithium carbonate equivalent (LCE) were deployed globally in new EV batteries, an **88%** increase year-on-year.

EVs and battery storage have already displaced consumer electronics to become the largest consumer of lithium and are set to take over from stainless steel as the largest end user of nickel by 2040.

A typical electric car requires six times the mineral inputs of a conventional car, and an onshore wind plant requires nine times more mineral resources than a gas-fired power plant.

Minerals used in selected clean energy technologies



Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies.

SUPPLY AND DEMAND – AVOIDING THE BOTTLENECK

It is evident that the shift to renewable energy is pushing the market at a rapid rate. Such rapid growth has resulted in opportunity and economic upside, as witnessed by the five-fold increase in cobalt prices between 2016 and early 2018.

But how is the market handling this large demand for these specific minerals and is the market ready? Recent events have shed light on the bottleneck within the renewable energy supply – more specifically with regards to the production and supply of key minerals.

Many minerals come from a small number of producers. In the case of lithium, cobalt and rare earth elements, the world's top three producers control well over three-quarters of global output. This high supply concentration raises the risk of supply constraint – which if not managed correctly can affect the entire supply chain.

Whether you are at the source or merely the consumer of the end product, managing and understanding the driving forces behind the current and future supply and demand of the aforementioned key minerals is becoming more and more import for you and your business.

The shift in the market is evident and change is upon us.

To help you navigate through the Future of Mining, Moore will provide insight into key trends about the critical minerals which are becoming increasingly important to everyday life, the impact that changing technology will have, as well as how Environmental, Social and Governance requirements will challenge the way we mine in the future. Further, we will identify the challenges and opportunities that a business will likely face in this sector.

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