Metals of the future: Commodities making the energy transition happen (Part one)

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Key Takeaways

- Copper demand is expected to increase significantly as the world deploys more renewable energy and electric vehicles
- Nickel makes batteries more efficient and is also used to generate nuclear power
- Aluminium's conductivity and light weight make it a top choice for numerous applications, including high-power cables and hydrogen production
- Silver, the best electrical conductor in the world, has a valuable role to play in solar panels and electric vehicles.
- Tin is the glue that holds the energy transition together and it helps bind all electrical contacts
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There are 118 different known elements commonly illustrated in the periodic table and around 93 of them are metals1. Everything we use in our daily lives either contains metals or has gone through a process involving metals to reach us. In clean technology, one common property makes metals particularly important – that they are very good conductors of heat and electricity.

Of course, there is considerable variation in terms of how abundant and important the metals are. For investors looking to invest in one of the most important megatrends of our time, the transition towards low-carbon sources of energy, then identifying the right metals matters.

This two-part blog series highlights the ten key commodities that make the energy transition possible. The blogs will offer a whistle-stop tour of why these metals are important in the energy transition with the aim of inspiring readers to further explore the fascinating world of energy transition metals.

1. Copper

Electrification is at the heart of the energy transition, which can only be made possible with copper. According to our energy transition industry expert partner, Wood Mackenzie, copper's annual demand is expected to rise from around 28 million tonnes in 2020 to over 68 million tonnes by 2050 – driven almost

entirely by emerging sources of demand like electric vehicles (EVs), charging infrastructure, renewable energy, and energy storage systems2.

According to the International Energy Agency (IEA), generating one megawatt (MW) of power from coal requires 1150 kilograms (kg) of copper. Generating the same amount of power from offshore wind requires 8000kg of copper. Similarly, an electric car can have 53.2kg of copper per vehicle compared to 22.3 kg for an internal combustion engine (ICE) car. For larger vehicles like electric buses, the numbers are significantly higher.

These are merely a few examples of how clean technologies will increase copper demand dramatically as the world ramps up its decarbonisation efforts.

2. Nickel

Today, stainless steel accounts for over two-thirds of nickel demand while batteries account for less than 10%3. Although not all nickel grades are suitable for batteries, batteries are expected to be the biggest source of demand growth for at least the next two decades. According to the Nickel Institute, “Nickel in batteries helps deliver higher energy density and greater storage capacity at a lower cost”. Among the most dominant lithium-ion battery cathodes are NCA (nickel cobalt aluminium) and NMC (nickel manganese cobalt) chemistries. Within these mixes, the share of batteries with higher nickel percentages is expected to rise precisely for the reasons stated by the Nickel Institute.

According to the IEA, an electric car has nearly 40kg of nickel per vehicle compared to virtually nothing in a comparable ICE car. If nickel loadings keep rising, this could increase further. And even if solid-state batteries (which promise high energy efficiency, giving EVs longer ranges and short charging times) become mainstream, nickel is expected to remain relevant.

Another interesting avenue of nickel demand is nuclear power. The Nickel Institute states that nickel-containing heat and corrosion-resistant alloys play an important role in ensuring the integrity, durability, and long-term performance of nuclear power stations. They are used in the heat transfer, cooling systems and inside the reactor vessel. According to the IEA, generating one MW of power from nuclear requires 1297kg of nickel, the highest loading of nickel to generate power from the various sources of energy.

3. Aluminium

From wind and solar power to green hydrogen, and high-voltage cables to batteries, aluminium is fully integrated in the energy transition. In addition to being highly conductive and lightweight, aluminium is also corrosion-resistant, which makes it ideal for harsh outdoor conditions. According to the World Bank, aluminium accounts for more than 85% of the material used in solar power frames.

In batteries, aluminium’s thermal conductivity prevents the battery from overheating or cooling down too much, improving the battery’s performance and lifespan. In transmission and high-voltage cables, aluminium provides a superior conductivity-to-weight ratio compared to copper. In the production of green hydrogen, aluminium is used as a base plate metal. With a 360% increase in the deployment of hydrogen electrolysers (the machine used to produce green hydrogen) in 2023 compared to 2022, this is another

promising area of growth for metals like aluminium and platinum (more on that in part two)4. In heat pumps, which are quickly becoming a viable alternative to gas boilers for heating, heat exchangers are typically made with aluminium.

4. Silver

Silver forcefully makes its way among industrial metals in this list of energy transition commodities. Even as it stands, around 57% of silver's physical demand comes from industrial applications5. But solar power and EVs are expected to be the strongest growth areas for silver demand going forward.

A typical solar panel can contain as much as 20 grams of silver6. When light strikes the solar panel, a paste made from silver – considered to be the world's best conductor of electricity – helps carry the electrons that are set in motion, maximising the energy output of a solar cell. According to the IEA, there was an 85% annual increase in solar deployment worldwide in 2023, making it an exciting area of structural demand growth for silver.

In EVs, which also experienced a 35% increase in annual sales in 20237, silver is used for its conductivity and corrosion resistance. In a car, all electrical connections are coated with silver. This not only applies to the electric engine, but also to features like power windows and seats, parking and braking assistance, infotainment systems and so forth.

5. Tin

Tin's primary industrial use is in making solder, a material used to create electrical connections. Therefore, tin is often referred to as the glue that holds the energy transition together. According to Wood Mackenzie, without tin, electrons don't flow, which means mobile phones don't work, EV batteries don't change, and the Internet of Things ceases to exist.

Tin also has very specific uses in renewable energy. According to Fastmarkets, solar panels are formed of many individual solar cells, which are connected by a "solar ribbon" of copper wire coated in a layer of tin8.

EVs can require around 4kg of tin compared to an ICE vehicle, which requires just over 1kg. Although these are relatively smaller numbers compared to, say, copper, but for a much smaller commodity market, the multiplicative effect is still meaningful.

Closing word…

As evident from some of the highlights presented in this blog, the different metals have distinct roles to play in the energy transition. Indeed, each metal is influenced by its own set of demand and supply factors, which can be cyclical. And so, prices can fluctuate and diverge. A basket approach can give investors who are seeking long-term exposure to the energy transition megatrend diversification over the long run while capturing the broad opportunity set across the wide spectrum of investable metals.

This blog outlined the first five in our list of 10 metals. The discussion will continue in part two…

Source

1 LibreTexts, 2024.

2 Forecasts aligned to a 1.5-degree scenario.

3 Statista, 2024.

4 IEA Clean Energy Market Monitor, March 2024.

5 Metals Focus, March 2024.

7 International Energy Agency Clean Energy Market Monitor – March 2024.

8 Fastmarkets, April 2024.

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