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A rapidly changing world is changing resources demand

Research and Insights

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The Global Economy has shifted its focus towards accelerating both the removal and the reduction of carbon dioxide (CO2) output. The trajectory towards global decarbonisation, since the Paris Agreement in 2015, has rapidly accelerated, and will have a significant impact on equity markets for some time. Particularly, demand dynamics within the natural resources universe are being profoundly impacted as a result of this shift in focus. We discuss how decarbonisation is changing the demand profile for critical metals from cyclical swings to secular rising demand.

With the benefit of working in global equity markets, we are witnessing a tidal wave of change in how we interact with, source from, and manage the environment with decarbonisation. In particular, leading countries like China, Europe and the US, have been proactively seeking to reduce their environmental impact for some time. Decarbonisation had been a relatively 'slow burning' issue until the Paris Agreement in 2015 connected in a deep way with a receptive world psyche. The trajectory towards decarbonisation since 2015 has rapidly accelerated. The 2020 COVID pandemic saw an acceleration in 'green stimulus' globally aimed at accelerating the economic recovery through green infrastructure and energy transition programs. COP 26 then confirmed the world's commitment, and even brought forward decarbonisation programs.

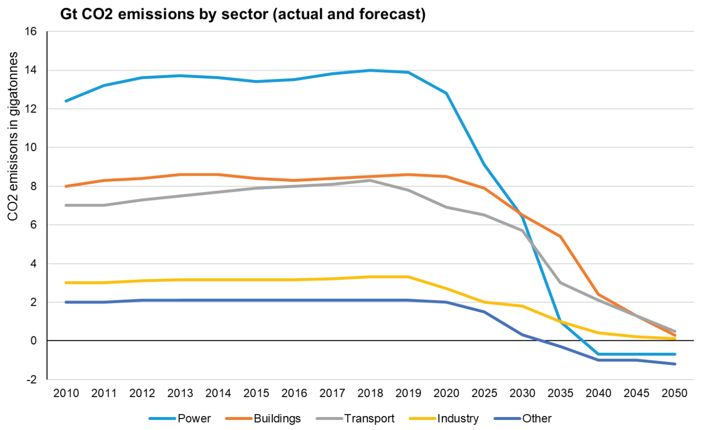
Despite this acceleration in decarbonisation related activities, we are still far from reaching our required green targets, Fortunately, people are now acutely aware of the importance of a healthy environment, and our global 'consciousness' is now ready for a tech-enabled clean energy future. In this now unstoppable trajectory towards decarbonisation, what are the opportunities and how will metals markets look in the future?

What are the opportunities in Decarbonisation?

The opportunities in decarbonisation are nothing short of overwhelming. Before the pandemic, decarbonisation projects were still significantly riskier propositions from the perspective of institutional investment support, access to capital markets, evolving technologies, and timing with respect to the end-customer's appetite for 'decarbonised' product like clean energy, electric vehicles, clean supply chains, a circular economy and the tech-enabled electrification-and-internet-of-things.

If we review the opportunities in decarbonisation, Chart 1 from the International Energy Agency (IEA) projects the estimates for emissions by sector out to 2050. Power, industry and transportation are the largest emitters of CO2, and therefore offer the biggest opportunity set for investors when focusing on decarbonisation and reducing emissions.

Chart 1: Forecast carbon emissions by sector (Gt CO2)



Source: International Energy Agency

From an investment perspective, we can organise the opportunities methodically across the investment universe as illustrated in Figure 1.

Figure 1: The upstream/downstream opportunity for resources with rapid decarbonisation

	Power Storage	Low Emission Fuels	Transportation Electrification	Charging Infrastructure	Renewables	Nuclear Generation	Hydrogen	Carbon Capture and Storage
Upstream	Battery Raw Materials	Gas, lower sulphur fuels	Battery Raw Materials	Copper demand	Solar/Wind raw materials	Uranium producers		
	Pumped Hydro/alternative storage	Refiners/ producers	Battery Component Manufacturers		Panel and Turbine manufacturers	Uranium Enrichers	Producers	
	Service Providers/ construction		Battery Manufacturers	Installation companies	Service Providers/ construction	Construction companies	Infrastructure installation	
Downstream	Operators/ utilities			Operators	Operators/ utilities	Operators/ utilities	Distribution/ Operators	Operators
			EV manufacturers				Vehicle manufacturers	
	Technology developers		Technology developers		Technology developers	Technology developers	Technology developers	

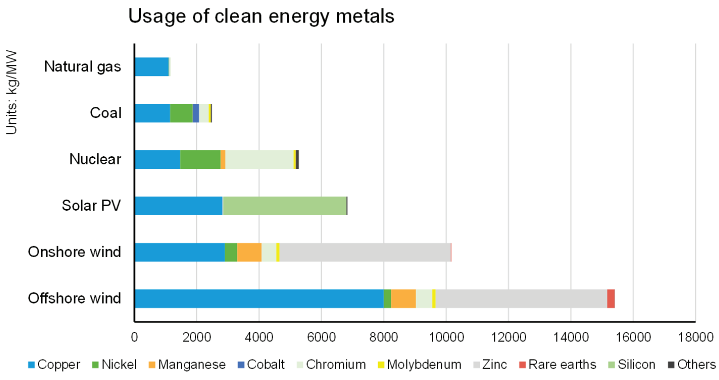
Source: Ausbil

Within the Ausbil Global Resources Fund, we are seeking to benefit from the demand structure illustrated in Figure 1 through the three major areas of resources demand: power generation, transmission and storage; transportation infrastructure, vehicles, energy capture and batteries; and industrial, commercial and residential opportunities from infrastructure to energy demand and communications. All of these opportunities manifest themselves in some form of end-demand for metals, rare earths or other commodities, ensuring a rich vein of decarbonisation investment opportunities globally for our active long short natural resources strategy.

Power generation

Power usage is pervasive in modern economies, 24/7, and incredibly interconnected. We use power and electricity everywhere in our everyday lives. Not only directly (running home appliances or industrial equipment) but also in the manufacturing process of things we use every day. This power generation is a major consumer of natural resources, as illustrated in Chart 2.

Chart 2: Clean energy technologies use way more minerals



Source: International Energy Agency

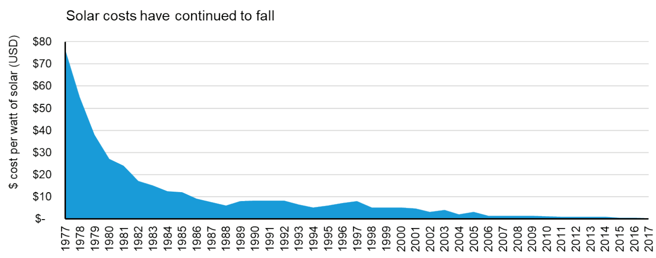
If you take coal energy as the baseline for minerals demand for purposes of comparison, for every megawatt (MW) of power produced: half the demand is required on a kg/MW basis for gas energy; but nuclear uses more than twice the mineral weight per megawatt as coal; solar 2.75 times; onshore wind more than 4 times; and offshore wind more than 6 times that of coal. The commodities needed for clean energy are needed in multiples of volume to what is needed for bulk fossil fuel burning technologies.

Even though the 'old' fossil fuel energies like thermal coal, oil, diesel and gas will give way to renewables and lower-carbon forms of energy supply in the future energy complex, their relevance in the transition to a renewable world is universally misunderstood. For example, thermal coal. Not all thermal coal is the same, and not all thermal coal power generation facilities are the same. Technology has enabled major reductions in emissions from thermal coal generation, but this comes at a cost. The developed world was built on cheap coal generation, and the developing world has followed suit. Irrespective of technological advances, the proportion of thermal coal generation is falling globally, and headwinds are likely to continue. Natural Gas is also a source of carbon emissions in its use from power generation, but to a relatively lesser extent than thermal coal and oil-based power generation. Where we have held a view that natural gas was likely to be a transition fuel, enabling a transition towards a cleaner energy, we now see renewables leapfrogging gas and rapidly gaining traction at gas' expense.

Future energies may not all be new, but they are at the forefront of investment in the future energy complex. Over the past few years, we have seen investment and technological advancements reduce costs, making future energies more competitive against traditional fossil fuels, including solar, wind, hydro and nuclear power.

Solar power generation has been around for many years. The main driver of increased solar production through the years has been a reduction in cost and increases in the efficiency of panels. Once panels are produced, there are no emissions from solar generation. However, generation is weather dependent and needs sunlight, so it is not ideal as a reliable base load generation alternative without the ability to store excess energy that is produced during the day, or provide supplementary generation for solar downtime. Regardless of the challenges of intermittency and latency with respect to transporting energy from solar panels to end users, the cost of solar energy has fallen significantly as illustrated in Chart 3, making it an essential part of the future energy complex.

Chart 3: Solar gets cheaper and cheaper



Source: Freeing Energy

Wind generation has also been around for many years and, like solar, technology has seen efficiency increase, and costs fall. Wind generation can be small scale in remote applications, or built up into onshore or offshore wind farms. Wind generation is also clearly weather dependent. Large onshore wind turbines can generate ~5MW (150m diameter turbine), enough to power ~1100 homes daily. Whereas large offshore wind turbines can generate ~15MW (236m diameter turbine), enough to power ~3300 homes per wind turbine. The main commodities needed in wind turbine construction are steel and aluminium for the unit, copper for the generator, and increasingly rare earths for higher efficiency generators.

Hydro generators use gravity to produce power as water flows downhill. The water flow can come from streams, rivers or dams. Hydro is a renewable energy source and has the advantages of low greenhouse gas emissions, low operating costs, and a high ramp-up rate. The commodities used in hydro generation are limited, though, including cement and steel for dam construction, and copper for generators.

Pumped hydro is also a form of energy storage which can be used with other less reliable sources of renewable energy. For example, if excess solar or wind power was being generated, this power could be used to pump water up hill for a hydro scheme. When solar / wind generation falls, water can then be released to generate power. This can help solve some of the intermittency in wind and solar, but at an added cost.

Finally, nuclear power generation offers a carbon-free energy source that reduces emissions production. However, generation of nuclear energy has had legacy issues surrounding reactor failures such as Chernobyl (1986) and Fukushima (2011) that endangered lives and changed the environmental landscape forever. The reactor failure events were ultimately caused by design and engineering failures (the Fukushima reactor was built in 1971 and Chernobyl in 1977). Suffice to say there have been significant technological advances in the past 40-years to increase safety in nuclear power generation and which make it a viable part of the future energy complex.

There is also a stigma attached to waste material storage for nuclear generation, however, to put this in perspective, a typical 1,000-megawatt nuclear power station which would supply power to more than 1 million people produces just three cubic meters of high-level waste per year.

We are seeing an increasing trend towards broader acceptance of nuclear at the moment as an alternative to base load fossil fuel generation. The main commodity impacted by an increase in nuclear power generation is, of course, yellow cake or uranium.

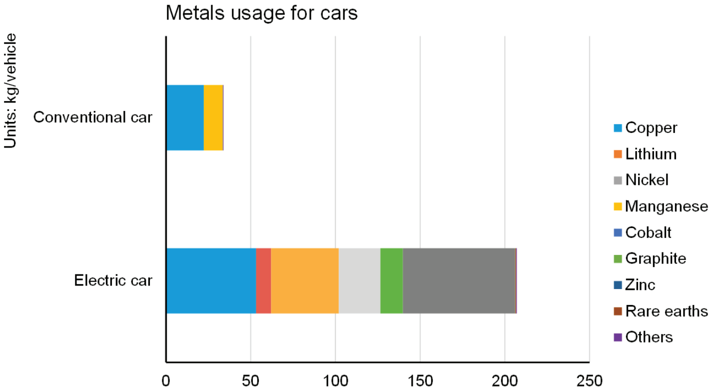
Transportation

Global transportation accounts for just under a third of greenhouse gas emissions. This includes shipping, aviation, trains, trucks, passenger vehicles and every other form of transport you can imagine or that you have seen.

One of these, electric vehicles (EVs), has been grabbing headlines for some time, and we are heavily invested in the EV theme as we see a trend towards the electrification of personal and public transport. The EV thematic creates investment opportunities for us in battery materials (lithium, graphite, nickel and to a lesser extent copper), while ultimately reducing the reliance on fossil fuels over time.

Like renewable energy, electric vehicles consume multiples of certain commodities compared to their fossilised ancestors. As Chart 4 highlights, the production of EVs consumes more than 6 times the key minerals and metals by weight than does the production of conventional cars. Of the approximately 207 kilos of minerals used in typical personal EVs electrification system, 32% is graphite, 26% is copper, 19% is nickel, 12% manganese, 6% cobalt and 4% lithium. By contrast, conventional cars use mainly manganese and copper, but in much smaller measures.

Chart 4: Minerals used in electric cars compared to conventional cars



Source: International Energy Agency

Another old but new technology, hydrogen, has surfaced recently as another potentially critical part of the future energy complex. Hydrogen can be produced as needed through a chemical reaction, it can be made 'green', and it can make use of existing gas and energy infrastructure, including as an alternative vehicle fuel source.

Aviation is changing to meet decarbonisation targets. A Boeing 787 uses approximately half the fuel of the legacy 747, for example, in part due to technology, light-weighting materials like carbon fibre, advanced alloys and aluminium, all creating opportunities in the natural resources universe.

Shipping is also under pressure to reduce emissions, using higher quality fuels, and more effective pollution management technology. Recent regulation required upgrades to fuel standards, and pollution (scrubbers) fitted to shipping fleets.

Solving the problem in reverse by getting better at converting energy

So far, we have focussed on power generation alternatives. Another area worth mentioning is power efficiency, that is, through the more efficient use of power, we can generate less to meet our needs.

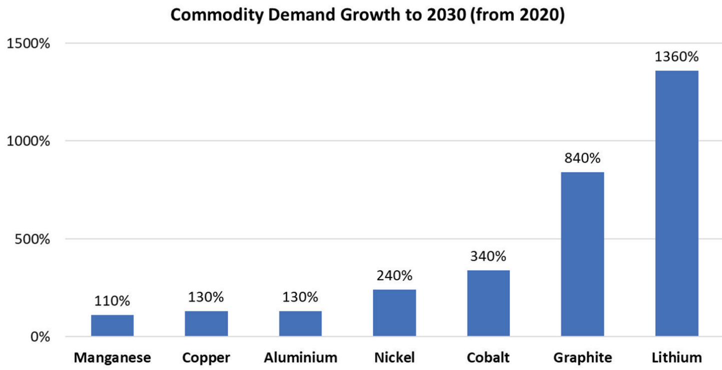
A household fridge in 1975 used around 2200 KWh/y of energy. By 1985, this was 1700KWh/y, in the 1990's this dropped to 850KWh/y, and now your double 'ice-churning' refrigerator uses just 500KWh/y. We are seeing this same trend across other forms of energy consumption, heating, air conditioning, audio-visual, automation, everywhere as batteries, motors, machines and semi-conductors become radically more efficient.

Efficiency is driven by technological advancement, whether it be the materials used in construction, for example, more efficient insulation in fridges, or more efficient use of power. Rare earths magnet motors increase efficiency, and can use less power than alternatives. More efficient use of power means less power production is needed, and this can impact commodities as well.

More demand for metals and rare earths

In summary, decarbonisation is driving major demand for metals and other resources that are essential for the transitions of energy generation, transport and energy demand to more renewable and efficient sources. Chart 5 summarises the major underlying demand growth expected in these key commodities that are enabling decarbonisation, and presenting a major secular opportunity for natural resources investors.

Chart 5: Key electrification metals demand growth is huge



Source: UBS, Ausbil

Lithium is an abundant mineral, but currently extraction and processing capacity is limited, meaning there is a very tight market for lithium, with demand exceeding supply. The lithium-ion battery is currently the incumbent battery technology, and this is not likely to change any time soon. We see a tight lithium market for at least 12-18 months, potentially longer, as new projects and existing resource expansion are needed to meet growing demand.

Graphite can come from two sources, natural (mined and processed) graphite and synthetic (manufactured from oil/carbon sources). Synthetic graphite production is energy intensive, and can be environmentally damaging, but typically produces a more consistent product. Natural graphite can produce a slightly lower quality product with less impact on the environment. Right now, energy constraints in China are seeing constraints on synthetic graphite production which is supportive of natural graphite prices in the near term.

One area we believe is underestimated by the market is the demand for NdPr, a rare earth used in high-strength magnets. Rare earths magnets are used in energy efficient motors. Because of the very high magnetic strength of rare earths magnets, electric motors use less energy to produce the same amount of power (that is, they employ less electrical power to produce the same amount of mechanical power). This trend is likely to continue, with rare earths magnets in everything from EV's to vacuum cleaners and home appliances.

Part of the change that needs to occur with an increasing trend towards renewables is growth in the availability and quality of energy storage. Since renewables can be unreliable, and may not be suitable for base load power, some form of storage is needed to offset the intermittency of some renewable sources. There are many models that can work together to solve the storage puzzle, such as giant utility-sized batteries like that which Tesla installed in South Australia, to fragmented batteries that create a network of energy at the household level, where the home or even the EV is part of the energy storage grid. Much of this technological development is about policy and how it evolves, and a lot will be determined by the behaviour of consumers, and technology firms that offer new options not previously considered possible.

To meet the significant growth forecasts for metals from global decarbonisation, investment in new mines and processing facilities is required to meet growth targets. Investment is also needed in exploration. This cycle (as with most commodity cycle) usually stems from high commodity process incentivising new production (rather than the market preparing for growth, where prices rise drive investment. What we have now is demand dragging prices forward for these key green metals where supply and mineral development have simply not kept up. We believe this is likely to be a trend for some time as explorers and producers scramble to meet the underlying growth in green metal demand.

Ausbil is heavily invested in the decarbonisation theme, with investments in lithium, graphite and rare earths. Across the lithium space, we see opportunities in both producers and developers, while in graphite, we own an interest in Syrah Resources, the only large-scale developed market natural graphite producer. In the rare earths space, we prefer current producers, as construction and commissioning of new projects is incredibly complicated and faces significant regulatory hurdles, producers such as Australia's Lynas Rare Earths.

As is the case where supply undershoots demand, there will be a flurry of exploration and development, mergers and acquisitions. Exciting as this is, perhaps more compelling is the strong underlying demand growth we expect to see in green metals over the next two decades. Unlike many of the boom-bust commodities cycles of the past, these metals may see a more structurally stable demand profile, offering truly long-term compound returns in this space, across the cycle.

So what does this all mean for resources demand?

This shift towards renewables and decarbonisation is instigating a dramatic commodity led response. We are seeing a staggered change in commodity demand for commodities related to the new energy theme, while structural headwinds are in place for fossil fuels. Demand trends are changing fast, and that creates significant opportunities for a fund such as ours, both on the long and short side. New Energy related markets right now, appear to be an incredibly tight across most decarbonisation related commodities, but in time there is a risk of oversupply (which would create shorting opportunities for our fund) although right now these are hard to see and the main direction is forward and long. Join us for the ride.

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