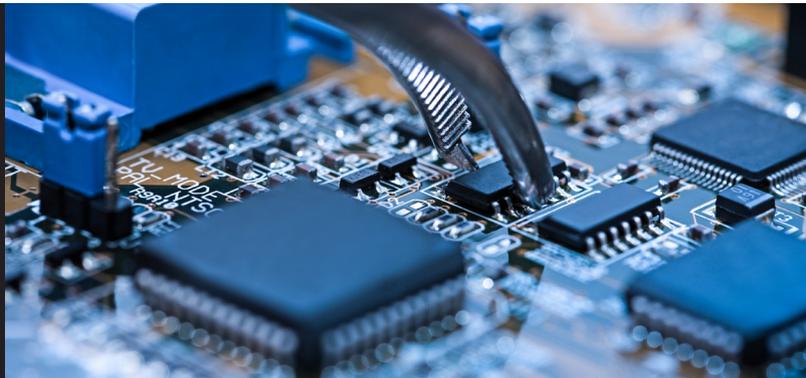




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Argus White Paper: Metals, technology and change – Charging up for 2020



Technology continues to advance in ways that challenge the supply chains for most metals. Argus' global team of analysts have assessed five key themes that are charging the market for 2020. Argus is at the forefront of these market developments as a transparent price reporting agency working to illuminate these relatively opaque markets. We assess non-ferrous prices relevant to technology products.

While some global themes – such as electrification and increasing corporate social responsibility (CSR) – are unlocking demand for new technology materials, more is required of metals supply to properly meet growing demand over the short term. Copper concentrate markets are increasingly undersupplied, while markets for rare earths require new sources of supply as US-China trade relations deteriorate. With the drive for electrification and battery materials taking a more tangible hold of our cities, supply chains will need to modernise and pivot to different geographies in order to solve problems related to climate change, globalisation and ensuring responsible metals supply.

Economic uncertainty clouds rare earth outlook

China's manufacturing industry purchasing managers index (PMI) endured eight months below 50 during the first 11 months of 2019, which weighed on demand for rare earth magnets, particularly from automobile manufacturing, data from China's national bureau of statistics (NBS) show. The IMF in its October *World Economic Outlook* forecast global economic growth of 3.0pc in 2019 and 3.4pc in 2020, which suggests that macroeconomics could improve this year. But this could well be revised lower as a result of increasing geopolitical uncertainty at the start of 2020 driven by rising tensions between the US and Iran. Crude prices rose by over \$3/bl following the US air strike on 3 January that killed a leading Iranian general. Higher oil prices will raise the cost of industrial production, thereby limiting metals demand.

China's rare earth magnet producers have kept expanding capacity in recent years to meet increasing demand from downstream sectors, with production of 155,000t in 2018 up from 141,000t in 2016. Demand from new energy vehicles (NEVs) and electronic equipment is expected to rise in China in 2020, despite lingering weakness owing to the continuing trade war between China and the US. Economic uncertainty

continues to cause issues for long-term contracts around Chinese rare earths, which renders spot pricing assessments an important tool through which to measure value in this turbulent industry.

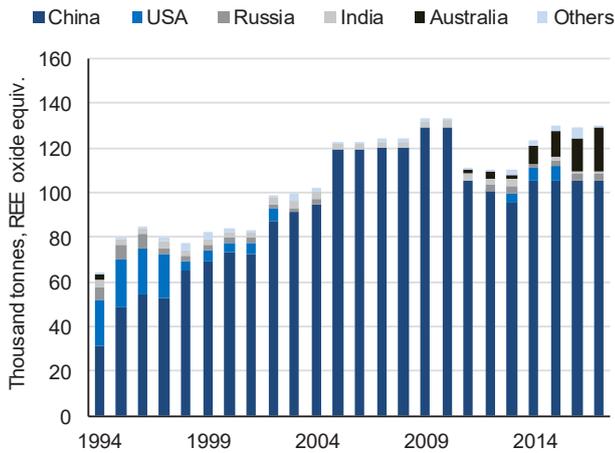
Electrification is a key theme for 2020 and China's modernisation of its power sources will provide new and increasing demand for steel, base metals and rare earths in particular. China's wind power turbine manufacturing consumed more rare earth magnets in 2019, and its demand is expected to remain firm in 2020 because of government's subsidy policy for the wind power industry. All onshore wind power projects that were approved before the end of 2018 will lose subsidies if they are not completed by the end of 2020, according to a notice issued in May 2019 by China's main economic planning agency the NDRC.

These positive demand drivers are likely to outweigh concerns from the supply side of the equation. China's production capacity for rare earth permanent magnets increased in response to higher demand from downstream sectors in 2019. According to published reports, 10 expansion or new-build projects were completed or received approval from local

Metals
illuminating the markets

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Rare earths sources of supply



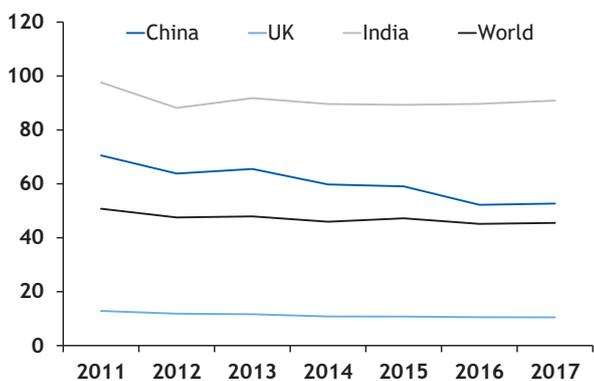
governments in 2019, covering 47,000 t/yr of capacity for NdFeB production spread across south, north and east China, including Zhejiang, Sichuan and Jiangxi provinces. We expect Chinese demand for rare earths to remain robust in 2020 and for investment to flow to the industry outside of China, as the world seeks to pivot away from Chinese supply.

Environmental restrictions to spur supply uncertainty

The international markets will be closely watching production levels in China in 2020, after the overhang from the now bankrupt-Fanya Metal Exchange (FME) diminished on the markets. Furthermore, mining restrictions in China will be exacerbated by simultaneous supply curbs elsewhere in the world as the metals and mining community places greater emphasis on CSR.

Chinese 2019 tungsten concentrate production is likely to surpass 2018 output of 116,271t. All eyes are likely to be on Chinese production this year as Beijing implements environmental restrictions, updates production quotas and cracks down on illegal mining. In 2019, concerns of a supply glut faded after China Molybdenum outbid China Minmetals in an auction to buy 28,336t of FME's ammonium paratungstate (APT) stocks.

PM2.5 Air Pollution, mean annual exposure mg/m^3



Key trends to watch for in 2020...

- Increasing macroeconomic volatility and technology wars will challenge traditional metal supply chains, particularly rare earth oxides.
- Tightness in concentrate markets for base metals will increase owing to higher realised demand and under-investment in mines.
- The dash for clean energy and low-carbon metals will challenge pricing systems for battery materials over the short term.
- Corporate Social Responsibility (CSR) pressures on investors and the global metals supply chain will necessitate a rapid evolution within key commodity markets.
- Electrification will drive increased demand for specialty and minor metals, as the fast and reliable transfer of energy becomes ever more important in a wider array of consumer products.

China produced 114,407t of tungsten concentrate containing 65pc WO₃ (tungsten trioxide) in the first 10 months of 2019, up by 8.41pc from a year earlier, statistics released by the China non-ferrous metals industry association show. Production in Jiangxi, the largest producing province for tungsten in China, rose by 4pc on the year to 48,907t. Output in Hunan province increased by 18.5pc compared with a year earlier to 33,032t. Production in Henan province rose by 8.6pc over the period to 15,077t.

The Chinese government also implemented a new policy requiring copper scrap importers to apply for licences to be eligible for quarterly import quotas, leading to a steady drop in imports, customs data show. China's copper scrap imports plummeted by 49pc on the year to 90,000t in October, while deliveries in the first 10 months of last year fell by almost a third to 1.32mn t. China has issued a copper scrap quota for the first quarter on tariff code 7404000090, for a total of 7,970t. The latest quota was lower than the fourth-quarter quota issued in early November, at 11,110t.

China also plans to reclassify high-grade non-ferrous scrap metal as a raw material. If this change goes into effect, there will be no import restrictions for the newly reclassified copper scrap. Implementation of this change is expected to be delayed until March-June. We expect these environmental pressures to continue to have an impact on the metals industry and to increase both prices and premiums for raw materials.

EU green deal could transform metals demand

Environmental and broader CSR concerns are also set to develop Europe in 2020. The EU’s green deal climate policy could transform demand for metals used in technology and green applications, with some benefiting and some losing out. The European Commission announced its proposed green deal in December, aimed at reducing emissions to net zero by 2050. The plan is a broad indication of EU policy in the coming years.

The deal is intended to support green initiatives such as transitioning to electric vehicles (EVs), a circular economy, lower-emitting steel production technologies and reducing freight emissions. If delivered, the policies will impact demand for several minor and specialty metals. But the plan will have to pass votes in the EU Council and the European Parliament before its provisions come into effect.

Member states are currently responsible for their own country-specific EV incentives, resulting in an inconsistent approach across the EU. Some countries have encouraged EV sales, with the French government increasing its EV subsidies on 1 January, aiming to increase its sales by 2022. But on the same day, the Netherlands reduced tax incentives for EVs, which led to a rush of purchases in December ahead of the change, with EV licence plate registrations jumping to 22,989 in December from 6,874 in November, according to Dutch car data provider Kentekenradar.

If the EU legislates for a cohesive continent-wide system with incentives that encourage EVs, as proposed under the green deal, demand for battery metals would increase sharply. Argus estimates that global demand for lithium could rise to 136,000t by 2030, from 51,000t in 2017. Cobalt demand could grow to 218,000t in 2030, up from just under 120,000t in 2018. Most of this demand growth would be driven by the EV sector.

The commission also said it would support the deployment of public recharging points across the continent, which Euro-

pean auto industry association ACEA has called for. There are around 144,000 public charging points in Europe at present, according to ACEA research. It is estimated that by 2030, the EU will need around 2.8mn charging points, which will require copper wiring, galvanised steel and aluminium alloys, as well as minor metals that are used to improve the properties of those alloys.

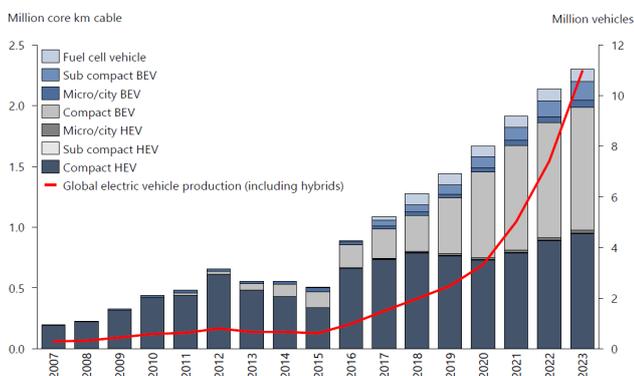
Underinvestment to tighten copper concentrate

Global copper mine production fell by 0.3pc on the year to 15.15mn t in the first nine months of 2019. Copper concentrate production was flat on the year and solvent extraction-electrowinning declined by 1pc. Reduced output in major copper producing countries more than offset growth in other countries, according to the International Copper Study Group. Disruptions continued around the world and exceeded a 5pc expectation, while LME three-month prices fell to below the 90th percentile of costs and below \$6,000/t. Net-short positions reported in the LME’s *Commitment of Traders* reports detailed the extent to which financial agents were taking profits from the industry, largely owing to a strong dollar that weighed on demand from sources outside the US, especially China.

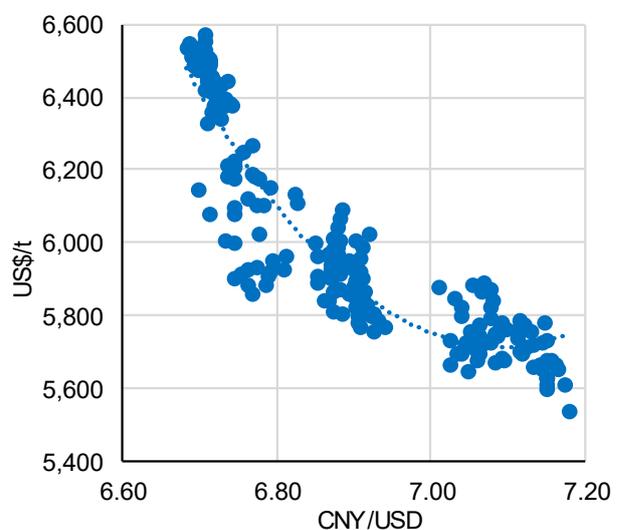
Mined copper output in Chile, the world’s largest producing country, declined by 0.3pc as a result of production disruptions and lower copper head grades. Indonesia’s output fell by 50pc because of lower production in the country’s two main mines, while production in Zambia and the Democratic Republic of Congo (DRC) dropped by 3pc owing to temporary suspensions at some mines. Copper output rose in Australia, China, Mexico, Peru and the US.

With the commissioning of the Cobre de Panama mine, Panama was the biggest contributor to world mine production growth in the first nine months of last year. Electrolytic refined

Global NEVs by type



Copper negatively correlated with US\$



copper production in Chile was down by 30pc on the year as smelters were temporarily shut down for upgrades to ensure they comply with new environmental regulations. Refined copper output in Zambia dropped by 35pc following interruptions in power supply, smelter outages and shutdowns, and the introduction of a 5pc customs duty on copper concentrate imports on 1 January 2019.

Canadian mining firm Ivanhoe's chief executive, Robert Friedland, said last year that "Our industry is facing a crisis in the middle of the next decade. The remaining average copper grade at Escondida, the world's biggest copper producer, has fallen to 0.52pc from 1.72pc in 2006. The electric vehicle market alone is going to need around 1.5mn t/yr of copper." We expect increased tightness within copper concentrate markets over the near term.

Renewed drive for EVs to provide upside for cobalt

After a volatile year, cobalt prices ended 2019 on a downward trend. But this does not indicate weakness in the medium-to-long term, and a recovery in prices appears close as supply fundamentals tighten.

EVs accounted for a 3.1pc share of total vehicle sales in the EU in the third quarter of 2019, signalling significant room for growth. The European Commission has said vehicle emissions must be cut by over 90pc by 2050, requiring a full transition to EVs by that point, and it "will consider legislative options" to boost EV demand in the coming years.

European cobalt prices began 2019 at \$27-30/lb du Rotterdam for chemical-grade metal and \$26-29/lb du Rotterdam for alloy-grade metal, having dropped from record highs of over \$40/lb in April-June 2018, according to *Argus* assessments. They continued to soften amid weak demand and oversupply until April, when prices bottomed out at around \$12-13/lb before bouncing back. Since then, prices have wavered in a \$13-18/lb range. These hydroxide prices are the most relevant prices for battery end-users as the market becomes driven by trade in the chemical forms of cobalt (min. 30% Co) rather than the price of the metal traded on the London Metal Exchange (LME; 99.8% Co).

The most recent fall in cobalt prices is because of lower chemical spot demand in China and destocking towards the end of last year. There is additional pressure on the market because of continuing long-term contract negotiations, which are often accompanied by a period of increased metal production that weighs on pricing. But this has not discouraged traders from purchasing material to build positions and prices have been creeping up, assessed by *Argus* at \$15.75-16.30/lb du Rotterdam for chemical grade and \$16.30-16.80/lb du Rotterdam for alloy grade on 20 December.

Traders who do not commonly engage with cobalt have bought into the market, expecting price rises in the first quarter of 2020. And fundamentally, the outlook for cobalt in 2020 is strong, with the global market now tipping away from the surplus that was evident last year.

Furthermore, in the DRC, Glencore – which held excess stocks throughout 2019 – has now halted production at its Mutanda copper/cobalt mine. Mutanda was the largest source of mined cobalt in the world, and following its closure Glencore has revised down its forecast cobalt output for 2020 to 25,000-33,000t, from 43,000-47,000t in 2019. Most of Glencore's cobalt will now be produced at the Katanga mine in the DRC. Katanga's production was supposed to be higher at this point in its life cycle, but ramp-ups were delayed because of impurities contained within its output. The mine is not expected to be fully operational until 2021.



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