# Transition towards Critical Materials

World Materials Forum

17 June 2021

HIGHLY RESTRICTED

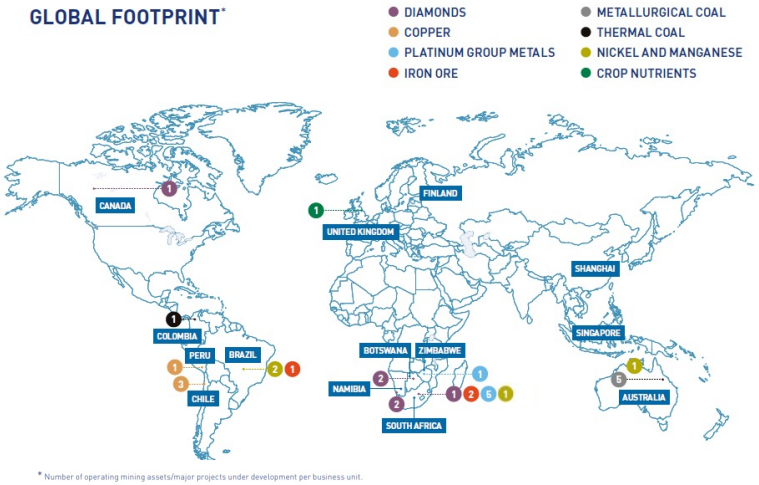
# Who we are

## Anglo American is a Leading Global Diversified Mining Company

"Our portfolio of world-class competitive mining operations and undeveloped resources provides the metals and minerals that enable a cleaner, more electrified world and that meet the fast growing consumer-driven demands of the world's developed and maturing economies."

**OUR PURPOSE:**

**To re-imagine mining to improve people's lives**




**OUR VALUES:**

# Key Themes:

- Addressing climate change implies increased demand for minerals.
- ESG trends imply strong fundamentals for Copper in particular.
- Anglo American's portfolio is transitioning towards a sustainable future.
- Anglo American is focused to produce more with less, via its FutureSmart Mining™ programme.
- Anglo American is an active participant in the hydrogen economy.
- PGMs have a prominent role to play in the hydrogen economy, and new materials applications.

# Global GDP scenarios

## Alternative scenarios reflect differing pathways for global cooperation, technology development, and wealth

**Downside ('crisis')**
**2.3%** 21-40 GDP; **~3ºC** warming

- Slower Covid recovery, weaker economic environment promotes populism.
- Political instability continues. Income inequality grows
- Reduced international cooperation and a weak investment environment result
- Short-termism hampers green development
- On-going risk of financial issues results in on-going caution and a drag on the global economy

**Base Case**
**3.1%** 21-40 GDP; **~3ºC** warming

- The Covid recovery follows the opening of economies as vaccines roll out and are effective on a global basis
- Longer term, on-going geopolitical and economic contention leads to on-going international tension and uncertainty
- The self-interest of key nations prevent open conflict and foster the continuation of globalisation, trade, and economic development
- Economic and health concerns dominate over climate
- While the economic recovery from Covid is reasonably quick and growth resumes, a few years of growth are "lost" forever

**Upside ('co-op/tech')**
**3.7%** 21-40 GDP; **~2ºC** warming

- The Covid recovery teaches us the value of co-operation, particularly on common issues solvable through technology.=
- Improved global cooperation and revitalised trade and technology relationships, driving faster advances in energy efficiency result
- Health, environment, climate are prioritised
- More stability, and an improved investment environment allows for positive effect over the longer term
- Development allows for growth in later years that was difficult to see while recovering from the Covid years

***Source:*** *AA Macro & Commodity Research*

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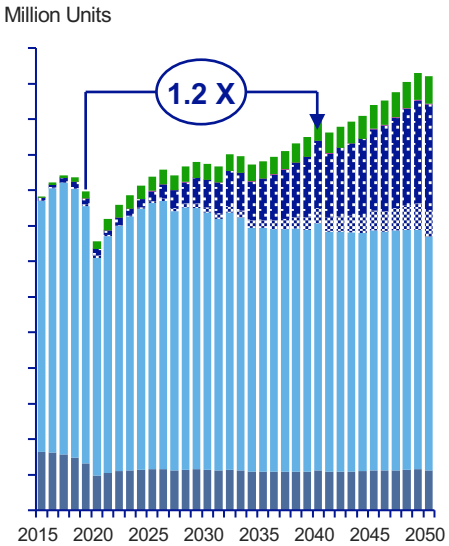
# Vehicle demand impacted by global GDP scenarios

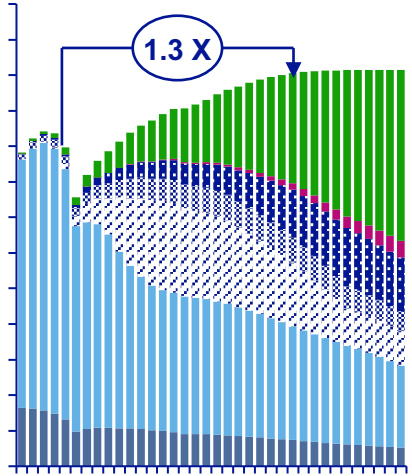
Scenarios with differing technology development and wealth see materially different outcomes for the global drivetrain mix.

## "Downside Case" LDV Sales



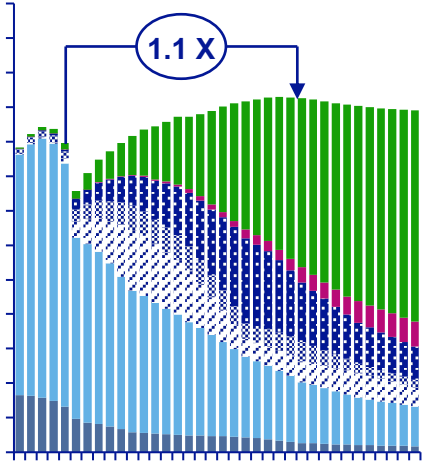

| Global share | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| BEV | 3% | 5% | 5% | 6% |
| FCEV | 0% | 0% | 0% | 0% |

## "Base Case" LDV Sales




| Global share | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| BEV | 3% | 15% | 28% | 43% |
| FCEV | 0% | 0% | 2% | 4% |

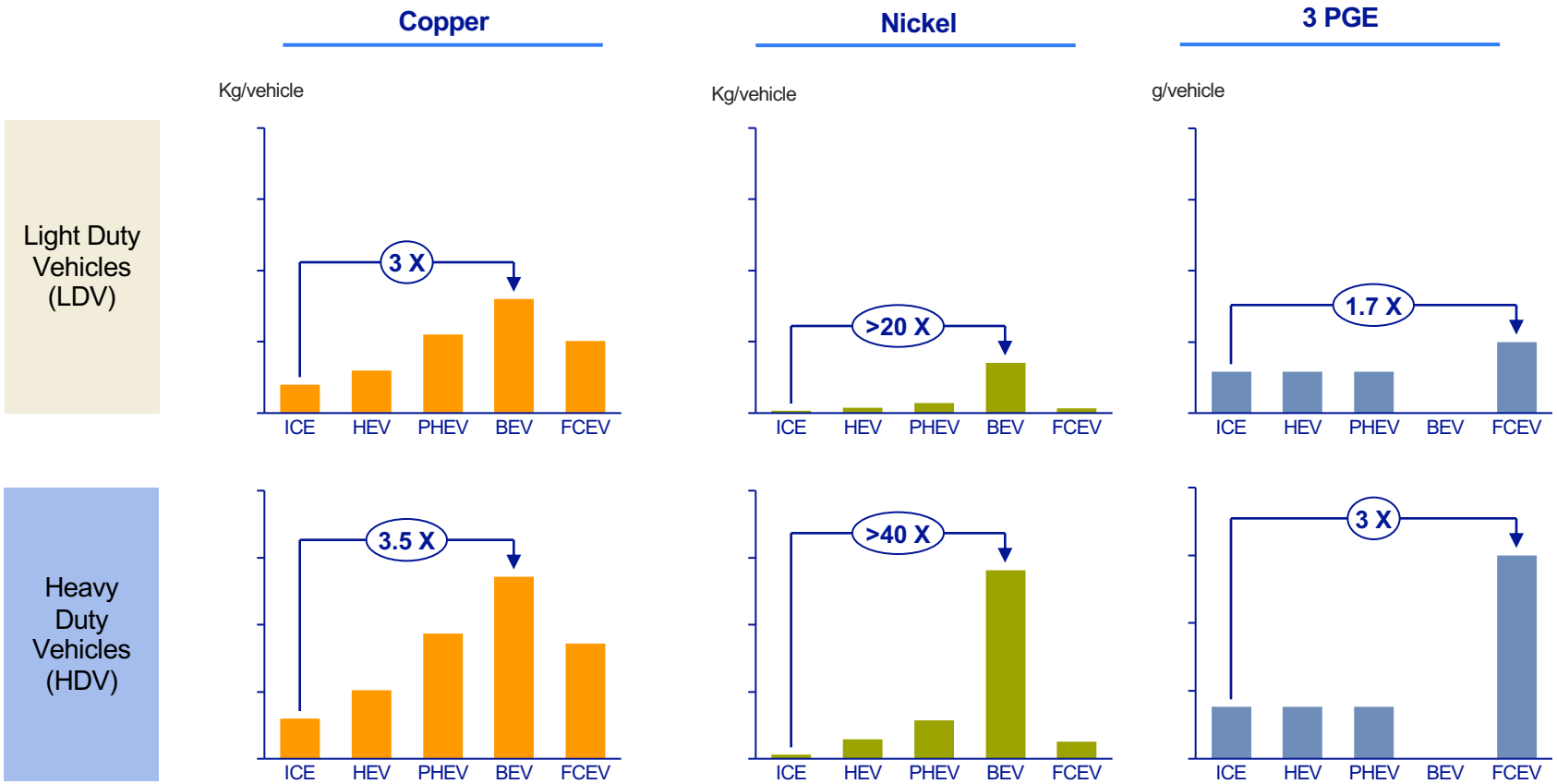
## "Upside Case" LDV Sales




| Global share | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| BEV | 3% | 21% | 48% | 62% |
| FCEV | 0% | 1% | 4% | 7% |

*Source: Macro & Commodity Research, IHSM*

# Regardless of global GDP scenario, vehicle drivetrains are becoming more metals-intensive




***Source:*** *AA Macro & Commodity Research*

Note: Ni intensity is based on an NMC622 cathode



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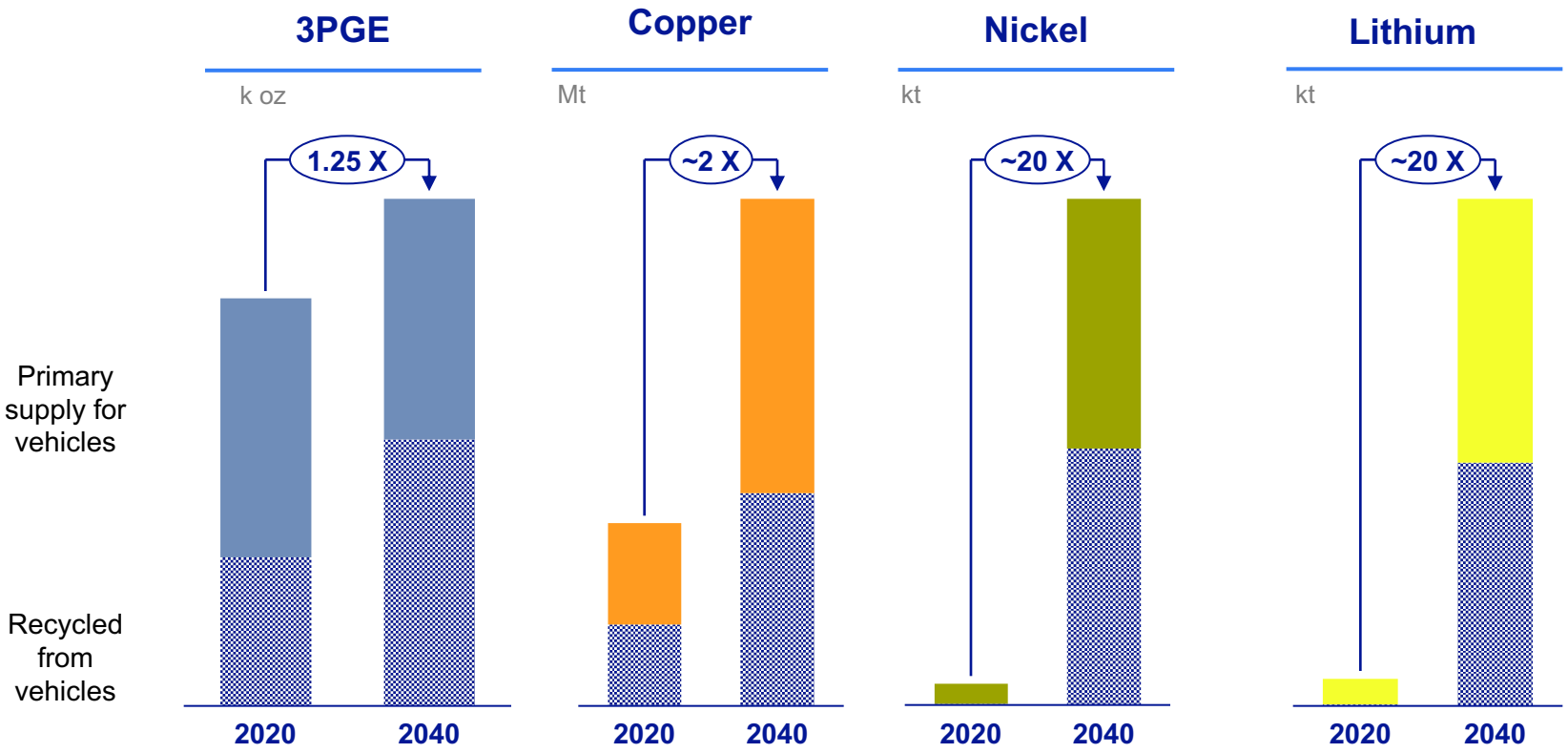
# Resulting in a significant uplift in metals demand, notably copper.

Demand for materials related to electrification of the drivetrain are set to grow, despite recycling (shaded) increasing




*Source: Macro and Commodity Research. Values are consistent with 'Base Case' Outlooks. Shaded area represents proportion of demand satisfied by recycled material*



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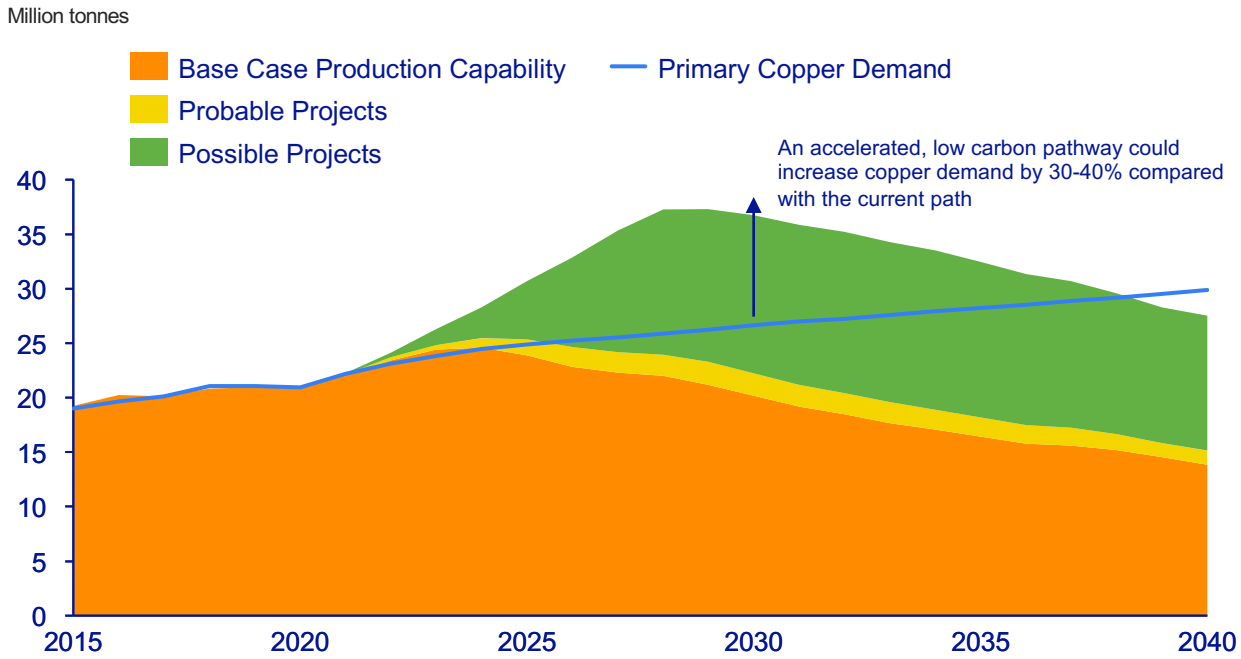
# The supply pipeline for copper needs to expand to the end of the decade

New projects exist, but project development takes many years and the industry has not been in expansionary mode

## Primary copper demand and supply by status



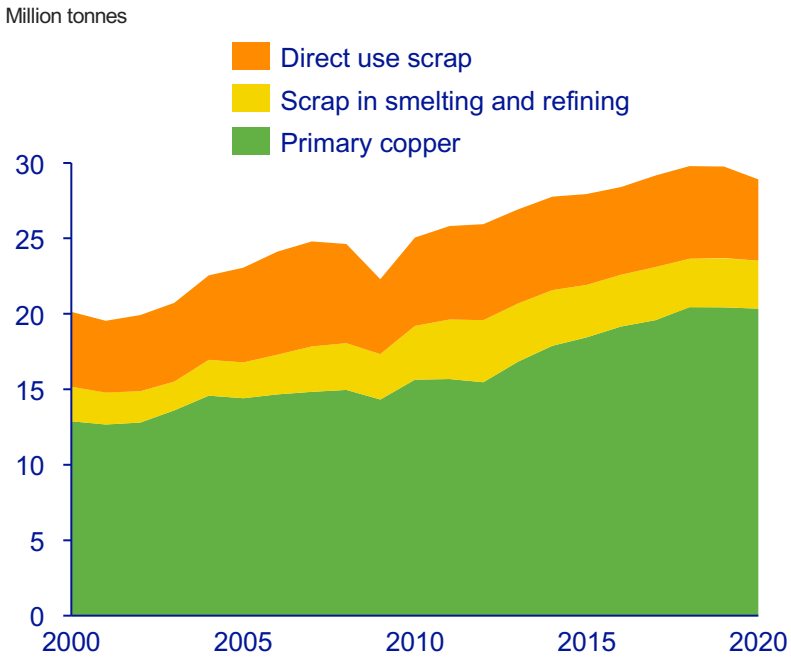

## Commentary

- Base case supply falls due to grade decline, mine closures and the limited number of committed projects.
- At a similar demand growth rate as the previous two decades, currently known projects could meet demand if supply development picked up significantly.
- However, an accelerated low emissions case would require a combination of a step-change in supply discovery and development, higher scrap collection and demand side substitution from certain applications.

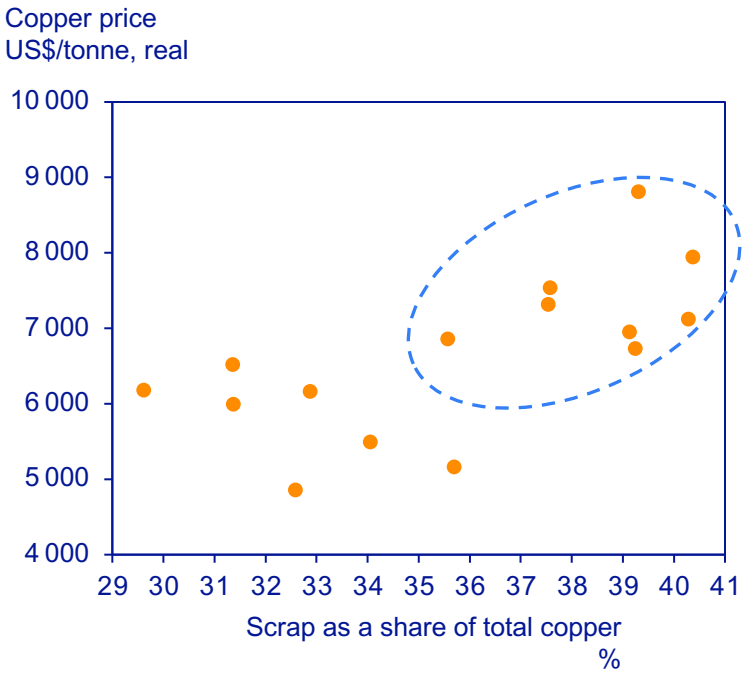
*Source: Wood Mackenzie LTD, Global Copper Long-term Outlook Q1 2021*

# Scrap plays an important role today and collection rates are likely to rise due to high current prices and tighter recycling legislation

## Copper source by type




## Copper scrap share vs copper price, 2006-2020




*Source: Wood Mackenzie LTD, Global Copper Long-term Outlook Q1 2021*

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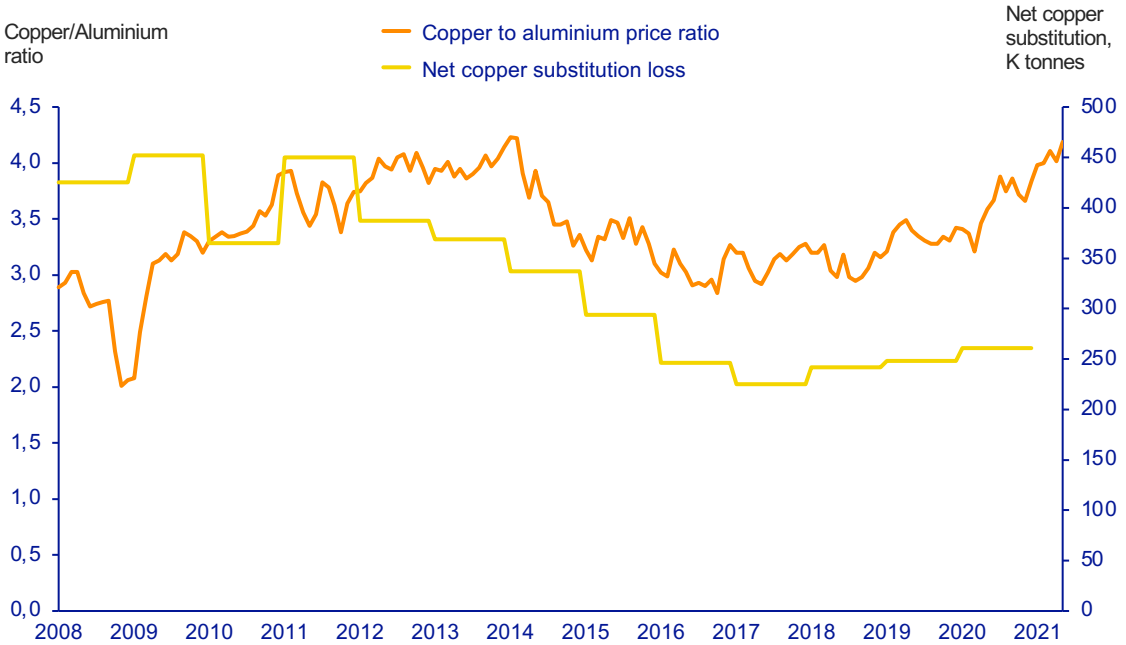
# Copper is a preferred metal in many applications, but others – most notably aluminium – can be used if prices warrant a switch

## Copper / aluminium price ratio and copper net substitution




*Source: International Copper Association, Substitution Survey 2021*

## Commentary

- Copper has excellent conductivity, ductility and reactivity compared with other industrial metals.
- Trends such as miniaturisation, increasing energy efficiency regulations and undergrounding power distribution cables are long-term drivers of substitution gains for copper.
- However, in the last decade net substitution losses in copper are estimated to account for ~1% of total demand each year.
- Copper offers better conductivity, corrosion resistance and stability compared with aluminium, but substitution will be encouraged if prices remain significantly higher for a long period of time.



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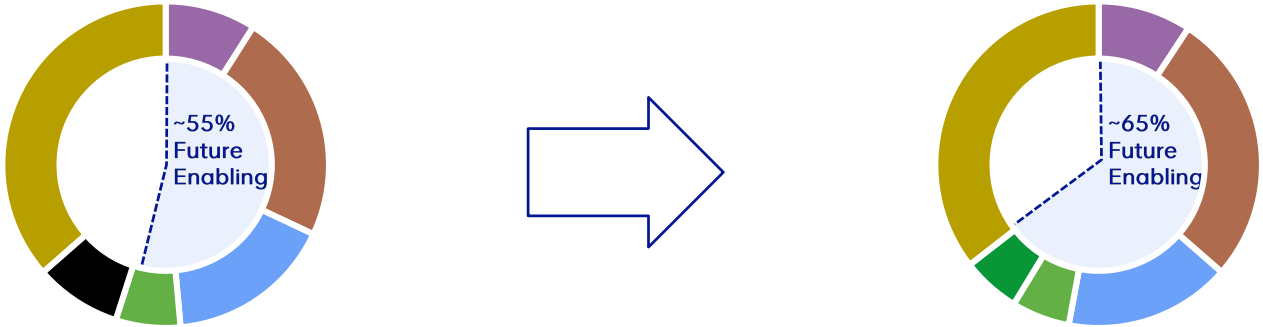
# Anglo American is undergoing a portfolio transition….positioned to provide minerals and materials solutions.

**Greener World** | **Electrified World** | **Consumer World**

Cu Eq production



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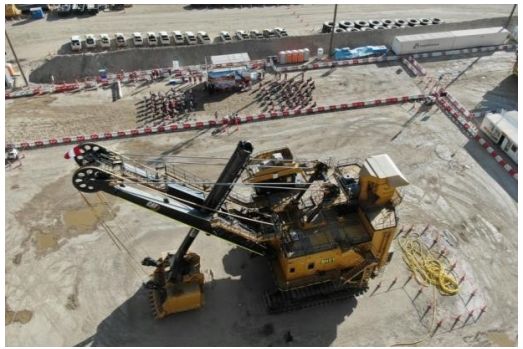
# Examples – portfolio transition

## Growth In Future-enabling minerals and materials solutions

**Quellaveco**
Greenfield copper project



First fully digital mine with 100% renewable electricity.

Incorporates a suite of FutureSmart Mining™ technologies.

**Woodsmith**
Greenfield crop nutrients project

Multi-nutrient fertiliser product with a carbon footprint 85% below that of potash fertilisers.

**Thermal Coal**
Exit from South African portfolio

Delivering a responsible transition

A sustainable future for all stakeholders

# FutureSmart Mining™

Extraction of minerals with optimal efficiency

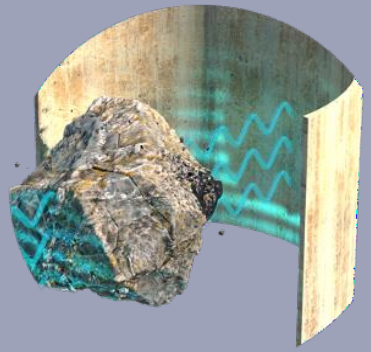
## Example: Bulk Ore Sorting

Up to 40% less waste processed

## Example: Coarse particle recovery

Up to 85% water recovery with hydraulic dry stack

## Example: Microwave

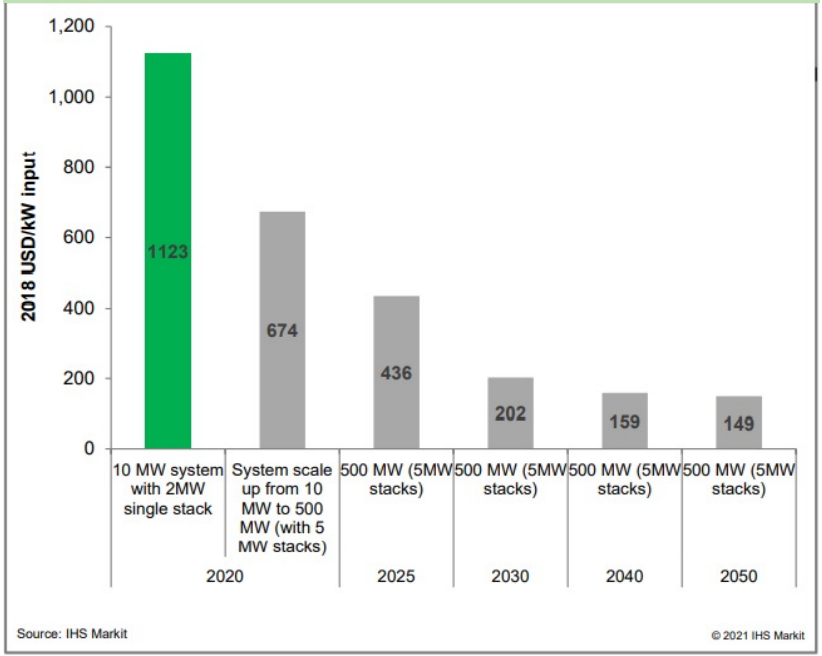


Up to 20% reduction in comminution energy

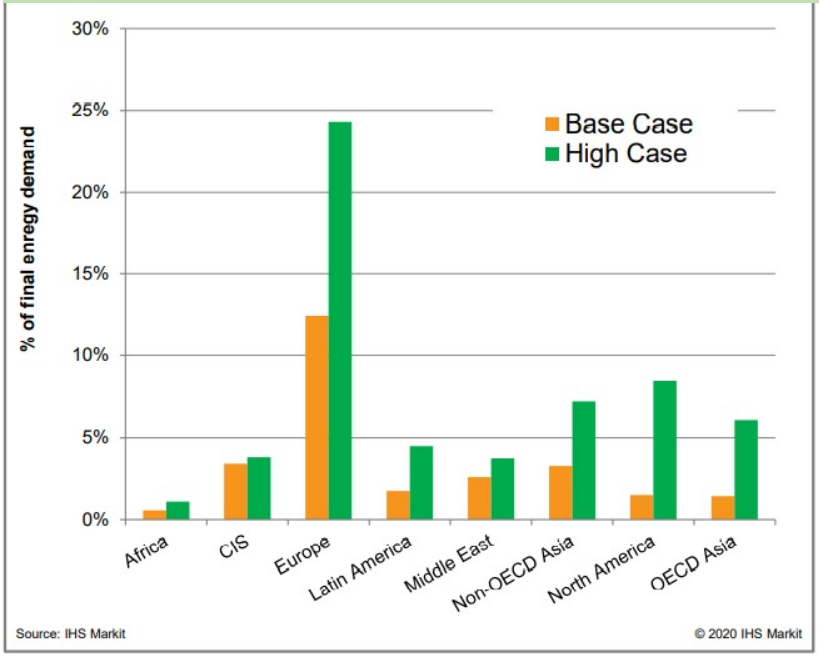
# Hydrogen – a new energy frontier

With lower costs, hydrogen can be expected to see increasing application as an energy carrier in difficult-to-decarbonise sectors such as industry and transport.

## Overall cost reduction for electrolysis – PEM plants




## Share of hydrogen in final energy demand in 2050



# PGMs are still seeing new applications emerge

## Spurring Green Tech Development and efficiency on multiple fronts

***"PGMs for the battery of tomorrow while improving the battery of today"***

Lion BATTERY TECHNOLOGIES

**Partner**

PLATINUM GROUP METALS | FIU FLORIDA INTERNATIONAL UNIVERSITY

Pd (and Pt) solution to improve lithium-sulphur, lithium-air & lithium-ion batteries

Pt Pd

IT'S Fresh! as nature extended

FOOD FRESHNESS TECHNOLOGY

PGM filter pack that delays ripening of produce to reducing food waste in the B2B chain

Pd

**Furuya Eco-Front Tech for Refrigerators**

KFK FURUYA METAL Co., Ltd.

PGM-containing scavenger to keep food fresh for longer, and deodorising air, reducing waste in the B2C chain

Pt

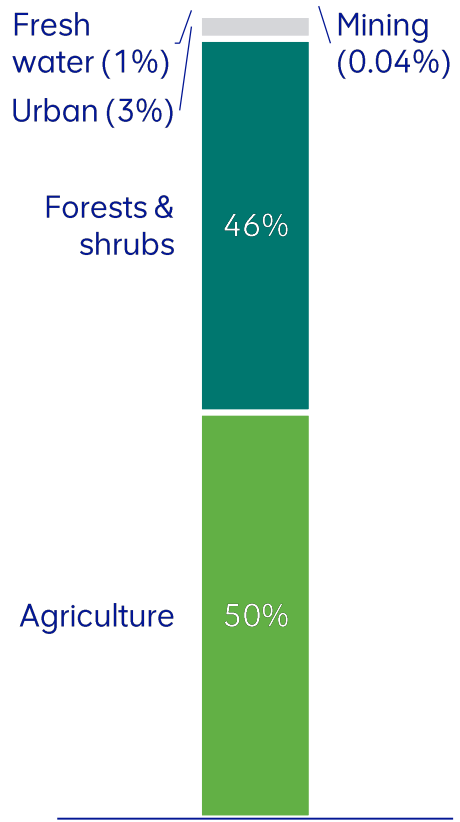
# Conclusion

Anglo American provides many of the essential metals and minerals that are fundamental to the transition to a low carbon economy and enabling a cleaner, greener, more sustainable world…

…doing so with industry-leading efficiency and with innovative technologies….

…in an industry that supports ~45% of the world's economic activity, directly or indirectly…whilst disturbing only 0.04% of the earth's surface.

Use of global habitable land



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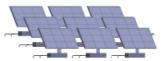
# Thank you

# Anglo American is leading the mining industry in developing hydrogen ecosystems

**Core offering** | **Growth opportunities**

## The SMART Power mine-site turnkey solution

**Supply renewable electricity**



*Convert to $H_2$*

**Supply hydrogen ($H_2$)**

*To mine operations*

*To refuel trucks*

**Zero carbon mine trucks**
*Power Plant Module (PPM)*

## Additional options in the broader $H_2$ industry opportunity

**$H_2$ supply**

**Other PPM applications:**

Mining

Non-mining