Net Zero Emission Mining in Western Australia: Decarbonisation across the mining value chain

Transformative Technology Solutions

Carbon Neutral Metals Production Challenges

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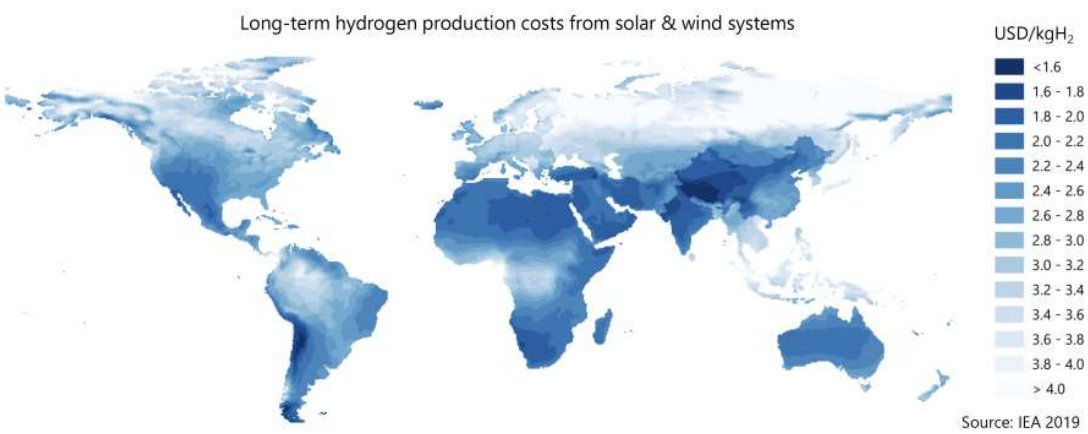

The projected long-term cost of production of 'green' H2 from renewable wind and solar PV energy.
Sources: IEA (2019) & HiTeMP Outlook #2(2020)

Carbon Neutral Metals Production Challenges – Global Context

- Metal production: energy intensive, difficult to decarbonise
- WA largely exports to countries that import carbon-based fuels to convert our minerals to metals
- Production of carbon-neutral metals and metal-precursors from renewables is likely to cause a big shift in where production takes place
  - Offshoring metal production by developed countries likely to be the easy/essential path for them, not us
  - Scope 3 emission penalties likely to force an ultimate change to green **metals** supply not green **minerals** supply, which levels the playing field
  - Presents a generational opportunity for customers to retire legacy infrastructure (e.g., sinter plants, BFs), by switching to new processes (e.g., EAFs) that use imported metalised products
- Presents a significant risk and opportunity for WA minerals producers to tap renewables - but it must be sustainable and achievable

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Source: POSCO – FINEX)

Carbon Neutral Metals Production – Challenges for WA & Curtin

1. **Lack of skills in pyrometallurgy/metal production**
   - Challenge and inspire the next generation to find science and engineering solutions

2. **Lack of a WA-focused pyrometallurgy research capability**
   - Curtin has established a new state-of-the art high-temperature pyrometallurgical research facility in Kalgoorlie, via $600k grant, but **urgently needs industry financial support**
   - Change the practice of outsourcing critical WA pyrometallurgy research

3. **Define optimum green metal production paths - KMRL**
   - What metals/precursors should be produced in WA and the extent of processing? (e.g. nickel sulphate, not Ni metal; HBI or pig iron, not steel?)
   - Alternatives to carbon as a fuel/reductant?
   - Research partnerships in renewable energy solutions

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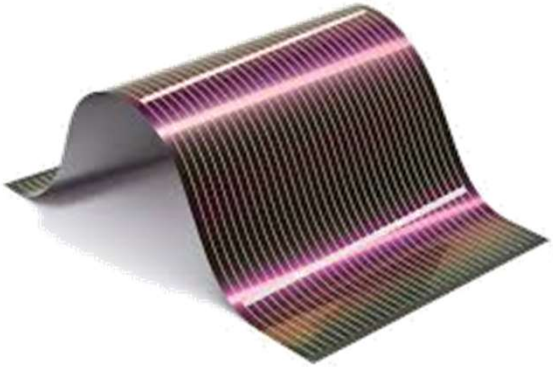

Carbon Neutral Metals Production – KMRL Key Research Areas

1. Alternatives to Carbon –
   - Heating options via renewables (e.g. EAF, rotary kilns) and green hydrogen
   - Green hydrogen for direct reduction of metals, including green iron (HBI)
   - Metallothermic reduction (e.g. via scrap Al)
2. Transforming critical minerals and oxides to green metals and high-tech alloys
3. Improved energy and extraction efficiency of pyromet-hydromet processes
4. Characterisation to better understand each pyromet process, to drive improved outcomes

Seeking industry partnership!

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Carbon Neutral Metals Production – Challenge Question

If and when penalties for scope 3 emissions force WA miners to export green metals or precursors, will you know how to get there and still stay in business?

THANK YOU

Make tomorrow better.

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