

Skarn Decarbonisation Quarterly

Mining companies' decarbonisation plans – the risks, cash flow implications and timelines associated with them – are now of critical importance. This new quarterly report tracks global trends in decarbonising supply chains for the key energy transition metals; copper, cobalt, nickel and lithium.

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The Skarn Decarbonisation Quarterly will be launched in September 2024

Valuable insight for miners, commodity traders, financial institutions and governments, whether undertaking competitor benchmarking, due diligence, portfolio assessment, developing decarbonisation strategies, supply chain emission reduction or establishing low-carbon product premia.

Benchmark and compare decarbonisation projects

- Underlying decarbonisation initiatives – filter by company, asset, technology type and size
- Decarbonisation in action - from fleet electrification to PPAs; technologies, costs and timelines.
- Cost impacts for incorporation in cash flow models

Go-to reference for company decarbonisation plans

- Detailed overview of major mining companies' emission profiles over time, types of target and basis of consolidation
- Quantify the impact of decarbonisation initiatives within the companies' targets and monitor the status of each project

Stay current in a fast-evolving market

- Track global trends in decarbonising supply chains for copper, cobalt, nickel and lithium
- Expert review of innovative technologies and applications to the wider market
- Impact of policy developments and reporting standards

In addition to the **30-to-40-page quarterly report**, includes a **comprehensive Excel (+API) dataset** and **quarterly webinars**.

Unique. Impartial. Expert. Data-led.

Anglo American: Scope 1 and 2 Decarbonisation Roadmap

Company decarbonisation waterfall, Mt CO₂e



PPA

Methane

Mobile fleet

Renewable farms

Organic Growth

Net emissions

30% Target

Source: Skarn Associates, Company Reports

Planned
Done as of date
Completed / Permitted
Pending permit
Scope 2
Scope 1

Carbon Neutrality 2040
Operational Control Basis

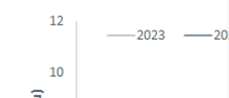
The baseline year is 2016 and is defined for Scope 1 and Scope 2 emissions. The baseline does not include emissions from divested businesses but includes incremental emissions from organic growth. The restated baseline includes 1.2Mt of emissions attributed to divested assets (thermal coal, tarmac and niobium and phosphates).

GHG Intensity Curve changes: Copper Mines

Around 75% of copper mine production is from open pit mines, for which mine fleet decarbonisation solutions are still in development. Therefore, the reductions in emissions from existing mines so far have been predominantly from lower Scope 2, facilitated by renewable power purchase agreements (PPAs) or installing renewable capacity directly on site.

Some countries have significantly decarbonised (such as South Africa) do not have a production relies on predominantly fossil fuels. This will also be crucial for Scope 1 reduction expected.

Copper Mines E1 GHG Intensity



2024: Possible decreases in E1 emissions

Asset Name

Cadia Valley

Boddington

Telfer

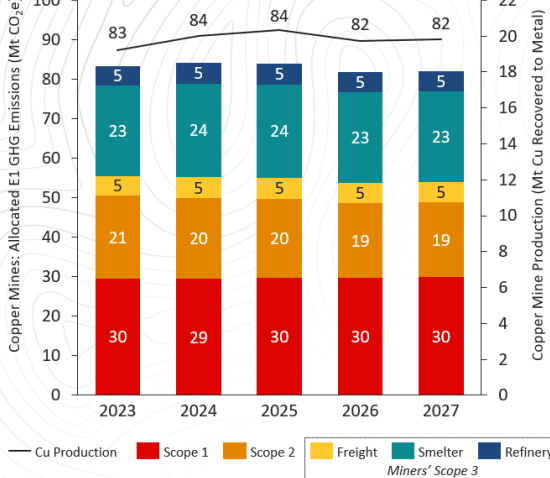
Olympic Dam

Source: Skarn Associates

Decarbonisation Outlook: Primary Copper

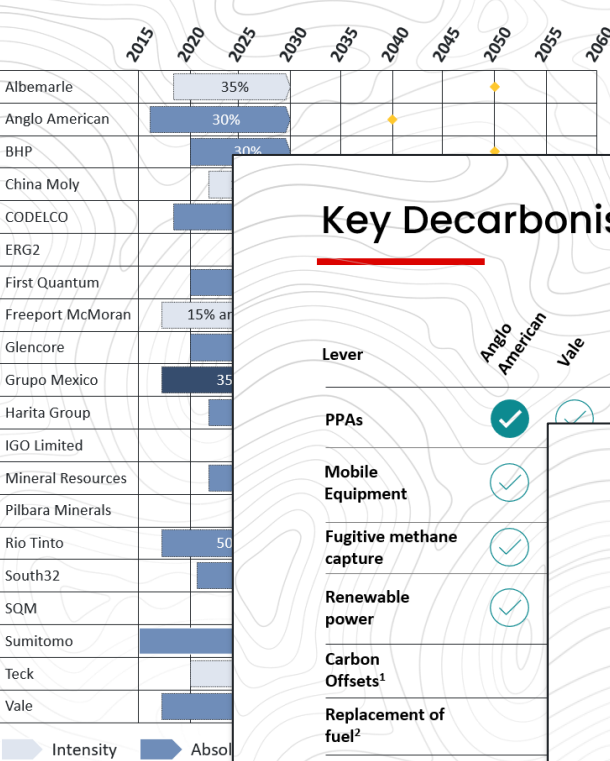
E1 GHG emissions from primary copper production are dominated by Scope 1 emissions at mine sites (35% of E1), mostly from diesel consumption in mobile equipment. Smelting and refining – which can be regarded as Scope 3 from the non-integrated miners' point of view – is the next-largest component (29%), followed by Scope 2 purchased electricity (24%). Near-term (2030) decarbonisation targets are heavily focussed on Scope 2 reduction, with typically less well-defined plans for reducing Scope 1 post-2030, given the immaturity of technologies which will facilitate this.

Allocated E1 GHG Emissions by Component (2023-2027)



Source: Skarn Associates

Key Companies' targets



Emissions (kt CO _{2eq})				Included in Target			Comments
Baseline	2023	Delta		S1	S2	S3	
698	619	↓		✓	✓		Defined for Specialties and Ketjen business
13,420	12,510	↓		✓	✓		For Scope 3 target is 50% reduction by 2040
13,435	9,136	↓		✓	✓		Net zero target includes Scope 3 but partial target not (-30%)

Key Decarbonisation Levers

Lever	Anglo American	Vale	BHP	Glencore	South32	Freeport	Albemarle	Rio Tinto	CODELCO	Comments
PPAs	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sourcing renewable electricity from grid supply
Mobile Equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Fugitive methane capture	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Renewable power	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Carbon Offsets ¹	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Replacement of fuel ²	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Heat efficiency	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Inert Anodes (Aluminium)	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Process or equipment optimisation	✓	✓	✓	✓	✓	✓	✓	✓	✓	

1. Often included in decarbonisation targets
2. Diesel, coal, and HVO are high-emission fuels

Scope 1: On-Site Renewable Power Projects

In parallel with adoption of renewable PPAs to reduce Scope 2 emissions, some producers have elected to build renewable power projects to exclusively and directly generate electricity for their own operations. Most of the power projects announced do not meet 100% of the mine's electricity requirements and do not include an accompanying battery energy storage solution (BESS). Some of the notable projects which have been completed recently and those scheduled to be commissioned in the next few years are summarised below ([click here for the full data set](#)).

Economics of renewable power have improved significantly in the last two decades according to various sources [cite]. The industry expects the cost of battery storage solutions to decline in the next decade. Consequently, the industry could increasingly consider "ahead-of-the-meter" self-generation on site.

Capex of renewable power installed on site; unit cost normalised to a 10-year mine life

Start Year	Project name	Operator	Country	2024 GEF (tCO ₂ e/MWh)	Full / Partial Capacity ³	Annual Capacity GWh/a	Initial Capex US\$ M	Initial Capex US\$/kWh ¹	Source of Renewables	Comments
2022	Nevada	Barrick Gold	USA	0.3	10 – 15%	438	118	0.03	Solar	200MW solar facility with battery storage
2023	Sol Do Cerrado	Vale	Brazil	0.04	15 – 25%	1,678	500	0.03	Solar	766MW Solar PV plant, c. % of capacity is relative to Brazilian operations
2024	Fenicias	Grupo Mexico	Mexico	0.4	75 – 85%	680	256	0.04	Wind	168MW onshore wind power (40 x 4.2MW turbines)
2027	Chariot Eren JV	First Quantum	Zambia	0.06	55 – 65%	876	500	0.06	Solar and Wind	230MW solar and 200MW wind facility for Kansanshi and Sentinel
2025	Lygend	Harita Group	Indonesia	Self-Gen	80– 100%	657	n/a	n/a	Solar	300MW solar farm to reduce coal consumption at existing power plants
2025	Pilbara	Rio Tinto	Australia	Self-Gen	25 – 35%	438	600	0.14	Solar / BESS	200MW renewables capacity to displace supply from gas power plants
2025	Sibanye PGM	Sibanye Stillwater	South Africa	1.0	15 – 25%	383	510	0.13	Solar	175MW solar farm to partially displace the current demand of 310MW
2026	Korusun 2	Anglo American ²	South Africa	1.0	20 – 40%	1,138	n/a	n/a	Solar and Wind	240MW solar and 280MW wind project under the Enxusa Energy JV
2026	Sishen	Anglo American	South Africa	1.0	30 – 35%	142	n/a	n/a	Solar	65MW solar project for Sishen mine
2026	Unki	Anglo American	Zimbabwe	0.5	55 – 65%	77	n/a	n/a	Solar	35MW solar project for Unki mine

¹ Normalised to a 10-year mine life ² As part of the Enxusa Energy Joint Venture project to develop 3 – 5 GW renewable energy by 2030. Korusun complex is compound of 3 projects that are the Umsobomvu wind project (140MW), the Hartbeesthoek wind project (140MW) and the Mooi Plains solar project (240MW) ³ We assume 2024 when the project is operating and if not, we assume start year forecasted electricity consumption BESS = Battery Energy Storage Solution

Source: Skarn Associates, Company reports

Deep insights – every quarter

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First Edition
September 2024

Second Edition
December 2024

Third Edition
March 2025

Fourth Edition
June 2025

1 Executive Summary

Summarising the key decarbonisation trends and initiatives including policies, primary drivers of GHG emissions, corporate targets and performance, abatement technologies and costs

2 Policies and standards

Roadmap: current and
upcoming policies
In Focus: ESRS

Roadmap: current and
upcoming policies
In Focus: Battery Passport

Roadmap: current and
upcoming policies
In Focus: TBC

Roadmap: current and
upcoming policies
In Focus: TBC

3 Industry trends to 2027

Copper & Cobalt:
Key Drivers, GEF Forecasts
In Focus: China

Nickel & Lithium
Key Drivers, GEF Forecasts
In Focus: Australia

Copper & Cobalt:
Key Drivers, GEF Forecasts
In Focus: Peru

Nickel & Lithium
Key Drivers, GEF Forecasts
In Focus: Indonesia

4 Targets and performance

Targets Dashboard
Top 10 Producers: E1 profile
*In Focus: BHP, Rio Tinto,
Anglo American, Glencore*

Targets Dashboard
Top 10 Producers: E1 profile
*In Focus: Vale, South32,
China Moly, CNMC*

Targets Dashboard
Top 10 Producers: E1 profile
*In Focus: CODELCO, Teck,
First Quantum, Grupo Mexico*

Targets Dashboard
Top 10 Producers: E1 profile
*In Focus: Mineral Resources,
Albemarle, Sumitomo, Harita*

5 Insights & Data

XLS Table of Initiatives
*In Focus: Hydrogen in
Copper Smelting*
In Focus: Risk-free PPAs?

XLS Table of Initiatives
*In Focus: Energy Profile of
Nickel Smelters*
In Focus: Carbon Offsets

XLS Table of Initiatives
In Focus: TBC
*In Focus: Decarbonisation
Economics of Mine Fleet*

XLS Table of Initiatives
In Focus: TBC
*In Focus: Decarbonisation
Economics of Green Power*

Focus topics are subject to confirmation

The Essential Subscription

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Skarn is the front-runner in quantifying mining sector environmental impacts

Serving mining companies, project developers, governments and financial institutions

Detailed asset level analysis of 2,600 mines, smelters and refineries globally

Trader and Commercial Strategy

"To know discreetly what the competitors are doing is invaluable, I know exactly where and how we would use this."

Financial Institution

"This is a strategist's dream product. I can see the high quality of the product... it will support our due diligence processes."

Major Producer

"There is real value to keeping a finger on where things have got to, and knowing the quality of the research underlying this product I know I could put it to good use."

Major Producer

"To have all this in one place is great – we are constantly asked how we compare with our peers. The visualisation of KPIs are effective and very useful."

Financial Institution

"Super interesting insights, great that the analysis is inherently forward looking. I can see the level of detail that has gone into the analysis."

Annual subscriptions to the Decarbonisation Quarterly are available now

Discounts are available for existing Skarn clients and early adopters

Contact kate.cummings@skarnassociates.com to arrange a demo