

Rio Tinto

Climate Change Report 2023



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Our operations are located on land and waters that have belonged to Indigenous Peoples for thousands of years. We respect their ongoing deep connection to, and their vast knowledge of, the land, water and environment. We pay respects to Elders, both past and present, and acknowledge the important role Indigenous Peoples play within our business and the communities where we live and work.

The climate change section of the *Annual Report* has been prepared in accordance with the Companies Act Climate-related Financial Disclosure requirements and UK listing rules, and provides details on climate-related governance, strategy and risk management, as well as metrics and targets. Climate change matters are also integrated into other parts of the *Annual Report* such as in the Key performance indicators (KPIs), Principal risks and uncertainties and Notes to the financial statements.

Progress on our Climate Action Plan is detailed in this 2023 *Climate Change Report*.

We will continually enhance our climate reporting in response to standards and requirements set by the International Sustainability Standards Board and national regulators.

Some data in the tables and charts presented in this report do not total precisely. This is due to rounding.

Our 2023 reporting suite

Our *Climate Change Report* is part of our broader 2023 reporting suite. You can find this report and others, including our 2023 *Annual Report*, *Sustainability Fact Book*, 2023 *Addendum - Scope 1, 2 and 3 Emissions Calculation Methodology* and *Industry Association Disclosure* on our website. Some of our reports are published on our website later in the year, including our 2023 *Taxes Paid Report*, *Country by-Country Report*, *Modern Slavery Statement*, and our *Voluntary Principles on Security and Human Rights* report.

 To view and download these documents
visit our website www.riotinto.com



2023 Annual Report



2023 Climate Change Report



2023 Sustainability Fact Book



2023 Addendum –
Scope 1, 2 and 3 Emissions
Calculation Methodology



2023 Industry Association Disclosure

2023 highlights

Scope 1 and 2 emissions: Decarbonising our operations

Targets: 15% by 2025; 50% by 2030
(relative to 2018 equity baseline);
net zero by 2050

Scope 1 and 2 emissions

32.6Mt CO₂e

(2022¹: 32.7Mt CO₂e) Delivery of our abatement projects slightly exceeded emissions growth from higher production

Scope 1 and 2 abatement projects committed

1.9Mt CO₂e

2022: 0.2Mt CO₂e

Biofuels

100% biofuels operation

Boron became the world's first open cut mine to fully transition its heavy machinery from diesel to biofuels

Renewable Energy

146MW

Wind and solar projects commenced construction at QIT Madagascar Minerals (QMM) and Richard's Bay Minerals (RBM)

Minerals Processing

BlueSmelting™ demonstration plant commissioned and first tonne of pre-reduced ore produced

Nature-based Solutions

Continued to develop pilot projects in Madagascar and progressed pre-feasibility and feasibility work in South Africa, Guinea, US and Argentina

Scope 3 emissions: Partnering across our value chains

Committed to helping our customers and suppliers achieve their targets a decade earlier – reaching net zero by 2050

Steel

Collaborated with Baowu on various low-carbon pathways. Made advances on our breakthrough Biolron™ technology and with BlueScope on Electric Smelting Furnace (ESF) technology

Aluminium

Defined potential areas of collaboration to help decarbonise alumina refining with customers, representing 47% of global bauxite sales

Shipping

Lowered shipping emissions intensity by 37%², added five liquified natural gas dual fuel vessels, and progressed end-state fuel option development (low-carbon ammonia and methanol)

Procurement

Enhanced our understanding of the sources and nature of our procurement-related emissions, including our highest emitting categories and suppliers, and potential abatement solutions

Investing in decarbonisation

Aligning our capital and operational expenditure with our climate change targets and goals

Capital expenditure (abatement projects and investments)

\$130m

2022: \$128m³

Investment ramp-up expected later this decade

RECs and offsets (intangible assets)

\$61m

2022: \$33m

Operational expenditure

\$234m

2022: \$138 million

Includes biofuels and steel decarbonisation

Capital expenditure guidance to 2030

\$5–6bn

Excluding capitalised costs of RECs and voluntary and compliance offsets

\$1.5bn estimated capital investment 2024–2026

1. We have restated prior year emissions numbers and our 2018 baseline following an update to our GHG reporting methodology. See our *2023 Addendum - Scope 1, 2 & 3 Emissions Calculation Methodology* for further detail.
2. Versus International Maritime Organization's 2008 baseline.
3. Restated from 2022 to include other investments by the Office of the Chief Scientist and in battery materials.

Chief Executive's statement

We are continuing to execute the strategy we set in 2021, which will deliver long-term value by focusing on growth in materials for the low-carbon transition, decarbonising our operations and tackling emissions across our value chains. We are creating more definition around how we will achieve our targets, and seeing the early results gives me confidence that we have the right objectives, the right team and the right strategy.

2023 was another year of extreme weather and broken temperature records. In December, I attended the UN climate summit (COP28) and came away concerned the world is not on track with the Paris Agreement goal to limit warming to 1.5°C by 2100. National targets are not in line with the overall goal, and current climate policies in many countries are not yet aligned with their stated ambitions.

Many 1.5°C scenarios now overshoot the long-term temperature goal and rely on significant deployment of carbon dioxide removals to get to net zero that may not be plausible. No single company or country can halt the course of climate change alone, so partnering to reduce emissions is vital. This is why we put the low-carbon transition at the heart of our business strategy and are working with governments, customers, communities and others to decarbonise our operations and value chains.

Our Scope 1 and 2 emissions targets are a 15% reduction by 2025 and 50% by 2030 relative to 2018 levels. These targets are ambitious and aligned with 1.5°C, the stretch goal of the Paris Agreement. They are particularly ambitious as, unlike our competitors, around 80% of our emissions come from processing activities, which are typically hard to abate.

It is exciting to see some real momentum this year and we expect to have made financial commitments to abatement projects totalling more than 15% of our emissions by 2025. However, it takes time to deliver such complex and large-scale structural changes to our energy system, so the actual emissions reductions will lag this. In 2023, we made project commitments which will deliver abatement of around 2Mt CO₂e per year, mostly in renewable energy contracts and

biofuels deployment. Using commercial partnership models we also aim to reduce longer-term cash flow risks, while moving away from fossil fuels will also reduce the associated price volatility.

We have a clear pipeline of global projects that moves us towards our 50% target for 2030. To achieve this we need to accelerate both permitting and partnering while balancing the needs of our local stakeholders. Our target remains contingent on delivering deep decarbonisation of the electricity we use in Australia to operate our Aluminium business. We have taken important steps to provide renewable power to Rio Tinto's Gladstone operations and have agreed to buy all electricity from the 1.1GW Upper Calliope Solar Farm.

We continue to believe electrification is the most efficient and cost-effective way to eliminate our diesel emissions, but we are not expecting large-scale deployment of electric fleets to our operations before 2030. In the interim, we are investigating and deploying transitional, drop-in solutions, including renewable diesel. In May, our Boron operation in California became the world's first open pit mine to successfully transition heavy machinery from fossil diesel, resulting in an annual abatement of 45,000t CO₂. And in late 2023, we announced deployment of renewable diesel at nearly ten times this scale at our Kennecott Copper operation in Utah. Replacing diesel fuel with renewable diesel at this site in 2024 will reduce emissions at Kennecott by an estimated 80% or up to 495,000t CO₂ per year.

We have refined our approach to capital and operational spend on decarbonisation. We are shifting to greater investment in commercial contracts, such as sourcing biofuel from third parties or renewable electricity through power

purchase agreements (PPAs), rather than our own capital spend. Our expected capital investment in decarbonisation is now \$5–6 billion between 2022 and 2030, down from our original forecast, though much of the difference is balanced by substantial opex investment.

Our Scope 3 emissions were 578Mt CO₂e in 2023, of which 94% come from our customers processing our products. When we engage with our customers and their governments on climate change, we see they have real commitments to reduce their emissions. However, as they stand today, we estimate that those emissions will reach net zero by around 2060. It is clear that our customers and suppliers see Rio Tinto as being able to help them make a real difference to decarbonise. But it is clear we must do more, so we are committing to help them find better ways to achieve their targets a decade earlier – reaching net zero by 2050.

We are acting now by investing in the development of breakthrough technologies and upgrading our ores to be suitable for these. By holding ourselves accountable on real and measurable commitments in the near term, we can help to make sure technologies are developed early enough to accelerate the transition in the long term. This year we are setting new, specific near-term targets for steel, alumina refining, shipping and procurement decarbonisation across our value chains.



Jakob Stausholm

Chief Executive



Simandou iron ore project, Guinea

Our business at a glance

We have provided the materials the world needs for more than 150 years. Our portfolio includes iron ore, copper, aluminium and a range of other minerals and materials needed for communities and nations to grow and prosper, and to cut carbon emissions to net zero. We continually search for new projects that can support the energy transition, and are currently exploring for eight commodities in 18 countries.

As stewards of these minerals and metals we have a responsibility to minimise the impact of our operations on the environment. 72% of the electricity we use is from renewable sources and this enables the production of some of the world's lowest carbon intensity aluminium, copper and iron ore available to the global economy. Despite this, we still have a significant carbon footprint with Scope 1 and 2 emissions of 32.6Mt CO₂e in 2023 (2022: 32.7Mt CO₂e). Unlike peers in the industry, around 80% of our operational emissions come from hard-to-abate processing activities for which many of the necessary technological solutions do not exist at commercial scale today.

Our strategy and approach to climate change

Climate change has informed our strategic thinking and investment decisions for more than two decades. In 2021, we launched our business strategy with the low-carbon transition at its heart. This report focuses on two of the three pillars of our business strategy. The first pillar "Grow in materials essential for the energy transition" is covered in our *Annual Report*.

- 1. Grow in materials essential for the energy transition**
- 2. Accelerate the decarbonisation of our assets**
- 3. Partnering across our value chains to help our customers and suppliers decarbonise**

Managed and non-managed operations

Key Product groups

Iron Ore

Aluminium

Copper

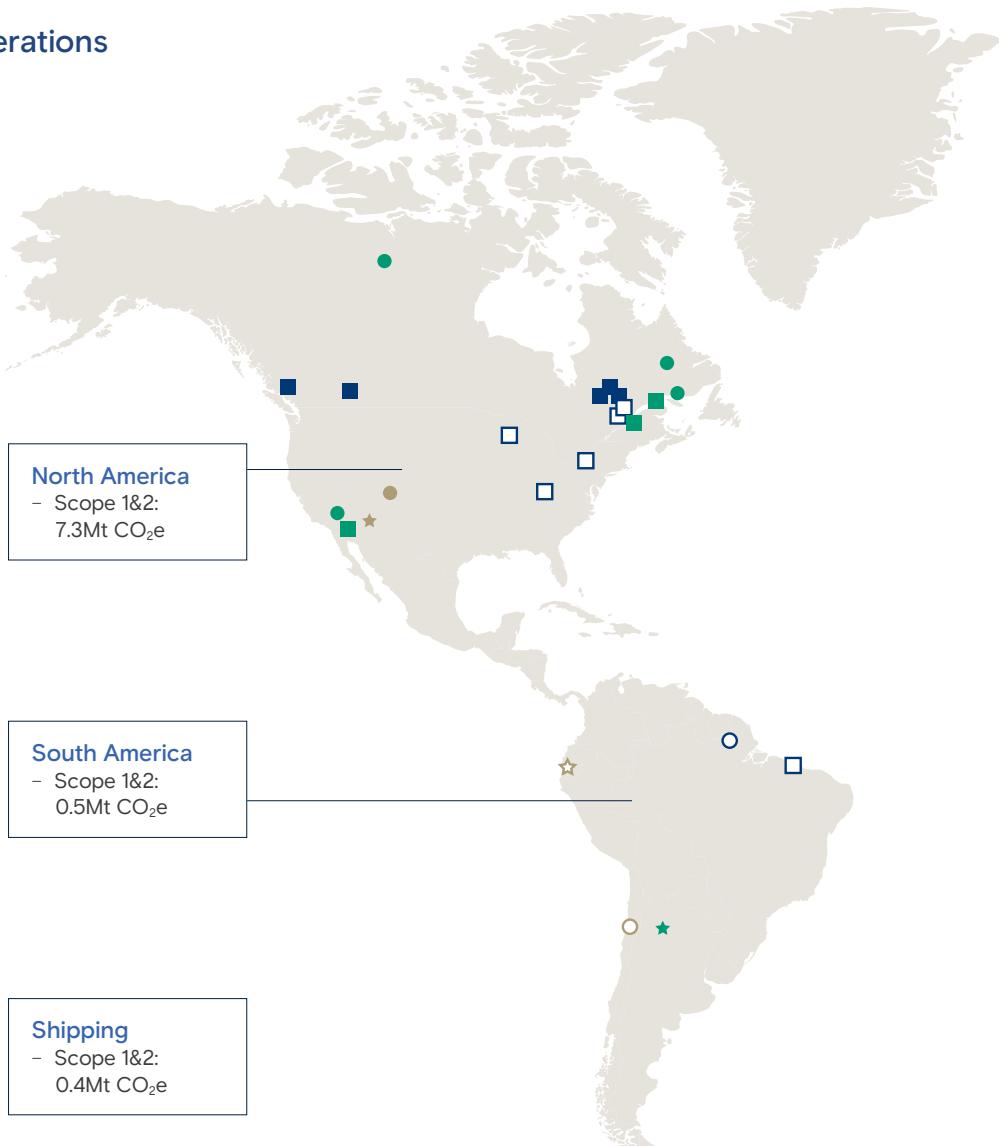
Minerals

● Mines

★ Projects

■ Smelters, refineries, processing plants and power and shipping facilities remote from mine

○ □ Non-managed operations



Scope 2 reporting

In 2023, we improved our carbon emissions reporting and now use the market-based method as our primary measure for assessing performance against our targets. Further detail on this change in reporting and the implications for our emissions baseline is available in our *2023 Addendum - Scope 1, 2 and 3 Emissions Calculation Methodology*.

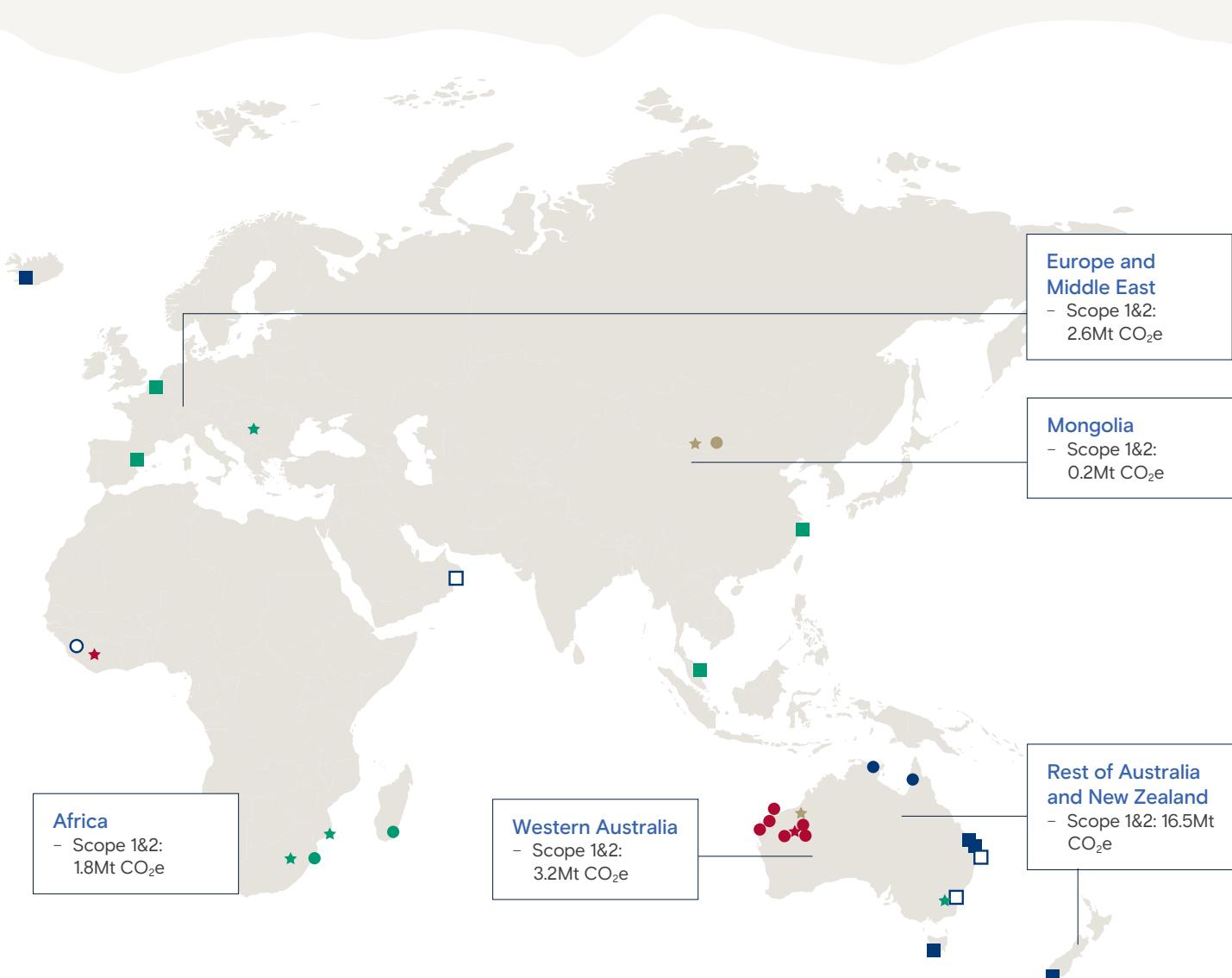
We support the goals of the Paris Agreement, and climate change considerations are integrated into our strategic and operational decision making. Our approach is supported by strong governance, processes and capabilities. A carbon price has been integrated into our investment decisions since 1998, with separate price assumptions applied for the regions and main markets in which we operate and sell our products. We first set emissions intensity targets in 2008, updated them from 2015 and achieved them in 2020.

Having divested the last of our coal businesses in 2018, we are orienting our growth capital expenditure towards materials that enable the energy transition, including copper, lithium and high-grade iron ore. Our ambition is to increase our growth capital to up to \$3 billion per year in 2024 and 2025, developing new options and finding innovative ways of bringing projects onstream faster.

Upstream emissions	32.3Mt CO ₂ e
Scope 3	
Cat 1 Purchased goods (spend data)	9.3
Cat 1 Bauxite and alumina purchases	1
Cat 1 Higher emission purchases (e.g. caustic, lime, explosives, coke, pitch, anodes)	7.3
Cat 2 Capital goods	2.5
Cat 3 Fuels	4.7
Cat 4 Transport (includes Rio Tinto chartered vessels)	6.8
Cat 5, 6, 7 Waste, business travel & commuting	0.8

Operational emissions	32.6Mt CO ₂ e
Scope 1 and 2	
Scope 1	23.3
Scope 2	9.3

Downstream emissions	545.7Mt CO ₂ e
Scope 3	
Cat 9 Transport (includes customer chartered vessels)	2.4
Cat 10 Processing	
- Iron ore	399.9
- Bauxite and alumina	129.8
- TiO ₂ feedstocks	4.9
- Copper	0.5
- Salt	7
- Other	1.2



Climate Action Plan – 2023 progress and 2024 update

Progress in 2023

Scope 1 and 2 emissions targets and roadmap

We have committed to reaching net zero by 2050 and set ambitious interim targets relative to our 2018 equity emissions baseline: to reduce greenhouse gas (GHG) emissions by 15% by 2025 and by 50% by 2030.

In the Pilbara, we remain committed to building 1GW of renewable energy capacity. However, due to the extended timeline for deployment of battery electric haulage solutions, we now estimate that 600MW to 700MW capacity is required by 2030.

Repowering Pacific Aluminium Operations

- Completed commercial and technical due diligence of submissions for supply of renewable electricity to Gladstone aluminium assets.
- Executed first renewable energy contract required for our Boyne smelter.

Action in 2024

- Execute further renewable energy contracts required for our Boyne Smelter.
- Launch a Request for Proposal, in partnership with other shareholders, for renewable energy projects for Tomago.
- Seek renewable energy and storage capacity for Tranche 1 of electrification at the Gladstone alumina refineries.

Alumina Processing

- Developed a decarbonisation energy strategy for Yarwun and Queensland Alumina (QAL) refineries.
- Approved the Yarwun Hydrogen Calcination Pilot Demonstration Program.
- Progressed an electric boiler feasibility study for Vaudreuil.
- Progressed a double digestion pre-feasibility study at QAL, and commissioned a pilot plant.
- Progressed studies on electric steam generation technologies, electric calcination and thermal energy storage systems for refineries.

- Progress QAL double digestion feasibility study.
- Commence construction of the hydrogen calcination demonstration project.
- Progress electric steam and thermal energy studies for refineries.
- Deliver biofuel studies for Gladstone refineries as potential low-carbon fuel feedstock for steam generation.

Aluminium Anodes

- ELYSIS™ progressed its research and development program with the ongoing aim of steadily improving cell performance. Learnings from the past two years will now be incorporated into the development of the larger-scale cells (450kA).

- Research and development to focus on growing carbon-free aluminium smelting from the ELYSIS™ prototype cells that will enable the joint venture to take the next step towards an industrial demonstration level project.

Renewable Energy

- Constructed a 5MW solar plant pilot project at Kennecott Copper.
- Approved a 12.4MW solar system and a 2.1MWh battery storage system via long-term Power Purchase Agreements (PPAs) for Amrun, with construction starting in 2024 subject to regulatory approvals.
- Continued discussions on the proposed coastal Pilbara solar photovoltaic (PV) and progressed studies for further solar and wind developments.
- Signed a memorandum of understanding (MOU) with the Yindjibarndi Energy Corporation (YEC) to explore opportunities to collaborate on renewable energy projects in the Pilbara region. The initial focus is on rapidly exploring the potential development of a solar power generation facility for the supply of energy to Rio Tinto.
- Voltalia began construction of Phase 1, 130MW solar farm for Richards Bay Minerals (via PPA)
- Commenced construction of 16MW Phase 2 Wind project at QIT Madagascar Minerals

- Aggreko will commence solar panel installation on the Amrun solar project, subject to regulatory approvals.
- Finalise the first tranche of renewable PPA commercial negotiations (up to 200MW) for our US renewable energy portfolio.
- Commission the Diavik Diamond Mine solar plant.
- Seek final investment decision on the Pilbara coastal solar PV.
- Commission the 5MW solar plant and start construction of Phase 2, 25MW solar plant at Kennecott Copper.
- Execute RBM Phase 2 PPA (approximately 200MW).

Minerals Processing

- Commissioned the BlueSmelting™ demonstration plant at Rio Tinto Iron and Titanium (RTIT) Quebec Operations and produced first tonne of pre-reduced ore.
- Completed an industrial trial of biocarbon at Sorel-Tracy¹.
- Progressed development of a biocarbon supply chain to provide a substitute for anthracite for the smelter operations.
- Implemented testing projects for electrification to reduce pelletising emissions at IOC.

- Ongoing validation of smelter gas and hydrogen use at the BlueSmelting™ plant.
- Production and testing of material from the BlueSmelting™ plant at the smelters.
- Progress with the installation of an electric boiler at the Iron Ore Company of Canada (IOC).
- Progress research and development analysis for biofuel and coke alternatives for pelletisation.
- Progress with the industrial ramp-up of biocarbon.
- Secure access to biocarbon sources.

Diesel Transition

- Transitioned heavy machinery at US Borax operation to 100% renewable diesel, and secured contract to supply Kennecott Copper with renewable diesel from 2024.
- Assessed application of trolley-assist haulage technology for our existing haul fleet.
- Collaborated with original equipment manufacturers (OEMs) to prepare for battery electric haul truck pilots in the Pilbara.
- Completed a six-month test program of a Scania 20 tonne battery electric truck in the Pilbara.
- Continued our involvement in CharIN and the ICMM's Initiative for Cleaner Safer Vehicles (ICSV) to solve challenges related to interoperability and large electric truck dynamic charging.

- Transition Kennecott Copper to renewable diesel.
- Commence battery electric haul truck trials in the Pilbara.
- Develop a deployment plan for partial electrification options.
- Consider options to develop an Australian biofuel supply chain.

¹ Biocarbon trials are implemented using a step-by-step approach with the objectives of preserving the quality of the finished product as well as guaranteeing the performance of operations. All these parameters are taken into account in the gradual introduction of biocarbon into the smelters.

Progress in 2023

Nature-based solutions (NbS)

- Completed five feasibility studies and commenced four feasibility studies in Guinea and South Africa.
- Implemented pilot projects in Fort Dauphin, in southeastern Madagascar, and completed restoration and REDD+¹ feasibility studies.

Action in 2024

- Finalise feasibility studies in Guinea and South Africa.
- Apply dual pilot-feasibility approach to our priority regions to finalise feasibility studies and ramp-up implementation pilots.
- Finalise and disclose information on voluntary commercial agreements.
- Provide detail on our carbon credit sourcing strategy, including our integrity criteria, due diligence process and volumes.

Scope 3 emissions goals and customer engagement

We are committing to partner with our customers and suppliers to find better ways to help them achieve their targets a decade earlier – reaching net zero by 2050. We are acting now by investing in the development of breakthrough technologies that will help decarbonise our value chains, and upgrading our ores to be suitable for these.

Steel value chain

- In 2022 we met our original target to engage with nearly all our direct iron ore customers. Since then, we have progressed to advanced discussions with 59% of them (by sales volume). In 2023, we made further progress on tangible prioritised projects with 25% of direct steel customers (by sales volume).
- Progressed design of Baowu Meishan microwave lump drying pilot plant.
- Completed feasibility study for Biolron™ Continuous Pilot Plant (CPP) and secured a location.
- Completed concept studies with BlueScope on ESF, and partnership with Baowu for small-scale pilot plant.

- Complete construction of the Baowu Meishan lump drying plant.
- Commence construction of the Biolron™ CPP².
- Continue research on pelletisation of Pilbara ores.
- Progress laboratory testing and work program with BlueScope and BHP including further test works and pre-feasibility study for a Direct Reduction-Electric Smelting Furnace (DR-ESF) pilot plant.
- Plan for construction of a small-scale electric melter at a Baowu steel mill.
- Conduct feasibility study to evaluate a pilot scale-up for a fines-based reduction process.

Aluminium value chain

- Defined potential areas of collaboration to help decarbonise alumina refining with customers, representing 47% of bauxite sales.

- Partner with two bauxite customers to advance research and development and process improvement projects in digestion and organics management.
- Develop technical options to reduce moisture content in bauxite.

Shipping

- Achieved 37% lower emissions intensity.
- Introduced five liquified natural gas vessels into the fleet.
- Completed a 12-month biofuel trial.
- Completed feasibility study as part of West Australia-East Asia Iron Ore Green Corridor Consortium with Global Maritime Forum.
- Progressed key elements for low-carbon ammonia deployment as part of ITOCHU Ammonia JDA including safety and regulatory considerations, vessel design and risk management.

- Accelerate fuel efficiencies across the freight portfolio.
- Introduce four more LNG vessels.
- Pursue further biofuel or recycled fuel deployment.
- Improve emissions transparency using actual voyage data for over 95% of our cargo shipments for which we manage shipping.

Procurement

- Completed a study to understand the sources of our procurement-related emissions. This enhanced our understanding of the sources and nature of our procurement-related emissions, including our highest emitting categories and suppliers, and potential abatement solutions.

- Engage with our top 50 suppliers in high-emitting categories on decarbonisation.
- Introduce decarbonisation criteria to evaluate all new sourcing in high emissions categories.

1. REDD+: reducing emissions from deforestation and forest degradation, plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.
2. Subject to technical and funding approvals.

Progress in 2023

Action in 2024

Capital allocation alignment with our 1.5°C decarbonisation strategy

We estimate the total capital expenditure on decarbonisation between 2022 and 2030 is expected to be \$5–6 billion¹ and \$1.5 billion in the period 2024–2026.

\$425 million total decarbonisation spend

- \$130 million capital expenditure (abatement projects and investments)
- \$234 million operational expenditure
- \$61 million RECs and offsets (intangible assets)

- We estimate our total spend on decarbonisation in 2024 will be approximately \$750 million including capital expenditure and investments, operational expenditure, offsets and RECs.

1.9Mt of abatement commitments made

- Renewable energy in Australia and Africa
- Renewable diesel at Boron and Kennecott
- Piloting low-carbon heat and using hydrogen in processing emissions

Climate policy engagement

We continue to encourage industry associations to align their advocacy with the goals of the Paris Agreement. We review the climate advocacy of industry associations annually, publishing our review on our website and using it to inform our membership renewal decisions.

- We published our review of industry associations in February 2023 and conducted an interim and year-end review of their advocacy. We engaged with four industry associations to discuss their climate advocacy.

- Formalise process to prioritise an energy transition that considers all issues.
- Assess projects in consultation with relevant stakeholders, including considering different partnership models and decarbonisation solutions that reflect the requirements of industry and local communities.

Climate governance

In the short-term incentive plan (STIP), safety, environment, social and governance matters, including climate change, are now assigned an explicit performance weighting.

- Safety, environmental, social and governance matters remain as targets within the STIP. The 2023 STIP measures comprised the following: Impeccable environmental, social and governance (ESG) (20%), People and culture (10%), Excel in development (10%), and Social licence (10%).
- The carbon abatement target set for 2023 was 10Mt of CO₂e. A total of 29 projects progressed through a development stage during the year, leading to an above target performance of 12Mt CO₂e abatement expected by 2030.
- For further information on climate governance, see page 45 of our *2023 Annual Report*. The 2023 STIP award calculation may be found on page 130 of the report.

- Climate change performance objectives are assigned an explicit performance weighting of 10% in the STIP in 2024. We will assess progress of moving carbon abatement projects through the various stages of development all the way to execution to meet our decarbonisation targets.
- Propose incorporating decarbonisation related performance measures into our LTIP as part of our 2024 Remuneration Policy. See page 135 of our *2023 Annual Report* for further details.

Just transition

We are committed to supporting a just transition to a low-carbon economy that is socially inclusive and provides decent work and livelihoods.

- We have seen tangible examples of teams across the business undertaking decarbonisation activities with a just transition at the forefront of the chosen approach. This has manifested through government engagement and host community partnerships, including the Diavik Diamond Mine closure investment, and contribution to energy hub development in both the Pilbara and Gladstone.

- Formalise the process to prioritise an energy transition that gives due consideration to ESG issues. Finalise alignment with the CA100+ net zero standard for a just transition.
- Ongoing assessment of projects in consultation with stakeholders, to consider different partnership models and decarbonisation solutions reflecting the requirements of industry and local communities.

Task Force on Climate-related Financial Disclosures (TCFD) disclosure

We support the TCFD recommendations and are committed to aligning our disclosures with the Climate Action 100+ (CA100+) Net Zero Company Benchmark.

- Integrated climate-related disclosures on governance, strategy, risk management, and metrics and targets into the *2023 Annual Report*.
- Ensured climate-related financial disclosures comply with the Companies Act 2006 as amended by the Companies (Strategic Report) (Climate-related Financial Disclosure) Regulations 2022. See pages 44 to 58 of our *2023 Annual Report* for further detail.
- Aligned our reporting on the CAP with the CA100+ Net Zero Company Benchmark.
- Published our *Scope 1, 2 and 3 Emissions Calculation Methodology report*.

- Publish our progress on climate change annually in line with the recommendations of the TCFD and other requirements.

¹ While our 2030 emissions reduction target remains unchanged, we now believe this can be met with \$5–\$6 billion of capital investment, down from previous guidance of \$7.5 billion. See page 33 for further detail on this change and our capital allocation and investment framework.

Scope 1 and 2 emissions: Decarbonising our operations

Our targets are to reduce our Scope 1 and 2 emissions by 15% by 2025 and 50% by 2030 (relative to 2018 levels), and to reach net zero by 2050.

We report these targeted emissions on an equity basis and they cover more than 95% of our operational emissions. We exclude reductions achieved by divesting assets and increases associated with acquisitions and so adjust our 2018 baseline. Following our acquisition of additional equity in the Oyu Tolgoi (OT) mine in late 2022 and the Mineração Rio do Norte (MRN) mine in late 2023, we have also adjusted our 2022 emissions total to compare our actual progress on abatement in 2023 relative to other changes at our operations.

While there is no universal standard for determining the alignment of targets with the Paris Agreement goals, we conclude our Scope 1 and 2 targets for 2030 are aligned with efforts to limit warming to 1.5°C. In 2021, KPMG provided limited assurance over the alignment of our Scope 1 and 2 targets with efforts to limit warming to 1.5°C. For this 2023 report, KPMG provide limited assurance over our progress reporting against our Climate Action Plan commitments (in addition to their assurance of our Scope 1, 2 and 3 emissions). Their statement is included at the end of the report.

Our asset portfolio has broadly remained stable over the period from 2018 to today. The share of emissions from our portfolio of commodities is largely unchanged with approximately two-thirds of our emissions from our Aluminium business. While the asset portfolio has remained stable, delivering net reductions in absolute emissions faces two significant challenges. First, increasing work indexes with longer haul distances and declining ore grades, typical for the mining sector, mean that more energy is required to achieve the same level of output. Second, we are continually looking to grow production, particularly in the commodities needed to deliver the energy transition. This growth may be brownfield organic (such as in the Pilbara), greenfield organic (such as Simandou), or through mergers and acquisitions (such as our investment in Matalco). Consequently, the timing, costs and carbon benefits of our plans will evolve as our business evolves.

Scope 2 reporting changes

In 2023, we updated our Scope 2 emissions reporting methodology to align with improved and evolving global GHG emissions reporting standards. We now report our Scope 2 emissions on both the market-based and location-based methods, and we will use the market-based method as our primary measure for assessing performance against our targets.

While this restatement increases our 2018 baseline and all subsequent years' reported emissions, it provides a better representation of the commercial decisions we are making in decarbonisation, such as electricity purchase contracts where the rights to the renewable attributes are secured. Further detail on this change in reporting and the implications for our emissions baseline is available in our *2023 Addendum -Scope 1, 2 and 3 Emissions Calculation Methodology* report.



Technician with pre-reduced product at BlueSmelting™ project in Sorel-Tracy, Canada

Where we are today

Our Scope 1 and 2 emissions were 32.6Mt CO₂e in 2023. This is 6% below our 2018 baseline of 34.5Mt CO₂e and slightly below our adjusted 2022 emissions of 32.7Mt CO₂e (adjusted for acquisitions). Abatement delivered by our projects in 2023 exceeded emissions growth from higher production giving a slight reduction in emissions on a like for like basis.

Our 2023 emissions were slightly higher than our actual 2022 emissions total of 32.3Mt CO₂e due to the recent acquisitions of additional equity in OT and MRN.

Our abatement projects are complemented by investment in nature-based solutions and the purchase of high-quality regulatory carbon credits. In 2023, our net emissions total does not include any carbon credit retirements from these sources.

Against a backdrop of rising production, the emissions reductions achieved since 2018 are mostly the result of decarbonising power. These include PPAs at Escondida and the purchase of renewable energy certificates (RECs) for our Kennecott and Oyu Tolgoi copper operations.

The four most significant sources of operational emissions are electricity (purchased and generated) at 41%, fossil fuels for heat at our processing plants and alumina refineries at 22%, carbon anodes in aluminium and reductants in titanium dioxide furnaces at 24%, and diesel consumption in our mining equipment and rail fleet at 12%.

Our Group-wide consumption of electricity is approximately four times that of other global diversified mining majors due to the high energy intensity of the Aluminium business.

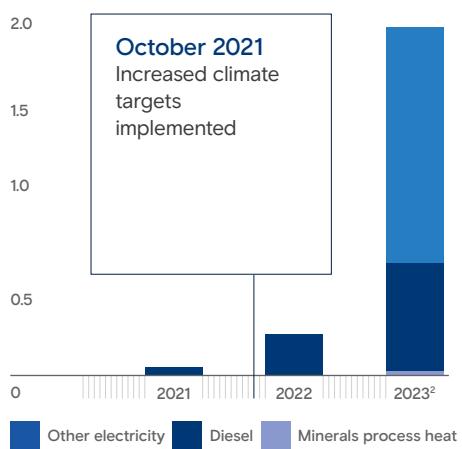
However, 72% of the electricity we use is from renewable sources and we are making investment and supply decisions to increase this.

The scale of our commitments has increased rapidly since we reset our Scope 1 and 2 emissions reduction targets in October 2021. In 2023, we made project commitments which will deliver abatement of around 2Mt per year, mostly in renewable energy contracts and certificates, and biofuels deployment.

In 2023 we committed to accelerate our decarbonisation towards our 2025 and 2030 targets. By 2025 we expect to have made financial commitments to abatement projects on renewables, diesel replacement and process heat that will achieve more than 15% of Group emissions, however, our actual emissions abatement will lag these. These delays are the result of a range of factors including engineering and construction timelines, pace of development related to new technology and energy systems in the locations we operate, and the need to carefully integrate our ambitions with the needs of our local communities and stakeholder groups. We also need additional abatement to address underlying emissions growth as our production plans evolve.

Commitments to abatement projects¹

Mt CO₂e equity basis

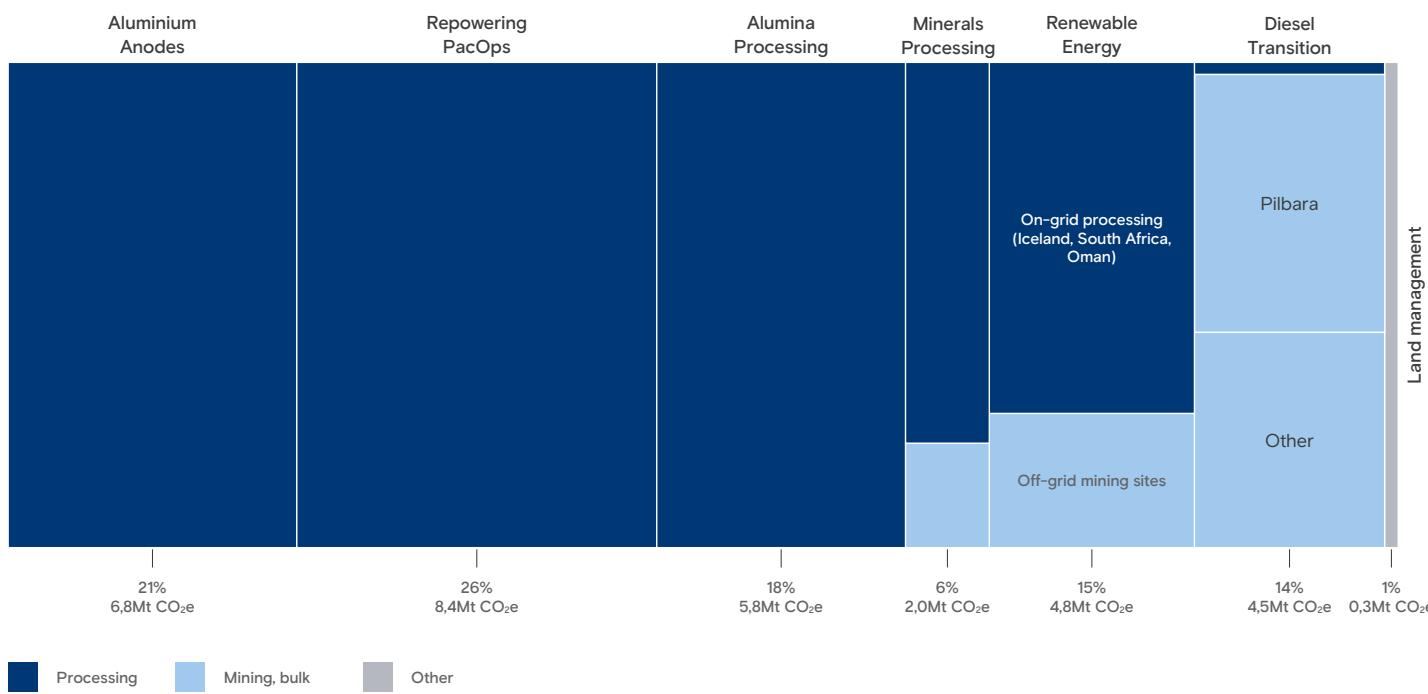


In response to these challenges and delays, we continue to work with our partners, governments and others to develop transformational projects and industry breakthroughs, and in parallel, we are turning to commercial solutions, such as PPAs and biofuels, that can deliver emissions reductions faster. Abatement from these are anticipated to occur substantially between 2025 and 2030.

2023 Scope 1 & 2 emissions

32.6Mt CO₂e

2022: 32.7Mt CO₂e (adjusted for acquisitions)



1. Represents the abatement from in-year project commitments. There may be a lag to realised abatement given execution schedules or the nature of contracts entered into.

2. Excludes signed Upper Calliope solar farm PPA with potential 1.8Mt per year of emissions reduction, pending project approvals.

Our roadmap to 2030

Between now and 2030, the most significant opportunities to reduce our Scope 1 and 2 emissions are to switch the electricity we generate or purchase to renewables, and to address process heat emissions from our alumina refineries.

Our six global decarbonisation programs tackle all sources of carbon emissions in our business. We have a pipeline of projects and committed investments that support our 2030 target.

To reach our 2030 goals, our single largest lever – accounting for around one-quarter of our emissions – is to develop a competitive renewable energy solution for the Boyne and Tomago aluminium smelters in our Pacific Aluminium Operations.

In December 2023, we signed a PPA to buy all the electricity, and associated green products to be generated in the future, from the 1.1GW Upper Calliope Solar Farm project, which if combined with more renewable power and suitable firming, transmission and industrial policy, could provide part of a solution to repower our three Gladstone production assets (Boyne aluminium smelter, Yarwun alumina refinery and the Queensland alumina

refinery). Once approved and developed, this solar project has the potential to reduce operating carbon emissions by 1.8Mt per year.

We must also execute other key projects in our pipeline related to renewable electricity contracts and alumina processing heat reductions to meet our 2030 target.

While prioritising emissions reductions at our operations, we are also investing in nature-based solutions that can bring benefits to people, nature and climate. We may retire high-quality carbon credits from these projects towards our 2030 targets. This will complement our abatement project portfolio – which aims to reduce operational emissions by 50% by 2030 – and support our compliance with carbon pricing regulation such as the Safeguard Mechanism in Australia. Our emissions reporting will continue to transparently distinguish between our underlying operational emissions, the

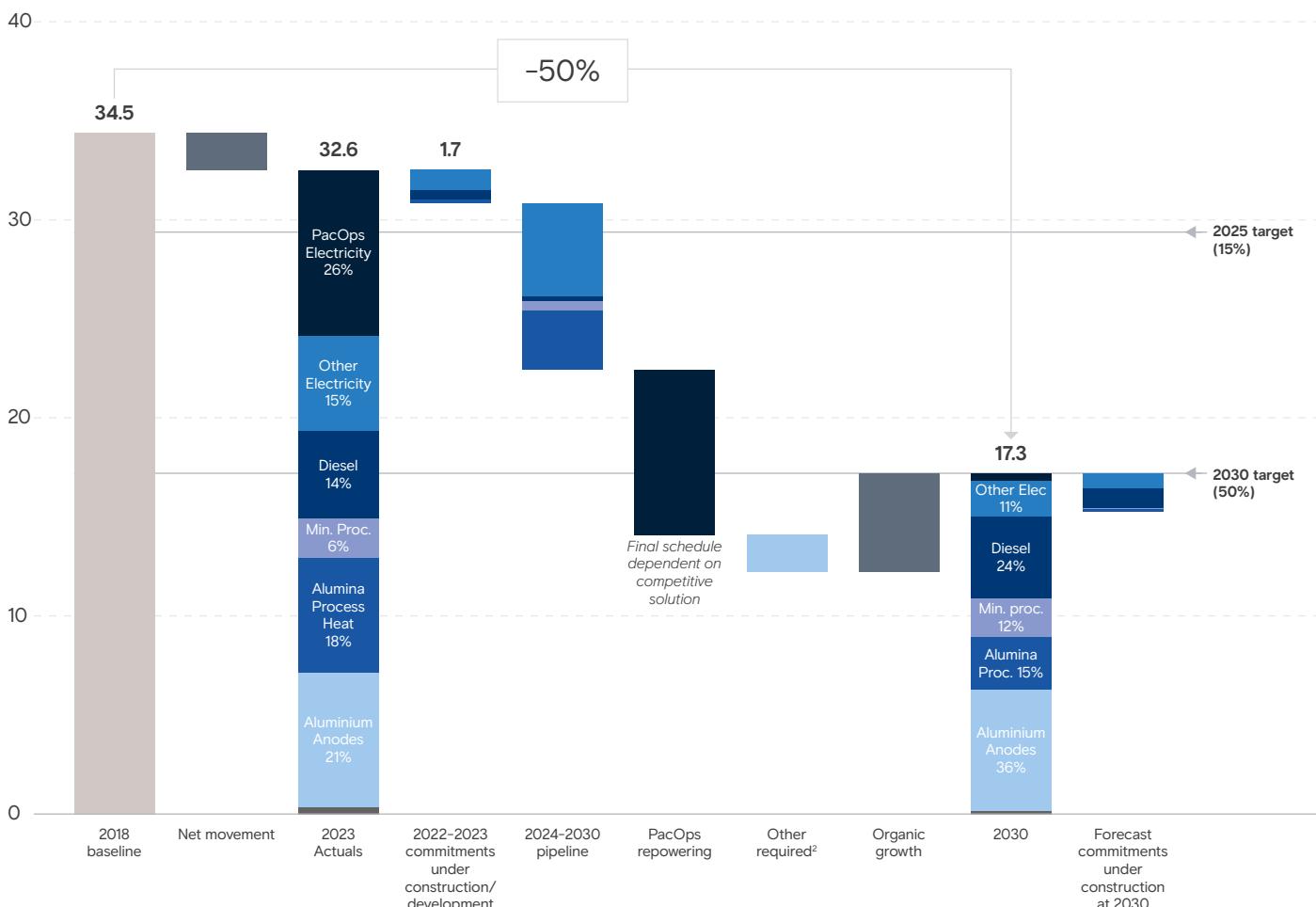
volume and type of carbon credits retired and net Group emissions.

Our decarbonisation trajectory does face headwinds, typical to the mining industry more broadly, from increased work indexes. In addition, production growth and growth from new projects such as Simandou, Jadar and Rincon must be accommodated within our absolute emissions reduction target. Collectively, this represents around 4Mt CO₂e to our baseline to 2030.

We expect to make financial commitments before the end of the decade that will result in structural abatement of our portfolio beyond 2030. This demonstrates our continued commitment towards our net zero goal.

Decarbonisation plan

(Mt CO₂e, equity basis)¹



Note: small differences in chart attributable to rounding

1. Rebased emissions due to Scope 2 methodology changes. Data represents 'gross' Scope 1&2 emissions and direct abatement projects.

2. 'Other required' will flex over time based on abatement project delivery, growth, closures and asset changes.

Our roadmap to 2050

We are targeting net zero emissions from our operations by 2050. This is challenging given approximately half of our Scope 1 and 2 emissions will require technology breakthroughs.

We're investing in technology to reduce our Scope 1 and 2 emissions, including:

- Industrial processing, including the use of double digestion and ELYSIS™.
- Electrification – electric boilers, battery electric haul trucks and locomotives.
- Biogenics – biocarbon and biofuels, as well as our development of nature-based solutions.

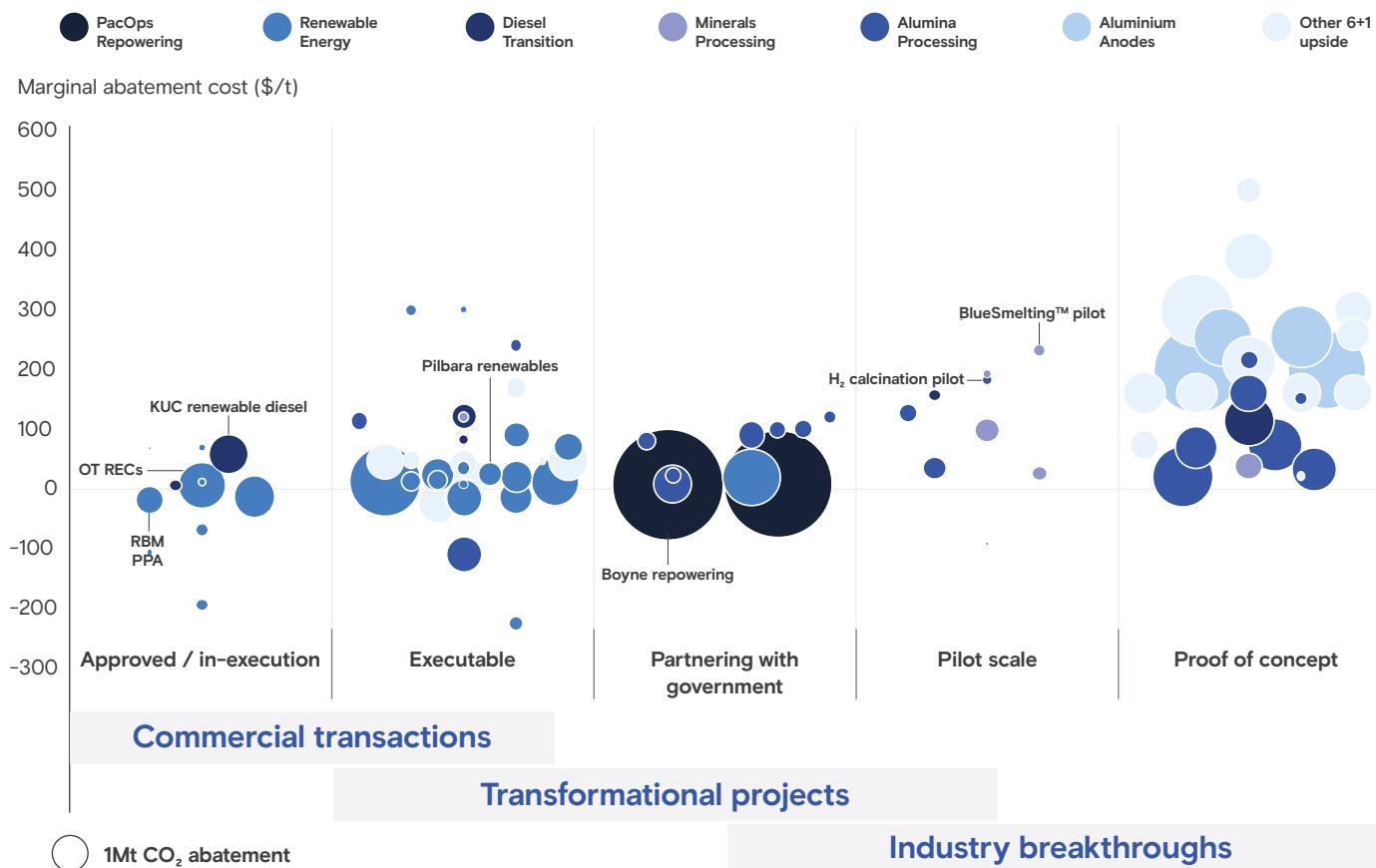
Our approach to decarbonisation is threefold, and considers the commercial and technical viability of the abatement options, categorised as: commercial transactions, transformational projects and industry breakthroughs:

1. Commercial transactions – projects we are moving quickly, with available technology and attractive economics, including PPAs and renewable energy certificates.
2. Transformational projects – those which transition our assets for the low-carbon future. These include the repowering of our Pacific Aluminium Operations and changes to our processing facilities.
3. Industry breakthroughs – research and development activities, which unlock technical and commercial challenges predominantly in hard-to-abate processing, including the progress we are making in piloting our BlueSmelting™ technology.

Our definition of net zero applies to our operational emissions on an equity basis. To reach net zero we will need to decarbonise our operations as far as technically and commercially practical and address all remaining emissions with carbon dioxide removals from the atmosphere and long-term storage. Each of our six decarbonisation programs has a pathway to net zero which follows this framing. Our greatest challenges are the emissions from aluminium anodes, alumina processing, diesel and minerals processing, that require technology breakthroughs.

Decarbonisation project pipeline

(Mt CO₂e, equity basis)



Beyond 2030, we aim to achieve deeper emissions reductions at our Australian aluminium smelters by deploying ELYSIS™ and phasing out the use of carbon anodes, progressing low-emissions battery electric trucks and mobile equipment at our mining operations, and addressing emissions at our minerals processing operations. Given the uncertain timing of suitable, proven and commercial-scale technology, our roadmap to 2050 allows for future opportunities to be defined post-2040. We believe this strikes a balance between developing and implementing commercial and transformational projects on our current roadmap and the expectation of advances and industry breakthroughs in future technologies over the longer term.

Additionally, we have ambitions to grow our business to provide the materials the world needs to deliver the energy transition. Our new projects are co-designed by our

growth teams, decarbonisation teams and external experts. This approach ensures we consider low-carbon options for new assets and the timing of their deployment to support our growth and decarbonisation goals.

Nature-based solutions

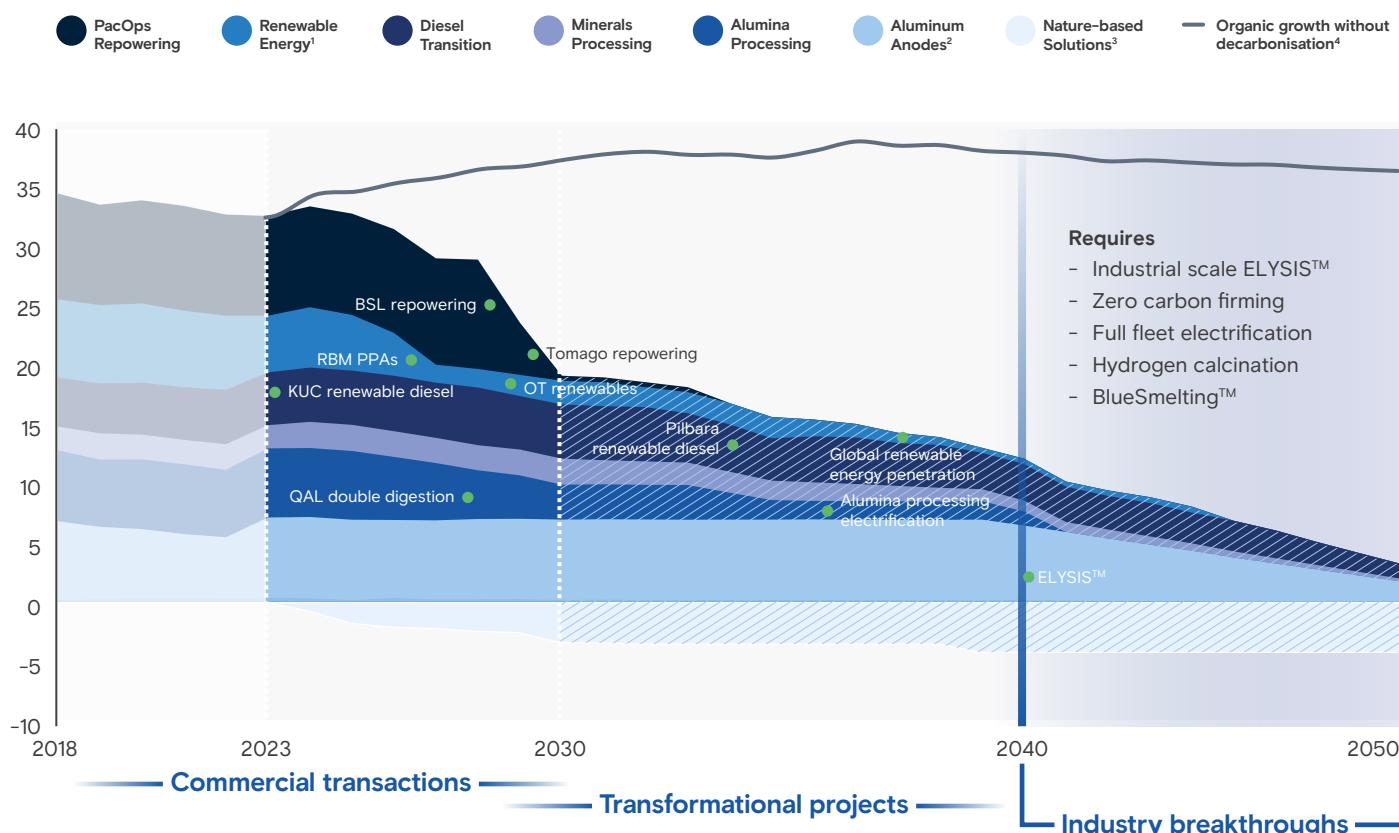
We believe in the use of nature-based solutions to halt and reverse nature loss, support positive, sustainable change for communities and address climate change. Focusing on quality, long-term benefits, we use our global presence to execute nature-based solutions projects in the locations where we operate, and will voluntarily retire carbon credits to complement the decarbonisation activity undertaken across our six programs.

Carbon capture and mineralisation

In 2023 we considered different technologies to capture the low concentration CO₂ from our Aluminum smelters with the potential for

first implementation at our Aluminum smelter in Iceland (ISAL). While the most promising technologies are an adaptation of direct air capture to point source capture, the technology readiness level is often low and requires significant development often from laboratory to commercial scale. We established several partnerships to develop a pipeline of potential capture technologies and aim to reach pilot stage with the most promising one at ISAL. In parallel, through our partnership with Carbfix, the characterization of the ISAL site for mineralization is progressing, aiming at first injection in 2026/2027. The assessment of the CO₂ mineralization potential of our co-owned Tamarack Nickel project in Minnesota has been initiated with the characterization of historical drill core samples and the initiation of a 2000m deep well drilling, aiming for full characterization in 2024.

Roadmap to net zero (Mt CO₂e equity basis)



- Electricity abatement assumes commercial solutions (power purchase agreements, renewable energy certificates) to be rolled over upon conclusion of contract terms or alternative abatement projects implemented. Our 2030 targets are dependent on the ability to repower our Australian aluminium assets.
- Aluminium anodes abatement shown illustratively as linear decline throughout 2040s, timing of ELYSIS™ deployment to be defined.
- Nature-based solutions play a role in addressing climate change and nature loss. High-quality offsets include regulated compliance and voluntary offsets from our nature-based projects.
- The transition to net zero requires proving and scaling-up technology breakthroughs for hard-to-abate processes. Baseline emissions extended post-2040 using assumed asset life extensions.

Our six abatement programs

In 2022, we established six abatement programs to focus on the decarbonisation challenges across our product groups: repowering Pacific Aluminium Operations, Alumina Processing, Aluminium Anodes, Renewable Energy, Minerals Processing, and Diesel Transition. Our pipeline of abatement projects is evolving as projects approach commercial and technical readiness.

Pacific Aluminium Operations Australia – refining and smelting

We operate a large-scale, fully integrated aluminium business producing some of the highest-quality, lowest-carbon-footprint aluminium in the world. Our aluminium comes mainly from hydro-powered smelting operations in North America, Europe, New Zealand and in Australia at the Bell Bay aluminium smelter.

In addition, in Australia, our Aluminium operations include mines, refineries and smelters. The operations primarily centre around the Gladstone region of Queensland, which is home to two alumina refineries: Yarwun and Queensland Alumina Limited (QAL), and Boyne Smelters Limited (BSL) aluminium smelter. Together the operations support more than 8,000 direct and indirect jobs.

These operations are some of the hardest-to-abate in our portfolio. Alumina refining requires large amounts of industrial heat, and reducing emissions from this process is challenging as much of the technology required does not exist today.

Our Boyne Smelter operates in a coal-based power grid and requires a reliable, firmed power supply to protect against major process disruption. Its transition must also take into account the broader impact on the grid.

Economically, repowering large, energy-intensive assets like the Boyne Smelter is a highly complicated and challenging process,

however, it also presents opportunity. Securing a long-term renewable power solution for the smelter could support a cohesive energy transition for the Gladstone region, maintain manufacturing jobs, create new industries and deliver a substantial uplift in renewable energy investment.

Successful emissions reduction across the aluminium value chain in Australia relies heavily on the availability of large-scale, competitive, firmed renewable power, alongside significant investment, collaboration and partnership with governments, technology developers and industry peers to support innovation breakthroughs.

The transformation of Australia's electricity market from the current fossil fuel baseload requires investment in off-and-onsite infrastructure, supported by strong coordination between government and industry. This transition is essential to enable guaranteed supply of internationally-competitive, large-scale and reliable renewable power over the long term for domestic industrial users.

8.4Mt

CO₂e Scope 1 and 2 emissions in 2023 from Repowering Pacific Aluminium Operations (2% decrease from 2022)

5.8Mt

CO₂e Scope 1 and 2 emissions in 2023 from alumina refining (including Atlantic Operations) (2% increase from 2022)

\$50m

Decarbonisation spend in 2023

Repowering Pacific Aluminium Operations

Our Pacific Aluminium Operations portfolio includes BSL and Gladstone Power Station in Queensland, and the Tomago Aluminium smelter in New South Wales. Both smelters are energy-intensive facilities sourcing third-party power from fossil fuel-based grids. These three facilities account for 26% of our electricity-related Scope 1 and 2 emissions and the smelters are dependent on renewable repowering solutions to maintain their long-term viability.

Decarbonising these assets is essential to meeting our 2030 carbon reduction targets and requires the delivery of complex technical and commercial solutions supported by governments. Our Boyne Smelter requires 932MW of power, which is equivalent to 4GW

of high-quality wind and solar capacity paired with appropriate and competitive firming assets and contracts. The smelter at Tomago requires 975MW of power, equivalent to 4–6GW of wind and solar capacity plus firming. Contracts for the current supply of electricity to our Boyne Smelter expire in 2029 and Tomago in 2028. Significant progress has been made to secure long-term electricity arrangements to Boyne. We have signed a PPA to buy 1.1GW of renewable energy from the Upper Calliope Solar Farm project and are continuing to assess other proposals, solutions and partnerships to competitively meet the needs of our production assets in the Gladstone region. A process is also

underway to identify high-quality, low-cost renewable power projects for Tomago.

We continue to engage with market participants and governments to deliver the integrated set of solutions required to fully decarbonise the electricity supply arrangements for Boyne and Tomago.

Full decarbonisation of our Australian aluminium smelting operations also requires deployment of ELYSISTM technology to remove emissions generated by the carbon anodes process.

Update on progress against 2023 Climate Action Plan commitments

Action 6

Progress renewable supply options for the Boyne and Tomago aluminium smelters

2021	2022	2023
Statement of cooperation signed with the Queensland Government to establish more renewable power in central Queensland.	<p>June 2022</p> <p>Requests for Proposals sent to market to support the development of large-scale wind and solar power.</p> <p>June 2022</p> <p>Commenced commercial and technical due diligence of high-quality submission for supply of renewable electricity to the Boyne Smelter.</p> <p>September 2022</p> <p>Tomago commenced separate Expression of Interest process to develop long-term renewable power.</p>	<p>June 2023</p> <p>Completed commercial and technical due diligence of high-quality submission for supply of renewable electricity to Boyne Smelter.</p> <p>Initial assessment of options for renewable electricity supply for Tomago Smelter.</p> <p>June 2023 – December 2023</p> <p>Negotiation and development of firming and transmission contracts for the Boyne smelter with the Queensland Government, and engagement with the Australian Government and renewable energy developers.</p> <p>December 2023</p> <p>Signed PPA to buy 1.1GW of renewable energy from the Upper Calliope Solar Farm project.</p>

What we will do in 2024

- Execute renewable power contracts required for Boyne Smelter.
- Put a Request for Proposal to market, in partnership with other shareholders, for renewable energy projects for Tomago. Complete commercial and technical due diligence on the relevant projects to target a viable contractual solution by Q1 2025.
- Go to market for renewable energy and storage capacity for Tranche 1 of electrification at the Gladstone alumina refineries for delivery of assets in 2029/2030 (currently provided by onsite power/LNG).

Alumina Processing

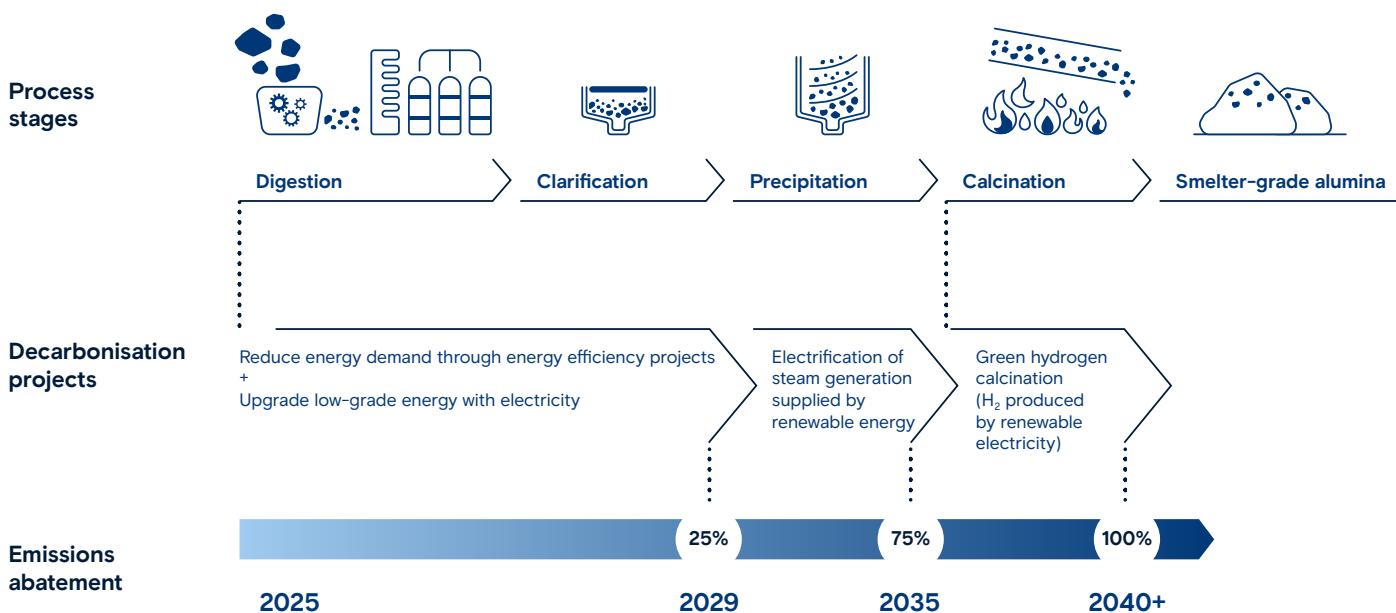
The alumina refineries in Gladstone, Yarwun and Queensland Alumina Limited (QAL) are the largest source of process heat emissions in the Group.

Alumina refining requires significant energy inputs for the high temperature processes, and in Australia, the industry has been underpinned by low-cost fossil fuels, predominantly coal and gas. In 2023, emissions from the refineries were 5.8Mt CO₂e or 18% of the Group's emissions (compared to 5.7Mt CO₂e in 2022).

Refinery emissions are generated through combustion of fossil fuels, to generate heat required for the digestion and calcination phases of the refining process. Our preferred decarbonisation strategy, based on technical merit and commercial viability, is a combination of fuel switching and electrification.

In the medium term, additional renewable energy capacity must be developed and secured to meet the increasing requirements of electrification of our alumina refineries in Gladstone.

Reducing emissions from the alumina refining process



In 2023, we published a case study on this program describing the challenges, the potential solutions and the policy backdrop for the successful decarbonisation of alumina refining.

For further information on decarbonising alumina refining, see our website riotinto.com/climate.

Update on progress against 2023 Climate Action Plan commitments

Action 1	
Develop the decarbonisation energy transition strategy for the Yarwun and QAL refineries.	<p>Our energy transition strategy focuses on three pillars:</p> <ul style="list-style-type: none">- Reducing energy demand through process change improvements.- Improving energy efficiency and use by recovering low-grade waste steam.- Switching to lower-carbon fuels including hydrogen and biofuels to generate heat.
Action 2	
Complete feasibility studies for electric steam generation and thermal storage options at Yarwun and QAL.	<ul style="list-style-type: none">- Electric steam generation studies continued in 2023, with a primary focus on transmission and distribution upgrade requirements to meet the increased electrical demand by transitioning from fossil fuels to electrification.- Order of Magnitude (OoM) studies are in progress for electric steam generation technologies for Yarwun and QAL.- Detailed concept and OoM studies have been completed on thermal energy storage systems and their application at our refineries. A preferred technology has been selected and the next phase of engineering is being scoped.
Action 3	
Seek approval for electric boilers at Vaudreuil.	<ul style="list-style-type: none">- The electric boiler feasibility study for Vaudreuil is nearing completion.
Action 4	
Advance studies on double digestion, hydrogen and electric calcination.	<ul style="list-style-type: none">- The QAL double digestion pre-feasibility study progressed in 2023. A pilot plant to simulate the double digestion process was constructed and commissioned to provide technical inputs to support the study.- Electric calcination studies progressed at Vaudreuil with pilot trials expected in 2024.
Action 5	
Commence construction of hydrogen calcination industrialisation demonstration at Yarwun.	<ul style="list-style-type: none">- We are partnering with the Australian Renewable Energy Agency (ARENA) and Sumitomo to build a hydrogen calcination pilot plant as part of a A\$111.1 million program.- The project will consist of a 2.5MW on-site electrolyser to supply hydrogen, a storage facility and a retrofit to one of Yarwun's four calciners to burn hydrogen as a fuel source, replacing natural gas. The trial will test and validate using hydrogen as a fuel source in the calcining process over two years.- Production is expected to be the equivalent of approximately 6,000 tonnes of alumina per year while reducing Yarwun's CO₂ emissions by 3,000 tonnes per year.- Site preparation works are underway ahead of construction in 2024 and operations in 2025.

What we will do in 2024

- Progress the double digestion feasibility study at QAL.
- Commence construction of the hydrogen calcination demonstration project.
- Progress electric steam and thermal energy studies for QAL and Yarwun and finalise approvals for electric boilers at Vaudreuil.
- Deliver biofuel studies for the Gladstone refineries as potential low-carbon fuel feedstock for steam generation.

Aluminium Anodes

We are working to develop a breakthrough smelting technology to produce aluminium with no direct greenhouse gas emissions

Emissions from the use of carbon anodes in our aluminium smelters are 5.5Mt CO₂e and represent a longer-term challenge. This Global Decarbonisation Program also addresses some other smaller sources of emissions. We established the ELYSIS™ partnership in 2018 with Alcoa and with support from Apple and the governments of Canada and Quebec, to develop the world's first carbon-free aluminium smelting process using inert anodes instead of carbon.

With the first industrial-scale pilot cell producing aluminium with zero carbon emissions at the ELYSIS™ Industrial Research and Development Center, work is now focused on scaling up the ELYSIS™ technology towards the demonstration of even larger commercial-size cells.

The smelting cells will operate on an electrical current of 450kA, which is the commercial scale for many large, modern aluminium smelters. So, between now and 2030, we aim to grow zero carbon aluminium smelting capacity from ELYSIS™ rather than to reduce emissions from carbon anodes at existing smelters. Beyond 2030, we expect to phase out the use of carbon anodes at our smelters.

6.8Mt

CO₂e Scope 1 and 2 emissions in 2023 (9% increase from 2022)

\$61m

Anode decarbonisation spend in 2023

Update on progress against 2023 Climate Action Plan commitments

Action 6

Commission 450kA ELYSISTM cells currently under construction at Alma

- ELYSISTM has started commissioning activities following completion of the construction work. ELYSISTM progressed its research and development program with the ongoing aim of steadily improving cell performance. Learnings from the past two years will now be incorporated into the development of the larger-scale cells (450kA).

What we will do in 2024

- The focus will be on continuing to grow our zero carbon aluminium smelting from the ELYSISTM prototype cells that will enable the joint venture to take the next step towards an industrial demonstration level project. ELYSISTM expects to start the first 450 kA cell in 2024.



Renewable Energy

We rely on renewable and non-renewable electricity to power our mines, processing plants and supporting infrastructure. We are working to displace gas and coal-fired power with solar PV, wind and other renewable technologies.

72% of the electricity we use is from renewable sources. See page 39 for further detail on the generation and use of electricity with and without contracted energy attributes. We are focusing on the transition to renewable energy sources in five main jurisdictions, representing 3.1Mt of emissions: the Pilbara in Western Australia, Richards Bay Minerals (RBM) operations in South Africa, bauxite operations in Weipa, Australia, Kennecott operations in the United States, and Oyu Tolgoi in Mongolia.

Decarbonising the electricity at each of these locations has varying degrees of complexity, including whether the power is externally or internally generated, land access requirements (including permitting and Traditional Owner engagement) and availability of commercial solutions.

4.8Mt

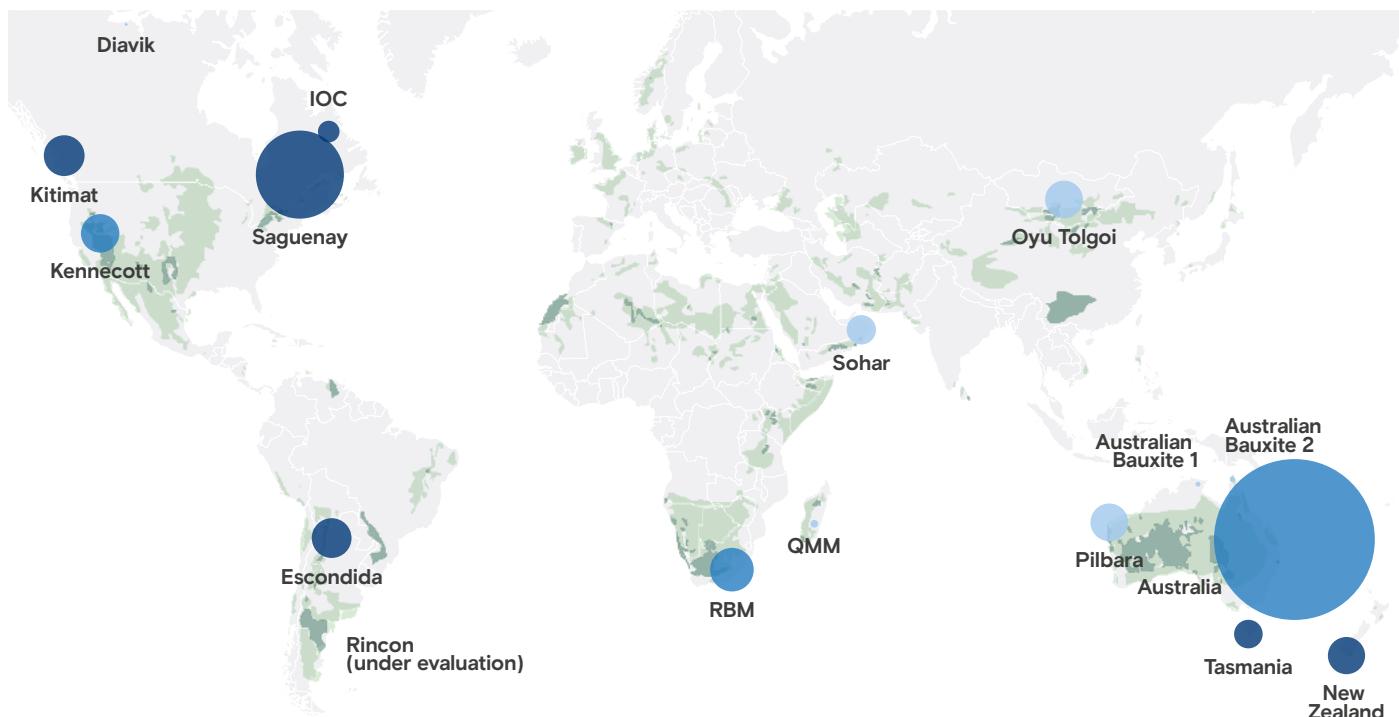
CO₂e Scope 1 and 2 emissions in 2023
(7% decrease from 2022)

72%

Percentage of electricity used from renewable sources

\$55m

Decarbonisation spend in 2023



Totals are provided on a 100% equity basis.

Update on progress against 2023 Climate Action Plan commitments

Action 7

Approve and commence construction of 100MW of solar photovoltaics (PV) for the Pilbara.

- Discussions for the proposed coastal solar PV are nearing completion with key stakeholders, including Traditional Owners, allowing for further cultural heritage surveys to inform the final solar farm design and capacity. The timeframe for these discussions has pushed the potential start of construction to 2025.

Action 8

Progress studies on the next 130MW solar PV for the Pilbara.

- Detailed integrated system planning has identified preferred locations for future solar developments and planning for Traditional Owner engagement to enable support and land access is underway.

Action 9

Sign power purchase agreement (PPA) for Amrun microgrid and start construction 2023/2024.

- Financial approval for Phase 1 was approved and includes a 12.4MW solar PV system and a 2.1MWh battery storage system via long-term PPAs. These agreements are expected to deliver greater than a 35% reduction in diesel use for electricity generation.
- Subject to final regulatory approvals, installation of the solar PV infrastructure and energy storage is planned to start in 2024.

Action 10

Sign a wind PPA at RBM.

- The next tranche of 200MW wind PPA negotiations has been delayed from Q4 2023 to 2024.
- Early works and site preparation for the 130MW Bolobedu PV solar facility commenced in 2023, after the first 20-year PPA was executed in 2022. This project will reduce RBM's annual emissions by 230ktpa, or 10%.

Action 11

Sign commercial agreements for our US operations.

- Conducted market reviews of different commercial structures and determined appropriate commercial and technical solutions, which may include renewables PPAs.
- We had expected to finalise commercial agreements representing 570MW of renewable energy capacity in 2023, however continued assessment is required amid tightening market conditions in the US. Abatement from agreements is now expected from 2027, noting that our US operations are currently fully abated via an agreement with Rocky Mountain Power until the end of 2025.

Other actions

- Signed a memorandum of understanding with Yindjibarndi Energy Company (YEC) to explore opportunities to collaborate on renewables projects, including wind and solar power and battery storage systems, on Yindjibarndi Country in the Pilbara region.
- Ground works are underway and the first set of turbines was delivered in December for QIT Madagascar Minerals' 16MW Phase 2 Wind project
- Constructed a 5MW solar plant at Kennecott Copper to reduce operational emissions by 3,000 tonnes of CO₂ equivalent per year.
- Announced construction of a 3.2MW solar plant at the Diavik Diamond Mine in Canada, which will provide 25% of Diavik's electricity, reducing diesel consumption by 1 million litres and emissions by 2,900 tonnes each year.

The activity undertaken in 2023 represents:

146MW

Wind and solar projects commenced construction at QIT Madagascar Minerals (QMM) and Richard's Bay Minerals (RBM)

1TWh

Approved in renewable energy certificates (RECs)

What we will do in 2024

- Subject to final regulatory approvals, start solar panel installation on Amrun Phase 1 renewables project (12.4MW).
- Finalise the first tranche of renewable PPA commercial negotiations (up to 200MW) for our US renewable energy portfolio.
- Commission the Diavik Diamond Mine solar plant.
- Seek final investment decision on the Pilbara coastal solar PV plant.
- Commission the 5MW solar plant and start construction of Phase 2, 25MW solar plant at Kennecott Copper.
- Voltalia will continue construction of the 130MW solar plant for Richards Bay Minerals (Phase 1 PPA) and we will execute Phase 2, approximately 200MW PPA.



Case study: Pilbara renewables

We operate one of the world's largest microgrids in the Pilbara, with four gas-fired power stations underpinning 480MW of firm power capacity and approximately 1,000 kilometres of transmission lines. Each year we spend \$100 to \$200 million to purchase and transfer natural gas to power our operations. Our electricity use in the Pilbara accounts for 2.5% of our emissions and presents multiple opportunities to introduce renewable power generation in our network.

Maintaining grid security and reliability while ensuring optionality and optimisation of the energy mix is critical to the development of large-scale renewable power for our Pilbara network. We have almost 1.5GW of studies underway, across multiple locations and at varying stages of development across our portfolio. This work is informed by, and supports, the extensive stakeholder engagement required to facilitate land access, studies and regulatory approvals.

In 2021, we announced our intention to build 1GW of renewable energy capacity for our Pilbara grid by 2030. This would largely displace gas-fired electricity generation and support the first phases of fleet electrification. However, the timeline for large-scale deployment of battery electric haulage solutions has been extended until the 2030s. As a result, we now estimate we require approximately 600MW to 700MW of renewable power capacity by 2030, although we continue to plan to deliver 1GW. Our first

solar project, announced in 2020, was a 34MW capacity solar farm at the Gudai-Darri mine. Work is continuing to integrate this renewable project into our private Pilbara power network without negatively impacting our operations, and taking into account the remote setting, power network uniqueness and mining operations context. This, alongside project delays and challenges in accessing adequate technical capability during the COVID pandemic when travel was restricted, has led to delays in commissioning the project.

In 2024 we will continue to work with Traditional Owners to progress studies and approvals for approximately 300MW of solar projects, with regard to our stakeholders' timeframes and constraints.

A typical iron ore mine, such as Hope Downs, currently has a disturbed operating footprint of approximately 200 hectares. This is similar to the land area as required for a 100MW solar PV facility. Although relatively simple to install and low impact on the ground, the sheer scale of this footprint means that we must take the time required to engage with Traditional Owners, to find appropriate sites, and walk these areas for cultural artefacts before all parties are satisfied to select a site. This is a critical part of our co-stewardship of the region, to ensure that the cultural heritage and ecological considerations are carefully assessed before each site is selected.

Minerals Processing

Our second-largest source of process emissions, after alumina and aluminium, arises from processing titanium dioxide (TiO_2) in Canada and South Africa.

Each year, Rio Tinto produces approximately 1.2 million tonnes of TiO_2 feedstocks at our operations in Quebec, Canada and South Africa. This represents around 15% of the global TiO_2 market and produces primary products including chloride and sulphate slags, Upgraded Slag (UGS), rutile and co-products including zircon and metallics. Finding new and innovative technologies to support the decarbonisation of these facilities

represents both a challenge and an opportunity. Carbon abatement can be partially realised by transitioning from fossil fuels to renewable energy sources for heating and operating these facilities, yet adopting new technologies and modifying traditional processing flowsheets is also critical.

In 2023, we continued to test innovative technology solutions and fuel sources.

2.0Mt

CO₂e Scope 1 and 2 emissions in 2023 (7% decrease from 2022)

\$64m

Decarbonisation spend in 2023

Update on progress against 2023 Climate Action Plan commitments

Action 12

Commission the BlueSmelting™ demonstration plant at RTIT Quebec Operations, to test the ilmenite pre-reduction process.

- The plant was commissioned and the first tonne of pre-reduced ore was produced in July 2023.
- For further information on BlueSmelting™, see our website.

Action 13

Commence industrial trials of biocarbon at RTIT Quebec Operations and RBM.

- A one-month industrial trial of biocarbon at our Quebec Operations in Sorel-Tracy in June 2023 confirmed biocarbon could be used in smelters without impact on product specification or quality¹. The trial utilised ilmenite ore from our Havre-Saint-Pierre mine.

Action 14

Investigate options to develop a sustainable supply chain.

- The development of a biocarbon supply chain is in progress to serve as a substitute for anthracite.

Action 15

Commission plasma burner pilot at IOC.

- We have implemented development and testing projects for electrification to reduce pelletising emissions at our IOC operations. These initiatives range from testing plasma torch technology in induration furnaces to installing state-of-the-art electric boilers and exploring the adoption of biocarbon and pyrolytic oil as new sources of heat.

What we will do in 2024

- Ongoing industrial validation of smelter gas and hydrogen use as a reductant at the BlueSmelting™ demonstration plant.
- Production and testing of material from the BlueSmelting™ plant at the smelters.
- Progress with the installation of an electric boiler at IOC.
- Progress research and development analysis for biofuel and coke alternatives for iron ore pelletisation at IOC.
- Progress with the industrial ramp-up of biocarbon.
- Secure access to biocarbon sources to support our decarbonisation efforts.

 For further information on decarbonising minerals processing, please see our website

1. Biocarbon trials are implemented using a step-by-step approach with the objectives of preserving the quality of the finished product as well as guaranteeing the performance of operations. All these parameters are taken into account in the gradual introduction of biocarbon into the smelters.

Diesel Transition

Diesel is the primary energy source for Rio Tinto's core mining operations, powering our operations globally and accounting for 12% of our total emissions in 2023.

Our efforts in developing solutions to decarbonise our operations, which include the modelling of energy systems and solutions, reinforce the view that the long-term solution for transitioning our mining fleet and equipment from fossil fuels is electrification.

However, to support meaningful emissions reductions in the mining industry, specialised electric vehicles – distinct from those used in the transportation and consumer sector – are essential. These vehicles must be adaptable to changing mining plans and must deliver powerful performance to support intense work cycles. Most importantly, they will need to be safe, reliable and capable of supporting extended battery capacity and cycle life under harsh and perpetual operating conditions.

A robust fleet is only part of the infrastructure required to support the large-scale transition to an electric mining fleet at our operations. Dynamic and flexible charging infrastructure is also required to support constantly evolving mine plans and equipment routes. It is likely charging stations cannot remain fixed in one location and may need to be complemented by mobile solutions. The charging network must also be underpinned by access to renewable energy sources and the related systems needed to operate these.

Although current technology does not yet deliver the energy density required in large mining vehicles, exciting progress, including the pace of electric vehicles roll-out and breakthroughs in mining fleet development, assures us that these challenges can be met through innovation and working together.

We cannot pursue the electrification of our fleet in isolation. This is why we are committed to transitioning away from diesel through parallel investment in research and development projects, and the development of complementary approaches to reduce diesel-related emissions. These include increasing fuel efficiency and biofuels procurement.

Category	Approximate number of vehicles 2023
Haul trucks	700
Locomotives	350
Loaders	300
Dozers	250
Excavators	150
Graders	100

4.5Mt

CO₂e Scope 1 and 2 emissions in 2023 (2% decrease from 2022). The Diesel Transition program also addresses marine fuel and some other smaller emissions sources.

\$38m

Decarbonisation spend in 2023

1.6 billion litres

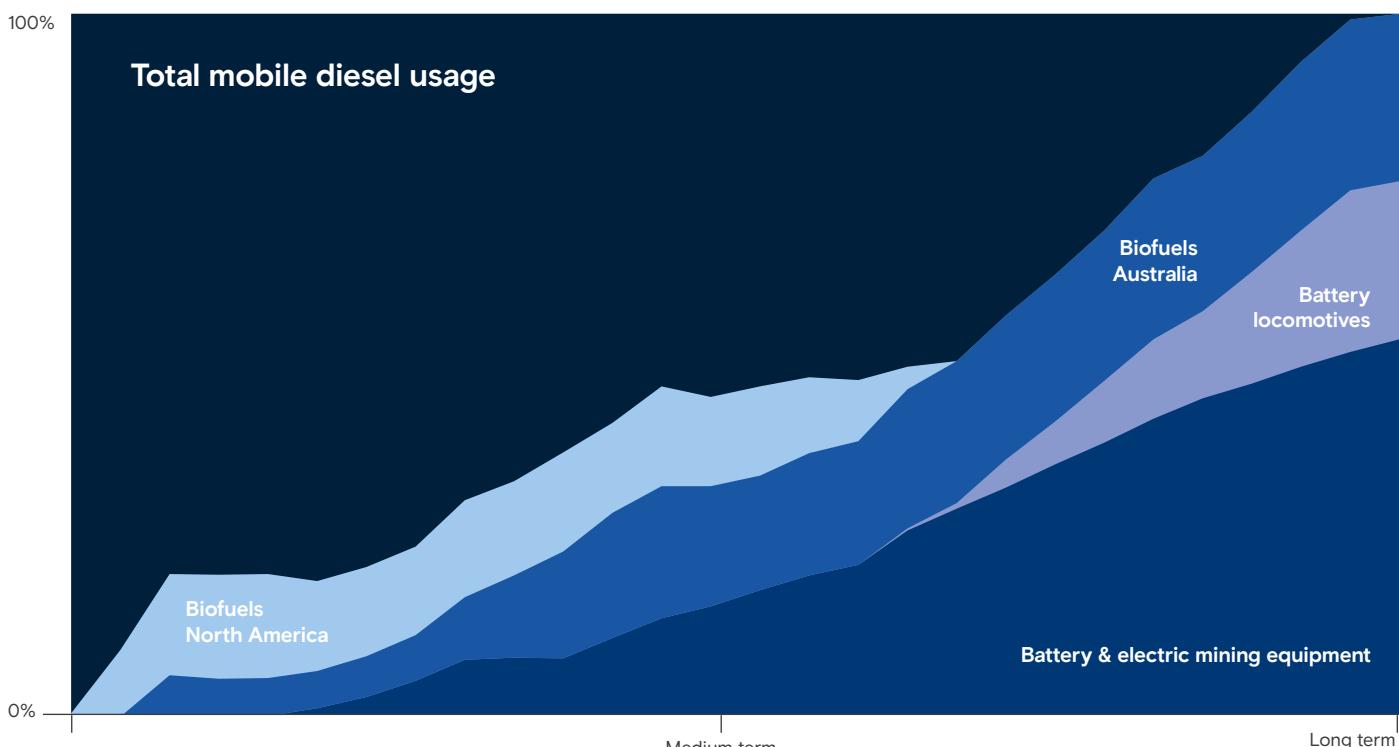
diesel consumed at our major managed operations in 2023

\$1.6 billion

spent on diesel fuel in 2023

Medium to long-term transition of diesel usage

(mobile sources)



Contribute to 2030 targets

Utilise biofuels as an interim decarbonisation solution, subject to commercial or technical constraints, to further enable net zero technology maturation.	- Biofuels are critical to ensuring we meet our 2030 Scope 1 and 2 emissions targets and we are exploring short and medium-term commercial biofuel options to rapidly reduce our reliance on diesel.
Develop and deploy partial abatement solutions with shorter execution timelines and existing technology.	- We are prioritising projects that can contribute meaningfully to diesel reduction in line with our 2030 targets. These projects achieve partial abatement and include commercially available technology such as lower fuel-burn dig units and cable electric shovels, and shorter lead-time technology such as innovative trolleys.
Contribute to net zero	
Partner with suppliers, OEMs and mining industry peers to support battery electrification.	- Active partnerships are required to accelerate the development of battery-electric haul trucks and charging solutions, which we believe will be operationally available at scale after 2030, and will be critical to 2050 target.

Update on progress against 2023 Climate Action Plan commitments

Action 16

Progress plans to convert the entire fleet at Boron to renewable diesel ahead of the requirement to do this in California in 2024.

- Boron operations were the first open pit mine globally to successfully transition heavy machinery to 100% renewable biofuel from May 2023, a year earlier than anticipated.

Action 17

Develop a viable trolley assist option for the existing haul fleet, to enable a substantial reduction in diesel use while on trolley.

- We continue to assess this technology to identify suitable operations where it can be deployed, either standalone or as a precursor to wider fleet electrification.
- Limitations to deployment include retrofitting to existing operations and a dependence on the availability of renewable energies.

Other action

We have undertaken the following activities through our partnerships and industry collaborations on diesel transition.

- Completed a six-month test program of a Scania 20 tonne battery electric truck at our Channar operations in the Pilbara.
- Continued involvement in CharIN and the ICMM's Initiative for Cleaner Safer Vehicles to build on collaborative industry partnerships, to solve challenges related to inter-operability and large electric truck dynamic charging.

What we will do in 2024

- Transition our Kennecott Copper operations to renewable diesel.
- Commence battery electric haul truck trials in the Pilbara.
- Develop a deployment plan for partial abatement electrification options.
- Consider options to develop an Australian biofuel supply chain.



Case study: biofuel trial at Kennecott Copper

We partnered with engine manufacturer Cummins to complete a seven-month trial of renewable diesel at our Kennecott operation in Utah, US. This successful trial has led to the execution of a commercial supply agreement for biofuel to be used at Kennecott. Transitioning heavy mobile equipment and processing activities to 100% biofuel will target a CO₂e reduction of more than 495,000 tonnes, comparable to eliminating annual emissions of over 107,000 cars.

Nature-based solutions

Nature-based solutions (NbS) complement our decarbonisation program. They do not compete for capital with, or replace, our decarbonisation projects, rather they are treated as standalone carbon and nature investments that can bring positive outcomes in the regions where we operate.

Our ambition is to work with communities to commit at least 500,000 hectares of land to high-integrity NbS programs globally by 2025. We define high-integrity as projects that balance positive outcomes for people, nature

and climate and take an integrated landscape perspective.

We expect to ramp-up the retirement of carbon credits to approximately 3.5 million per year over the next decade. This is equivalent to around 10% of our 2018 baseline emissions. We will then flex this up or down depending on the level of progress we make on technology breakthroughs for our hard-to-abate emissions.

We have three pathways to securing carbon credits: investment in Australia Carbon Credit Units; the development of our own voluntary projects; and commercial agreements with voluntary carbon credit developers.

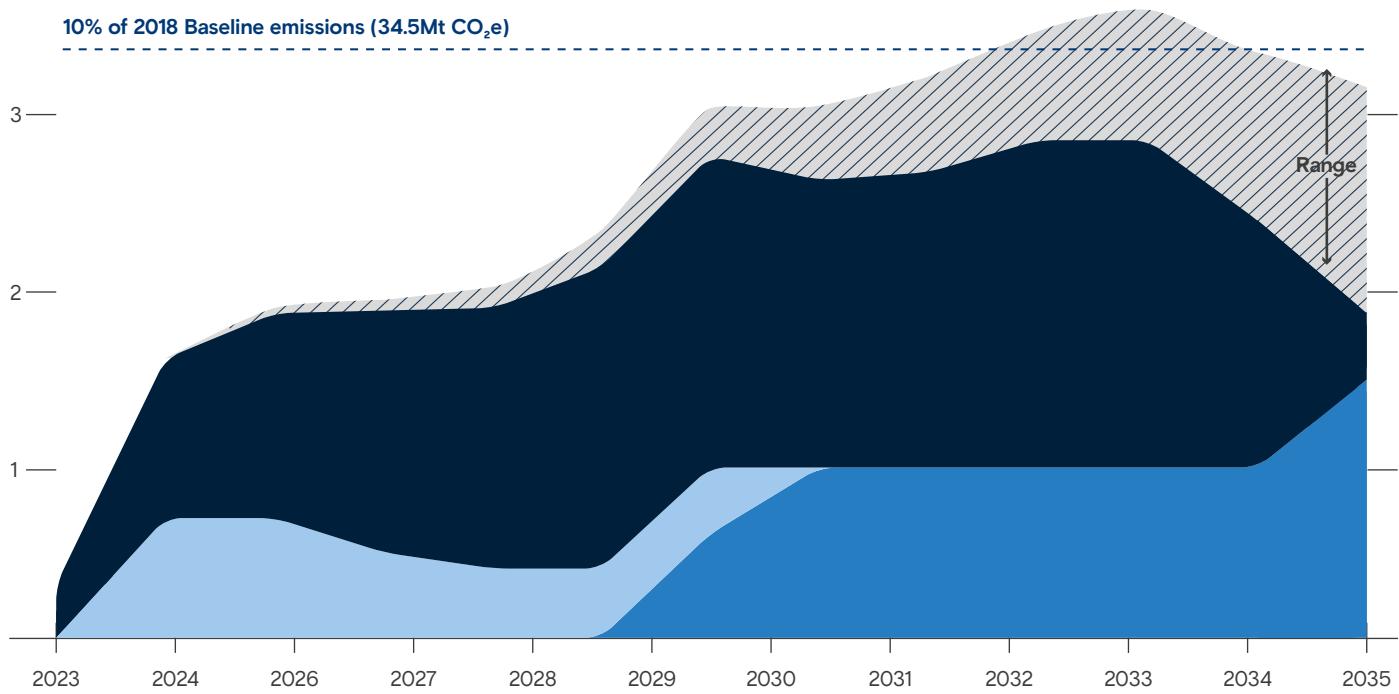
\$88m

2023 spend on carbon credits and Nature-based Solutions

Forecast carbon credit retirements

(Mt CO₂e, equity basis)

4 —



NBS pathways

- 1a: High range of Australian Carbon Credit Units (development and commercial)
- 1b: Low range of Australian Carbon Credit Units (development and commercial)
- 2: Voluntary development projects
- 3: Voluntary commercial agreements

Regardless of the pathway, we use similar development and assessment criteria covering the carbon integrity and social and ecological safeguards that underpin the projects. These quality criteria are described in more detail in our 2022 *Climate Change Report* and based on our standards, along with guidance from organisations such as:

- International Union for Conservation of Nature (IUCN) Global Standard for Nature-based Solutions
- United Nations Framework Convention on Climate Change (UNFCCC)
- Integrity Council for the Voluntary Carbon Market (ICVCM) and Voluntary Carbon Markets Integrity Initiative (VCMI).

We continually review our criteria to consider the latest developments in best practice and our own learnings.

1: Investment in Australia Carbon Credit Units (ACCUs)

Our carbon team sources, develops and invests in Australian carbon farming projects to meet our Safeguard Mechanism liabilities. Sourcing focuses on high-quality projects within three land-based methods: savanna burning, human-induced regeneration (HIR)/ integrated farming land management (IFLM) and active planting.

We have an opportunity to invest in carbon projects that have positive outcomes for nature and promote Indigenous participation in carbon markets. This year we purchased:

- Approximately 500k ACCUs from Indigenous-owned carbon projects and are in discussions to create long-term partnerships with multiple Indigenous project developers.
- An equity stake in AI Carbon, an Australian nature-based carbon developer. This provides us with access to a pipeline of high-quality HIR carbon removal and native regeneration projects, many of which are on land with Traditional Owner connections presenting opportunities for partnerships.

We are also focused on project development to reduce our overall reliance on spot transactions and move ACCU costs closer to the marginal cost of development. In 2023, our net emissions total does not include 86,000 ACCUs retired for compliance with the Safeguard Mechanism for the period 2021-22. We expect to include ACCUs in our net emissions figure from 2024 onwards.

2: Voluntary development projects

A critical long-term component is to support the development of REDD+ (reducing emissions from deforestation and forest degradation), restoration and sustainable landscape management programs in the regions connected to our assets. We believe these are much-needed tools to finance large-scale, long-term activities that bring urgent positive outcomes for people and climate, while preventing the deterioration of pristine environments and restoring the ecosystem services on which we all rely.

Our priority areas are Madagascar, Guinea, South Africa and Argentina due to their high-carbon, biodiversity and social potential. These regions cover a diverse set of landscapes including forests, coastal dunes, mangroves and pastoral lands.

These development projects focus on implementing solutions that result in long-term changes in land and water stewardship, to restore or protect ecosystems while generating benefits for communities. In addition to conservation and restoration efforts, there is strong focus on energy management projects (such as cookstoves), efficient agriculture and agroforestry projects (with potential links to markets) and ecotourism. Together, these will help to define a more diversified and self-sustaining economy for these regions. Project design is focused on securing areas under immediate threat, largely generating avoidance credits. This will shift to a greater balance of removals as our restoration projects mature.

Local partners, including non-governmental organisations, communities and their representatives, have the knowledge and experience of what works best in their context. Some of these local parties are connected to leading international organisations able to support the responsible scaling of activities. Our NGO partners include: BirdLife International, Asity Madagascar, BirdLife South Africa, Guinée Ecologie, Peace Parks Foundation, Sayari Earth Foundation, Wildlife Conservation Society and WILDTRUST.

2023 Progress

We completed five feasibility studies, with four additional feasibility studies currently ongoing in Guinea and South Africa. These studies, which include stakeholder engagement, assess the viability of a project to generate sustainable carbon credits with long-term positive outcomes for people and nature.

Our efforts are most mature in Fort Dauphin in the Anosy region of Madagascar, where we have been implementing pilot projects, while completing restoration and REDD+ feasibility studies. These pilots focus on a variety of protection and restoration activities for forests and mangroves. We use pilots to test ideas with interested communities, develop models addressing their land management challenges, and secure early wins as we progress government engagement and partner capacity building.

While we are committed to this work, our progress is dependent on governments agreeing and implementing clear policy and stable regulatory environments, in alignment with Article 6 of the Paris Agreement.

3: Voluntary commercial agreements

Government engagement and capacity building takes time, so our development portfolio is unlikely to be at scale before 2030. In the meantime, we will enter commercial agreements with a small number of high-quality carbon projects in our operating regions to build net reduction progress and deliver positive outcomes for people and nature.

What we will do in 2024

- Finalise feasibility studies in Guinea and South Africa.
- Ramp-up activities in priority regions, including NbS pilots and studies.
- Finalise and disclose information on voluntary commercial partnerships we have secured.
- Provide details on our carbon credit sourcing strategy, including integrity criteria, due diligence and volumes purchased.

Scope 3 emissions: Partnering across our value chains

In 2023, our Scope 3 emissions were 578Mt CO₂e (equity basis), approximately 18 times higher than our Scope 1 and 2 emissions. Most of these emissions (94%) stem from customer processing of our products, particularly iron ore and bauxite and alumina, contributing 69% and 22% respectively.

We have seen a significant increase in the number of our customers setting public targets for their Scope 1 and 2 emissions (our Scope 3). About 53% of our total iron ore sales are now to steel producers with already set public targets to reach net zero by 2050, up from about 50% in 2022 and 28% in 2021. Meanwhile, nearly 40% of our bauxite sales are to customers with set net zero emissions targets, though only 13% of this is to companies aiming for net zero by 2050. As these numbers rise, we expect to enhance our ability to partner through the value chain to achieve our common sustainability objectives.

We actively engage with our customers including encouraging them to set targets aligned with a net zero future while partnering on impactful areas of mutual collaboration.

As things stand today, our analysis of our customers' targets and their governments' commitments to reduce their emissions shows a trajectory for those processing emissions that approaches net zero by around 2060.

We are committed to partnering with our customers and suppliers to find better ways to help them achieve their targets a decade earlier – reaching net zero by 2050.



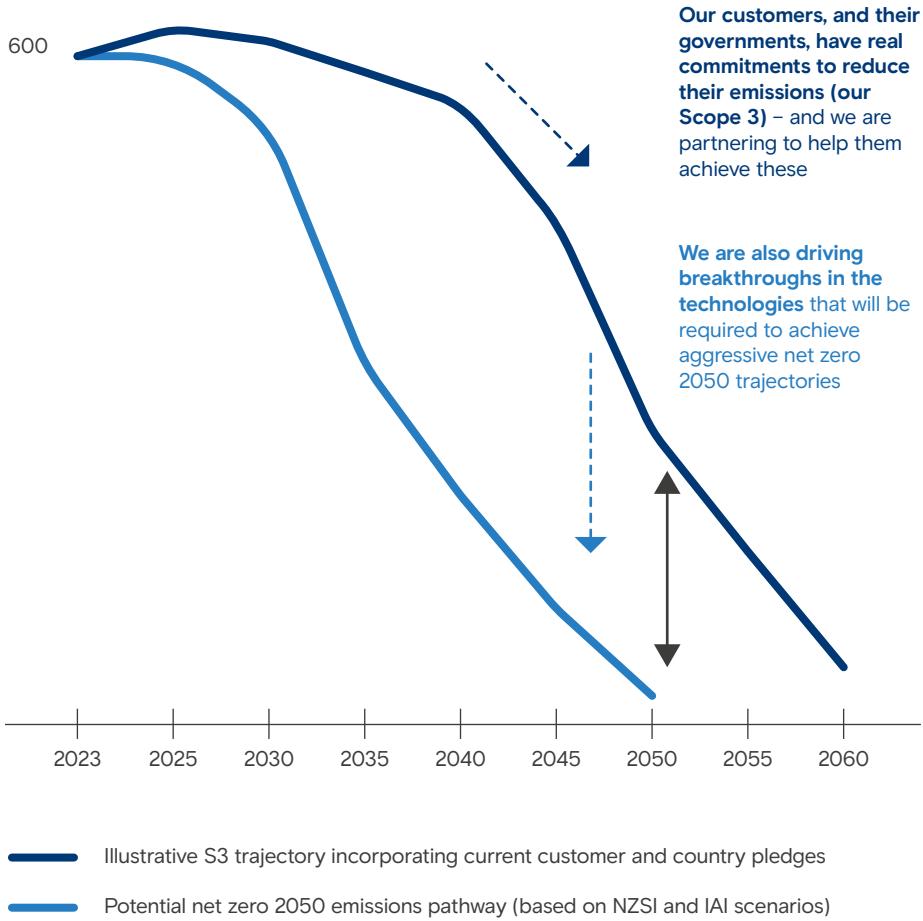
Kitimat: shipping products to our customers

To do this, we are acting now by investing in the development of breakthrough technologies aiming to help decarbonise our value chains and upgrading our ores to be suitable for these. By holding ourselves accountable on real and measurable commitments in the near term, we can help to make sure technologies are developed early enough to accelerate the transition in the long term. Therefore, this year we have set specific near-term targets for steel, alumina refining, shipping, and procurement decarbonisation, that are detailed further in this section.

Approximately 78% of our Scope 3 processing emissions come from China, which has pledged to be carbon neutral by 2060. 18% come from Japan, South Korea and other countries that have pledged to be carbon neutral by 2050.

The biggest source of our Scope 3 emissions is the traditional coal-powered blast furnace, followed by electricity-intensive aluminium smelting. In 2023, Scope 3 processing emissions related to our iron ore rose from 387Mt CO₂e in 2022 to 400Mt CO₂e in 2023 primarily due to an increase in production. Downstream processing emissions from bauxite and alumina decreased from 147Mt CO₂e in 2022 to 130Mt CO₂e mostly as a result of reduced emission intensities related to aluminium smelting in China.

Illustrative Scope 3 emissions trajectories (Mt CO₂e)

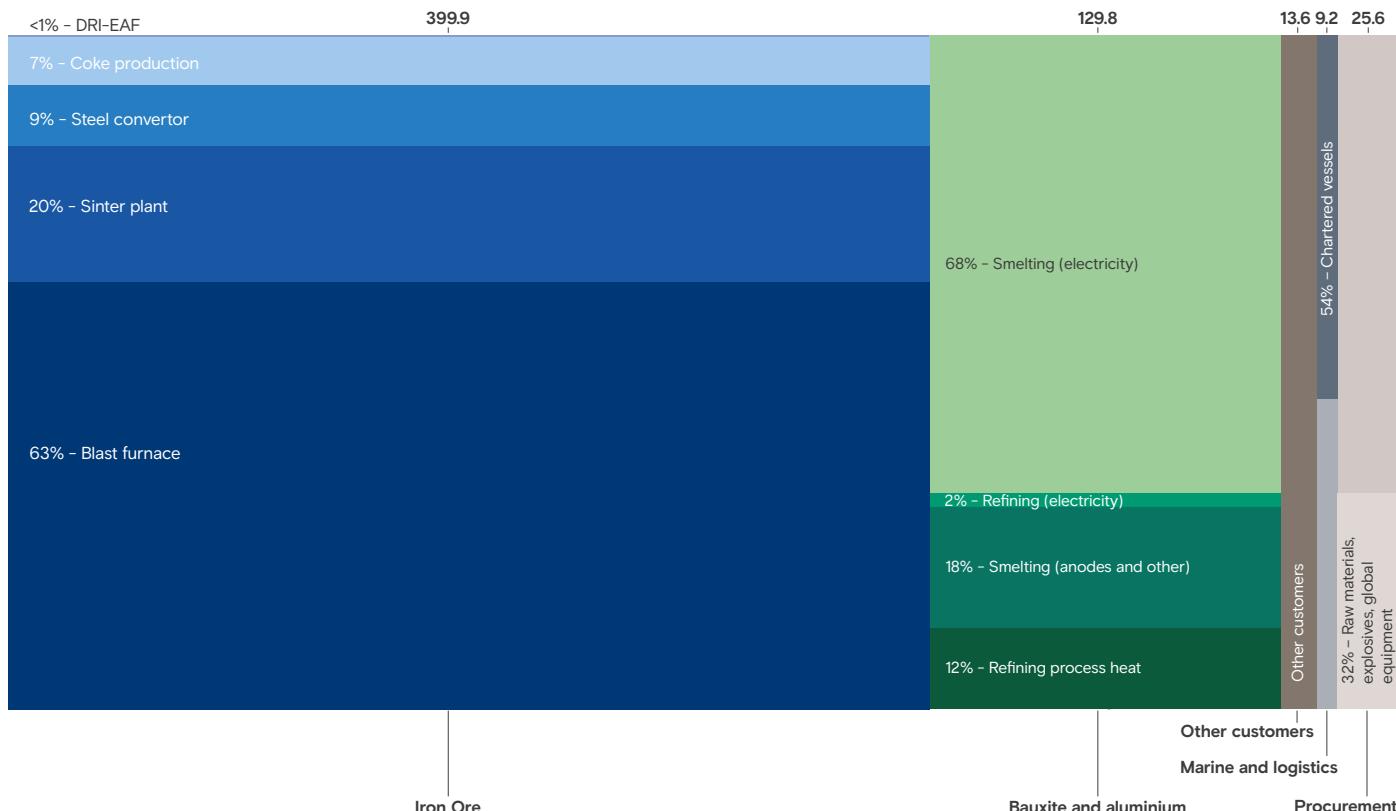


Estimates are based on current product and customer mix. The net zero trajectory for our Scope 3 emissions and the illustrative Scope 3 trajectory represent two potential pathways, and are not definitive forecasts.

2023 Scope 3 emissions

578Mt CO₂e

(2022: 584Mt CO₂e)



What we are doing

In 2023, we defined 4+2 focus areas to address our Scope 3 emissions. These cover our four most significant categories – steel, alumina refining, shipping, and procurement decarbonisation – considering the magnitude of emissions and our ability to drive meaningful incremental impact. In parallel, we are also working on two transversal programs aimed at leveraging our scale to support collective industry and policy action and enhancing emissions transparency across our value chains.

Steel value chain

Steel is one of the most cost-efficient construction materials and is essential in low-carbon infrastructure, transportation and buildings. With close to two billion tonnes of crude steel produced globally in 2023, the industry overall emits over 3 billion tonnes of CO₂ annually, equivalent to around 8% of global carbon emissions.

As the world's largest iron ore producer, we have a key role to play in decarbonising the steel industry. We are partnering with our customers and industry participants to build a portfolio of options spanning the entire value chain, from iron ore processing to steelmaking.

In 2022 we met our original target to engage with nearly all our direct iron ore customers. Since then, we have advanced to collaborating on tangible projects. We are currently working with over 40 partners, across 50 projects, in 10 countries.

Supported by research on our orebodies, our objective is to unlock the most sustainable and economic pathways for our iron ores. We prioritise our project portfolio at key project milestones considering parameters technical and commercial feasibility, and abatement potential, to ensure a disciplined

approach to investing capital and effort. We focus on three pathways:

1. Existing pathways

We are actively working with our customers to help reduce their carbon emissions from the current blast furnace process. We are working with customers on increasing the ratio and usage of iron ore lump as well as pelletising Pilbara ores as a blast furnace feed. New technologies are also looking at ways to recycle and optimise residual slag as well as exploring the usage of carbon capture, utilisation, and storage.

2. Emerging pathways

We leverage our high-grade iron ore from IOC, and eventually Simandou, to help accelerate the proliferation of shaft furnace, direct reduced iron (DRI), which is the only economic low CO₂ ironmaking route available today. We are also working to secure offtakes of low-carbon hot briquetted iron (HBI) as a way of better understanding the emerging low-carbon iron and steel market while lowering our Scope 3 emissions. This pathway will, however, eventually become constrained by the scarce availability of high-grade ores, which represent only 5-10% of the global iron ore supply.

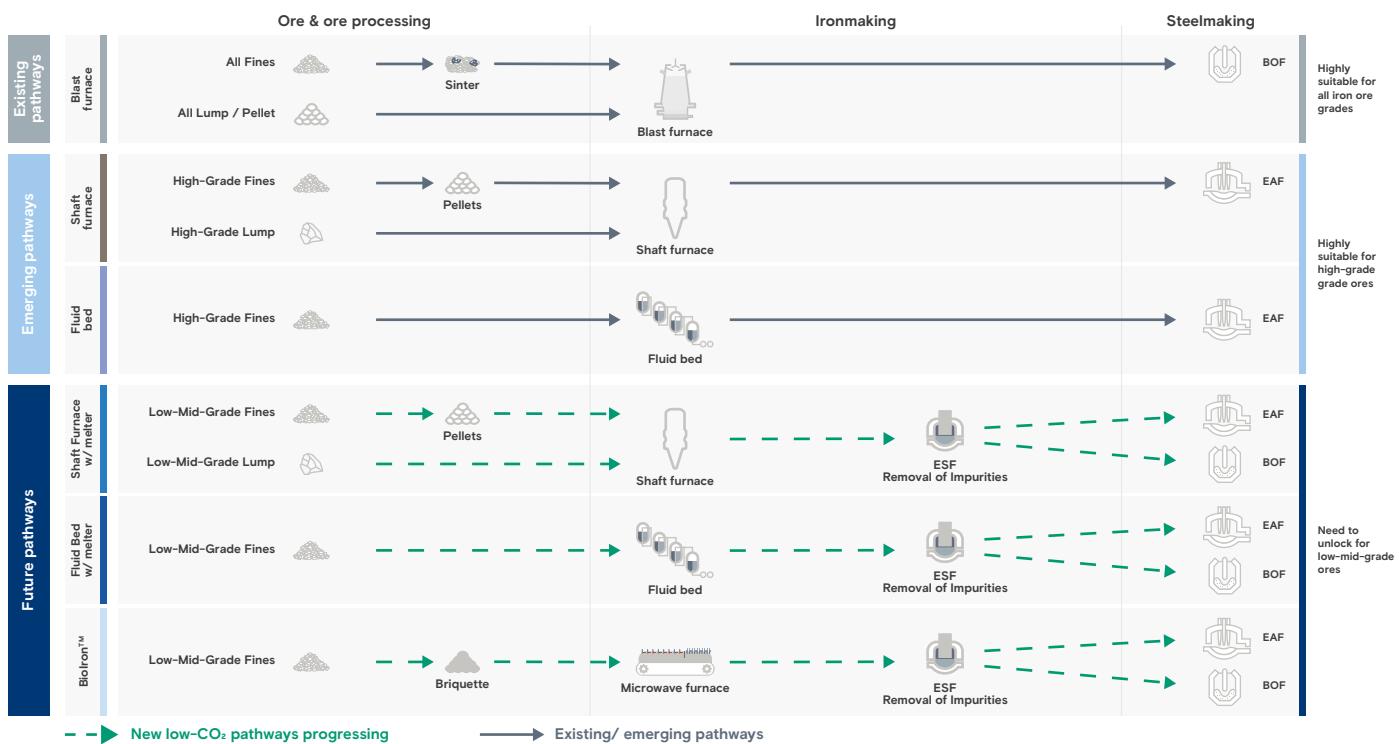
3. Future pathways

The main focus of our research and development is, therefore, on a range of new technologies that unlock competitive low-carbon technologies for low and medium-grade iron ores. We are working to solve the key constraints to this, notably removing impurities found in low-mid-grade iron ores prior to and during iron and steelmaking. We are working on beneficiating our ores as well as partnering with our stakeholders on the development of an electric smelting furnace (ESF). Beneficiation involves the removal of impurities prior to processing while the addition of an ESF enables impurity removal following the ironmaking process and prior to the conversion into steel.

We have also developed an alternative end-to-end proprietary process called Biolron™, which uses biomass instead of coal, along with microwave energy, to convert Pilbara ores into metallic iron. The process was proven effective in 2023 in a small-scale pilot plant in Germany, with the potential to reduce CO₂ emissions by more than 95% when compared to pig iron produced in the blast furnace.

In 2023, we spent \$28 million on steel decarbonisation initiatives, and have set specific action-oriented targets for steel decarbonisation.

Our objective is to unlock the most sustainable and economic pathways for our iron ores



BOF: Basic Oxygen Furnace

DR-EAF: Direct Reduction - Electric Arc Furnace

Detailed progress on key steel decarbonisation projects and objectives for 2024

2023 progress

1. Existing pathways – Blast furnace optimisation

Working with our customers to lower the CO₂ intensity of the blast furnace:
Potential abatement of 20-30% from traditional blast furnace

- Baowu Meishan microwave lump drying pilot plant detailed design plan nearing completion. Potential for a 2% increase in the proportion of lump used within the blast furnace and 32Ktpa carbon emissions reduction at the site.
- Testing increased lump usage in the blast furnace with POSCO and Zenith. Laboratory tests indicate the potential to increase lump usage by at least 3-5% per customer. A 5% increase in lump usage can drive a reduction of approximately 1% in blast furnace emissions per customer, by mitigating the need for pre-processing (eg sintering and pelletising).
- Developing an economically viable carbon capture technology with Shougang that could capture blast furnace gas (which consists of approx. 20-25% CO₂). At scale, this technology could deliver up to 2.5% reduction in CO₂ emissions from the blast furnace, compared to a baseline of 2.26t CO₂/t steel. A small-scale test facility, designed in 2023, is under construction.

2024 objectives

- Complete construction of the Baowu Meishan lump drying plant.
- Continue to work with key steelmakers to progress higher lump usage trials where lab tests are showing positive results.
- Complete small-scale carbon capture test facility construction.
- Complete large-scale pilot facility detailed design and begin construction.

2. Emerging pathways – High-grade DRI

Utilise our high-grade iron ores to accelerate the early proliferation of low CO₂ technologies
Estimated abatement compared with a traditional blast furnace emitting 2.3tonnes CO₂/ tonne steel:

- Natural gas DR shaft + Electric Arc Furnace - 50-65%;
- Hydrogen DR Shaft + Electric Arc Furnace - 70-90%

- Signed a multi-year agreement to supply high-grade direct reduction iron ore pellets from our IOC operations to H₂ Green Steel's integrated low-carbon steel plant in Boden, Sweden.
- Evaluating a portfolio of options in energy-advantaged regions (Canada, the US, Europe, Australia, the Middle East) to accelerate the build-out of natural gas and, eventually, hydrogen shaft furnace solutions.

- Progress a portfolio of options in energy-advantaged regions to secure a lower CO₂ technology for our high-grade iron ores. This will include the completion of engineering studies and the formation of partnerships in key regions.

3. Future pathways

Fundamental research to understand and enhance the suitability of low to mid-grade ores for future low CO₂ technologies

Estimated abatement compared with a traditional blast furnace emitting 2.3tonnes CO₂/ tonne steel:

- Hydrogen DR shaft + Electric Smelting Furnace (ESF) + Basic Oxygen Furnace - 70-90%
- Biolron™ + ESF + Basic Oxygen Furnace - 80 - 95%

- Research to improve our scientific understanding of our ores' properties to enhance their suitability for new low CO₂ technologies and processes.
- In 2023 we developed AI-based techniques to predict ore characteristics such as density and porosity, partnering with the Australian National University (ANU).
- Launched a multi-year research and development program with Future ENergy EXports and the University of Western Australia to research how Pilbara ores react to different gases and under different conditions, to inform performance in low CO₂ technologies (shaft furnace and fluid bed).

- Progress our program with ANU, building a small-scale pilot facility to further study how our ores would behave under different types of hydrogen-based processing.
- Commence lab-scale test work to investigate how our ores behave under different ironmaking conditions.

Pilbara beneficiation (ore upgradeability)

- Evaluating the extent to which impurities can be removed from our Pilbara blend ores economically prior to processing, so these ores can be used effectively in low CO₂ technologies.
- Completed mineral resource and inventory reviews to understand how much of our future reserves are suitable for upgrading.
- Developed conceptual process flows to upgrade suitable ores, and began lab-scale test work to improve our understanding of the amenability of our ores for low CO₂ technologies.

- Complete lab-scale test work and progress small-scale beneficiation trials.
- Complete conceptual study into pilot plant options using an existing plant as a pilot facility.

Biolron™

- Completed a detailed feasibility study, secured a site for the next Continuous Pilot Plant (CPP), and continued test works on the Small Scale Pilot Plant (SSPP) with the University of Nottingham (UoN), to improve our understanding of the process and equipment design.
- Continued to work closely with environmental organisations such as the World Wide Fund for Nature (WWF) to develop credible guidelines for the definition of "sustainable" biomass.

- Commence construction of the CPP¹ which will help demonstrate production at 1 tonne per hour.
- Launch global studies for microwave scale up and for raw biomass supply.

Hydrogen DRI and electric melter

- Progressed research on pelletisation of Pilbara ores for the shaft furnace with research partners (such as COREM) and customers including Nippon Steel and Kobe.
- Completed a concept study with BlueScope and OEMs, providing initial estimates and a conceptual design for the shaft furnace and ESF technology using Pilbara iron ores.
- Agreed with Baowu to collaborate on the development of an ESF, and pelletisation of Pilbara ores.
- Progressed research with Rio Tinto's Bundoora Technical Development Centre (BTDC) to develop a fines-based reduction process (fluid-bed process) using Pilbara ores, achieving encouraging results at batch scale.

- Continue research on pelletisation of Pilbara ores with partners including Baowu, Nippon Steel, Kobe, COREM and BlueScope.
- Progress laboratory testing and work program with BlueScope and BHP including further test works and pre-feasibility study for a Direct Reduction-Electric Smelting Furnace (DR-ESF) pilot plant.
- Progress plan to construct a small-scale ESF at one of Baowu's steel mills in China.
- Conduct a feasibility study to evaluate a pilot scale up for our fines-based reduction process.

1. Subject to funding approval and technical feasibility.

Steel decarbonisation targets:

- Support our customers' ambitions to reduce their carbon emissions from the blast furnace by 20-30% by 2035¹.
- Reduce our Scope 3 emissions from our IOC high-grade ores by 50% by 2035 relative to 2022 levels².
- Commission the Biolron™ CPP by 2026².
- Commission a shaft furnace (DRI) + ESF pilot plant by 2026, in partnership with a steelmaker^{1,3}.
- Finalise study on a beneficiation pilot plant in the Pilbara by 2026.

We estimate that we will spend \$100m on steel decarbonisation in 2024. Approximately one third of this will be capital expenditure on Biolron™ (subject to approvals and technical feasibility), with the remainder being operational expenditure on our other partnerships.

Aluminium value chain

We are the world's largest bauxite producer and a leading producer of low-carbon aluminium. Our efforts to decarbonise our own operations are at the core of our Scope 3 partnerships with our customers – helping them find more efficient, lower emissions ways of processing our bauxite and alumina.

More than 85% of our 130Mt CO₂e Scope 3 emissions in the aluminium value chain comes from the aluminium smelting process – the most electricity and emissions intensive part of the value chain. However, the majority of our product is processed in China using coal-fired refining and smelting processes, where we have little influence over the power source for these electricity grids.

Our short-to-medium-term focus is to help our customers improve the alumina refining process to increase energy efficiency and optimise use of our bauxite⁴.

In 2022, we met our target of engaging with nearly all bauxite customers and have since then advanced engagement with them.

In 2023, we worked with three key customers representing 47% of our bauxite sales, to shortlist potential areas for collaboration. We are now developing action plans to collaborate on priority environmental topics and build on our work on residue management. We also continue to advance and share new research and development in the refining process, and draw on learnings from our own assets.

Beyond electricity, emissions are mostly related to the oxidation of carbon anodes in the aluminium smelting process, and the use of energy for process heat in the alumina refining process. These emissions sources account for approximately 11% and 12% respectively of Scope 3 emissions, related to our bauxite and alumina sales. As we advance ELYSISTM technology at our own assets, we will gain crucial experience to enable better industry-wide outcomes in the future.

Alumina decarbonisation targets:

- In 2024, partner with at least two bauxite customers with the goal of improving energy efficiency and reducing emissions, focusing on:
 - a. Digestion – implement and validate digestion improvement technology
 - b. Organics management – develop approaches to control or remove organic compounds from the refining process.
- In 2024, develop technical options to reduce moisture content in our bauxite, leading to greater energy efficiency in refining, transport and distribution.

Shipping

Our Scope 3 emissions from shipping and logistics are 9.2Mt CO₂e. Of this, 5.1Mt (54%) is generated by our chartered fleet, and around 2.2Mt (24%) comes from shipping our products, where freight has been arranged by the purchaser. The remaining 2.0Mt (22%) comprises other logistics elements such as truck, rail, container movement and spend based emissions. In addition to Scope 3 emissions, there is an additional 0.4Mt of Scope 1 shipping-related emissions attributed to the vessels we own.

In order to reduce emissions from shipping, we focus on:

Energy efficiency: By the end of 2023 we achieved a 37% reduction in emissions intensity relative to 2008 levels (up from 30% by the end of 2022), mostly by:

- a. Incorporating larger vessels such as Newcastlemax vessels which have ~10% lower emission intensity compared with 170–180k deadweight tonnage (DWT), and smaller Capesize vessels.
- b. Design improvements and technical modifications to the hull, propeller design and engine efficiency. As we improve the energy efficiency of our own vessels, we are also prioritising chartering vessels with energy-saving devices installed.
- c. Speed and route optimisation: We deploy sophisticated weather routing software and seek to continually optimise scheduling and reduce unneeded time waiting in port.

We also identified and implemented emission reduction technologies on our owned fleet. In 2024, we plan to trial further technologies, while also exploring opportunities to apply these to our chartered fleet.

Transitional fuels: We are exploring opportunities for biofuels and liquified natural gas (LNG). In 2023, we introduced five LNG dual-fuel Newcastlemax vessels to our portfolio, each capable of delivering up to 15 to 20% CO₂ emissions reductions. A further four will be introduced in 2024. We completed a 12-month biofuel trial on our owned vessels with a 30% blend with very low sulphur fuel oil which could reduce CO₂ emissions by 26%. The trial affirmed the fuel's technical viability for existing vessels, although the economics remain challenging. We continue our work with our partners to develop commercially viable biofuel bunkering solutions as well as recycled fuel deployment.

1. The support will be in the form of direct technical support and co-developing technology solutions.
2. Subject to funding approval and technical feasibility.
3. In 2023, we signed an MOU with China Baowu to explore a range of industry leading projects including a pilot scale melter at one of Baowu's steel mills in China. Additionally, it was announced in early 2024 that Rio Tinto, BHP and BlueScope have partnered to jointly investigate the development of Australia's first ironmaking electric smelting furnace (ESF) pilot plant. If approved, following a pre-feasibility study expected to conclude at year-end, the pilot facility could be commissioned as early as 2027.
4. Mostly via sweetening and improved digestion and renewable energy for heat source via hydrogen calcination and electric boilers in the longer term.

End-state fuels: To achieve our 2030 and 2050 goals, our marine team is focusing on end-state fuels. Although there is no clear, single end-state fuel solution for the shipping industry, low-carbon methanol and low-carbon ammonia are considered the most promising to reach net zero shipping. We are focused on bringing dual fuel, net zero vessels into our portfolio by 2030.

Alongside technological breakthroughs, regulations will support the drive towards net zero shipping. In 2023, the International Maritime Organization (IMO) announced stronger ambitions, including guidance for net zero shipping “by or around 2050”, with interim non-binding emissions reduction targets set for 2030 and 2040, however, it has not set out how these targets will be achieved.

Shipping decarbonisation targets:

- Aim to reach net zero shipping by 2050 across our shipping footprint.
- First Movers Coalition (FMC) pledge of 10% of time-chartered fleet to be running on net zero fuel by 2030¹.
- Extend our current emissions intensity targets. We continue to aim to reduce emissions intensity by 40% by 2025 (five years ahead of IMO targets), while also setting a new target for 50% intensity reduction by 2030².
- Enhance accuracy of emissions reporting. By 2024 we aim to use actual voyage data (eg actual fuel consumption) rather than industry estimates for more than 95% of our cargo shipments³.

Procurement

Upstream Scope 3 emissions from procurement were 25.6Mt CO₂e in 2023, split between purchased fuels, goods and services. The goods and services are further divided between emissions related to operational expenditure purchases (such as caustic, explosives, coke, pitch) of 17.5Mt, and capital expenditure purchases (such as machinery, electrical equipment) of 2.5Mt. Due to the nature of our businesses, many of our purchased inputs are from hard-to-abate sectors, such as caustic, coke, pitch and steel.

We work with more than 20,000 suppliers across complex multi-layered supply chains. We are taking a systematic approach, initially prioritising engagement with 50 of our highest-emitting suppliers representing over 40% of our procurement-related emissions, to focus our efforts, drive supplier accountability for setting and delivering against their decarbonisation targets, and collaborating on improving emissions measurement and abatement.

Short-term pathways to reduce emissions for our highest-emitting suppliers resemble our own efforts, notably converting to renewable energy, decarbonising transport and sourcing low-carbon raw materials, and we are exploring opportunities for knowledge sharing and collaboration.

In 2024 we are also strengthening decarbonisation as a key evaluation criterion for all new sourcing arrangements in high-emission categories such as raw materials, explosives and mining equipment, based on suppliers' GHG performance and disclosure.

Procurement decarbonisation targets:

- Starting in 2024, prioritise engagement with our top 50 suppliers, focused on driving supplier accountability for setting and delivering against their decarbonisation targets, and collaborating on improving emissions measurement and abatement.
- Starting in 2024, decarbonisation will be used as a key criterion in all new sourcing arrangements in our highest-emitting categories (raw materials, explosives and global equipment).

Collective industry action and policy advocacy

We leverage our size and scale to drive collective industry action, share lessons learned and insights, and advocate for informed industry position and policy (including economic incentives). We do this by engaging with entities such as the International Council on Mining and Metals (ICMM), First Movers Coalition, the International Maritime Organization via member states, investor groups, and governments. In 2023, we worked with our peers at ICMM to develop two guidance documents on Scope 3 emissions, the first focused on a common reporting and the second on target-setting. Additionally, in sectors such as shipping, we more specifically support regulatory incentives, carbon pricing and the development of low-carbon bunkering infrastructure. We also actively champion collective action with our customers and experts. In October, we held the Iron Ore Technical Forum in Xi'an, China, where 400 international experts discussed the road to decarbonisation for a particularly hard-to-abate sector.

Transparency and traceability

We maintain a complete and audited inventory of Scope 3 emissions to ensure quality and traceability in our calculations. Each year, we enhance measurement accuracy by integrating more specific data from customers and suppliers. For iron ore processing, where customer data is scarce, we use a technical energy and mass balance approach. In 2022, we enhanced transparency related to our emissions from shipping, launching a reporting platform and partnering with shipowners for actual emissions data on voyage-chartered vessels. The accuracy of our emissions from shipping has subsequently improved, and we aim to extend this accuracy to at least 95% of all managed freight, including owned and chartered vessels, by the end of 2024. In the aluminium value chain, we track product flow from bauxite to aluminium, integrating customer data, our lifecycle assessment inputs, joint venture data and industry intelligence for more accurate emissions tracking.

Our Scope 3 emissions factors and assumptions are detailed in our 2022 *Scope 1, 2 and 3 Emissions Calculation Methodology Report*, available on our website. The Scope 3 methodology this year is largely the same and updates are set out in an *Addendum* to the 2022 report.

1. Subject to the availability of technology, supply, safety standards, and the establishment of reasonable thresholds for price premiums.

2. Relative to IMO's 2008 baseline.

3. Where Rio Tinto manages the freight (excluding free on board shipments).

Capital allocation and investment framework

Our investment framework

Decarbonisation investment is derived from the Group's capital allocation framework and aligned to our 2025 and 2030 Scope 1 and 2 emissions targets. Decarbonisation investment decisions are made under a dedicated evaluation framework which considers the impact of the investment on shareholder value, the impact on an asset's cost base, the level of abatement, the maturity of the technology, the competitiveness of the asset and its policy context, and alternative options on the pathway to net zero. Projects are also assessed against our approach to a just transition, with consideration to the impact on employees, local communities and industry.

The composition of the portfolio of decarbonisation projects is complex. In some cases, such as renewables, projects are already cost competitive compared with traditional fossil fuel processes and are expected to deliver cost savings. In other cases, such as our new renewable diesel contract at Kennecott, opportunities come at an incremental cost. Consideration often needs to be given to higher-cost options that are available today, vs lower-cost options that may be available later. Our investment framework seeks to balance these quantitative and qualitative drivers,

recognising that only focusing on "cash positive" projects will not get us to our 2030 target.

For nearly a quarter of a century, we have included a cost of carbon in our investment decisions. However, legislated carbon penalties are now starting to have a greater influence on our portfolio, such as the expansion of Australia's Safeguard Mechanism. Approximately half our emissions are covered by carbon pricing regulation, principally in Australia and Canada.

Pricing of future carbon penalties remains uncertain, but based on today's policies we expect a long-term return across our portfolio of 3% to 5%. While this is currently below our cost of capital, when modelled under our Competitive Leadership scenario which limits the global temperature outcome to 1.8°C, we see returns increasing to 10% to 13%, indicating that "the business of decarbonisation is good business".

These qualitative and quantitative metrics ensure we make investment decisions that deliver on our targets and improve the economics of our projects under increasing carbon pricing regulation. Overall, we aim for our projects to be value accretive at a modest carbon price.

Progress in 2023

\$425m

Total decarbonisation spend
(2022: \$299m)

\$130m

Capital expenditure and investments
(2022: \$128m)

\$234m

Operational expenditure
(2022: \$138m)

\$61m

RECs and offsets (intangible assets)
(2022: \$33m)

Our 2022 figures have been restated to include decarbonisation spend by the office of Chief Scientist and other investments. Spend on RECs and offsets are treated as capital. See page 162 of our 2023 Annual Report where we have discussed our accounting policies and the classification of climate-related items.

Our decarbonisation project portfolio includes approximately 70 projects and is segmented into five categories based on readiness for execution. This is constantly evolving as new projects are added and project timelines adjusted following further technical and commercial assessment.

Our investment framework has enabled us to explore alternative ways to deliver our decarbonisation portfolio and create new partnership models. We now anticipate that up to 70% of our abatement by 2030 will be delivered by commercial partnerships, with several renewable PPAs and biofuel contracts executed over the past 12 months. While total capital expenditure across the portfolio will be lower, significant capital expenditure is expected across multiple projects including renewables development in the Pilbara and other locations, alumina process heat, and establishment of a biofuel supply chain.

2030 decarbonisation spend guidance

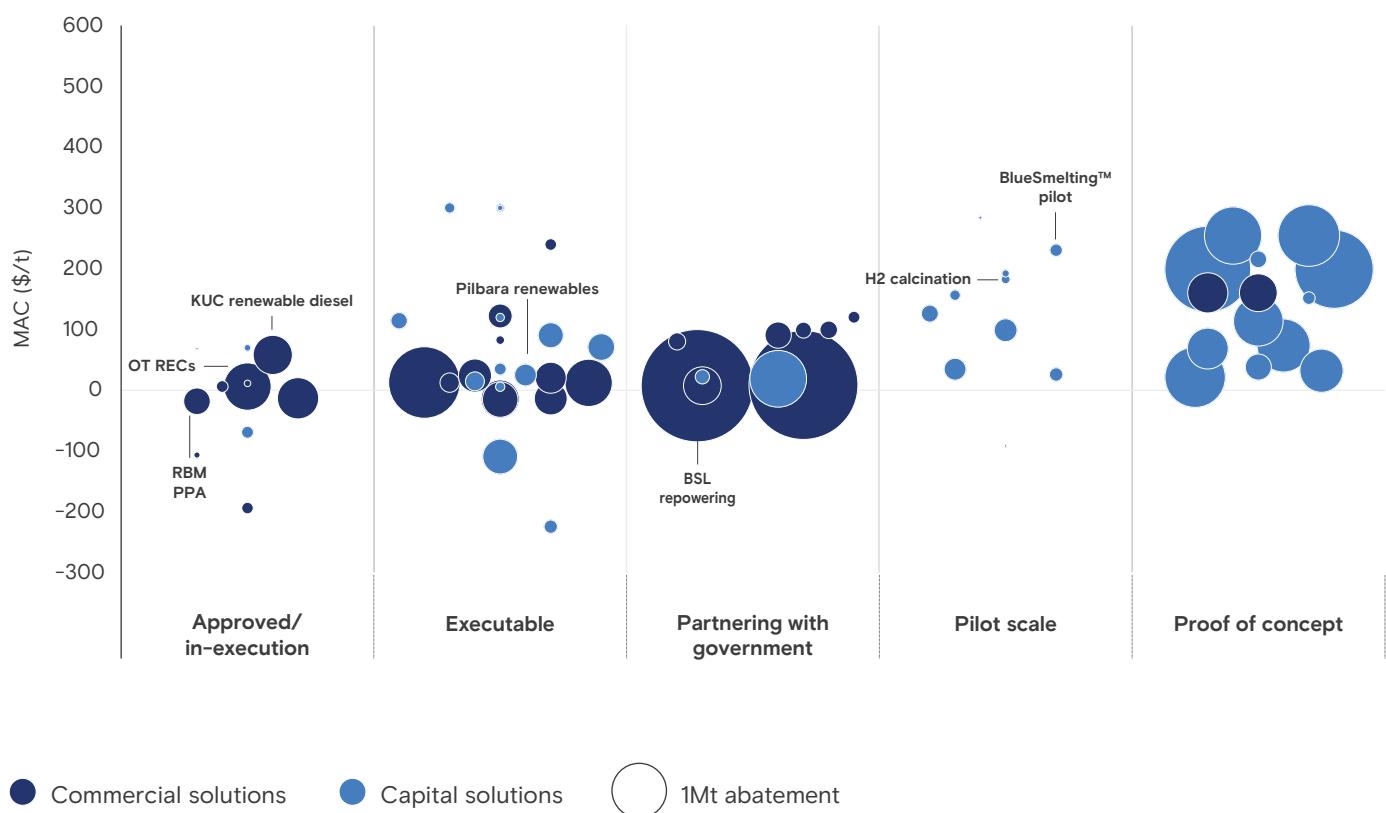
Our target to reduce emissions by 50% by 2030 relative to 2018 levels remains unchanged, however we now believe that achieving this will require less capital investment and more operating expenditure. We originally estimated that approximately 3GW of renewable power would be needed to decarbonise our operations in the Pilbara - 1GW to replace gas-fired power generation and 2GW to decarbonise our diesel-based fleets. Carbon reduction from economically viable, large-scale fleet electrification has always been expected post-2030, however delays in the availability of this technology mean that we now do not expect to invest in the same scale of Pilbara renewables pre-2030. We remain committed to developing 1GW of renewable energy capacity in the Pilbara, however, we now estimate that 600 to 700MW capacity is required by 2030.

To accelerate our emissions abatement, we will take advantage of commercial solutions that can be ready in the market this decade and avoid lengthy project development schedules. Examples of these include the use of renewable diesel in our mining fleets as well as potential PPAs with Traditional Owners in the Pilbara. Therefore, although our 2030 emissions target remains unchanged, we now believe that this can be met with \$5bn-\$6bn of capital investment, down from previous guidance of \$7.5bn. This excludes capitalised RECs, voluntary offsets and compliance offset costs.



Decarbonisation pipeline

(Mt CO₂e equity basis)



What we will do in 2024

Our actual spend on decarbonisation was \$299 million in 2022 and \$425 million in 2023. We estimate our total spend on decarbonisation in 2024 will be approximately \$750 million, including:

- \$250 million in capital expenditure on abatement projects and investments
- \$440 million on operational expenditure
- \$60 million for RECs and offsets (intangible assets).

In addition, we anticipate entering into new energy contracts that are in addition to the above.

We estimate our capital expenditure on decarbonisation will be \$1.5 billion in the period 2024–2026.

We estimate that we will spend \$100m on steel decarbonisation in 2024. Approximately one third of this will be capital expenditure on Biolron™ (subject to approvals and technical feasibility), with the remainder being operational expenditure on our other partnerships.



Climate policy engagement

We support the goals of the Paris Agreement, to pursue efforts to limit the global average temperature increase to 1.5 degrees and do not advocate for policies that undermine this or discount Nationally Determined Contributions.

While business has a vital role in managing the risks and uncertainties of climate change, governments can support the challenge by providing enabling frameworks, which increase momentum towards shared net zero goals. Higher carbon prices and other forms of support are necessary to enable us to address harder-to-abate parts of our portfolio. However, these in isolation or on a standalone country basis, in the absence of a global carbon price, may not support global emissions reductions.

Governments and government-owned providers are key to ensuring the access to internationally competitive, large-scale and reliable renewable energy required to support companies' abatement projects and the broader global energy transition. Without access to firmed renewable power, it is often challenging to justify the significant capital investment required to decarbonise, particularly for energy intensive processing facilities.

Some of the technologies required to decarbonise our operations are at very early stages of development. A range of policy measures are necessary to support early movers to innovate and deploy low-carbon technology in hard-to-abate sectors and provide regulatory certainty to attract investment. Incentives, investment from, and partnership with, governments and others are key to support industrial transitions and competitive low-carbon manufacturing. This funding must be commensurate with the level of capital investment required to transition to net zero.

We know the transition to net zero is both a challenge and an opportunity, and we cannot do it alone. The recent rapid shift in the external context, including increasingly ambitious emissions abatement targets, greater investment through funding for the development of low-carbon technologies and energy systems, and increased disclosure of reporting of climate-related data promoting transparency, supports the shared ambitions required for progress.

Australia

We support Australia's legislated emissions reduction targets. The Safeguard Mechanism reform introduced in July 2023 plays an important role in reducing Australia's emissions by 43% below 2005 levels by 2030, and meeting the commitment to reach net zero by 2050. Rio Tinto supports its role as part of a suite of measures to incentivise genuine industrial abatement.

We have financial interests in 20 facilities covered by the Safeguard Mechanism, including bauxite mines, alumina refineries, aluminium smelters, iron ore mines and rail, marine shipping and ERA uranium mine closure activities. These facilities represent approximately 8% of the emissions covered by this legislation.

We also advocate for a Safeguard Mechanism which considers the financial impact of this policy on lower-margin assets, and balances this with the shared commitment on the transition to net zero and the extended timeframes and investment required for technological breakthroughs.

Broader Australian government activity is focused on establishing the structural and national energy systems to support the pathways to net zero. As a large domestic energy user, we continue to advocate for policies supporting development of new renewable energy generation and storage capacity which provide firmed, competitively priced energy to enable the decarbonisation of our operations.

Canada

Most of our facilities in Canada are covered by carbon pricing regulation. The Government of Quebec and the California Air Resource Board (CARB) are currently assessing possible changes to the operating parameters of their joint cap and trade system. These include the level of the annual allowance caps, the treatment of saved and accumulated allowances, the market control mechanisms, the use of offsets and the treatment of carbon sequestration. We advocate for the continued flexibility of compliance instruments, accessibility to compliance-grade offsets from California and to maintain the current market control mechanisms. We have also engaged with the Government of British Columbia on reforms to the Output-Based Pricing System and their implications for our Kitimat smelter.

United States

The United States has enacted policies which aim to support economic growth, trade opportunities and supply chain security, in a manner consistent with broader decarbonisation ambitions. The Inflation Reduction Act provides financial incentives for projects including fleet decarbonisation, production of renewable fuels and clean energy and manufacturing credits for the production of critical minerals.

In addition to domestic supply and trade policies, the US is in the process of extending existing trade relationships, including with Australia, that support the development of regional clean energy systems and supporting supply chains.

Europe

Recently, the European Union (EU) has implemented the Carbon Border Adjustment Mechanism (CBAM) that applies to imported goods including cement, iron, steel, aluminium and fertilisers, electricity and hydrogen. While currently in a transitional reporting phase, the CBAM will result in costs being payable by importers of carbon intensive goods where no carbon price is levied in the producing country.

We currently export aluminium, iron ore and some minerals to the EU from Canada and Australia. As the reporting requirements are based on products sold (rather than producing facilities) the regulation brings a new level of reporting complexity for our operations worldwide. We are developing the necessary tools to gather the emissions and carbon pricing data needed by importers. We are also engaged with different industry associations on the future expansion of the EU's CBAM, the inclusion of indirect emissions, and the definition of new precursors (such as anodes and alumina).

Industry associations and civil society

Industry associations and civil society organisations play an important role in policy development. In 2023 we engaged with external stakeholders on an enhanced approach to advocacy, to support the decarbonisation of our operations.

The Rio Tinto Board approves our positions on climate change policy and approach to engaging with industry associations and the annual review of their advocacy. Responsibility for comparing our positions with those of individual industry associations is delegated to management on a 'comply or explain' basis.

Where our membership is significant, we work in partnership to ensure the positions of industry associations and our public positions are consistent and aligned with the Paris Agreement. Our annual review of our industry associations' memberships supplements this report and can be found on our website.

Just transition

Our decarbonisation strategy presents an opportunity to work closely with the local communities in which we operate, to explore different partnership models and ensure the low-carbon transition is undertaken in a manner where employees, society and local communities are not left behind.

The low-carbon transition impacts all aspects of our business, and the wider community. It requires significant investment and, in some of our key geographies, increased access to land to enable renewable energy growth. This introduces social impact risks to vulnerable communities, employees and the wider industry, and we continue to build meaningful relationships and partnerships to manage social and human rights risks and implement the opportunities.

While our broader business objectives of impeccable ESG and social licence guide our approach to a just transition, we work to ensure these guiding principles are felt on the ground across our decarbonisation portfolio. Potential risks and opportunities are assessed on a project-by-project basis.

Our progress on our 2023 commitments was largely through our work with local communities and our employees on projects to decarbonise our operations or as part of our approach to closure. Across all areas of our business, we are seeing tangible examples of teams undertaking decarbonisation activities with a just transition at the forefront. This has manifested through government engagement and host community partnerships.

Gladstone community

Our operations in the Gladstone region support 8,000 direct and indirect jobs. We continue to work to ensure the decarbonisation plans for these assets consider the associated impact on our people and the local community.

Diavik closure investment

Our solar plant at Diavik Diamond Mine will generate approximately 4,200MWh of electricity each year and provide up to 25% of Diavik's electricity during closure work until 2029. We worked with the Government of the Northwest Territories and community partners to determine how renewable energy infrastructure can best benefit the region following closure.



What we will do in 2024

- Formalise the process to prioritise an energy transition that gives due consideration to ESG issues.
- Continue our assessment of projects in consultation with stakeholders, to consider different partnership models and decarbonisation solutions reflecting the requirements of industry and local communities.

Community collaboration

In October 2023, we signed a memorandum of understanding (MOU) with Yindjibarndi Energy Corporation to explore opportunities to collaborate on renewable energy projects on Yindjibarndi Country in the Pilbara region of Western Australia. Together, we will study and evaluate a range of opportunities including wind and solar power as well as battery energy storage systems.

This MOU builds on our partnership with the Yindjibarndi Aboriginal Corporation, following the signing of an updated agreement in 2022 to deliver improved social and economic outcomes for the Yindjibarndi People.

The partnership is an example of how we intend to approach projects – creating new partnerships, strengthening existing relationships and providing long-term benefits to local communities. This partnership approach is reflective of our focus on a just transition instead of specific delivery model approach or capital spend commitment. The significant land requirements in the Pilbara for our solar projects, potential impacts to the local flora and fauna and associated heritage surveys are all being studied in consultation with Traditional Owners.

Data tables

Greenhouse Gas Emissions

Scope 1 and 2 greenhouse gas emissions – equity basis (Rio Tinto Share¹).

Performance against target

Equity greenhouse gas emissions (Mt CO ₂ e)	2023	2022	2018
Baseline Scope 1 & 2 emissions ²	32.6	32.7	
Carbon offsets retired	0.0	0.0	
Baseline Net Scope 1 & 2 emissions	32.6	32.7	
2018 emissions target baseline (adjusted for acquisitions & divestments)			34.5

Our 2030 greenhouse gas emissions targets are to reduce our absolute Scope 1 & 2 emissions by 15% by 2025 and 50% by 2030 compared with our 2018 equity baseline. Please see GHG Emissions Methodology sheet for details of our approach to reporting Scope 1, 2 & 3 emissions.

Changes to our 2018 baseline include: Scope 2 update to market-based methodology, the additional equity share of the Oyu Tolgoi mine that was purchased in mid-December 2022, and the additional equity share of MRN purchased in 2024

The baseline value is based on the current equity in each asset, including zero equity in divested assets.

1. Rio Tinto Share (equity basis) represents emissions from our benefit or economic interest in the activities resulting in the emissions

2. Scope 2 emissions in the Baseline are calculated using the market – based method.

Scope 1, 2 and 3 greenhouse gas emissions – equity basis

Equity greenhouse gas emissions (Mt CO ₂ e)	2023	2022	2021	2020	2019
Scope 1 emissions	23.3	22.7	22.9	23.0	23.1
Scope 2: Market-based emissions ³	9.3	9.6	10.1	10.4	9.9
Total Scope 1 & 2 emissions	32.6	32.3	33.0	33.4	33.0
Carbon offsets retired ⁴	0.0	0.0	0.0	0.0	0.0
Total Net Scope 1 & 2 emissions (with offsets retired)	32.6	32.3	33.0	33.4	33.0
Scope 2: Location-based emissions ⁵	7.8	8.2	8.5	8.6	8.1
Scope 3 emissions	578.1	583.9	558.3	576.2	–
Operational emissions intensity (tCO ₂ e/t Cu-eq)(equity) ⁶	6.8	7.0	7.2	7.0	6.8
Direct CO ₂ emissions from biologically sequestered carbon (eg CO ₂ from burning biofuels/biomass) ⁷	0.03	0.0	0.0	0.0	0.0

Queensland Alumina Limited (QAL) is 80% owned by Rio Tinto and 20% owned by Rusal. However, as a result of QAL's activation of a step-in process following the Australian Government's sanction measures, Rio Tinto is currently entitled to utilise 100% of the capacity at QAL, but paying 100% of the costs for as long as that step-in continues. Our 2023 equity emissions and our 2018 baseline include QAL emissions on the basis of Rio Tinto's 80% ownership. In 2023, the additional emissions associated with the step-in were 0.8Mt. Rusal has commenced proceedings challenging the validity of the step-in and the sanctions regime may change over time, such that the duration of the step-in remains uncertain. Historical Scope 1 and 2 emissions have been restated to reflect improvements in data quality.

3. Scope 2: Market-based emissions reported as zero include Escondida, Resolution Copper, Weipa and Kennecott Copper with surrendered Renewable Energy Certificates (RECs) and Oyu Tolgoi I-RECs from Inner Mongolia and nearby provinces. QMM has a wind and solar contract with energy attributes.

4. In 2023 we are not reducing our reported net emissions by using any surrendered carbon units as eligible offsets retired. Our net emissions total does not include 86,000 ACCUs retired for compliance with the Safeguard Mechanism for the period 2021-22. We expect to include ACCUs in our net emissions figure from 2024 onwards.

5. Scope 1 and 2 emissions total – location-based: 31.1Mt CO₂e

6. Historical information for copper equivalent intensity has been restated in line with the 2023 review of commodity pricing to allow comparability over time

7. GHG Protocol Corporate accounting and reporting standard recommends disclosure of CO₂ emissions from biologically sequestered carbon for transparency. These are from biofuel use and are not classified as our Scope 1 emissions.

2023 equity greenhouse gas emissions by product group and decarbonisation program (Mt CO₂e)

	Renewable energy projects	PacOps Repowering	Aluminium Anodes	Alumina Processing	Minerals Processing	Mobile Diesel	Offsets and Nature Based Solutions	2023 Total Emissions (Mt CO ₂ e)
Aluminium	2.5	8.4	6.8	5.8	0.0	0.3	0.3	24.2
Aluminium (Pacific)	0.0	8.4	2.1	0.0	0.0	0.0	0.0	10.5
Aluminium (Atlantic)	2.2	0.0	4.7	0.0	0.0	0.0	0.0	7.0
Bauxite & Alumina	0.3	0.0	0.0	5.8	0.0	0.3	0.3	6.7
Minerals	1.4	0.0	0.0	0.0	2.0	0.3	0.0	3.7
Iron Ore	0.8	0.0	0.0	0.0	0.0	2.3	0.0	3.2
Copper	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
Other	0.1	0.0	0.0	0.0	0.0	0.5	0.0	0.5
Total	4.8	8.4	6.8	5.8	2.0	4.5	0.3	32.6

Note: The sum of the categories may be slightly different to the Rio Tinto total due to rounding.

2023 Scope 2 reporting methodology update

Equity greenhouse gas emissions – Baseline (Mt CO₂e)

Scope 2 emissions as reported in 2022 Sustainability Fact Book and Climate Change Report	2023	2018
Scope 2: Market-based emissions	–	9.3
Scope 2: Location-based emissions	7.8	8.0

Note: 2022 reported number adjusted for update to Oyu Tolgoi equity for comparison purposes and standardised location-based factors as part of the review.

Scope 3 greenhouse gas emissions – equity basis

Total equity Scope 3 greenhouse gas emissions (Mt CO ₂ e)	2023	2022	2021	2020
Scope 3 emissions – Upstream	32.4	32.6	32.3	30.4
Scope 3 emissions – Downstream	545.7	551.3	526.0	545.8
Total	578.1	583.9	558.3	576.2

Sources of Scope 3 equity greenhouse gas emissions (Mt CO₂e)

	2023	2022	2021	2020
Upstream emissions				
1. Purchased goods and services	17.5	18.9	19.5	19.3
2. Capital goods	2.5	2.1	1.9	1.4
3. Fuel and energy related activities	4.7	4.5	4.5	4.5
4. Upstream transportation and distribution	6.8	6.5	5.9	5.1
5. Waste generated in operations	0.1	0.1	0.1	0.0
6. & 7. Business travel and employee commuting	0.8	0.5	0.4	0.1
8. Upstream leased assets	Not applicable ^a	Not applicable	Not applicable	Not applicable
Downstream emissions				
9. Downstream transportation and distribution	2.4	2.3	2.7	3.0
10. Processing of sold products				
- Iron ore	399.9	386.6	364.6	376.4
- Bauxite & alumina	129.8	147.3	144.5	152.0
- Titanium dioxide feedstock	4.9	5.9	4.9	5.8
- Copper concentrate	0.5	0.5	0.5	0.6
- Salt	7.0	7.1	7.2	6.0
- Other	1.2	1.6	1.6	2.0
11. Use of sold products	Not applicable ^a	Not applicable	Not applicable	Not applicable
12. End of life treatment of sold products	Not applicable ^b	Not applicable	Not applicable	Not applicable
13. Downstream leased assets	Not applicable ^b	Not applicable	Not applicable	Not applicable
14. Franchises	Not applicable ^b	Not applicable	Not applicable	Not applicable
15. Investments	Not applicable ^c	Not applicable	Not applicable	Not applicable
Total	578.1	583.9	558.3	576.2

Note: The sum of the categories may be slightly different to the Rio Tinto total due to rounding. Some minor allocations to categories changed in 2023. For details refer to the 2023 Addendum – Scope 1, 2 and 3 Emissions Calculation Methodology

a. Not applicable since Rio Tinto does not produce fossil fuels or manufacture products applicable to this category.

b. Not applicable since Rio Tinto does not lease significant upstream and downstream assets or have franchised operations. In relation to end of life treatment, our products, and end use materials from our products, are predominantly recycled.

c. This category is for reporting emissions from company investments not already reported in Scope 1 and 2. Rio Tinto reports using the equity share approach, so all Scope 1 and 2 emissions from managed and non-managed investments are included in Scope 1 and 2 reporting and Scope 3 emissions within other applicable categories of Scope 3 reporting.

GHG Emissions (indicative) breakdown by Product Group

Product Group	Upstream Scope 3 (Cat 1-3,5-7) Mt CO ₂ e	Marine seaborne transport (Scope 3, Cat 4&9) Mt CO ₂ e	Logistics transport (Scope 3, Cat 4&9) Mt CO ₂ e	Scope 1&2 emissions Mt CO ₂ e	Processing of sold products (Scope 3, Cat 10) Mt CO ₂ e	Total Scope 1, 2 &3 Mt CO ₂ e
Total	26.6	7.2	0.9	32.6	543.3	610.7
Iron ore (includes Pilbara iron ore and Dampier Salt)	6.0	4.8	0.0	3.2	395.0	409.0
Aluminium	13.2	1.9	0.4	24.1	129.8	169.5
Copper	3.0	0.0	0.1	1.0	0.5	4.7
Minerals (includes IOC)	2.7	0.5	0.4	3.7	18.0	25.3
Other (includes shipping and corporate functions)	1.7	0.0	0.0	0.5	0.0	2.3

Data includes some rounding and approximations when apportioning between product groups.

Energy

100% managed basis, location-based method

Total energy use (PJ)	2023	2022	2021	2020	2019
Renewable energy (PJ)	156	146	148	153	156
Non-renewable energy (PJ)	251	248	246	251	252
Total energy (PJ)	406	395	394	404	408

Energy reported on 100% managed basis excludes export to third parties. The renewable energy is calculated based on location-based method in accordance with GRI; however, this does not include energy in the 'renewable energy' category where we have purchased the rights to the energy attributes.

Self generated electricity (percentage)	2023	2022	2021	2020	2019
Hydro	69.7 %	69.9 %	69.6 %	70.6 %	70.7 %
Natural gas	24.5 %	24.5 %	24.4 %	23.1 %	23.1 %
Diesel	4.4 %	4.3 %	4.6 %	5.0 %	5.0 %
Fuel Oil	1.3 %	1.2 %	1.3 %	1.2 %	1.1 %
Other renewables	0.1 %	0.1 %	0.1 %	0.1 %	0.0 %

Note: Due to rounding, the sum may not total 100 per cent.

Equity basis, market-based method

Total energy use (PJ)	2023
Renewable energy purchased (PJ)	14
Renewable energy generated (PJ)	86
Non-renewable or grid energy purchased (PJ)	139
Total energy (PJ)	239

Energy reported on equity basis includes market-based electricity. Wherein, "Renewable energy purchased" consists of energy with zero emission sources due to contracts where we have the rights to the energy attributes (e.g. purchase and surrender of Renewable Energy Certificates (RECs)).

Renewable energy generated includes our equity share of generation of hydro power from Energy Electrique in Quebec, Kemano & Iron Ore of Canada as well as renewable power plants in the Pilbara region, Australia.

Some renewable and non-renewable electricity include above is exported to third parties

Electricity generation & use, equity basis – indicative table

Total electricity generated and used (GWh)	2023
Renewable electricity purchased (with contracted energy attributes)	3,804
Renewable electricity purchased (without contracted energy attributes)	20,270
Renewable electricity generated	23,896
Electricity purchased from other energy sources	14,843
Electricity generated from other energy sources	3,608
Total electricity generated and used (GWh)	66,421

This table provides further transparency over electricity sources, including commercially purchased attributes which enabled us to claim zero emissions. It is a mixture of market and location based methods. The data is on an equity basis and includes electricity generated and sold to third parties.

"Renewable electricity purchased (with contracted energy attributes)" is where we report zero Scope 2 emissions for the equivalent electricity purchased (in MWh). Under these circumstances, the renewable supply may or may not be connected to the site and follows the reporting energy market rules of the country/region.

Rio Tinto has entered into electricity supply contracts for operations with low emission or renewable electricity suppliers, in many cases before market-based reporting and renewable energy certificates existed from these suppliers. The "renewable electricity purchased (without contracted energy attributes)" is indicative of the physical location of sites in relation to large renewable energy suppliers we are contracted to on physical supply including ISAL in Iceland, NZAS in New Zealand, Bell Bay in Tasmania Australia. Under a market-based Scope 2 method these are not treated as zero emission sources and these are grid connected and not classified as direct supply.

Assurance statement (KPMG)



Independent Assurance Report

of KPMG (KPMG Australia) to the Directors of Rio Tinto plc and Rio Tinto Limited

CONCLUSION

Climate Action Plan Progress – Limited assurance

Based on the evidence we have obtained from the procedures performed, we are not aware of any material misstatements in the reporting of Rio Tinto's progress against its Climate Action Plan commitments (CAP Progress) presented in the Rio Tinto Climate Change Report 2023 for the year ended 31 December 2023, which has been prepared by Rio Tinto plc and Rio Tinto Limited (together, Rio Tinto) in accordance with the Reporting Criteria.

Scope 1 and 2 GHG Emissions – Reasonable assurance

In our opinion, in all material respects, Rio Tinto's total Scope 1 and 2 Greenhouse Gas (GHG) emissions (equity basis) of 31.1Mt CO₂e (Location-Based) and 32.6Mt CO₂e (Market-Based) (Scope 1 and 2 GHG Emissions) presented in the Rio Tinto Climate Change Report 2023 for the year ended 31 December 2023, has been prepared by Rio Tinto in accordance with the Reporting Criteria.

Scope 3 GHG Emissions – Limited assurance

Based on the evidence we obtained from the procedures performed, we are not aware of any material misstatements in the Scope 3 GHG emissions (equity basis) of 578.1Mt CO₂e (Scope 3 GHG Emissions) in the Rio Tinto Climate Change Report 2023 for the year ended 31 December 2023, which has been prepared by Rio Tinto in accordance with the Reporting Criteria.

Information Subject to Assurance

The Information Subject to Assurance comprised the following data and information for the year ended 31 December 2023:

- CAP Progress, as disclosed in "Our Climate Action Plan – 2023 progress & 2024 update: Progress in 2023" and the disclosures directly related to each "Progress in 2023" update within the body of the report
- Total Scope 1 and Scope 2 (Location-Based) GHG Emissions (equity basis) 31.1Mt CO₂e
- Total Scope 1 and Scope 2 (Market-Based) GHG Emissions (equity basis) 32.6Mt CO₂e
- Total Scope 3 GHG Emissions (equity basis) 578.1Mt CO₂e

in the Rio Tinto Climate Change Report 2023 available on Rio Tinto's website at <https://www.riotinto.com/en/sustainability/climate-change>.

Reporting Criteria

The Reporting Criteria used as the basis of reporting are:

- For the CAP Progress, the Basis of Preparation as described and presented within the Climate Action Plan and the Rio Tinto Climate Change Report 2023;
- For the Scope 1 and 2 GHG Emissions, the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD)'s GHG Protocol: A Corporate Accounting and Reporting Standard (Revised Edition) (2015), GHG Protocol: *Scope 2 Guidance* and the Basis of Preparation as described and presented within the Scope 1, 2 and 3 Calculation Methodology (2022 Report and 2023 Addendum); and
- For the Scope 3 GHG Emissions, the WRI and WBCSD's GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (2013) and Technical Guidance for Calculating Scope 3 Emissions (version 1.0) and the Basis of Preparation as described and presented within the Scope 1, 2 and 3 Calculation Methodology (2022 Report and 2023 Addendum).

Basis for Conclusion

We conducted our work in accordance with International Standard on Assurance Engagements ISAE 3000 and International Standard on Assurance Engagements ISAE 3410 (Standards). In accordance with the Standards we have:

- Used our professional judgement to plan and perform the engagement to obtain limited assurance that we are not aware of any material misstatements in the CAP Progress in 2023 and the Scope 3 GHG Emissions, whether due to fraud or error;
- Used our professional judgement to assess the risk of material misstatement and plan and perform the engagement to obtain reasonable assurance that the Scope 1 and 2 GHG Emissions are free from material misstatement, whether due to fraud or error;
- Considered relevant internal controls when designing our assurance procedures, however we do not express a conclusion on their effectiveness; and
- Ensured that the engagement team possess the appropriate knowledge, skills and professional competencies.

Summary of Procedures Performed

In gathering evidence for our conclusions, our assurance procedures comprised:

- Enquiries with relevant Rio Tinto personnel to understand and evaluate the design and implementation of the key systems, processes and internal controls to capture, collate, calculate and report the Information Subject to Assurance;
- Assessment of the suitability and application of the Reporting Criteria in respect of the Information Subject to Assurance;
- Corroborative enquiries with relevant management to understand progress against the Climate Action Plan commitments;
- Testing the disclosed information on CAP Progress to source documentation on a sample basis;



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- Analytical procedures over the Scope 1, 2 and 3 GHG Emissions;
- Substantively tested the Scope 1 and 2 GHG Emissions, on a sample basis at corporate and operational level, which included testing a selection of 15 operations being Tom Price, Pilbara Rail Operations, Richards Bay Minerals, Tomago, Oyu Tolgoi, RTM Boron Operations, Kennecott, Queensland Alumina Limited, Gladstone Power Station, RTA Yarwun, Boyne Smelters, Bell Bay Aluminium, RTA Weipa, RTA Alma and RTA Arvida;
- Interviews and walkthroughs with site personnel at each of the 15 operations listed above to assess the key systems, processes and internal controls to capture, collate, calculate and report Scope 1 and 2 GHG Emissions at an operational level, and how this information is reported and captured at corporate level;
- Testing the Scope 3 GHG Emissions to source documentation on a sample basis;
- Testing the mathematical accuracy of a sample of calculations underlying the Scope 1, 2 and 3 GHG Emissions;
- Assessing the appropriateness of a sample of emissions factors applied in calculating the Scope 1, 2 and 3 GHG Emissions;
- Reviewing the Scope 1, 2 and 3 Calculation Methodology (2022 Report and 2023 Addendum) and the Rio Tinto Climate Change Report 2023 in their entirety to ensure they are consistent with our overall knowledge of Rio Tinto and our observation of its operations.

How the Standard Defines Limited Assurance, Reasonable Assurance and Material Misstatement

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for a reasonable assurance engagement. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed.

Reasonable assurance is a high level of assurance, but is not a guarantee that it will always detect a material misstatement when it exists.

Misstatements, including omissions, are considered material if, individually or in the aggregate, they could reasonably be expected to influence relevant decisions of the Directors of Rio Tinto.

Use of this Assurance Report

This report has been prepared for the Directors of Rio Tinto for the purpose of providing assurance conclusions on the Information Subject to Assurance and may not be suitable for another purpose. We disclaim any assumption of responsibility for any reliance on this report, to any person other than the Directors of Rio Tinto, or for any other purpose than that for which it was prepared.

Management's responsibility

Management are responsible for:

- Determining that the Reporting Criteria is appropriate to meet their needs;
- Preparing and presenting the Information Subject to Assurance in accordance with the Reporting Criteria;
- Establishing internal controls that enable the preparation and presentation of the Information Subject to Assurance that is free from material misstatement, whether due to fraud or error;
- Ensuring the Basis of Preparation in accordance with which the Information Subject to Assurance has been determined and compiled is clearly and unambiguously set out in the Rio Tinto Climate Change Report 2023;
- Telling us of any known and/or contentious issues relating to the Information Subject to Assurance; and
- Maintaining integrity of the website.

Our Responsibility

Our responsibility is to perform a limited assurance engagement in relation to the CAP Progress and Scope 3 GHG Emissions and a reasonable assurance engagement in relation to the Total Scope 1 and 2 GHG Emissions for the year ended 31 December 2023, and to issue an assurance report that includes our conclusions.

Our Independence and Quality Management

We have complied with our independence and other relevant ethical requirements of the *Code of Ethics for Professional Accountants (Including Independence Standards)* issued by the Australian Professional and Ethical Standards Board, and complied with the applicable requirements of Australian Standard on Quality Management 1 to design, implement and operate a system of quality management.

KPMG

21 February 2024

Adrian King

Partner
Melbourne, Australia

riotinto.com



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RioTinto

Rio Tinto plc
6 St James's Square
London SW1Y 4AD
United Kingdom

Rio Tinto Limited
Level 43, 120 Collins Street
Melbourne VIC 3000
Australia

