RioTinto

Rio Tinto Aluminium & Lithium

Aluminium - Greenhouse Gas Emissions Reduction Pathway and Plan (2025)

Image: Solar panel array. Gove, Northern Territory, Australia

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Contents

1 Who we are

Rio Tinto Aluminium and Lithium (RTAL) consists of all aluminium and lithium assets within Rio Tinto. Made up of Rio Tinto managed assets and non-managed joint ventures, the aluminium division of RTAL is a global leader in aluminium, with a large-scale, vertically integrated business that includes bauxite mines, alumina refineries, smelters, casthouses, power plants, recycling / processing plants, as well as research and development centres. RTAL lithium assets are world class, with Rio Tinto-managed and non-managed joint ventures conducting mineral extraction and downstream mineral conversion.

Image: RTAL aluminium assets.

1.1 Our commitment to decarbonisation and climate resilience

A critical material – lightweight and highly recyclable – aluminium is found in diverse products ranging from solar panels and transmission lines to jet engines, electric vehicles and smartphones. As a global leader in low-carbon aluminium, we are uniquely positioned to further decarbonise our whole value chain and support the world's transition towards a lower-carbon footprint.

Through our partnerships, we are progressing breakthrough technologies that will reduce the emission intensity of aluminium production in our operations globally, and we will continue working with our customers and suppliers to decarbonise our operations.

Our certification against the Aluminium Stewardship Initiative performance standard demonstrates our commitment to responsible aluminium.

Jérôme Pécresse
Chief Executive Aluminium and Lithium

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2 Purpose

This report outlines the progress and future direction in reducing Scope 1, 2 and 3 greenhouse gas (GHG) emissions of Rio Tinto's managed aluminium assets, with focus on areas with the greatest potential impact.

It draws on information from Rio Tinto's disclosure of decarbonisation targets and roadmap published within the *Rio Tinto Sustainability Fact Book*[1]*, Annual Report*[2] *and the 2025 Climate Action Plan*[3], aiming to support stakeholders - including communities, investors, customers, suppliers, governments, and civil society organisations - in understanding Rio Tinto's aluminium businesses emissions reduction strategy and progress.

Aluminium Stewardship Initiative
The report outlines our managed aluminium assets decarbonisation strategy in line with the Aluminium Stewardship Initiative (ASI) Performance Standard, specifically the ASI endorsed emission reduction pathway methodology[4].

For the purpose of reporting against the ASI Performance Standard, the RTAL emissions reduction pathway includes Rio Tinto managed aluminium smelters and casthouses from both ASI-certified sites and those currently outside of our certification scopes, reinforcing RTAL's commitment to responsible and certified practices as an ASI member[5].

Image: Aerial view of the Chute-à-Caron hydro-electric power station. Saguenay, Quebec, Canada.

[1] Sustainability Factbook – Tabs include '*GHG emissions', 'Energy', and 'GHG emissions methodology'*

[2] Rio Tinto Annual report https://www.riotinto.com/en/invest/reports

[3] 2025 Rio Tinto Climate Action Plan (extract from our 2024 Annual Report) https://www.riotinto.com/en/invest/reports/climate-reporting

[4] ASI Performance Standard Version 3 – Clause 5.3a GHG emissions reduction plan using ASI endorsed methodology

[5] Rio Tinto Aluminium ASI member page - https://aluminium-stewardship.org/about-asi/members/Rio-Tinto-Aluminium-Division

3 Climate strategy

RTAL contributes significantly to Rio Tinto's GHG emissions profile. In 2025, RTAL contributed approximately 77% to Rio Tinto's gross Scope 1 & 2 emissions of 31.5 Mt CO_2e. Additionally, 23% of Rio Tinto's 575.7 Mt CO_2e of Scope 3 emissions in 2025 stemmed from customers processing our bauxite and alumina.

Accordingly, RTAL's emission reduction pathway is intrinsically linked with the *2025 Rio Tinto Climate Action Plan* (*CAP*) and therefore follows the Rio Tinto strategy in relation to decarbonisation and climate resilience. Full details of the *2025 Rio Tinto CAP* were within the *2024 Rio Tinto Annual Report*[2], with update and progress against the *2025 CAP* within the *2025 Annual Report*[2].

The specific focuses for decarbonisation are:

1. Reducing emissions from our own operations
2. Partnering to decarbonise our value chains
3. Enhancing our operations' resilience to changing climate

While no universal standard exists for determining alignment of targets with the Paris Agreement goals, Rio Tinto concluded that the Scope 1 and 2 target for 2030 was aligned with efforts to limit global warming to 1.5°C when set in 2021. At that time, KPMG provided limited assurance over the alignment of this target with efforts to limit warming to 1.5°C. Targets were not set using a sectoral decarbonisation approach as there was no sector-specific methodology at the time. This remains the case today.

3.1 Targets

The below climate emission reduction targets were set for Rio Tinto in 2021 and remain current.

Reducing emissions from our own operations[6]	Partner to decarbonise our value chains
• 50% reduction by 2030 • Net zero by 2050	• Helping our customers and suppliers to achieve their targets earlier and reach net zero by 2050

Many of our customers have set public targets for their Scope 1 and 2 emissions (our Scope 3). Nearly 40% of our bauxite sales are to customers with net zero emissions targets, though only 22% of customers are aiming for net zero by 2050 [7]. Our analysis of our customers' targets and their governments' commitments to reduce their emissions shows a trajectory for those processing emissions to approach net zero or carbon neutrality by around 2060 [8]. We are committed to partnering with customers and suppliers to help them achieve their targets earlier, reaching net zero by 2050.

For the aluminium value chain, a target set for 2025 was "partner with at least 2 bauxite customers with the goal of improving energy efficiency and reducing emissions, focusing on digestion improvement technology; controlling or removing organic compounds from the refining process; and technical options to reduce moisture content in our bauxite."

[6] Target reduction relative to 2018 levels. Targets apply to our Scope 1 and 2 net operational emissions on an equity share basis.

[7] These figures are dependent on our sales mix, so is not comparable year-on-year.

[8] This is driven in large part by China (80% of Scope 3 emissions), which has pledged to be carbon neutral by 2060.

4 Emissions reduction pathways

Pathways to meet Rio Tinto's targets were developed using a risk-based approach. These pathways include immediate actions, longer lead-time projects, and investment in research and development of future technology options.

Rio Tinto's aluminium assets have prioritised progress toward the 2030 target, recognising that significant research and development, as well as the implementation of longer lead-time, high-impact emissions reduction projects will be required.

In 2025, Rio Tinto achieved its strongest year of decarbonisation to date, with gross Scope 1 and 2 emissions reduced by 0.2 Mt CO_2e compared to the previous year, and 14% below 2018 baseline. After applying high-integrity offsets, our net adjusted Scope 1 and 2 emissions are 17% below baseline. The business remains on track to meet its 2030 and 2050 climate targets.

4.1 Scope 1 and 2 emissions reduction pathways

The primary emissions reduction initiatives being investigated, progressed and implemented at Rio Tinto's aluminium sites are highlighted in Table 1, with section 8 of this report outlining references for further information. These align with the Rio Tinto level areas of abatement, which are: renewable electricity; diesel transition; processing of minerals and metals; and nature-based solutions. Some of these initiatives are relevant across other Rio Tinto product groups, particularly the diesel transition.

RTAL is always looking at *Finding Better Ways*™ to operate and make positive impacts on emissions reduction. In addition to the work within the primary Rio Tinto Group initiatives, aluminium sites drive emissions reduction through smaller process improvement projects and operational excellence.

Image: Yarwun Hydrogen generation pilot. Gladstone, Queensland, Australia.

Table 1- GHG emissions reduction pathways initiatives at Rio Tinto managed aluminium sites

Initiative / Measure	Status [9]	Rio Tinto initiative grouping
Repowering Pacific Aluminium Operations		Renewable electricity
- Repowering of the Boyne Island smelter with renewable energy sources	Renewables supply to BSL beyond 2029 is progressing.	
- Long-term power agreement to supply our New Zealand Aluminium Smelters with electricity	Implemented in 2024.	
Other renewable electricity and fuel sources		
- Solar PV at Gove (10MW)	Implemented in 2025.	
- Solar PV at Amrun mine (12MW)	Commissioning expected in 2026.	
- Biofuel generation, using Pongamia trees (Shared amongst product groups)	100,000 plantings completed to date.	Diesel Transition
Aluminium anodes		Processing minerals and metals
- ELYSIS™ Aluminium anode research and development	450 kA industrial-scale cell demonstrated late 2025. 7 new 100 kA cell pilot to be commissioned, with hot metal expected in 2027.	
Alumina processing		
- Yarwun Alumina refinery hydrogen calcination	Industrial trial program to commence in 2026.	
- Use of bio-pellets to replace coal for energy and steam generation	Initial trials successful, request-for-proposals market process progressing.	
- Thermal energy storage (TES) studies for refineries	Pre-feasibility study completed in 2025. Feasibility study to progress in 2026.	
- Vaudreuil electric boilers for generation of process heat	Implementation expected in 2027.	
- Vaudreuil electric calcination of alumina	Preparatory work for industrial-scale demonstration is progressing.	
Nature based solutions		Nature based solutions
- Rio Tinto climate group – sourcing high-integrity criteria for all Rio Tinto carbon credits	Implemented and continues to remain an ongoing focus.	
- Australian Carbon Credits: o Partner for the long term with Indigenous project developers: ▪ Arnhem Land Fire Abatement ▪ Aurukun Savanna Burning Project ▪ Oriners & Sefton Savanna Burning Project		

[9] Implementation timeframes are indicative, based on current goals and plans, and subject to investment decisions. Timeframes may change as there is increasing uncertainty further into the future. Further detail on project progress and milestones available within the *2025 Annual Report* full climate action plan progress pages, 59-72, with an *'Operational decarbonisation project tracker'* on page 63 indicating overall timelines.

4.2 Scope 3 emissions reduction pathway:

We regularly engage with our customers to understand their ESG priorities and requirements and identify and agree on collaboration opportunities aligned with our capabilities. Our short-to medium-term focus is to help our bauxite customers improve the alumina refining process to increase energy efficiency and optimise use of our bauxite.

In 2025, we met our partnership targets and strengthened our partnerships with bauxite customers to drive refining efficiency and reduce emissions. A milestone was the signing of a Memorandum of Understanding with a strategic partner, establishing a platform for regular technical exchanges and collaboration across the aluminium sector. Through this partnership, we aim to optimise bauxite processing and explore decarbonisation technologies and bauxite residue reuse options.

We also supported several customer refineries in the design, construction, and commissioning of processing technologies. This included the delivery of a new low temperature digestion unit at one operation and the advancement of sweetening concept at another site scheduled for commissioning in 2026. In parallel, multiple refineries are transitioning to a co-precipitation technology with our technical support, a step change that improves the product quality and organic management. Together, these initiatives are enabling more efficient processing of our bauxite, lowering energy intensity, and supporting our customers' decarbonisation pathways across the alumina refining process[10].

Table 2 captures initiatives related to reduction of Scope 3 emissions within the aluminium value chain.

Table 2 – Aluminium value chain Scope 3 emissions reduction pathway initiatives

	Initiative / Measure	Status	Recent progress
-	Support customers to improve digestion technology - Digestion sweetening	Ongoing	Supported several customer refineries in the design, construction and commissioning of processing technologies, including delivery of a new low temperature digestion unit at one operation. Advancement of sweetening concept at another site scheduled for early 2026.
-	Support customers in organics management technology	Ongoing	Multiple customer refineries are transitioning to a co-precipitation technology with Rio Tinto support, introducing a step change in organics management.
-	Bauxite moisture reduction	Ceased	The bauxite moisture reduction project was discontinued due to resource and capital constraints.
-	Hydrogen calcination technology (once proven at Yarwun Alumina refinery)	Potential long term opportunities	
-	Electric boilers		
-	Decarbonisation evaluation criteria raw material sourcing	Ongoing	Implemented decarbonisation as evaluation criteria for new sourcing in high-emitting categories.

[10] This is mostly via sweetening and improved digestion. In the longer term, this will be mostly through using renewable energy for the heat source, via hydrogen calcination and electric boilers.

5 Aluminium Stewardship Initiative GHG reduction pathway

The Aluminium Stewardship Initiative (ASI) is a global non-profit standards setting and certification organisation whose vision is to maximise the contribution of aluminium to a sustainable society[11].

Rio Tinto was the first company to achieve certification against the original ASI Standards in 2018 and now has 23 aluminium operations certified against version 3 of the ASI Performance Standard, demonstrating a continued commitment to responsible aluminium[12]. Our ASI Performance Standard certifications span our mines, refineries, smelters, casthouses and supplementary support sites within Australia, Canada, Iceland, and New Zealand.

The ASI Performance Standard defines environmental, social and governance principles and criteria, addressing a broad range of sustainability areas in the aluminium value chain. The ASI Performance Standard includes specific requirements related to GHG emissions in Principle 5.

5.1 Principle 5 – GHG emissions

Principle 5 of the ASI Performance Standard (version 3) sets out the requirements for certification against GHG emissions. It includes 4 clauses:

5.1 Public Disclosure of GHG Emissions and Energy Use[13]
5.2 Aluminium Smelter GHG Emissions Intensity
5.3 GHG Emissions Reduction Plans
5.4 GHG Emissions Management

This report section focuses on the ASI endorsed methodology for GHG Emissions Reduction Plans, as outlined in clause 5.3. In 2022, version 3 of the ASI Performance Standard, strengthened the commitment to driving the aluminium sector towards a 1.5 degree aligned future by calling for certifying ASI Entities (no matter where they sit on the aluminium value chain) to: "*establish a GHG Emissions Reduction Plan and ensure a GHG Emissions Reduction Pathway consistent with a 1.5 degree warming scenario, using an ASI-endorsed method… publicly disclose the latest version of the GHG emissions pathway and emissions reduction plan*" [14].

ASI released its Entity level GHG Pathway Method in February 2024 (version 1)[15], and this was incorporated into the ASI Performance Standard Guidance document, version 3.2.

5.2 ASI GHG Pathway Method

The ASI GHG Pathway Method uses a 1.5 degree sector-wide pathway to 2050, developed by the International Aluminium Institute (IAI) in 2021, and broadly aligned with the International Energy Agency (IEA) Net Zero Emissions (NZE) Scenario.

The ASI GHG Pathway Method follows a Sectoral Decarbonisation Approach (SDA), requiring convergence on a target emissions intensity (or intensities) in 2050 by similarly scoped Entities, with differing baseline emissions.

A GHG Pathway Decision Tree and Calculation Tool have been prepared by ASI to assist Entities to produce Entity-specific emissions reduction slope(s) to 2050 in accordance with the SDA, including Intermediate Target years, against which the Entity will need to demonstrate performance.

[11] For more details about the Aluminium Stewardship Initiative, refer to their website https://aluminium-stewardship.org/

[12] Rio Tinto Aluminium's ASI certifications and detail of ASI membership is available at https://aluminium-stewardship.org/about-asi/members/Rio-Tinto-Aluminium-Division

[13] All disclosures related to Rio Tinto Aluminium energy use and GHG emissions are within the *Rio Tinto Annual Report*, and the *Rio Tinto Sustainability Fact Book*.

[14] For the full clause 5.3 requirements, refer to the ASI performance standard at https://aluminium-stewardship.org/asi-standards/performance-standard

[15] https://aluminium-stewardship.org/asi-standards/asi-entity-ghg-pathways-method-and-calculation-tool

5.3 Application of ASI Calculation Methodology

This section describes Rio Tinto's aluminium assets GHG Reduction Pathway slopes to 2050 according to the ASI GHG Pathway Method.

DISCLAIMER

The ASI calculation tool data is only valid for the purpose of generating a reduction pathway against the ASI methodology. There is significant difference in this methodology to other calculation methodologies in use, due to this, the calculation tool (and its results) is not comparable to any other RTAL GHG reporting or commercial GHG information[16].

A complex vertical structure exists within Rio Tinto's aluminium value chain, with a mixture of wholly owned sites, managed joint ventures and non-managed joint ventures which includes a mixture of ASI certified sites and non-ASI certified sites.

Applying the ASI GHG Pathway Method calculation to our value chain:

- 2023 was selected as the baseline year, as this represents the most comprehensive available dataset across Rio Tinto's aluminium portfolio.
- The portfolio is represented on a production based weighted average emissions intensity which is inclusive of all Rio Tinto managed aluminium smelters, irrespective of whether they are within a Rio Tinto ASI Entity or not. Data from non-managed joint ventures are not included in the weighted average RTAL portfolio[17].
- Although some scrap is remelted within the scope of the calculation, Rio Tinto has confirmed with ASI that the percentage input to total metal is immaterial, therefore we have used the *Primary (100% Electrolytic)* calculation approach according to the ASI pathway decision tree[18].
- Calculation input data is *derived* from cradle to gate Life Cycle Assessment (LCA) dataset for the casting, and limited casthouse upstream. Additionally, the ASI methodology cannot completely accommodate some aspects of our value-chain. As such the ASI methodology is not directly comparable to our whole of process LCA calculations.

[16] Including but not limited to: GHG emissions regulatory reporting, Rio Tinto annual sustainability reporting, life cycle assessments, environmental product disclosures, START labels, and RenewAl.

[17] It is noted that this differs from the Rio Tinto reporting of RTAL's GHG emissions and energy use, which uses equity basis within reporting.

[18] The ASI Methodology Decision Tree is available on the ASI website:
https://aluminium-stewardship.org/asi-standards/asi-entity-ghg-pathways-method-and-calculation-tool

5.4 ASI GHG Pathway 2023 Baseline Slopes

Figure 1 shows the entity slope for Rio Tinto aluminium assets against the industry sectoral pathway, according to the ASI method.

Within the multiple assets included in the slope, there is a single smelter currently supplied by a coal powered electricity grid. This asset increases the overall emissions intensity materially compared to Rio Tinto's low emitting renewable powered aluminium smelters.

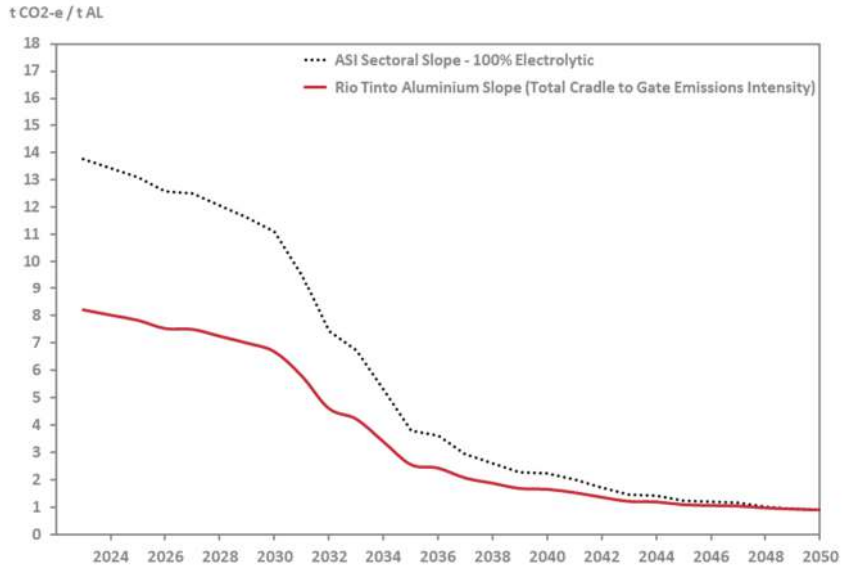

Figure 1 – Rio Tinto aluminium ASI method pathway

6 Progress

Progress on significant decarbonisation projects at RTAL aluminium assets is described within the *Rio Tinto CAP* update within the *2025 Rio Tinto Annual Report*. Section 8 within this report highlights the specific references, as such, information is not duplicated within this section.

6.1 Progress against the ASI GHG Method Pathway

Progress using the ASI tool is calculated annually using the methodology defined in Section 6.2.

Progress as of the end of 2024 is observed in Figure 2. The portfolio of Rio Tinto aluminium assets is progressing marginally above the ASI proposed pathway for the entity, however remains greatly below the proposed sectoral slope and in line with our decarbonisation strategy aligned to our targets.

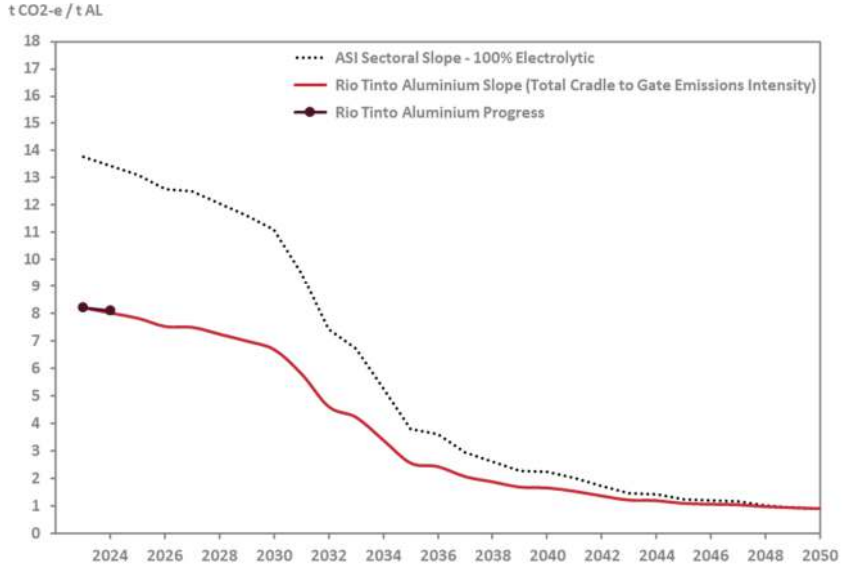

Figure 2 - Progress against entity pathway - 2024

6.2 ASI Pathway Method Progress - Calculation Methodology

The cradle to gate LCA dataset utilised, which the ASI calculation is derived from (5.3), is updated on a 5 yearly basis[19]. The methodology (at high level) to perform a progress estimate on annual basis is described below.

- An in-house calculator has been developed specifically for producing ASI calculation progress updates.
- Annual updates are limited to sub-processes identified as LCA hotspots at the electrolysis and casting stages, for which high-quality data is available on an annual basis.
- Sub-processes not identified as hotspots (bauxite, alumina, anode production, and all other electrolysis and casting) remain fixed and are based on the results of the most recent complete LCA. These fixed sub-processes account for less than 3% of the results respectively at electrolysis and casting stage.

Image: Shipshaw Chute-à-Caron hydro-electric power station. Saguenay, Quebec, Canada.

[19] Full LCA datasets are completed every 5 years through a rigorous and structured process. It is not feasible to be complete in full on an annual basis.

7 Definitions & acronyms

Term	Meaning
Aluminium Stewardship Initiative (ASI)	A global non-profit standards setting and certification organisation whose vision is to maximise the contribution of aluminium to a sustainable society. (https://aluminium-stewardship.org/)
ASI GHG Pathway Method	The ASI's endorsed reduction pathway methodology designed to allow Entities to articulate aluminium intensity reduction slopes. (https://aluminium-stewardship.org/asi-standards/asi-entity-ghg-pathways-method-and-calculation-tool)
ASI Performance Standard	Defined environmental, social and governance principles and criteria, which address a broad range of sustainability issues in the Aluminium value chain. Entities are able to be certified against this standard. (https://aluminium-stewardship.org/asi-standards/performance-standard)
CAP	Rio Tinto's Climate Action Plan (https://www.riotinto.com/en/invest/reports/climate-reporting)
CO_2e	Carbon dioxide equivalent
t CO_2e/ t Al	Emissions intensity unit for tonnes of carbon dioxide equivalent produced per tonne of cold metal aluminium production.
ESG	Environment, social and governance
GHG	Greenhouse gas
RTAL	Rio Tinto Aluminium and Lithium - the aluminium and lithium product group within Rio Tinto.
Scope 1 emissions	Direct emissions from sources that a company owns or controls (e.g. Burning fuel in company-owned vehicles or boilers, or fugitive emissions from refrigerant leaks).
Scope 2 emissions	Indirect emissions from the generation of purchased energy (e.g. emissions from the electricity used to power the company's offices, data centres, or manufacturing facilities).
Scope 3 emissions	All other indirect emissions that are a consequence of a company's activities but occur from sources not owned or controlled by the company (e.g. transportation of goods, business travel, waste disposal, and the use of sold products).
Sectoral Decarbonisation Approach (SDA)	The Sectoral Decarbonisation Approach (SDA) is a methodology developed by the Science Based Targets initiative (SBTi) that allows companies in carbon-intensive sectors to set greenhouse gas emissions reduction targets aligned with climate science. It does this by creating sector-specific pathways that account for the different decarbonization rates of various industries.
International Aluminium Institute (IAI)	The IAI is the global body for the aluminium industry. Collecting data and promoting understanding of aluminium production, consumption, and its use in sustainable applications and recycling.
International Energy Agency (IEA)	The International Energy Agency works with countries around the world to shape energy policies for a secure and sustainable future.

8 Project references

Project	Progress update reference
Repowering Pacific Aluminium Operations	
Repowering of the Boyne Island smelter with renewable energy sources	2025 Rio Tinto Annual Report, specifically: • "Our Roadmap to 2030 - Repowering Pacific Aluminium Operations" (p.56) • "2025 Climate Action Plan update - BSL repowering" (p.59) • "Progress and actions - Repowering Pacific Aluminium Operations" (p.61)
Long-term power agreement to supply our New Zealand Aluminium Smelters with electricity	Towards a Sustainable Transition – 2024 Decarbonisation Progress Update (p.29)
Other renewable electricity and fuel sources	
Solar PV at Gove (10MW)	2025 Rio Tinto Annual Report, specifically: • "2025 Climate Action Plan update - Other renewable electricity developments" (p. 62)
Solar PV at Amrun mine (12MW)	
Biofuel generation, using Pongamia trees (Shared amongst product groups)	2025 Rio Tinto Annual Report, specifically: • "2025 Climate Action Plan update - Self-generated renewable diesel" (p. 61) • "2025 Climate Action Plan update – Diesel transition" (p.62)
Aluminium anodes	
ELYSIS™ Aluminium anode research and development	2025 Rio Tinto Annual Report, specifically: • "Our roadmap to 2050" (p. 57) • "2025 Climate Action Plan update - Anodes: ELYSIS™" (p.60) • "2025 Climate Action Plan update - Processing minerals and metals" (p.62)
Alumina processing	
Yarwun Alumina refinery hydrogen calcination	2025 Rio Tinto Annual Report, specifically: • "Our roadmap to 2050" (p. 57) • "2025 Climate Action Plan update – Yarwun hydrogen calcination" (p.60) • "2025 Climate Action Plan update – Alumina processing" (p.62)
Use of bio-pellets to replace coal for energy and steam generation	2025 Rio Tinto Annual Report, specifically: • "2025 Climate Action Plan update – Yarwun" (p.60)
Vaudreuil electric boilers	2025 Rio Tinto Annual Report, specifically: • "2025 Climate Action Plan update – Alumina processing" (p.62)
Vaudreuil electric calcination of alumina	Details and updates on the progress of this project are available in the 2025 Rio Tinto Annual Report, specifically: "2025 Climate Action Plan update – Alumina processing" (p.62)
Nature based solutions	
Rio Tinto climate group – sourcing high-integrity criteria for all Rio Tinto carbon credits	2025 Rio Tinto Annual Report, specifically: • "Nature Based Solutions" (p.52)
Australian Carbon Credits: Partner for the long term with Indigenous project developers	

Note: a visualisation of the Rio Tinto decarbonisation tracker is available within the 2025 Rio Tinto Annual Report (p.63) with key activities and milestones indicated from 2021 through to 2030.