Rio Tinto

# Decarbonisation Update

Thursday, 5 December 2024

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Jonathan McCarthy

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## Introduction

**Jonathan Grant:** Okay. Hello, everybody, and welcome to Rio Tinto's Decarbonisation Update. I am Jonathan Grant, the Chief Advisor on Climate Change, and I have spoken to many of you in the past few months about our overall climate action plan. Today, we are just focusing in on our operational Scope 1 and 2 emissions and our investments in low-carbon technology. Jonathan McCarthy, our Chief Decarbonisation Officer, and the team here will give a presentation for about 45 minutes, and then we will have a time for about 45 minutes of Q&A after that.

As usual. I have got a couple of housekeeping items for those of you in the room. First, please, could you put your mobile phones on silent? And secondly, the fire alarm will be tested at 10.00 after this event, but if it goes off before that, please use the fire escape, the fire doors at the top of the stairs up here.

## Cautionary statements

And finally, please, could you all take note of our cautionary statement?

Jonathan, over to you.

## Introduction

**Jonathan McCarthy:** Thanks, Jonathan.

Welcome and thank you for joining us both here and online today. I wanted to start by paying my respects and acknowledging the traditional owners and the First Nations people that host our projects and operations around the world. I am Jonathan McCarthy, I am Rio Tinto's Chief Decarbonisation Officer. I first worked at Rio Tinto 18 years ago in what was then our Energy division. However, Energy has changed a lot since then. I now lead the Global Energy and Climate team that we formed in 2023, and this team is charged with tackling the ambitious targets that we set towards 2030 and a net-zero 2050.

## Today's programme

With me today are members from this global team, Ben, Kate and Stefan. I wanted to share a bit about what this team means for Rio Tinto.

Having a global energy and climate team is just so critical to what we have been able to achieve in the last few years. We have been able to draw new talent from renewable developers, from technology firms and other companies across the world, which has elevated the skills that we need to navigate in this era. Frankly, bringing in so much external talent has also helped us to challenge the speed at which we operate, our willingness to fail. And to be fair, it has been a blunt reminder of our need to partner and the fact that Rio does not have all of the answers.

The team is set up in specialist groups that tackle each of our emissions categories, and these groups drive the portfolio globally, working with our assets to put new projects into the ground. This has been amazing for our learning rate. It takes what we can see in certain areas, smart contracting strategies in the US power market, straight to Australia or South Africa, where we can replicate that quickly.

We are one global, connected team, and that has made a difference in the speed at which we operate. In fact, there is a printed copy for those in the room of our Decarbonisation project update, and this document is also available online. And you will see in there a map of our global projects. And when I started this job a few years ago, there were just two dots on that map and quite frankly, it looked pretty thin, and it reminded us of the task ahead in order to meet what we had set out to do. However, I was asked recently, as we went to publish that update, which projects I would like to take off the map because it was getting a bit crowded. And I think that has a small but symbolic win for how far we have come in recent years.

I would also like to thank you all for being here and online. We have really strengthened our approach by having the discussion and the conversation with this community. This is moving fast. There is a lot to uncover and our investor and analyst community has helped us to think about what matters and how to tackle this challenge

Today, I trust you will leave with the same confidence that I have in our 2030 targets and our plan to net-zero. The team and I will share a plan that is thoughtful, under control and well underway, a genuine business approach to decarbonisation and a seriousness in making sure that our communities come along this transition with us.

**A new era in decarbonisation commitments**

You can see here that we are now getting on with the job. We have had an increasing number of commitments year-on-year, and if you add these, they total to 5.8 million tonnes of abatement in the past few years. That is a significant commitment for Rio Tinto, but it is also significant at an industry scale. To give you an equivalence, that is the same as taking 1.3 million cars off the road. They are big projects and there is a lot of them, but it has fair to say it has not been a straight line.

Many of you will probably recall that by 2030, we had hoped to have 1 GW of renewables in the Pilbara. We had anticipated that we would have our first electric fleets running and that some of our low-carbon processing would have made it through technology and into proliferation. Each of those three things has struggled to come online by 2030. However, this has not stopped us. In fact, it has not even slowed us down. We found new projects and new partnerships to continue to take action. Let me share a video with you that showcases some of what has gone on around the globe.

**Roadmap to net-zero**

**Jonathan McCarthy:** We have shared this pathway towards 2030 and 2050 previously in our reports and our presentations in the last few years. However, today I wanted to take you inside the planning and considerations that we have in place to get there. I will talk to our repowering efforts with renewable energy, before handing to Ben and then Kate to talk about

the diesel transition, and then the complex road to 2050 in our processing assets. Stefan will close today's discussion talking about the value considerations in the portfolio.

**Rio Tinto is a significant user of energy**

Our starting point today is energy and at Rio Tinto, we use a lot. The majority of our energy is consumed as electricity, but we also directly consume diesel, gas and carbon fuels and reductants in our processing.

To reach net-zero, we have to do two things. Firstly, we have to repower to renewable energy, and it has to be competitive. And secondly, we have to change how we directly use those fossil fuels in our business. And more often than not, this will mean electrifying those processes, which means even more renewable energy in the future.

However, we are fortunate to be starting from a strong base. We have 71% of our existing electrical load of nearly 8 GW already renewable. This includes approximately 4 GW of directly owned and operated hydroelectricity that underpins our world-class Canadian aluminium business.

With this strategy that we are now undertaking, we are going to take that leadership position even further. Our renewables programme this decade is putting us on track right now to have greater than 90% renewable energy by 2030.

**Increasing our share of competitive, high-quality renewable electricity**

I also wanted to share a bit about the quality of how you get renewable energy. In this role, I find myself in a lot of forums where there is a discussion about going renewable, but there is little care taken to how companies are actually getting there.

At Rio Tinto, we are really prioritising solutions that focus on either securing owned and operated renewables or directly contracted and long-term renewables that underpin our business.

In the last two years, we have either built or secured new contracts in South Africa and Madagascar, the US, Canada, up in Cape York, in the Pilbara and of course in Queensland. We will push to reach beyond the 90% renewable by 2030 and even the 95% by 2040. However, this will take some breakthroughs in low-carbon storage or firming for us to get there. We still see, based today, a role for fossil fuel firming on our largest off-grid energy systems.

As a team, we really push to take this quality lens to our repowering. We do not simply want to reduce the carbon footprint of the energy we use. We also need to use this transition to lock in a competitive energy base for our business.

**Significant progress to repower Boyne smelter**

Of course, our largest non-renewable electricity source is at our Pacific smelters. Transitioning these back to competitiveness and to a lower-carbon footprint has been a core component of the 2030 strategy.

To deliver on this, we have made great strides at the Boyne smelter in Queensland. We secured Australia's largest PPAs, and we have a landmark agreement with the Queensland government that will support this industry through to 2040. However, this new approach

does require major new energy assets, and we have agreed with all of those stakeholders that this plan only works if Boyne smelter returns to a globally competitive position.

Therefore, we are working with governments to get the right national policies in place so that we can secure the remaining renewables to make this plan finally come to life. And we anticipate that these commitments will be in place next year.

**Flexible smelting and energy management can unlock value in a transitioning grid**

This is an incredible position to be in. I am sure many of you have followed the challenges at Pacific Aluminium over the years. I certainly remember five years ago I was asked to look at this, and I must admit there was no clear solution as to what we would do. However, the falling cost of renewables, the really steep fall in battery prices we are getting now in the grid, combined with our willingness to change how we use energy and how we flex the smelter, has unlocked this pathway for a successful future for that smelter.

I wanted to share a little bit of insight into how that blueprint works at Rio Tinto. We think it is good for us, but we also think it is good for the grid around us. By contracting a significant renewable and storage portfolio, we will produce energy beyond our needs. And that portfolio will have the capacity to recharge the batteries and sell excess energy into the grid at different points in the day.

To further enhance this approach, we can modulate the smelter in periods of high prices, further releasing energy into the grid when it is needed most. This strategy does not make us an energy company. In fact, it harnesses the very one defining capability we have that other market participants in the region do not. We can effectively freeze the low-cost renewable at different points in the day for export as low-carbon aluminium. I think A lot of you will agree that there has been many national transition plans that rely on being able to export advantaged renewable electricity, either as green hydrogen or value chains. However, with this blueprint, we now have the skills, the assets and the energy strategy to export this green energy as low-carbon aluminium.

**Partnering to deliver Pilbara renewables**

I also wanted to take today to share a bit of an update on our renewable pathway in the Pilbara.

Solar and wind are land-intensive, and it therefore takes time for cultural clearing. And I think some of you will have noticed yesterday that Simon Trott described these challenges similarly for our mine replenishment programme in that region. However, we have taken this challenge to our schedule to make the plan better, not just for Rio Tinto, but also for our partners in the region.

Across the Pilbara, right now, we have over 2.5 GW of under development or under advanced study wind and solar projects in the region. First, they come online to displace the gas that we use in the electricity grid, before they set the backbone for the electric fleets that we can run in the future. All of those projects will connect to our almost 1,000 kilometres of transmission lines that we own in the Pilbara. This is a unique and incredible advantage for us, so that we can locate the renewables in the right spot for the environment and for our traditional owner partners.

Having that grid has enabled us to progress the development of an 80 MW solar farm with the Ngarluma Group near Karratha. And we are also finalising right now an agreement to secure energy from a 75 MW solar farm being developed by the Yindjibarndi Energy Corporation, where Rio Tinto is acting as the customer, not the owner. I know that the CEO of that group is online with us today, and we are really proud of the partnership that we are forming with that team. That breakthrough agreement acts as a catalyst for their strategy to become one of the major energy producers in the Pilbara in the next era. And that has an ambition that we are really happy to support with this commitment.

**Taking action for a competitive transition**

The insights that I have shared from the Pilbara and from Queensland highlight what this transition can do for our business and our regions. And we are seeing the same positive impacts all across the portfolio in South Africa, on our off-grid sites in Northern Canada and the US. Our plans are not designed just to meet the targets for 2030 and 2050. They are intended to reduce cost volatility for our operations. They improve the underlying economics of our businesses, and they are strengthening the regions and communities where we operate to have a successful transition.

Just like everything in the last few years, not everything will go to plan, but our recent history tells me that we will have just as many projects outperform as we have slips. Ben and the team have an incredible portfolio of options emerging, and I am excited to see what the coming years bring for this portfolio. I am confident that we will be surprised and impressed by what Ben and the team can achieve. Thanks.

## Diesel Transition

Ben Woffenden

*General Manager, Global Equipment & Diesel Transition, Rio Tinto*

**Introduction**

Thanks, Jonathan. That is quite the setup.

By way of introduction, my name is Ben Woffenden and my role as the General Manager of Global Equipment and the diesel transition. So in that role I am responsible for Rio Tinto's pathway to reduce our diesel-based emissions, as Jonothon has alluded to. And I also have responsibility for the supplier relationships and contracts with our major equipment providers across both the fixed and mobile equipment categories.

**Displacing diesel through electrification and renewable diesel**

I wanted to start by setting some context for this work.

Diesel-based emissions represent about 14% of our global emissions. And within that, as it shows in the chart, about 45% is haulage, which is effectively our large mining trucks. This sets the background for the fundamental focus areas for our diesel transition strategy. And it is important to recognise that this haulage component will, in fact, grow over time as our haulage distances increase and our mining grades decrease. Very much like the rest of the industry. Rio is not unique in that sense.

Our strategy to deliver this is focused in two areas. The first is electrification, and this is our primary and target end state. Fundamentally, the benefit of electricity is that it has more efficiency benefits than internal combustion engines. You need less energy input to deliver the same amount of energy to the wheels of a haul truck. And that presents us with a whole lot of opportunities that I will talk to in a moment. And hence, it has our target end state.

The second part of the strategy is around renewable diesel. Now, renewable diesel has a number of advantages, including that it has a drop-in fuel, you do not need to change or modify the engine. So it is easy to implement, and available in a lot of our jurisdictions today. And there is a lot of uncertainty around that, which I will talk to in a moment.

This two-pronged strategy enables us to ensure that we can deliver the full range of options to tackle diesel-based emissions. Now, I should note that there are other sources of energy that we maintain a watching brief on, including hydrogen and ammonia and hybrid engines. However, the focus is on these two areas. We do believe that the combination of those two can enable us to not only deliver the decarbonisation targets associated with diesel emissions, but to in fact deliver shareholder value over the longer term as well, which I will speak to in a moment.

**Trialling multiple technologies to secure viable fleet pathways**

We have a very clear and structured approach to deliver the solutions required to underpin this strategy, and there is a number of elements of this shown on the slide. As Mark Davies alluded to in his short decarb briefing yesterday, the key here is options – and we have a number.

Let me talk to some of these, the first of which is our battery-electric haul truck programme. Now, this has been widely publicised to date, so I will not spend a lot of time on the specifics. However, there is one element of this that I did want to emphasise and that really relates to the way that we are going about it. This is a programme that we are now doing in collaboration with BHP, Komatsu and Caterpillar, we are taking a different approach to collaboration that the industry is thinking about doing this together is really important to us.

Bringing together large miners and large equipment manufacturers with separate pilots, for obvious reasons, is a new way of working. And we see this new way of working as being fundamental to how we deliver rapidly against these targets.

The second part that I wanted to touch on here is the programme we have got with China's state power investment corporation, SPIC, with the trial that we have announced recently at Oyu Tolgoi. This is a really, really exciting programme. I visited an operation in China earlier in the year to witness this technology in operation in a mine, and I am really proud of what we have been able to achieve in partnership with SPIC.

In less than a year, we will have moved from an exploratory site visit to having this equipment operating on one of our facilities. That is phenomenal for us, and I am really pleased with the work we have been able to do. Not only does it give us speed, it also enables us to access into the rapidly evolving and highly innovative technologies that the China ecosystem provides, particularly around batteries and battery systems.

We are also looking at renewable diesel, and I think the commercial solutions that we have developed and implemented have been discussed at length. However, I did want to just

emphasise the pilot investment that we have made in Northern Queensland, where we will be growing Pongamia as a feed source for renewable diesel.

We see this as a really important part of stimulating the renewable diesel industry in Australia in particular, and it has a critical part of our broader strategy, as I outlined earlier.

**Taking learnings from our major fleet transformations**

We also have to think very seriously about how we are going to transition these fleets. The important thing I want to emphasise here is that this technology is not yet at the maturity levels that we require. It has simply not ready for deployment.

What we need for it to be ready for deployment is safe, reliable and productive systems. A full ecosystem that incorporates element such as battery charging, energy management, fleet management system, where I am sending the trucks to so that they can continue the mining work, charging infrastructure, and all of that needs to connect with our autonomous haulage systems.

We are seeing good progress on these fundamental technology building blocks, but we are not there yet. The key part of this message, though, is that we have a track record of delivering major technology change, particularly in our large Pilbara operations. We have done this before. We know what it takes and to be frank, we know how hard it is. This is not easy to do.

For example, we rolled out our autonomous haulage system over a period of 13 years or longer, depending on when you mark the start date. And amongst other things, what this has highlighted to us is the importance of a systematic and sequential process that incorporates learnings around safety and productivity, in particular. It is this experience that we are going to be leveraging to ensure that we can successfully, and at the right speed, deploy this battery-electric haulage technology.

**Solving electrification and self-development of renewable diesel can deliver value**

Now, let us talk about economics because this is important. There is potentially long-term value in the transition to electrification, as I alluded to before, and that is driven by the fundamentals of the energy dynamics, but also the fact that the input cost of energy associated with renewable electricity is lower than that of diesel. This provides us with real benefits, real potential to lower the input costs associated with running our haulage operations.

However, there are challenges associated with productivity. Equipment utilisation, so how long you are running the truck for, needs to be higher than the current technology can deliver. We need to work through how batteries perform, how charging systems perform, and what that means for how we run our operations. And this is exactly the challenge that our trials, in conjunction with our partners, are targeting to solve for, clarify and improve.

Similarly, renewable diesel has the potential to be cost-comparative with fossil fuels, but it is highly uncertain. In many areas, the markets are still very immature. And this explains why our investment in self-generated fuel feedstocks is so important, and it is going to teach us a lot about the fundamentals of this opportunity.

**Deployment is reliant on asset life and other characteristics**

Lastly, I just wanted to emphasise that the value accretive nature of this transition to electrification is not something that is going to apply evenly. It will not apply at all sites in the same way. It will depend on our site characteristics.

We have done a lot of work to understand how this can fit together, and the reality is that the economics of electrification systems do not make sense at certain sites. It is well-suited to large greenfield applications where we have large fleets, but less so to brownfield operations with smaller fleets or other operational complexities. These sites are far more suited to renewable diesel, hence the two-pronged strategy.

We see a long-term role for both of these solutions and hence, as shown on the chart, you can see both play an important role. We see these being able to do not only reduce our reliance on fossil fuels and ultimately reduce our emissions, but also to do so by protecting underlying shareholder value.

So in closing, the challenge to abate diesel-based emissions is substantial. We cannot shy away from that fact. The technology is not yet sufficiently mature, and the reality is that this transition is going to take some time. However, we have a robust strategy, we have a clear bunch of plans, we have a process to assess how these are performing, which Kate will speak to a little more in a moment, and we have the right partnerships so that we can just get on with it. This is the making this transition happen as fast as possible.

I will hand over to Kate now to talk more about the post 2030 pathway.

## Post 2030 Pathway

Kate Harris

*Decarbonisation Investment Manager, Rio Tinto*

**Our post 2030 hard to abate emissions require deployment of breakthrough technology**

Thanks, Ben.

For those that do not know me, I am Kate Harris, and I am the Decarbonisation Investment Manager.

As you just heard from Ben, widespread deployment of battery-electric haul trucks is not expected until after 2030. This is true for other hard-to-abate emissions, particularly at our processing assets. Our approach has evolved as we and our peers and partners have come up the learning curve on what it will take to decarbonise a global and energy-intensive industrial business.

By 2030, most of our electricity will be sourced from renewables. We also expect to have made progress in processing through double-digestion in refineries, the use of biofuels and small-scale electrification of steam generation.

After 2030, 17 million tonnes, which is 90% of our remaining emissions, require breakthroughs in technology to be deployed on an industrial-scale. We know these emissions will be difficult to abate. The technology still needs to be proven, they have challenging

economics which mean they have a high marginal abatement cost, and they often occur in operations that have other constraints, including short asset life and profitability challenges.

The implementation of these technologies should not be underestimated and require significant modifications to large, complex operations, whilst ensuring we maintain safe production. Despite these challenges, we are not sitting still. We are determined to be part of the solution. We are investing in breakthroughs, many of which were developed by our in-house experts.

**Investing now for a net-zero future**

Of course, R&D is a long, complex and costly process, and there is never any guarantees that the trials we undertake now will progress to become technically or commercially viable. Some of our challenges are actually quite niche, but are potentially game-changing for the industry if we can succeed.

We like to focus R&D on areas where we have a competitive advantage and with the potential for industry-wide adoption. In our partnerships with government, industry partners and tech providers, we have around $1 billion of committed co investment in industrial-scale R&D. Some of these partnerships have led to exciting developments, a few of which I want to highlight to the room here today.

With ELYSIS, our partnership with Alcoa and Canada and Quebec governments, we committed in June this year to install ten cells at a demonstration plant at our Arvida smelter in Canada.

In Gladstone, we are building a first-of-a-kind hydrogen calcination plant at the Yarwun refinery, which I visited recently and saw the construction that was underway. This technology could address the last 25% of refinery emissions that cannot be abated through electrification, and it has the potential to also underpin local hydrogen demand and catalyse other green industries in the region.

Our BlueSmelting demonstration plant at Sorel-Tracy that Nigel spoke about in September, has been operational for one year now, and has successfully validated ilmenite pre-reduction technology.

And finally and most recently, we formed Evolys in partnership with Aymium to manufacture biocarbon which is sourced from biomass, an alternative reductant in the ilmenite smelting process. I find this particularly exciting as manufactured biocarbon could be versatile across a number of our industrial processes. Substitution of biocarbon for existing energy sources or reductants can be a low CAPEX-intensity solution over rebuilding traditional industry.

**Net-zero industry requires coordinated global action**

As we develop these technologies, we are starting to gain insights into the economics to transition our facilities. Starting on the left side of the chart, which depicts our pathway to 2030, this portfolio is incentivised at current carbon pricing and more than 80% of the abatement comes from non-capital-intensive solutions and proven technologies. Moving across to the right, the next wave of decarb required to get us to net-zero is characterised by higher MAC, capital-intensive projects that predominantly will require industry breakthroughs.

Reaching economic deployment is not easy. And while we are doing what we can, a coordinated global response is required. Currently, region-specific carbon pricing imposes additional costs on facilities, which tightens asset economics. This is not a cost that those relying on fossil fuels in other jurisdictions are exposed to. An example of this is in Australia, where the rising cost of carbon is placing an additional cost on facilities that cannot yet be recovered through the global commodities marketplace.

We need global carbon pricing to support large-scale transition investment, or there would need to be a willingness or a requirement to pay a premium for low-carbon products. In the meantime, we are progressing our comprehensive R&D pipeline, and we expect this to evolve as we optimise for decarbonisation impact and shareholder value.

Stefan will now talk through the wider business implications of our pathway.

## Value Considerations

Stefan Kwiatkowski

*General Manager, Decarbonisation Officer, Rio Tinto*

**Introduction**

Thank you, Kate.

My name is Stefan Kwiatkowski, and I lead Rio Tinto's central carbon management office. We look after everything from our carbon accounting through to project controls and also the investment evaluation side of things.

So we are going to finish up by talking a little bit about what this means for Rio Tinto, what it means for our cost structure, what it means for our products, and what it means for our host nations and communities.

**Transitioning from fossil fuels is a key business imperative**

Firstly, on our cost structure. We see decarbonisation as a key business imperative for two reasons. To manage our exposures to volatile fossil fuel energies, and to manage our exposure to additive and inflationary carbon penalty costs.

Ultimately, commodities are largely driven by the production cost curves, and success or failure is usually won or lost at the marginal cost of production. Looking at Rio Tinto's cost structure, approximately 18% of our operating cash costs are directly exposed to fossil fuel energies. Meeting our 2030 targets will diversify our energy away from these volatile globally traded fossil fuel energy sources and into structurally secure, long-term, low-cost, low-carbon alternatives. If we are to be leaders in providing the low-carbon minerals and metals, then it is critical that our assets remain competitive. And that has why at a portfolio level, we now forecast that achieving our 2030 target will be broadly OPEX neutral, before even considering the impost of carbon costs. We expect that this will secure competitive positioning on our cost curves for many decades to come.

However, we must also consider the cost of carbon. Global carbon policy is relatively nascent and also geographically asymmetric. It is worth noting that nearly half of our emissions now are covered by legislative carbon penalty schemes. However, despite this large proportion,

our carbon cost exposures today are actually very small. This will not last forever, though. And without action on decarbonisation, our exposures will increase, as you can see in the projections in the bottom chart.

If policy gets tighter on carbon, these costs have the potential to increase further. It is therefore essential that we reduce these exposures as far as possible. And our programme does exactly that. It is designed to ensure that these costs do not materialise.

**Positioning our assets competitively for a low-carbon future**

The benefits of decarbonisation are not just about protecting the bottom line and improving our position on the production cost curve, but also about being well-positioned to grow the top-line revenue. And in this sense, it is the carbon intensity curves that we have on the screen that matter, how much carbon is emitted per unit of product sold, something that those of you who were with us yesterday would have heard both Mark and Jerome talking about.

We pay particular attention to the carbon curves of our commodities, understanding how competitive our products are in the markets based on their carbon content. This is why moving our assets down the carbon intensity curve positions us well for green premiums. However, just as itis difficult to forecast the evolution of fossil fuel markets, it is also hard to predict with conviction the timing and extent of society's willingness to pay for green products.

However, we believe this moment will come, and our decarbonisation efforts will position us to take advantage. With a cost-neutral pathway to 2030. We see this as no cost optionality.

Looking at our major commodity groups, our Atlantic portfolio is already world-class, and our repowering efforts in the Pacific aluminium operations will bring our Australian smelters to a similar position. Our copper portfolio has seen a total reduction of about 70% in its reported emissions since 2018. And for example, the 120-year-old mine at Kennecott now emits about 80% less carbon than it did just eight years ago.

We are committed to our 2030 and 2050 targets. However, we are often reminded that the assets we operate today are competitively-positioned for our global industry's carbon intensity. By enhancing our leadership position in each commodity, we will remain resilient and poised for opportunity as further shifts in global expectations and markets emerge.

**Supporting our regions for success in the transition**

How we navigate the transition is crucial, and decarbonisation is more than just plain economics. We need strong, thriving communities to support our assets, and we are working to deliver decarbonisation activity that creates opportunity and values for our region.

We have discussed our approach to renewable energy partnerships with indigenous communities and how it can unlock greater levels of participation and through that transition. Repowering the Boyne smelter will secure the aluminium industry in Queensland and the four and a half thousand direct jobs it supports. And the new renewables can incentivise green industries in the region that will feel the impacts of the transition most acutely.

The new products and facilities we are developing for the transition is also creating opportunities. So in Canada, as Kate mentioned earlier, the biocarbon that we will use to

replace anthracites will be produced in a repurposed paper pulp mill, reinvigorating that region and creating new jobs. The pilot Pongamia farm we are developing is already creating new jobs now, and also has the potential to instigate a new renewable diesel industry in Northern Australia.

And whilst we have not talked much about it today, given the focus on operational decarbonisation, our nature-based solutions are also an excellent example of bringing investment to regions where we are operating. We are working on more than 14 voluntary projects across 0.5 million hectares of land, and these investments generate high-quality carbon credits, create work and new supply opportunities, while also providing benefits in their natural environment.

**Continuous optimisation for carbon reduction and shareholder value**

And we are just going to finish today with a recap of one of Peter Cunningham's concluding slides from yesterday.

Our decarbonisation effort has been one of steady and measured improvement. We are continuously optimising for abatement, for value, and for broader social benefit. We know we have not solved everything, but the pathway ahead is becoming clearer, and I hope that this session has helped provide you with some clarity and insight into what we are seeing within our programme.

On our performance. First and foremost, our 50% emissions reduction target for 2030 is unchanged. We know that this is not without challenges. It will require big decisions to be made, both inside and outside of Rio Tinto. However, for reasons we have shared, we have increasing conviction in our ability to meet it.

Pleasingly, the implications for cost, CAPEX and returns within the programme are all moving in the right direction. Our focus on economic fundamentals and capital allocation across the portfolio has ensured that the same robust principles we use for our mining investments also underpin our decarbonisation investments and that our decisions do not become an economic drag to asset performance.

Our extensive use of partnerships in our portfolio has allowed us to share risk and reduce the CAPEX we need to deploy without compromising on our plans and objectives. As Kate shared with us earlier today, meeting our 50% target predominantly does not require any CAPEX at all. And our competitively priced contracts at an aggregate level are expected to be OPEX-neutral. Our efforts to lower the capital intensity of the programme is working, which means we are guiding to the lower end of our $5-6 billion.

All of this, combined, along with avoiding an increasingly expensive cost of carbon, means that we are able to expect to achieve returns now above our cost of capital. Knowing that we are protecting and growing shareholder value is fundamental.

**Conclusions**

That concludes today's presentation. And before we move on to Q&A, I would just like to leave you with a few closing reflections.

None of what we have described today would have been possible without a very deliberate tilt to action. As Jonathan described earlier, our redesigned delivery model has been pivotal in

turning aspirations into outcomes. Getting investment flowing has built momentum internally, but also trust and credibility with our peers, suppliers and communities.

Our focus on value throughout our programmes means that we can approach the energy transition with confidence, knowing that our assets are more resilient to inflationary OPEX pressures and that our products occupy a more competitive position for their carbon content. And our work with all levels of our communities, at a grassroots level, through to national Government and beyond, means that our success can be a shared success.

So, with that, thank you very much indeed for joining us today. I am going to hand back over to Jonathan for the Q&A.

## Q&A

**Alain Gabriel (Morgan Stanley):** Hydrogen does not seem to feature as part of your solutions for diesel. I think we discussed this when we were back in the Pilbara last year. Has anything changed in the last 12-15 months, or where do you see hydrogen fitting in this whole puzzle?

**Ben Woffenden:** It is a really good question. We do not see it fitting largely because of, as I outlined upfront, the electrification energy benefit just far outweighs the comparison for hydrogen, to be honest. It is actually that simple. It does not mean we are not keeping an eye on it, but the fundamentals of electrification are much stronger. The other point I would make is that our discussions with our partners, OEMs in particular, they are very much more focused on electrification. Our role is not to design the truck, our role is to determine how we are going to implement it, and unless they see the value, then there is very little point in us going it alone.

**Alain Gabriel:** Thank you.

**Speaker:** Great, thank you for. Interesting presentation. Maybe just on PacAl, just a few things. Could you give us a sense? So we are going from the fourth quartile to the first quartile on the cost curve. When will we be there? Just in terms of timing, if we think about spot or consensus aluminium prices, what does that translate into in terms of EBITDA improvement? Because it has dramatic, it is really material, even at the company's largest, Rio's perspective. And why are you able to do it? Can we see the rest of the aluminium fleet around the world start to decarbonise, or is it just unique because of Queensland and the optionality in terms of renewables that gives you this opportunity? However, just a little bit more on that would be helpful.

**Jonathan McCarthy:** Yes, great. Thank you. I want to clarify where we think it will move to. . It is front half of the cost curve. So, I know that the arrow heads to the left on the chart, but we really want to get it in the front half. So, you probably take that more to mean sitting in the second quartile. It is a different step-change down to the first. However, what we have targeted, in that portfolio is 20% EBITDA margins from that business. And so that is a vast change from what we have experienced in those Pacific smelters in the last era.

And on timing, it is at the end of the decade. You may notice in that pathway chart that I showed, we are really confident on getting to 50% emissions by 2030. However, it does come late. And you can see it is the hockey stick of action, but it has built by all the

commitments that are going in now. They are just significant projects that are going to take the next few years to be built. So it has not a hockey stick in terms of hoping that things come together at the end. It has just about the delivery of mega projects coming online. And once our current energy contract finishes up towards the end of the decade, then we get onto this new energy solution, and we switch into that 20% EBITDA second quartile economics.

**Gillian Gailliaert (PGGM):** Thank you. Actually, I have three questions. So firstly, why have Scope 3 emission reductions not been part of this update? Rio Tinto does have ambitions and some targets on Scope 3, and it has a large portion of your carbon footprint.

**Jonathan McCarthy:** So when we think about our emissions footprint, it has important that there are things that we can do to take real action. And if you think about the messages here today, we are trying to make sure this programme improves the underlying economics of our business and the places where we operate. And so getting that message clear for everyone, for ourself, means that you have a different set of constraints to Scope 3, where largely they are the emissions of our customers.

And so, Bold shared yesterday some of the great progress we are making, particularly in steelmaking, but they do have different governance frameworks, and they have different approaches because one of them is totally in our control and inside of our assets and the energy systems we run, and the other one is about customer partnerships and being a positive force for what will happen downstream.

However, I think hopefully you notice in the video, we have also moved that programme to action. So that has not stepping back, talking about MOUs and bringing the industry together. And we have been doing that for a number of years, and it has been productive. We are now at the point where you are starting to see things being built, projects going in, pilots going in with BlueScope, BHP, our BioIron continuous pilot plan in Western Australia, things happening in the Chinese industry that were not happening a few years ago. So there is a tilt to action there as well, but it just comes from a different place than the projects we described today.

**Gillian Gailliaert:** Right, yes, understandable. Would be interesting to learn more about that as well. Second question is about the presentation. Slide nine, graph one. I am not sure if you can pull it up.

So from the graph, it seems to me that there is no electricity generation by wind during the day. Am I reading the graph wrong?

**Jonathan McCarthy:** No. As you might appreciate, every day, every region is different. some of our regions have good daytime wind, but some of our regions, it actually kicks in quite nicely in the evening. And so, it was a more simplified way, genuinely, to just put a typical day up to show people that if you get the wind-solar balance right, it covers. However, of course, our models run five-minute intervals for 30 years, and then they do thousands of iterations, and so, that chart looks different every single five-minute period forever. That is just for presentation purposes, it is not a particular region.

**Gillian Gailliaert:** Okay. Okay, clear. Thanks. And lastly, it is a question to Kate Harris. You have emphasised the importance of industry work partnerships for delivering

breakthrough technologies. Also, given the high investment costs of these technologies, are you working together with peers on those four projects that you just highlighted?

**Kate Harris:** Yes, we are working and partnering on those projects that I spoke about. And the $1 billion is the total value of us and our partners that we are partnering with on the projects.

**Jonathan McCarthy:** Can I just make one additional point? On the four projects that were on that slide, there is government support in all of those. The government has been an active participant in the ELYSIS joint venture since inception. We have worked with the Quebec government on repurposing that pulp and paper mill for Evolys, and they have been a big part of getting that across to be part of this. And there is real and material funding inside of the Yarwun hydrogen calcination project and BlueSmelting in Canada. And so, there is industry partnerships, but it has been quite a nice new era of real financial support to break through to that. And all of those projects have material government support in them as well.

**Gillian Gailliaert:** Right. However, no specific partnerships with the likes of BHP or other players?

**Kate Harris:** Not for those four. BHP is in the diesel space.

**Jonathan McCarthy:** Alcoa is. Alcoa is our joint venture partner in ELYSIS. Our largest North American peer in ELYSIS is Alcoa. And then Sumitomo in hydrogen. So they are a few there.

**Lewis Ashworth (Legal & General Investment Management):** Lewis Ashworth from Legal & General Investment Management. My question is for you, Ben. What are the infrastructure requirements or challenges for the rapid increase in renewable electricity and electric trucks on sites, particularly for charging?

**Ben Woffenden:** Yes, sure. Look the reality is a lot of that ties into the page that Jonathan represented, which is that fundamentally, we require a lot more energy, particularly in the Pilbara, where the bulk of our fleet is.

I think the challenges are very much aligned with the broader message here, which is around the fact that we have got access to the land. We need to work with the relevant partners, particularly traditional owner businesses, to put that renewable in place. Maybe others can comment a little further on that. The other part of the challenge is, of course, how do you actually get the energy to the equipment? So there is the need for the obvious things like transmission lines, but also the actual charging mechanism. How do you plug the equipment into that network to be able to recharge the battery? I guess, as I tried to emphasise, a lot of that technology exists, but it has still evolving.

To your point on, what are the challenges? The fundamental performance of the equipment, the reliability, does it work in hot and dusty environments? Can it work every day? As you can appreciate, this battery equipment is not like a domestic car, where it can work and then sit in your garage for most of the day. We rely on our equipment to work all the time, completely reliably. So the charging infrastructure and your question around how do we get energy to it has to meet that very high requirement?

**Jonathan McCarthy:** I want to add one thing. There are three circles on one of Ben's charts that says if we are building a new mine, and it has got a long life and a big fleet, you can probably amortise that charging infrastructure and electricity reticulation across that investment. However, if you think about that, and we are seeing it here in the UK, seeing it in Australia, charging infrastructure is becoming the bottleneck for EV rollout in a lot of regions. You can see the same thing in some of our operations. So, where we can get ahead and plan for that, we can, but there are other operations where that has just going to be hard to amortise all of that fixed infrastructure, even when we crack the truck, to be productive and fast and do the things that we need to do.

**Cody Hayden (Berenberg):** Cody Hayden from Berenberg. On your roadmap to net-zero, nature-based solutions play a role in achieving your targets, and I am wondering if you could expand on this. And second, is there any risk that this increases up to the 10% limit you have set against your 2018 baseline? Thank you.

**Jonathan McCarthy:** Thanks, Cody. I will go first. However, look, it is a really important part of the roadmap we feel, to heavy industry net-zero. And what you are hearing from the panel right now is that we actually do know how to get all of the emissions at Rio Tinto out of the system. We have had those unlocking technologies come online, but as Kate described, it looks expensive. Not everything does go to plan when you are planning R&D proliferation 30 years out. And so, we think it has still important to have those as part of the portfolio.

They are still recognised and there is healthy global debate, but they are still recognised as an important part of the global journey towards net-zero. Having a nature-based investment as a global community still appears to us and the people that we talk to in this community as a key part of that. And we really like the fact that the development projects we are running are in places like Madagascar and Guinea and Northern Australia, where we are putting money into communities and getting a community-positive and a nature-positive benefit. We are also being able to take out a traceable high-quality credit from that investment. So there is a bit more to it than just paying for an offset for us.

However, there is no danger that we go past 10%. And so why we set that was actually part of feedback from this community to give some confidence to the group to say what we are doing with this programme is seriously changing how we use energy at Rio Tinto. So all of the investments make good underlying sense, but so that we can manage that pathway to 2030 and 2050 and be transparent about the challenge, we do think they are in the portfolio, but they are capped at 10% of the baseline.

**Cody Hayden:** Thank you.

**Myles Allsop (UBS):** Thank you. The question I have is on the iron ore, which is the largest business within the portfolio. I guess the whole decarbonisation of Scopes 1, 2 and 3 will probably change how the value sits along the value chain. What conversations are you having within the firm of how further down the value chain are you willing to go? Because ultimately, maybe the value shifts away from the upstream to the midstream.

**Jonathan McCarthy:** Yes, I think what you are seeing if I answer that, is the business is getting serious about making sure we have got insight into those moments. We have got this team now, so we can see value differentials between our mines and our energy systems. And we talked a bit about that today. You have got the steel decarbonisation team that can

actually get us early insight into exactly what you are describing and inform that decision. So we are not as an industry at a point where we have to make that decision, but we are nicely set up to inform that decision in a really smart way.

And the one piece of that I will call out and one thing I will point you to is it might be 18 months ago now, we had an announcement that we are looking at that exact issue with Baowu in the Pilbara. And, so we talked openly and publicly about can we work with our biggest customer on thinking about where the future of the iron ore chain will be located, what is the best pieces of infrastructure that need to be in place, and who can do that in a cost-effective way starts to give you a chance to understand we do not have to figure that out on our own is also probably the other part. And there are people connecting up and groups connecting up to actually look at what is the lowest-cost pathway for all of us to build that new future value chain. And so, there is no chance to be left out of that discussion. We are right in the middle of that discussion with everyone in the value chain.

**Maurizio Carulli (Quilter Cheviot Investment Management):** Thank you very much. Maurizio Carulli from Quilter Cheviot Investment Management. A question I guess for Kate. You mentioned that in the projects where you invest, there is a participation of the government. In which form the participation of the government comes through? It is a one off grant? Subsidised loans? It is tax deductibility of the CAPEX? What form of facilitation the government implement in order to participate in the project?

**Kate Harris:** Sure. I would say it is a combination of those models across the different projects. In ELYSIS, it is in partnership with the government. With the hydrogen calcination plant for instance, that has ARENA funding, which is an Australian government agency, and has provided funding in the form of a grant to help facilitate hydrogen in Australia. Anything to add on that?

**Jonathan McCarthy:** We are seeing some equity participation models emerge in governments. So our portfolio today does not have a lot of that. There is little bits and also some things, but not a lot. However, we are starting to see some of those governments move towards is it better for them to have equity as this grows rather than grants? That has probably the emerging theme, but it has not the current status.

**Jonathan Grant:** And I would just add that I think you would expect to see different types of policy for different projects depending on the stage of development of the technology. So in early-stage technology development in R&D, you get more government grant and tax incentives. As you move to sort of first-of-a-kind projects and wider deployment, we will look to more market signals for demand for those products. So that might be in product standards or product requirements. So depending on the stage of the technology, would see different policies to support those low-carbon deployment.

**Myles Allsop:** A couple of questions. Maybe first going to the post-2030, harder to abate 70 million tonnes or 90 million tonnes. We have seen some companies stepping back, saying that if we do not have the support in terms of a global carbon cost, we are not going to do it because it has not economic, we will be uncompetitive, it is not in the interests of shareholders. What is Rio's stance with regard to that? Obviously, you are getting ready for it, hoping, but with a Trump government maybe kind of things are on the back burner for a while.

And then could you give us a sense as well on the CAPEX for that, the second slug? It is obviously dramatically more than the $5-6 billion to get half of it out. Can you give us a sense where we are going on that one?

**Kate Harris:** Yes, sure, I can have a first attempt and pass over to others. Yes, we do feel like our net-zero target in 2050 is still achievable. If we look at the progress that we have made in just the last few years and what we have learned, we expect to continue to learn and evolve. As I said, from where we sit today, the economics of those last hard-to-abate emissions are challenging. However, that is based on the economics today. We expect learning curves to come into play. We do, and we have already seen carbon prices rising in jurisdictions that we operate, and we expect that to continue to do so. And we do think there is the opportunity for green premiums as well.

So to answer it succinctly, yes, the target still holds and there is a lot of time between now and then, and we are investing and doing what we can now, while the industry matures.

On your second point on the CAPEX, so our $5-6 billion that we have provided guidance for to 2030, that includes abatement both pre-2030 and post-2030. Some of the bubbles that you would have seen on the chart there will be covered by that. Obviously, there will be additional capital requirements for the net-zero solution. However, we do not have guidance on that yet.

**Jonathan McCarthy:** No, we do not have 30-year guidance on that just yet. Myles, maybe I feel like I owe you in my words, but it has quite similar to Kate, but just on the first bit, we have a chance right now because we still have time through to 2030 to keep doing what we are doing. We have got the right teams working on the right technologies to see if we can crack the economics. So I think instead of stepping back, we have got a plan through to 2030, and we have got the right teams and things going on to see if we can unlock more economically the post-2030. So let us see how they go. And we have had some nice surprises in that so far.

However, we also wanted to make sure that that was quite clear with this group today, and some of Kate's points, which is right now it does have an economic challenge in that next wave, and so, we are going to need something to change in carbon taxes or green premiums. The model will have to flex from what we can see today. And so, we are going to have to see what our underlying project economics look like in a few more years of R&D work, and then what the macro looks like. However, we do not have to react to current changes in politics that we are seeing right now. That does not change our plans.

**Myles Allsop:** Unless the economics start stacking up. Is that the right way of thinking about it?

**Jonathan McCarthy:** At the moment, and maybe I will ask Stefan to add, but what we saw we have been able to achieve pre-2030 is pretty value-neutral outcome which we are really proud of. And so, when we take that, we say, well, what does our shareholder community want? What are market expectations at that point? How hard do you have to push your internal price of carbon to get on with it versus it almost becomes a question for this community together as we get to that point rather than for management a few years out? That has how we feel about how hard do you have to push on the economics of that?

**Stefan Kwiatkowski:** Yes, Myles, I think, you know, probably just sort of reiterate a little bit of what Kate and Jonathan have said, that tail end is very expensive and there is a big infrastructure bill, as you can imagine, to rebuild a lot of traditional industries that have been around for hundreds or even millennia. So that will come at a cost.

I think probably what I just reflect on is if we look at back at where we were in 2021 and where we are today, there has been a learning curve, as we showed on that last slide. So the underlying economics of the portfolio has improved, CAPEX has pleasingly come down, and we do not want to sort of sit back and just hope, so we will keep on pursuing those projects, but it will not come at the cost of shareholder value.

**Myles Allsop:** Maybe going back to Alain's question as well, on Scope 3 because almost like all this hard work on Scope 1 and 2, there are still massive emissions that you cannot kind of get rid of in the current form of steelmaking. You must have done a lot of work on this. However, how do your Pilbara ores compare to Simandou or in terms of Brazilian ores, in terms of that decarbonisation, the steel industry, we are going down HBI, how do you think the value equation moves? Is it just the 58% product gets a big discount? How are you thinking about the portfolio from an iron ore Scope 3, how can you keep your iron ore competitive longer term?

**Jonathan McCarthy:** I think the first part of the answer is a good story, which is we do have those other assets you just mentioned. So we have Simondou, we have IOC, we have different grades in the Pilbara, so we have got the full suite. And Simon had some nice charts yesterday that you saw. However, that has a good thing for the portfolio. We can hit those different parts of the market as they evolve. So it has a great iron ore portfolio as the landscape changes.

The second part is a bit like the chat we just had. Technology will create the space for this to land where it needs to land in some respects. And I want to call out BioIron. BioIron continuous pilot plant that has going in south of Perth in the next two years. That technology really, really likes converting Pilbara ores. And so the extra gangue and the extra spacing in the mineral matrix actually lets some of that carbon get in when it has being microwaved so that it actually responds really well. It responds better than some other ores that we often talk about in this conversation that obviously are higher grades.

So all of a sudden you are seeing massive interest from the entire industry. If there are low-carbon pathways that prefer Pilbara ores, this is good for everyone. And I called out the Baowu relationship before. It has just a simple indicator that the steel industry knows it needs Pilbara on units in the next era. You need that primary iron unit, so you need technologies where it plays a key role. And so the Electric Smelting Furnace that we are putting in place with BHP and BlueScope, the BioIron, you are starting to see projects emerge. That means Pilbara has to be on the map and everyone's on board with that same story. So I think the traditional view of will this move towards more high-grade is being a little bit replaced with technology is going to have to solve for the world to have its steel and a big part of that is going to have to keep coming from the Pilbara.

**Jonathan Grant:** Let me just add to that. One of the main reasons is that more than 90% of iron ore is sort of Pilbara grade or mid to lower grades ore. So the steel decarbonisation cannot be solved by the higher grade ores from IOC, for example.

**Peter Lunt (Ruffer):** Thank you. My name is Peter Lange from Raffa I have two questions, please. I think one is for Jonathan.

I think yourself and Kate have both mentioned marginal abatement cost, and I acknowledge you do have a lot of very good disclosure about pathways and technology pathways. However, I was curious, and going to the points around Scope 3, is it possible you can publish a marginal abatement cost curve including Scope 3 up to 2030 and beyond?

**Stefan Kwiatkowski:** Yes, sure. Look, I mean we do have a pretty clear focus on marginal abatement cost for us, Scope 1 and 2 emissions that we control and have that governance over and inside Rio Tinto. And so, I think sort of trying to really step inside our customers' emissions and sort of try and replicate that same set of data inside is quite challenging for the obvious reasons that we have the limited ability to influence those emissions. So yes, we have a very clear focus on solving the value question for our directly controlled emissions. However, for the Scope 3 it has a bit of a harder stretch.

**Peter Lunt:** Are you working on mapping the value chain, if you want to use that language?

**Jonathan McCarthy:** So we do it, but we do it with our customers. And so the other thing I would say is it has not all known yet. The steel industry, it is not an industry-level, step back spreadsheet MAC curve, it is an asset-level what will it take for steel in this region, for this downstream industry in parts of China or parts of Europe or parts of North America, what will it take for installed capacity right now with all of its inputs and scrap percentages to get across to the right technology for the future? And so there is some really great macro work done in this city actually and some other publications you probably read about steel industry at large at a technology MAC curve. However, we feel until it has down at the customer asset level, then there are better groups than Rio Tinto to provide an industry technology lens. We are working with our partners to try and get people that insight into, well, what does it mean for our value chains, not the global value chain.

**Peter Lunt:** Thank you. And a question for Kate, I think. You talked about global carbon pricing. You also talked about willingness to pay a green premium. And on one of your charts, you are saying that total cost of ownership is actually going to go down through the electrification. So, I was just curious about the balance between trying to attract higher prices and passing through some of that cost saving through to your client, customers, while maintaining your margin and so forth. Is this something that management has thought about in terms of accelerating the transition? Thank you.

**Kate Harris:** Yes, I mean, I can talk broadly and maybe hand over to Ben for the diesel specifically. However, when we look at the value proposition, that does include our view on the cost of carbon. So, when we talk about it being NPV-positive, it can still have a marginal abatement cost, but we are recovering that cost through legislated or forecasted legislation in carbon pricing.

Ben, do you want to address the diesel part?

**Ben Woffenden:** Yes, look, I think your observation is the right one, that should the technology prove that it can be effective and all the points I made around the broader ecosystem be reliable and safe and productive, then would we want to be able to move faster? Absolutely. If we could deliver a significant reduction in total cost of ownership

through this, then yes, and let us look at that as an investment that would make a lot of sense irrespective of carbon. So, the short answer is yes, but there is a lot of work to do. And I guess the reality is we have to accept that this is an R&D programme. There is a lot of change that is required, there is a lot of investment. So, it has a balance between making sure that we understand what this technology can do, that we can understand what value it can deliver. Because at the moment the reason that bar is so big is because there is a lot of uncertainty. Once we have got more certainty on that, would we like to go faster? That has the case. I will be pitching internally. Absolutely. I mean, if we can make it stack up, let us go as quick as possible.

**Patrick Jones (JP Morgan):** Hi, Patrick Jones, JP Morgan. Just a question on the Boyne smelter plan. So, you mentioned that you are basically increasing flexibility there to about 15% from nil before. What exactly are you doing there to implement that, and what is stopping you from then trying to roll that out further across the smelting portfolio?

**Jonathan McCarthy:** Yes. So, thanks Patrick. There is nothing stopping us. However, I will give you a little bit of colour on how to get from 0% to 15%. We have talked a few years about is actually hard. We put our hands up a few years and said, oh, we cannot do that, it has hard. And so, I want to show you how do you get to 15%?

Firstly, is being forced to do it. So, in Tomago, we have clauses with the New South Wales government where when Sydney is having a particularly hot day, the grid is now going under stress more often. Three years ago, when I used to look after that energy contract, we did it twice in a summer and last year we did it 21 times. And the site team used to hate it, and now they just kind of do it because they are good at it. So they go, they get ready, they get the phone call.

We have got a specific situation room that we watch the pot stability, the temperatures, the anode effect, all of the different amperages and get ready, and we take one of the pots, the potline down for an hour at 17.00 to help New South Wales get across that moment in the evening. And so, actually, just good old-fashioned having to do it, put people in a room with the right information and manage dropping a potline for an hour and bringing it back on. And you can think there is little things that we learned. 21 times, you start to learn. So, we have done it zero times for a decade and then 2 and then 10 and then 20. You start to watch, the team start to push the amperage up in the afternoon, get a little bit of extra heat in the pots, so that that hour you are back and you, you are quite stable for the rest of the night. The old way we used to do it was just get a five-minute phone call, drop the pots, lose some heat, and then it has sort of a week-long scramble back to stability. So, you have got a little bit of learning how to do it well. However, that has given us the confidence.

Then we have a programme called Flexpower. So, our R&D teams in aluminium are now working on how can we actually not just drop a potline, but flex it? The 15% comes from dropping big sections of the asset for periods, and then learning how to do that better, and getting more and more comfortable to do it more regularly. That number used to be quite small because we could do it, but we had say, oh, we do not want to do it now for another month. And now we can say we do it. Give us 48 hours or whatever. Each smelter is learning at a different rate on what is the repeat time. However, then we have got this Flexpower initiative where we are learning to be able to modulate, and right now, we can do

about say 50 MW on a 900 MW smelter. I will not try and back solve the percentage for you, but I know one of the assets, we are trying to push that out to two or three times that. So, it has not about dropping pots, but about flexing them and you have got that sort of learning and dropping and modulating starting to come online.

**Patrick Jones:** I appreciate that. So you said those 50 on 950 MW?

**Jonathan McCarthy:** Yes.

**Patrick Jones:** Okay.

**Jonathan McCarthy:** And we can do that today. We do a bit of that in to help the grid out, but we can try and extend that, obviously.

**Patrick Jones:** Yes, got it. Okay. And then if you can get to Boyne to over 15%, say on a 5-10-year basis, where do you think you can get that? Do you think you can get to 20-25%, or is that going to be getting past the limit of the potlines?

**Jonathan McCarthy:** We think it has one of the most valuable things we can crack in R&D in the next decade or two. I actually do not have a forecast. And a bit like when we set this target, how much abatement could you do by 2030? 50% is a pretty bold number. And then you get there by learning. We have not given the team, we have not asked the team to find 2% or 3%. We have asked the team to flex an aluminium smelter as much as you can. So they have got a near-term plan for Flexpower, but they have also got another programme which is can you start to recreate smelters to be flexible? So as energy is obvious, we used to just have so much flat baseload energy everywhere we had go. And now that we are going into all these variable energy markets, if we can flex, I mean, the value unlock is really material. So, we do not have a cap on what we are targeting there just yet.

**Patrick Jones:** Got it. And then putting that together with the other big R&D initiative in aluminium. ELYSIS, has this been tested at all, flexing any potlines running in our anodes yet?

**Jonathan McCarthy:** No. So, there is no flexing and ELYSIS in one spot just at the moment.

**Patrick Jones:** Cheers, thank you.

**Hannah Johnson (BlackRock):** Could you just briefly give a couple of details on the double-digestion project and the heat process reduction you are expecting there?

**Jonathan McCarthy:** Yes. Double-digestion, effectively, a lot of the steam that we raise at QAL, particularly because it has our oldest aluminium refinery, a lot of the steam that we raise, we raise it to quite a high temperature and high pressure, and then we put that into the solution where the bauxite is dissolved early in the process, and then it keeps going through the rest of the process, and all of that built up energy that you have put in to create that first moment gets dissipated away. And if you visit that site, you have got lots of blow-off valves and things going on. So what the process does is pulls the solution back around and the steam back around and takes that heat and steam and gets the solution to go through that again. So instead of bringing up to such a high-energy intensity of steam, you are running the process so that it gets two rounds of being dissolved at that first pressure before the rest of the precipitation circuit. And so, in some senses it has easy to think, well, that has pretty

simple. In another sense, it has a complex rewiring of an old asset. And so technically, it has not crazy.

We actually have a demonstration plan at QAL that you can go and stand at. And it is basically a very, very small version of QAL right inside of QAL. And the team have been playing with how is that going to be built? However, that has what it effectively does. It hits the steam twice.

**Hannah Johnson:** And do you have an estimate on the saving, the energy saving or the carbon saving?

**Jonathan McCarthy:** Yes, so it has about 30%. So the entire emissions of QAL, once we can double-digest all of the three circuits, is 30% less carbon emissions for QAL. And the rollout will be one unit. We get that right, then we will do the other two units.

**Hannah Johnson:** All by 2030?

**Jonathan McCarthy:** The first unit by 2030 or around. Then the other two.

**Hannah Johnson:** Afterward?

**Jonathan McCarthy:** Yes. So there is the first piece of that project inside the 2030 plan, and the rest happens just after 2030.

**Jonathan Grant:** Very good. Okay, so we are going to draw it to a close. So just before we do. So I want to thank all the speakers. It has been fantastic to have you here talking to our investor community. However, Jonathan, why do not I hand over to you just to leave the group with the key points that you want them to take away from this.

**Jonathan McCarthy:** Thanks. Thanks, Jonathan. Look, I appreciate, like I said, we know the conversation is as powerful as what we can share, and we appreciate all of the questions and the thinking. It has helped us straighten up the plans and get that feedback over the years, and it is genuinely appreciated. It is a little bit different to perhaps what we did yesterday, where we have been running that business for a long time. This is a bit more collaborative in terms of what do we think as a community we need to be doing here. And so, we are really appreciative of this moment.

For me, and I hope that perhaps you take the same confidence, there is a lot happening, but those things are happening to actually have a serious plan that does not just take carbon out of our business, but it is making the business stronger and more resilient and set up with some really great optionality for the next decade or two. And our communities will do well out of this alongside us. And we know that those two things have to happen for the scale of the investment and the scale of the transformation that we are asking of our employees and our regions. It is big. And if we cannot get everyone onboard with good economics, good outcomes for everyone, then the frictions are just too high. And so, we feel really confident that we are now in a place where everybody involved, shareholders, communities, employees, are getting value from what we are trying to achieve, which has made the plan come together and start to really accelerate. Thank you.

[END OF TRANSCRIPT]