

Department of Industry, Science, Energy and Resources
Email submission to:
TechnologyRoadmap@industry.gov.au

21 June 2020

Dear Sir/Madam

Re: Discussion Paper: Technology Investment Roadmap

Rio Tinto welcomes the opportunity to make a submission to the Department of Industry, Science, Energy and Resources (“the Department”) on the Technology Investment Roadmap discussion paper (the “Discussion Paper”). This paper outlines the Government’s vision for Australia to play a leadership role in “accelerating development and deployment of low emissions technologies”.

Rio Tinto actively participates in the development of climate policy. Our most recent dedicated climate change report, published in February 2020, provides detailed information on our approach to climate change and what we are doing to prepare our business for a low-carbon future¹.

In joining with businesses across the world in signing the Paris Pledge for Action, Rio Tinto supported the outcome agreed by 195 governments at the international climate negotiations at COP21.

Climate risks and opportunities have formed part of our strategic thinking for over two decades. We continue to take steps to manage risks and build resilience to climate change, as well as to position ourselves for new opportunities. Rio Tinto has committed to:

1. Produce the materials for a low carbon future
2. Reduce the carbon footprint of our operations with an ambition to achieve net zero by 2050
3. Enhance our resilience to physical climate risks
4. Partner to advance climate goals across our value chain

The implications of the Technology Investment Roadmap and the associated next steps

Before addressing each of the questions for stakeholders set out in the Discussion Paper, it is useful to address the overall approach of the paper. The Discussion Paper sets out the Government’s diagnosis of what is important to achieving significant decarbonisation outcomes and then seeks input into what should be considered for a coherent guiding policy and a set of actions to focus national resources for ‘driving down the cost of deploying low emissions technologies to a point where they are competitive with existing alternatives will deliver meaningful reductions in global emissions’.

This diagnosis prompts for us a key question: How can Australia focus resources and effort to lower the cost of low-emissions technologies in which it has a comparative advantage so that these technologies become the preferred pathway for businesses making investment decisions?

¹<https://www.riotinto.com/sustainability/climate-change>

This is important because it means the Discussion Paper is not just outlining a low-emissions technology strategy, *but a strategy to lower the costs of technology*. This strategy is then being focused on areas where Australia has a comparative advantage, so that Government resources and effort are focussed on those technical challenges that if solved will be of enormous benefit to a low emission future for Australia. Given the emphasis on lowering costs, this approach needs to be part of both a broader framework for emissions reduction and a broader framework of lowering costs and making Australia more competitive.

Our internal Rio Tinto approach to meet our 2030 targets and to deliver on our 2050 net zero ambition is founded similarly on focussing on areas of strength and opportunity while looking for pathways to lower costs and look for options to decarbonise our processes.

One of the important learnings of our business has been that making safety a priority does not automatically mean a trade-off between safety and other priorities – provided the right approach is adopted there is a pathway so that everything – safety, production, uptime, costs, all get better together. We see the same principle playing out for low emissions technologies and processes at both a company and a national level. This is not to say it will be easy given ‘the economic and technical barriers to widespread deployment today’ but we agree that there are grounds to take the stance outlined in the Discussion Paper of ‘remaining optimistic about future advances and the role different technologies may play in the global effort to reduce emissions’.

The challenges, global trends and competitive advantages that should be considered in setting Australia’s technology priorities

A welcome focus on meeting and beating Paris targets

Climate change is a global challenge and will require action across nations, across industries and by society at large. Accordingly we welcome the Government’s clear objective, set out in the Discussion Paper, of ‘Meeting, and where possible beating, Australia’s emissions reduction commitments and helping other countries to lower their emissions through the export of low emissions technologies, products and services’ and the Government’s vision to be a global leader in “accelerating development and deployment of low emissions technologies”.

Focus on low-emissions technology for the mining industry as an area of national comparative advantage

When considering areas of comparative advantage, the Discussion Paper outlines a strategy to prioritise investment in low emissions technologies to 2050 in ‘agriculture, industry, mining and energy-intensive exports’.

We would certainly endorse a focus on Australia’s world-class mining sector as an area of comparative advantage and national importance. Considering Rio Tinto alone, we employ over 19,000 people in Australia. We’re one of the largest employers of Indigenous Australians in the country (around 7 percent of our workforce). We are also one of Australia’s largest corporate taxpayers. Our 2019 taxes paid report shows that of the A\$8.8 billion Rio Tinto paid in taxes and royalties globally during 2018, A\$6.5 billion was paid in Australia. Further there is more than A\$10 billion in investment required over the next three years to sustain our business in Australia. And this is just for one of Australia’s many mining companies.

Getting energy policy right as part of the Technology Investment Roadmap

Rio Tinto is a large user of energy in Australia, in particular electricity, gas and diesel, spending more than A\$1.3 billion annually. Many of our operations are in remote locations and generate electricity both for our own use and also for surrounding communities. All of our operations are trade exposed, with our aluminium smelting and alumina refining assets also highly electricity and emissions intensive. Accordingly, we support the stated objectives set out in the Discussion paper for low-emissions technology that delivers energy affordability while maintaining energy security and reliability.

We also recognise that in deciding the areas of focus for technology it is not only the energy supply side that needs consideration but also managing the demand side of energy that provides a technology opportunity. Our observation is that this is an important decarbonisation lever but it is complex to give effect to and requires both appropriate commercial drivers as well as significant research and development effort as most industrial processes are designed around a stable 24/7 electricity supply.

The shortlist of technologies that Australia could prioritise for achieving scale in deployment through its technology investments

Shortlisting technologies is necessary to achieve the focus required for step change outcomes. One of the hardest parts of choosing what to do will be in making choices about what not to pursue. It is important that the Government perseveres with a shortlisting process as significant outcomes will only come by focusing resources and effort.

Focus on implementation

Recognising the focus on lowering the cost of technologies as part of lowering the cost of reducing emissions in Australia, rather than outlining our choice of particular technologies, we would urge consideration of:

- 1) Choosing technologies where making a real difference to lowering costs would support wide implementation in areas that would make a fundamental difference to Australia's emissions.
- 2) Focussing on high-leverage areas (e.g. firming up renewables) and looking for the lowest cost low emissions solution rather than choosing particular technologies (pumped hydro or flow batteries or li-ion batteries etc.)
- 3) From the already available technologies, understanding what hurdles are preventing us from deploying these technologies, and then focusing our efforts at addressing these specific hurdles to allow the technologies to be deployed at scale and low cost
- 4) Further development of the systems in which technologies are deployed including improvements in integration and how to leverage the digital transformation to deliver low-cost low emission system outcomes.

To that end, it is worth elaborating on how we are developing technology to give real competitive advantage to Rio Tinto as a basis for what processes might be used in shortlisting technologies.

We actively scan many industries looking for insights and opportunities to replicate or adapt.

We have a long-term commitment to the development of proprietary technologies and spend more than \$200 million each year on very early stage R&D. We then spend far more each year on the scaling and deployment of new technology into our business.

We have a strong innovation culture, world-class technical talent and an extensive partner ecosystem that we engage with. We have established Centres of Excellence in areas including Surface and Underground Mining, Processing, Automation, Ore Body Knowledge, and Climate Change & Energy.

These centres provide centralised technical assurance, service and support to our operations and are a pathway to nurture and grow our technical talent. In exploration we have taken an advanced approach to data and technology to improve our targeting, enabling us to uncover opportunities in areas that have been well explored by others.

In studies and construction, innovation and digital design are helping us to achieve improvements in safety and cost as seen with our new mine at Amrun in Queensland. We're also looking at more agile ways to build new mines, starting smaller, building quickly and safely, with embedded optionality for growth.

Technology also has an important role to play in helping us tackle critical industry challenges which include energy and carbon reduction initiatives. In 2019, we looked at every one of our operations in detail to explore emission reduction opportunities for each and develop marginal abatement cost curves. This comprehensive work informed our 2030 targets which are to reduce absolute emissions by 15% by 2030 and emissions intensity by 30% over the same period. We believe these targets are stretching but achievable. We will, of course, strive to do more.

Technology and innovation achievements can at times provide easy headlines, but being successful in the execution and integration of new technology at scale is difficult. This area of execution and integration at scale is where Australia will need to focus for the strategy outlined in the Discussion Paper to be successful.

Electrify everything with a technology-neutral approach

In general, energy and climate policy should adopt a technology-neutral approach, focused on meeting Australia's emission commitments, while leveraging our world-class energy resources, to deliver secure and reliable energy at internationally competitive prices.

One important observation is that there needs to be a focus on outcomes rather than technologies. This is particularly important in the electricity sector where, in our view, with current capital and operating cost structures, there is currently no single technology that provides all of the answers to meeting reliability/security, emissions and cost objectives for Australia.

Choices around electricity are particularly important as a number of possible technology pathways to delivering very low or zero emissions outcomes rely on electrifying (almost) everything and then producing zero-emissions electricity to meet energy needs. Where electrifying a process isn't possible (for example for particular process heat or transport applications), then hydrogen can be produced from zero-emissions electricity and used to drive a zero-emissions process outcome. For mining and agriculture, there should be a focus on supporting the difficult implementation task of developing a low emissions alternative to diesel on the pathway to electrifying everything.

For heavy mobile equipment this could mean either electrifying directly, or indirectly via green hydrogen with transitional pathways via for example blue hydrogen or green gas-to-liquid fuel.

Critical to the approach of producing low emissions electricity is lowering the costs of technology to firm intermittent renewables. The renewables themselves are rapidly becoming cost competitive. The focus of Government effort should be the development of low-cost pathways for firming renewables.

While electrifying everything is not the only pathway to zero, it is certainly an approach we have been working with. For example, in February 2020, Rio Tinto announced a A\$100 million investment in a new solar plant at the Koodaideri mine in the Pilbara, Australia, as well as a lithium-ion battery energy storage system to help lower emissions in the Pilbara power network.

Goals for leveraging private investment

Mechanisms for attracting investment

In considering mechanisms for attracting investment, there should be particular consideration for the technology investment to be made as part of a consortium or group leveraging Government funding to deliver outcomes. This has clearly been part of the approach by the Clean Energy Finance Corporation (CEFC) and Export Finance Australia (previously EFIC) and is central to the approach of the Australian Renewable Energy Agency (ARENA). For example as EFIC notes in their 2017-18 corporate plan “Indeed, we complement the private sector, notably banks, by working with them or encouraging them to participate in various transactions”.

Rio Tinto's program to reduce emissions relies on partnerships

We endorse an approach of using partnerships to deliver better low emissions outcomes. Rio Tinto's basic framework for climate change is one of partnering.² To help achieve our targets, we plan to invest around US\$1 billion over five years in emissions reduction projects, research and development, and activities to enhance the climate resilience of our business. As an example of where we are directing these funds and how we are working in partnership, in 2018, Rio Tinto announced a new technology partnership with Alcoa, with support from Apple and the governments of Canada and Quebec, to further develop ELYSIS carbon-free aluminium smelting technology.

Broader issues, including infrastructure, skills, regulation or, planning, that need to be worked through to enable priority technologies to be adopted at scale in Australia

We welcome the Government's overarching goals in realising its vision from low-emissions technology investment set out in the Discussion Paper which focus on energy affordability, maintaining energy security and reliability and seeking employment and growth in regional areas.

As noted already, successful deployment of the overarching framework around the Technology Investment Roadmap requires a focus on costs, and it is those other elements of the Australian economy that affect

² <https://www.riotinto.com/about/innovation/partnering-to-innovate>

deployment costs that also need to be delivered in parallel for this to be successful. Policy should be designed to encourage capital investment and ensure a stable economic climate conducive to long-term business success, which will in turn support a strong and stable national economy. In the same way that it is important that Australia's approach to low-emissions technology is part of a coherent national climate policy it also needs to be part of a coherent set of reforms to Australia's tax (including R&D tax concessions), energy, and other regulatory areas aimed at unlocking productivity, stimulating innovation and growth, and increasing the international competitiveness of the nation.

Focus on capital costs

A key question to ask is, Why will Australia have a competitive advantage relative to others with respect to delivering on particular low-emission technologies at scale? The current renewable energy revolution is effectively moving competitive energy from those countries that have an advantage in fuel costs to those countries that have an advantage in capital deployment. The competitive advantage arising from the quality of Australian natural renewable resources will only be accessible if we can deploy capital well as a nation.

Large-scale capital projects in Australia are expensive when benchmarked on a global scale across a range of infrastructure, process plants and energy technologies. Fundamental to success in delivering the Technology Investment Roadmap will need to be innovation and research on capital deployment to determine ways to lower capital costs in Australia. There needs to be a national conversation on this important enabler to a competitive future for Australia.

We should also recognise that particularly for emissions-intensive industries, the likely model for deployment is Brownfield retrofits of existing plant. We also need to look at pathways to ensure this very particular model of capital deployment is also a focus of innovation and opportunity to lower costs.

Critical concentrations of industry in regional areas

In choosing how and where to focus effort, Australia already has some natural locations to apply large-scale abatement effort because of a critical concentration of industry (e.g. Gladstone in Central Queensland). These regional areas are well serviced by infrastructure, energy supply and logistics, including ports. This also means for new and developing energy technologies that there are foundation energy customers who can provide support, security and scale of offtake to allow faster development and deployment. Importantly there is often a critical concentration of highly skilled smaller manufacturers and engineering firms to support the larger industrial sites in these same regions. This then provides a natural set of locations for pilot, demonstration and full-scale application of low emissions technologies, as well as the necessary capability to manufacture and export new technologies. In addition to considering which technologies to focus on, the Government should also give consideration to which locations provide the necessary critical clustering synergy for additional application of support.

As the Discussion Paper also notes, 'If significant cost reductions in energy storage are realised, careful and systematic deployment of low-cost renewable generation could re-establish our advantage in energy-intensive manufacturing and enable more onshore processing of our mineral wealth'. These regional locations where there is already a critical concentration of industry are the natural starting point to locate new energy-intensive manufacturing sites.

Where Australia is well-placed to take advantage of future demand for low emissions technologies, and support global emissions reductions by helping to deepen trade, markets and global supply chains

In formulating low emissions technology policy, it is important Australia demonstrates to the world the ability to act collaboratively, applying both policy and technical innovation, in a way which transitions not just the economy broadly but the Emissions Intensive Trade Exposed (EITE) components of the economy in industry and agriculture to a low emissions future. The impact of transition and moving too early in a manner that reduces the competitiveness of EITE industries and leads to carbon leakage is a challenge that Australia will need to successfully meet if we aspire to international leadership.

Rio Tinto's expectation is that demonstration of cost-competitive low emissions technology at scale in Australia will provide the necessary springboard for export to other parts of the world. By focussing on technology to decarbonise areas of Australian comparative advantage, the world-leading nature of Australian mining and agriculture means there is already considerable focus in other countries on emulating Australian best practice in these sectors. We would expect technology transfer to be rapid under those circumstances.

Suggestions for economic stretch goals that could help establish pathways for the cost-effective deployment of priority technologies

The process and context for setting stretch goals is important

To deliver on stretch goals there needs to be a framework and focussed actions to deploy national resources where leverage is highest. To do this, stretch goals will need to have both a quantum and a timetable to achieve them. The timing needs to be driven by meeting the Paris agreement national targets and overarching Paris temperature goals with Australia (as with other developed countries) looking to deliver outcomes as soon as practicable. Overlaid on this international agenda is a domestic agenda based on a critical assessment of where we currently are with respect to emissions and technology. This includes assessing the likely turnover of capital stock in certain sectors of the economy and therefore the timetable for alternative technology to be deployed.

Stretch goals should not only be for particular technology elements – they should also be for the overall process of delivering low-emission outcomes of which the technology is only one part. Accordingly models for determining stretch goals need to be based around equipment capital costs and on-going operating costs, the cost of debt, the cost of equity (and the ratio between the two), in some cases the importance of offtake (including government offtake to underpin debt) and the perception of decreased regulatory risk when government has partnered with industry (this is important particularly for international finance and part of the reason for the success of the CEFC and the Export Finance Agency).

There is a tendency in thinking about low-emissions technology (and technology more generally) to treat learning curves as being inevitable. Learning curves are not automatic, they are certainly not all exponential (and even the ones that are need to become linear eventually), and they are driven by fundamentals related to the actions and choices of businesses and governments around the world and the inherent nature of the processes involved. Work on better understanding the reasons for and trajectory of important learning curves (such as those exhibited by solar power and Li-ion batteries) should be a critical area of focus and benchmarking in understanding more to support the development of Australian stretch goals (note: learning curves are most often driven by volume, so

anything that stimulates demand for low-emissions technologies will lead to lower costs, so the question comes “What can Australia do to significantly increase the demand for low carbon technologies that will drive down their costs for all Australian adopters/users?”).

Stretch goals for existing inputs are simple to set as the ultimate quantum is what is needed to be competitive – it is the timing and the proximate objectives that are difficult

Australia is competing internationally on energy transition. The ultimate stretch goals in this area can be narrowed to three areas – does the low emissions technology provide a competitive price when compared to:

- current market conditions
- the current cost of producing energy for end consumption
- the cost for an internationally competing end-user to be competitive

Which measure to use depends on who the targeted end user is, and the stretch goal may be materially different for each.

Consideration of existing electricity pricing, existing coal supply and existing gas supply to end users can be made in respect of each of these three options. Where the existing alternative (e.g. solar power firmed to be 24/7 with batteries, green hydrogen) is currently a long way from competing on price with any of these three options, then a series of staged intermediate objectives will be required. Once the technology cost outcomes are improved sufficiently then there will need to be customised stretch goals to match particular end users. These will be different for different end users. For example, the largest energy users at an industrial scale are typically competing on international markets, but domestic household electricity users, may have a fundamentally different (higher) price point at which the low emissions technology becomes cost effective.

For example a stretch goal on firmed renewables for domestic users would be based on the retail price of electricity, for businesses/large domestic industry on the wholesale contract price, and for export-competing large industry the internationally competitive price to underpin the relevant commodity (e.g. aluminium smelting, copper refining and so-on). Useful benchmarks for stretch goals are international prices for electricity and industry-specific power price curves. A similar approach would apply for gas and coal where it is these energy commodities with which low emissions technologies (e.g. hydrogen electrolysis) needs to compete.

Having established the long-term stretch goal, it is the proximate objectives (for example the proposed price target for hydrogen set out in the Discussion Paper) along the way which will require nuanced consideration of what is required. These need to push capability but be achievable.

Stretch goals for the development of new processes are inherently complex

Stretch goals for new process development are potentially an important part of what needs to be considered. But the fundamental process chemistry and development is difficult for new processes that will deliver low-emissions outcomes in the ‘hard to abate’ sectors. The international experience of the development of fundamentally new processes is that it is difficult, expensive, takes a long time (10 years + or longer), and is subject to competitive pressures from existing, already developed processes which have much better costs than pilot or demonstration scale facilities or first demonstration of full scale plants. Examples abound in Australia of the difficulties of developing new processes (for example the CSIRO process to develop a new pathway for the production of magnesium). These are areas that should be entered into with a very clear vision of where the focus will be and a recognition of the scale of resources that may be required.



A multi-stage multi-year program is important

To deliver a program of the scale being contemplated, a multi-stage, multi-year program is needed as outlined in the Discussion Paper. The changes to the economy that the program seeks to address are multi-year and assembling the necessary commercial and engineering components for what will often be large complex projects, whether Greenfield or Brownfield, will be multi-year. It is important that the program fully assesses how and where to deploy funding. There must be a considered approach which will vary by technology and end-use opportunity. While in some cases replicating a past approach may work to direct additional funding to more Co-Operative Research Centres (CRCs) with the right scope and the right work program, in many cases this will not be the answer that leads to the deployable low-cost outcomes the Government is seeking. We encourage innovative thinking in the nature of partnerships and opportunities for how Government funding can be employed.

Rio Tinto looks forward to engaging with the Department on the content of the Discussion Paper. We would welcome the opportunity to discuss this submission further with you. If you have any questions in the interim, please contact Gerard Danckert ([REDACTED]) or Daniel Woodfield ([REDACTED]).

Yours sincerely

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