



Australian Industry Energy Transitions Initiative

PROGRAM OVERVIEW

2020

Acknowledgements

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Foreword by Simon McKeon



The corporate sector is undeniably responsible for a significant proportion of Australia's carbon emissions, especially when we consider its supply chains. There's no issue about that – and it's not something of which to be ashamed. Big business provides the vast majority of goods and services that Australians rely upon. Not surprisingly, it consumes a lot of energy, often in ways that can't be easily abated.

Business leaders, by and large, understand the necessity of playing the long game. Maybe in the past, some took shortcuts to achieve short term results. Today, though, that is simply wrong. We know that short term thinking doesn't contribute to long term success.

Investors understand, too. Most of them invest for the long haul. They want to know that the company they back today will not only be around tomorrow but will also flourish next year, next decade or in the decades to come. They want to invest in those who are taking steps in response to inevitable change.

That's why I see such a great opportunity for business even after the COVID-19 crisis. If we listen to what the scientists tell us, and if we recognise that community attitudes are shifting, we can ask, what can we provide? How can we alter what we do, not just to respond but to move ahead?

Those who act now will be in the same position as the businesses who first faced up to the arrival of the information age. Those who don't will be akin to the companies who dismissed the digital revolution as a passing fad.

I think of Bill Gates, Steve Jobs and other visionaries who saw, before anyone else, what information technology might mean. We can be just as farsighted, except in relation to something far more serious.

We know, of course, what will happen if we don't act. But it's not all doom and gloom – indeed quite the opposite. It's just a matter of being appropriately and sensibly optimistic, recognising the solutions at our disposal and in particular the new technologies that are emerging.

The Australian Industry Energy Transition Initiative invites you to come on a journey. Not all its participants will agree on everything and not all its solutions will work for everyone. But through honest discussions and a willingness to share, we can recognise the work that can be done and the possibilities to create wealth for companies and for shareholders while eliminating emissions from our supply chains.

I know, as well as anyone, that corporations generate frequent criticism. But I also know that they have extraordinary resources, fabulous people and have the ability to effect enormous change.

The Australian Industry Energy Transition Initiative provides a chance for business leaders to roll up their sleeves and get to work. I'm confident that the corporate community, including those in the hardest to abate sectors, can say, 'we produce what humanity needs – and as part of that we're willing to act in ways that are sustainable and will improve, not hurt, our planet'.

Executive summary

Nearly half of Australia's exports (some \$160 billion in 2018-19) comes from economic sectors in which carbon emissions cannot easily be reduced. The production of iron and steel, aluminum, other metals, chemicals and liquefied natural gas products contribute immensely to the economy – but, with their associated energy systems, they produce more than a quarter of the country's annual emissions.

Many of Australia's largest companies – including Rio Tinto, BHP, Qantas, Dexus and Mirvac – have now committed to achieve net zero emissions by or before 2050. Community attitudes are changing and investors increasingly expect net zero emissions targets in ventures they back. As a result, even companies in hard-to-abate sectors must contemplate the transition to decarbonised global economy.

The Australian Industry Energy Transitions Initiative (Australian Industry ETI) seeks to provide support.

An independent project convened by ClimateWorks Australia and Climate-KIC Australia (in collaboration with the Energy Transitions Commission), it focuses on five critical industries:

- iron and steel
- aluminium
- liquefied natural gas (LNG)
- other metals (copper, nickel, lithium, etc)
- chemicals, particularly fertilisers and explosives.

The initiative looks not merely at companies but also at the supply chains linking them to the global economy. The decarbonisation of those supply chains provides an effective way to accelerate the impact of emissions reductions across hard-to-abate sectors.

In 2019 and 2020, the initiative brought together industry representatives for meetings in Melbourne and Perth. After those consultations, a coalition of business – including BHP, Orica, BP Australia, NAB, Woodside, BlueScope Steel, Schneider Electric, AGIG, APA Group, AustralianSuper and Wesfarmers Chemicals, Energy and Fertilisers – united behind a commitment to accelerate action towards achieving net zero emissions supply chains by 2050.

This ambitious goal rests on research showing the potential of technology to achieve results previously thought impossible.

For instance, ClimateWorks' recent Decarbonisation Futures report models multiple scenarios for Australia to cut emissions in line with the Paris commitments. Its projections emphasise, across all sectors of the economy, new breakthroughs in renewable energy and battery storage.

Similarly, research from the Energy Transitions Commission concludes that net zero emissions can be achieved by 2050 in six hard-to-abate sectors – cement, steel, plastics, trucking, shipping and aviation – at a total cost of less than 0.5% of global GDP. The outcome depends on hydrogen, direct electrification, biomass, carbon capture and similar technology to achieve dramatic cuts from the energy and industrial systems.

The initiative emphasises the tremendous comparative advantage enjoyed by Australian businesses. Australia possesses superb wind and solar resources and the potential to develop other renewable energy technologies such as offshore wind, geothermal and solar thermal. The availability of land (and the expertise to manage it) facilitates the development of renewable projects, while the abundance of sunshine creates possibilities for the export of excess clean energy abroad, either stored and transported as hydrogen or as electricity carried by high voltage transmission lines for direct electrification of industry. Australia is the world's largest producer of lithium and has reserves of almost all the mineral elements and chemicals required for the production of lithium-ion battery storage. Australia also boasts other advantages such as existing mining expertise, efficient logistics, high-quality infrastructure and an attractive investment landscape.

The Australian Industry ETI will run for two years and will complement other concurrent processes, such as the federal government's Technology Investment Roadmap. The Initiative is funded by a combination of philanthropy, industry partners and the Australian Renewable Energy Agency (ARENA), on behalf of the Australian government.

Under the direction of a core group of industry representatives, it will work with leading Australian and international experts on energy transitions, such as the Rocky Mountain Institute, CSIRO and Energy Transition Commission. The initiative's aim is to develop a shared understanding of how hard-to-abate sectors can accelerate informed action towards the achievement of net zero emissions supply chains by 2050, while managing the transition to thrive in a decarbonised global economy. Industry and delivery partners will come together through Steering Group meetings, workshops and learning forums to develop a knowledge base of decarbonisation technologies and solutions. Its publications will build on existing literature and studies, as the initiative develops a portfolio of demonstration projects focussed on net zero emissions supply chains both nationally and with a regional orientation to Western Australia.

Objective and intent

Australia is in a unique position to capture opportunities arising from a decarbonised global economy. Advantages in renewable energy resources, the availability of (and expertise in managing) land, and an abundance of minerals and metals resources positions the nation to take advantage of an industrial recovery in the wake of the COVID19 pandemic.

Opportunities in emerging or growth markets such as hydrogen and green steel and greater presence across the lithium value chain could provide economic benefits over the next few decades.

Australian Industry ETI is an independent Australian project jointly convened by ClimateWorks Australia and Climate-KIC Australia, in collaboration with the Energy Transitions Commission. The initiative supports Australian industry in hard-to-abate sectors to accelerate action towards achieving net zero emissions supply chains by 2050, while managing the transition to a decarbonised global economy. It will support industry to develop pathways and take action towards this goal.

"The initiative supports Australian industry in hard-to-abate sectors to accelerate action towards achieving net zero emissions supply chains by 2050, while managing the transition to a decarbonised global economy."

The disruption caused by COVID-19 has focussed attention on supply chains in the economy. Coming out of the crisis, governments and businesses will want resilient supply chains to lay the foundation for a strong economy and healthy environment. A key feature of such supply chains will be the capacity to avoid future disruptions from climate change. Those able to transition to net zero emissions by 2050 will capture opportunities in a decarbonised global economy. The government support to businesses at this time, and the use those businesses make of such support, will determine the shape of the economy to come.

Some companies are already acting. With many businesses facing similar challenges, however, the transition to net zero emissions will require solutions to scale rapidly. Shared knowledge across and within supply chains can accelerate experimentation. It is on that basis that a two-year program to work towards net zero emissions supply chains in Australia by 2050 has been developed.

Founding partners of the Initiative include BHP, Orica, BP Australia, NAB, Woodside, BlueScope Steel, Schneider Electric, AGIG, APA Group, AustralianSuper and Wesfarmers Chemicals, Energy and Fertilisers.

The Australian Industry Group (Ai Group) and the Australian Industry Greenhouse Network (AIGN) are also supporting partners of the Initiative.

FOUNDING INDUSTRY PARTNERS



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Technologies and solutions are emerging for zero emissions industrial processes and products

New research published by ClimateWorks Australia – *Decarbonisation Futures* – explores options for Australia to cut emissions in line with the Paris commitments. The report highlights the remarkable progress made developing zero emissions technologies across major sectors of the economy. This progress means that the achievement of net zero emissions by 2050 remains a viable target.

This assessment supports earlier research from the Energy Transitions Commission (ETC) that concludes net zero emissions could be achieved in six hard-to-abate sectors – cement, steel, plastics trucking, shipping and aviation – by 2050, at a total cost of less than 0.5% of global GDP. The ETC brings together a range of leaders from across industry, non-profits and academia to accelerate change towards low-carbon energy systems. Significantly, the ETC's commissioners come from some of the world's largest industrial organisations: businesses such as Shell, BP, Rio Tinto, ArcelorMittal, Tata and Dalmia Cement.

New decarbonisation technologies such as hydrogen, direct electrification, biomass and carbon capture will be essential to achieving net zero carbon dioxide emissions from the energy and industrial systems. At the same time, the reduction of demand for carbon-intensive materials and the acceleration of energy efficiency improvements can significantly cut the cost of decarbonising harder-to-abate sectors (by as much as 45%). This can reduce the scale and pace at which the new decarbonisation technologies need to be deployed. The ETC report shows that emissions in the most hard-to-abate areas could be cut by 40%.

A recent ETC report on China provides a case study of the technical and economic feasibility of achieving net zero emissions even in a rapidly developing economy. It describes a shift towards a circular economy for steel, cement, fertiliser and plastics, with more efficient use and greater recycling of these key materials. In China, researchers suggest up to 60% of total steel production could be from recycled scrap steel (compared to less than 10% today), while cement demand could be reduced by nearly 50% compared to the business-as-usual level.

Full decarbonisation for industries such as steel, cement and chemicals require the use of electrification, hydrogen, bioenergy and carbon capture and storage (CCS). Processes that require intense heat demand can use hydrogen and bioenergy, whereas medium heat demands can be met through direct electrification. Hydrogen and bioenergy can be used as feedstocks, and hydrogen as a reductant in steel production. Process emissions and remaining fossil fuel usage (which falls by over 90% in a zero-carbon scenario) can be tackled through CCS.

The Chinese example illustrates that the achievement of the zero-carbon target is enabled by clear targets, forceful public policies and expanded investment – and demonstrates that living standards can rise alongside reduction in final energy demand.

Likewise, a recent report on India by The Energy and Resources Institute and ETC demonstrates the feasibility of the decarbonisation of steel production in another rapidly industrialising country. It suggests the Indian steel industry can decarbonise through a variety of methods. For example, the improvement of energy and resource efficiency and the adoption of material circularity can reduce emissions by up to 35% by 2050. The implementation of transition technologies (such as the HIsarna process, a system for the production of liquid iron directly from iron ore fines and coal) by the 2030s might reduce them by 20% – or, when combined with carbon capture and storage, by up to 80%. Deep decarbonisation technologies, such as hydrogen reduction, can reduce emissions by up to 94%.

International literature highlights the feasibility of decarbonisation in hard-to-abate sectors. Understanding this better in relation to critical sectors of Australian industry will be a core focus of this initiative.

Global and domestic markets have begun moving

Globally, and in Australia, major corporations, investors and governments are already moving to adopt the goal of net zero emissions.

In September 2019, an international group of institutional investors – representing some US\$4 trillion in assets under management – came together as the Net-Zero Asset Owner Alliance. Collectively, these investors declared that they would reach net zero emissions in their portfolios by 2050.

The Leadership Group for Industry Transition was announced in September 2019 to drive transformations in hard-to-abate and energy-intensive sectors. This group unites representatives from India, Sweden, Argentina, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, South Korea and the UK, as well as companies including Dalmia Cement, DSM, Heathrow Airport, LKAB, Mahindra Group, Royal Schiphol Group, Scania, SpiceJet, SSAB, ThyssenKrupp and Vattenfall.

Similarly, the World Economic Forum and the ETC launched the Mission Possible Platform, bringing together public and private sectors globally to cut emissions within aviation, heavy-duty road transport, shipping, aluminium, cement and concrete, chemicals, and iron and steel. Already, the world's largest container shipping group, Maersk, has pledged to achieve zero emissions by 2050, with global banks such as Citi and Société Générale agreeing on lending frameworks to promote green shipping.

In Australia, many large businesses, including BHP, Rio Tinto, Qantas, Dexu and Mirvac, have committed to achieve net zero emissions by or before 2050.

In 2019, BHP announced a five-year, US\$400 million Climate Investment Program deploying capital towards technologies to reduce emissions from its own operations as well as emissions produced through the use of its products. BHP recognises that emissions from its supply chain, including its suppliers and customers, are significantly higher than its own operational emissions. Similarly, Rio Tinto has pledged \$1 billion on climate related projects by 2025 and is partnering with others in its supply chain to reduce emissions. This includes Rio Tinto's partnership with Baowu Steel Group and Tsinghua University in China to reduce emissions across the steel value chain, as well as Elysis, a partnership with Alcoa and Apple to remove direct emissions from the aluminium smelting process.

Over 120 countries have net zero emissions targets or are discussing them. Globally, some 60 states, cities and companies have declared net zero targets – and many others plan to follow suit. In Australia, all states and territories aim to achieve net zero by or before 2050, and capital cities and local governments are increasingly setting net zero emissions targets for their communities.

With net zero emissions targets part of the 'new normal', even businesses in hard-to-abate sectors feel pressure to act to meet regulatory requirements and customer demands. Not surprisingly, many are already embracing partnership initiatives, recognising the value of working in concert in the necessary transition.

The initiative builds on this momentum.



Australia is in a unique position to benefit from an industrial recovery

The recent disruption caused by COVID-19 created potential economic opportunities for Australia. In a time of change, governments and businesses can not only revive industry but can reform it, in ways that otherwise might not be possible. Recent reports have highlighted the additional value that Australia could capture by increasing its reach across supply chains. The current moment provides an opportunity.

Australia is the world's largest producer of lithium, and is also home to almost all of the mineral elements and chemicals required for the production of lithium-ion battery storage. It could become a major player in the lithium market by leveraging these resource endowments alongside other advantages such as an existing mining expertise, efficient logistics, high-quality infrastructure and an attractive investment landscape. At present, however, estimates suggest that Australia currently captures just 0.53% of the global lithium value chain, a chain that could grow to more than A\$3 trillion by 2025 (up from around A\$200 billion in 2017). By increasing Australian presence in downstream lithium processing and battery cell production, Australia could position itself to seize this considerable economic opportunity.

Similarly, Australia currently exports more iron ore and aluminium ore than any other country. As Ross Garnaut notes, these metals are processed overseas. Though Australia accounts for just 0.3% of global steel production, he suggests that 'in the post-carbon world Australia will be well positioned to turn them into zero emissions iron and aluminium'. By leveraging a comparative advantage in renewable resources and other capabilities, Australia could produce energy – and capital-intensive materials such as green steel using zero emissions hydrogen. According to the [Grattan Institute](#), green steel represents the largest clean manufacturing opportunity for Australia in a low-carbon world, with the potential to create 25,000 jobs – a figure equal to just under half of current employment in carbon-intensive industries such as mining and heavy manufacturing. Importantly, many of these jobs could be created in regional areas that might otherwise be vulnerable to job losses resulting from decarbonisation, and the skills required are likely to overlap with many current carbon-intensive jobs.

Australia [enjoys tremendous advantages](#) in a decarbonising world since it possesses superb wind and solar resources, an existing hydroelectricity capability, and the potential to develop other renewable energy technologies such as offshore wind, geothermal, and solar thermal. The availability of land (and the expertise

to manage it) facilitates the development of biomass and carbon storage, while the abundance of sunshine creates possibilities for the export of excess clean energy abroad, either stored and transported as hydrogen or as electricity carried by high voltage transmission lines.

Two international reports have recently emphasised Australia's potential as a future major hydrogen supplier. The World Energy Council's [International Aspects of a Power-to-X Roadmap](#) identifies Australia as a 'giant with potential to become a world key player' while the International Energy Agency's [World Energy Outlook](#) projects Australia producing hydrogen equivalent to 100 million tonnes of oil, an amount equating to 3% of global gas consumption today. According to the Chief Scientist, Alan Finkel, the growing demand could foster an export industry worth \$1.7 billion by 2030, providing 2,800 jobs, many of them in regional areas.

Decarbonisation will also require minerals and metals.

A single 3MW wind turbine uses [4.7 tons of copper](#), [3 tons of aluminium](#), [2 tons of rare earth elements](#), [335 tons of steel](#), [1,200 tons of concrete](#). Not surprisingly, [the World Bank](#) expects a significant increase in global production of critical minerals for low-carbon technologies: 965% for lithium, 585% for cobalt, 383% for graphite, 241% for indium, 173% for vanadium by 2050. According to the [IEA Reference Technology Scenario](#), global steel demand will increase from 1.6Gt per annum in 2015 to 2.2Gt by 2050.

Decarbonisation represents an opportunity, as much as a challenge.



A range of challenges remain

In a series of meetings in Melbourne and Perth in 2019 and 2020, the Australian Industry ETI program team met with industry representatives across supply chains. There were a series of consultations aimed at drawing out the key challenges facing hard-to-abate sectors, particularly those unique to Australia. Industry representatives highlighted stable energy policy, comparable regulatory regimes, demand for zero emissions products and decarbonisation technologies that address process emissions as some of the key factors that will contribute to future success.

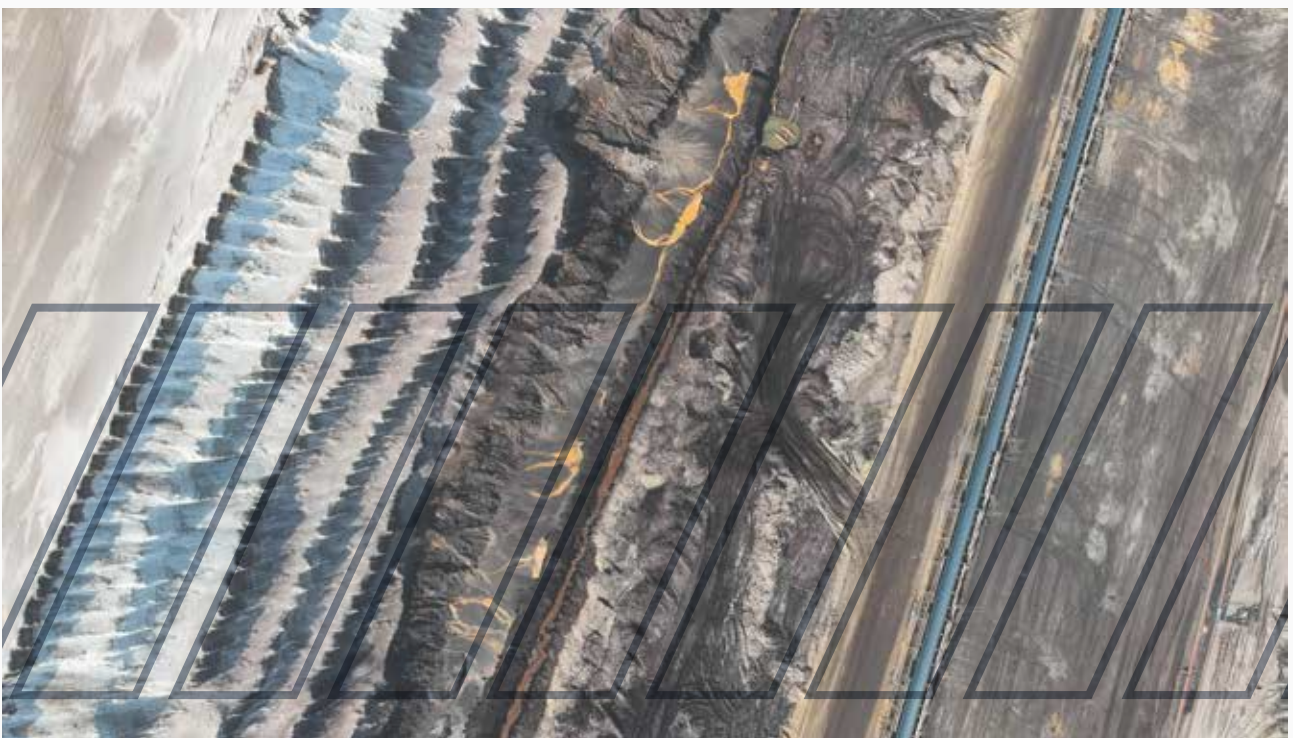
Participants spoke of the need for individuals to inspire others, both intellectually and emotionally, and identified ongoing challenges from industrial process emissions that cannot be reduced by renewable energy. These challenges take on a particular significance given the long asset investment cycles typical in the sector and the low level of investment in R&D by Australian companies (relative to their global counterparts).

They spoke of concerns about the long-term demand for net zero emissions products across supply chains. While end-use consumers can shift industry towards decarbonisation by altering their behaviour and preferences, some interviewees worried about the public's willingness to pay for environmental and social value, particularly since decarbonisation efforts have often not been backed by compelling investment

cases. Many boards have struggled to quantify the risks associated with inaction (for example, stranded assets and physical risk).

Corporate decision-makers face significant pressures from stakeholders and interest groups. In an economy dominated by high uncertainty and fluctuating demand for products, companies often focus on the actions of their competitors. They can be reluctant to invest in a new approach or industrial process that may reduce their competitive advantage. In managing the transition to net zero emissions, the perceived risks of being an early mover can be a powerful deterrent.

The initiative aims to mitigate such risks by fostering collaborative learning and experimentation. It will focus on areas identified by industry and business as necessary for progress. By assembling a coalition of firms committed to accelerate action towards net zero emissions supply chains, the initiative will encourage businesses to collectively learn. It will identify opportunities for on-the-ground experimentation with new technologies and approaches. By supporting industry to develop pathways and take action towards net zero supply chains in Australia by 2050, the initiative will allow companies to explore strategies that manage the risks associated with the transition, and to act in the best interests of all of their stakeholders. It will create a space to provide leadership for the transition.



Why focus on Australian industry?

The global climate challenge

The International Monetary Fund describes climate change as ‘an ongoing existential threat’ and notes that waiting to meet it will lead only to greater ‘loss of life and damage to the world economy’.

The World Bank warns that climate change puts both ‘economic growth and good development outcomes’ at risk.

The growth of energy demand and energy-related carbon dioxide emissions over the past 25 years lies at the heart of the global climate challenge. (PBL (2015), Trends in Global CO2 Emissions 2015 Report).

In 2015, the Paris Agreement brought countries across the world, including major economies together in an ambitious commitment to combat climate change, and to adapt to its effects. It established an international ambition to keep temperatures ‘well below 2°C’ and to pursue ‘efforts to limit the temperature increase to 1.5°C.’

This will require net zero emissions by mid-century – or earlier for developed economies. If planetary warming is to remain below 1.5°C or even 2°C, the energy system must be transformed at a dramatic rate over the next 15 years.

That means swiftly reducing energy-related carbon dioxide emissions while expanding energy services to meet growing demand. Climate goals and economic growth are interdependent: the progress towards net zero emissions by 2050 entails a series of interconnected transitions.

While the Paris targets are ambitious, unexpectedly rapid technological advances have created opportunities that did not exist even a few years ago. In particular, the costs of renewable energy and storage have declined at rates exceeding the most optimistic of past expectations. In the past five years, for instance, more solar plants have been installed than had been projected for a period of twenty years. Wind and solar photovoltaics have become the cheapest sources of new electricity generation, and can be supported by increasingly effective battery storage.

Nevertheless, some sectors still pose considerable challenges. For instance, industrial and heavy transport emissions are projected to increase without rapid action to change current market trends. The longer these sectors take to transition to net zero emissions, the greater the risk of ‘locking-in’ future emissions throughout supply chains, and the higher the cost of addressing the consequences in the future. This is particularly so in

industry due to the long-lived capital-intensive nature of equipment and assets.

Yet the challenges also present opportunities, with organisations such as the World Bank and the World Economic Forum highlighting growing demand for products and services fit for a net zero global economy. The transition to net zero facilitates the construction of energy and industrial systems that not only produce dramatically lower levels of emissions but also generate multiple social, economic and environmental benefits.

Understanding these challenges and opportunities as they relate to the Australian context is a key focus of this initiative.



The importance of industry in addressing climate change

Cement, steel and plastics, trucking, shipping and aviation – the sectors considered in the ETC’s report – collectively represent about 30% of current global emissions. Without further action, this figure could rise to 60% by 2050 as demand grows and the share of emissions generated by other sectors falls.

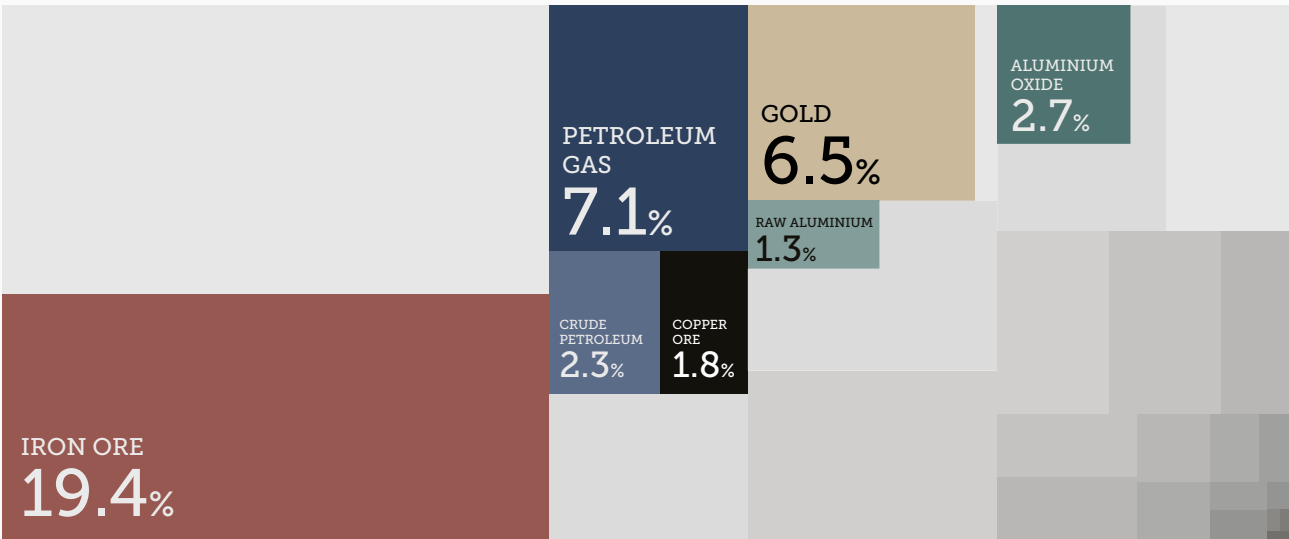
In Australia, hard-to-abate industrial sectors, including iron and steel, aluminum, other metals, chemicals and liquefied natural gas products, accounted for \$160 billion, or nearly half, of Australia’s export value in 2018-19. These sectors and associated energy systems contribute more than a quarter of Australia’s emissions each year.

Their centrality to the Australian economy creates important opportunities in the transition towards net zero emissions.

Australia can expand its economy while transitioning these industrial sectors to net zero emissions by 2050 by exploiting a combination of mineral resources, renewable energy opportunities, project finance, engineering capability, and existing trade relationships to establish international competitiveness in low-carbon energy and industry.

The research and analysis undertaken in this initiative will allow the scale of these opportunities to be better understood.

What does Australia export? (2017)



Source: The OEC

The scope of the initiative

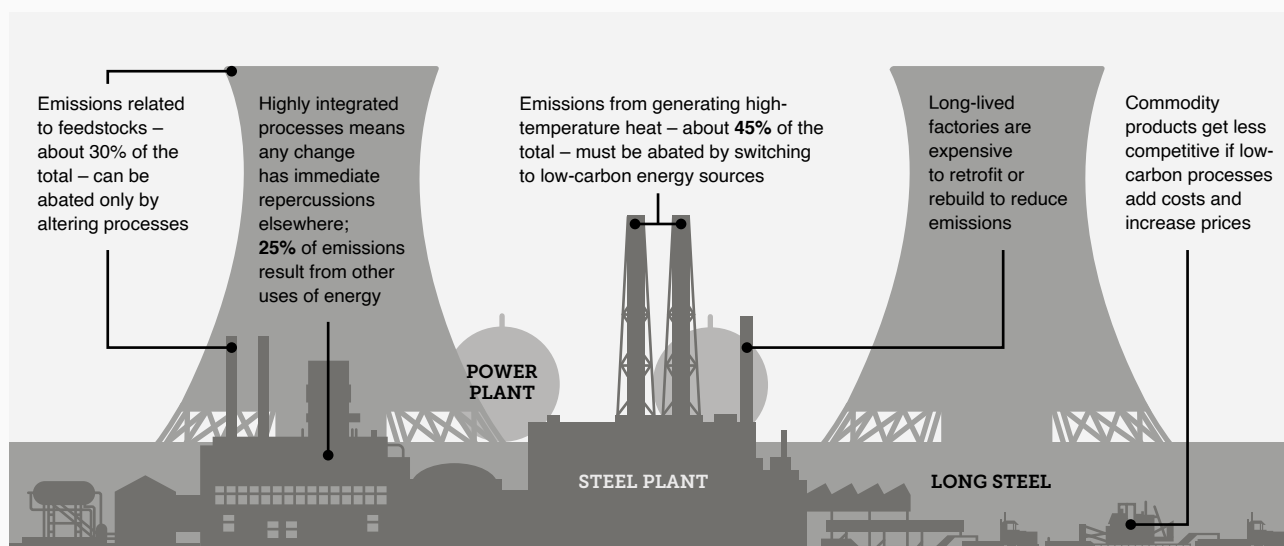
The five critical industries and supply chains working with the initiative are:

- iron and steel
- aluminium
- liquefied natural gas (LNG)
- other metals (copper, nickel, lithium, etc)
- chemicals, especially fertilisers and explosives.

These industries have been chosen because they contribute over \$160 billion in export revenue to the economy every year while also generating more than 130 mega tonnes of carbon dioxide equivalent in emissions – over 25% of Australia's annual emissions.

The sectors are known as hard-to-abate because the reduction of their emissions poses more technological challenges than do other sectors of the economy. For example, a 2018 [McKinsey report](#) found that 45% of emissions in ammonia, cement, ethylene and steel companies result from feedstocks and process emissions which cannot be decarbonised through zero emissions electrification. Many of these sectors also use industrial processes that rely on temperatures of up to 700 to 1600 degrees Celsius, a heat achieved at present only through the burning of fossil fuels. Because such processes are often highly interdependent and integrated, a change to one part of the process must usually be accompanied by corresponding changes to other parts. The difficulties are exacerbated because life spans of industrial production facilities typically exceed 50 years, and these emissions and energy intensive processes tend to be several steps removed from end consumers.

Illustration of the challenges in decarbonising steel production:



Source: The OEC

Why focus on supply chains?

The initiative focuses not only on companies and industries but also on their supply chains. Supply chains embody the highly complex and interconnected nature of the global economy. A focus on a sector's supply chain provides an effective way to accelerate the impact of emissions reductions across these hard-to-abate sectors, and manage the transition to a thriving, decarbonised global economy.

Large firms function within a web of relationships between customers, trading partners and suppliers. As they reduce their emissions to net zero by 2050, firms can influence not only their own operations but,

through their buying power, the operations of their suppliers. There is also an opportunity to provide the new products and services increasingly demanded by customers as they transition to net zero emissions within their own businesses.

This influence will become increasingly important, as markets and investors focus on achieving net zero emissions and put the networks that exist between a company and its suppliers under increasing scrutiny.

As the largest exporter of iron ore, bauxite and LNG, as well as a significant producer of other metals, Australia and the state of Western Australia play an important role in influencing the trajectory of emissions across these supply chains. This initiative will explore the opportunities for Australian industry to influence broader markets.

Western Australia represents a microcosm of the national challenge and opportunity

Attention will be focussed on Western Australia, given the unique challenges and opportunities for net zero emissions in that state.

The emissions intensity of Western Australia's economy presents particular challenges for decarbonisation. There are also particular opportunities in the state, given the mineral and energy resources that create potential for a transition in hard-to-abate sectors.

In a decarbonised global economy, the factors influencing competitiveness will shift. An abundance of renewable resources and the ability to develop renewable energy and flexible energy infrastructure will be important, alongside more traditional advantages such as finite mineral resources, export infrastructure and trade relationships.

Western Australia is home to high-quality renewable energy resources, with some of the highest levels of solar irradiance in the world and reliable wind resources. It is well placed to develop large-scale renewable energy generation because of its size, low intensity land use and low population density.

Industry and resources are critical for Western Australia and a transition to net zero emissions can future proof industry

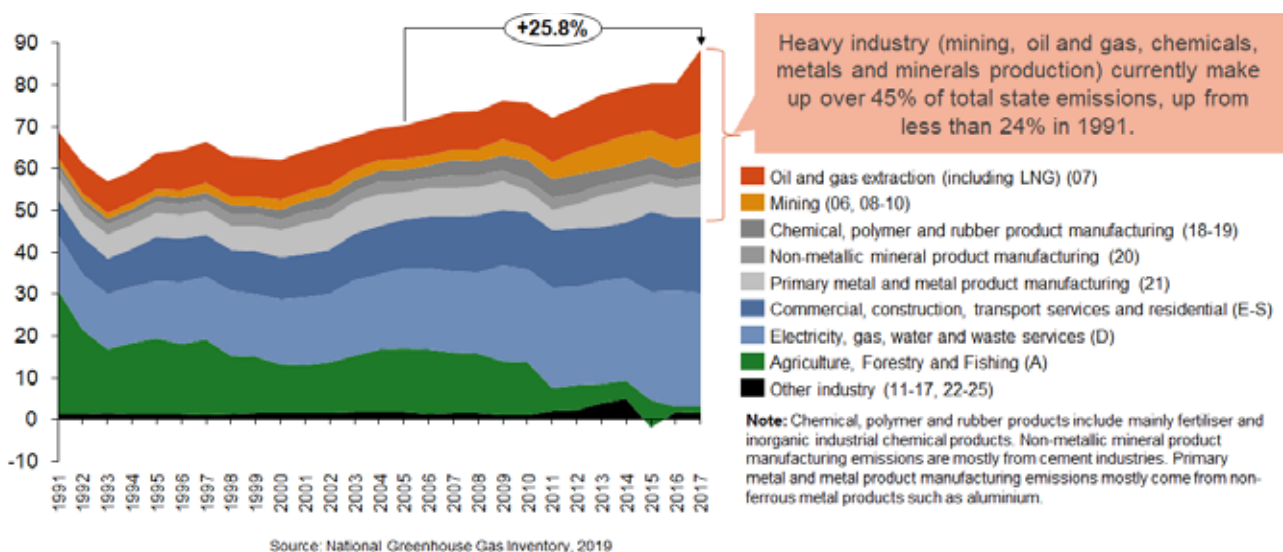
The Western Australian state economy is strongly dependent on hard-to-abate sectors, even more so than Australia overall. Emissions in the state have been rising strongly. Mining accounted for 36% of GSP in 2018-19, making it the largest sector of the economy. That contrasts with the rest of Australia, where services are a larger share of the economy.

Heavy industry is also a major part of the state's emissions, contributing over 45% of total emissions (up from 24% in 1991).

Heavy industry, in particular mining, is growing quickly, both as a proportion of emissions and the economy. Since 2005, emissions from industry and energy increased over 57% while emissions across the rest of the state increased by just 25%. Emissions in Western Australia have continued to rise over the period from 2005 to 2018 even as emissions in the rest of the country decreased.

The structure of Western Australia's industry is highly export oriented, contributing a substantial share of the world's total resources demand. In particular, WA supplies around one-third of the world's iron ore, 18% of the world's rare earth minerals and 14% of the world's LNG.

WA emissions by sector, MtCO₂e



Western Australia has distinct energy infrastructure and networks, which will make the state's transition distinctive

Western Australia's energy infrastructure and networks are separated from those in most of the rest of the country, which operate on the National Energy Market. Western Australian industry either operates on the South West Interconnected System (SWIS), the North West Interconnected System, on smaller remote grids or from dedicated generation.

In 2019, over one-quarter of households had solar photovoltaics on their rooftops on the SWIS, fast approaching 1GW – making this the equivalent of the single largest generator in the state. Apart from rooftop solar, the state lags in development of large-scale renewable generation, despite very good renewable resources. This network is also not beholden to the same market rules as the rest of Australia, providing an opportunity for market development that supports high penetration renewables in advance of the rest of the country.

Electricity in these remote grids will generally be more expensive than on larger networks as fuels such as diesel must often be transported considerable distances by truck or ship with a reserve stored on site in case electricity use is higher than expected or the area is cut off by the weather. Such factors can increase the case for renewables, although smaller grids also mean that mechanisms for managing variable energy generation become more important.

Industry has revealed strong interest in a range of opportunities to reach net zero emissions in the state and to capture industry growth

While industry will change substantially through the transition to net zero emissions, the world will continue to need steel, aluminium, fertilisers, plastics and other metal products.

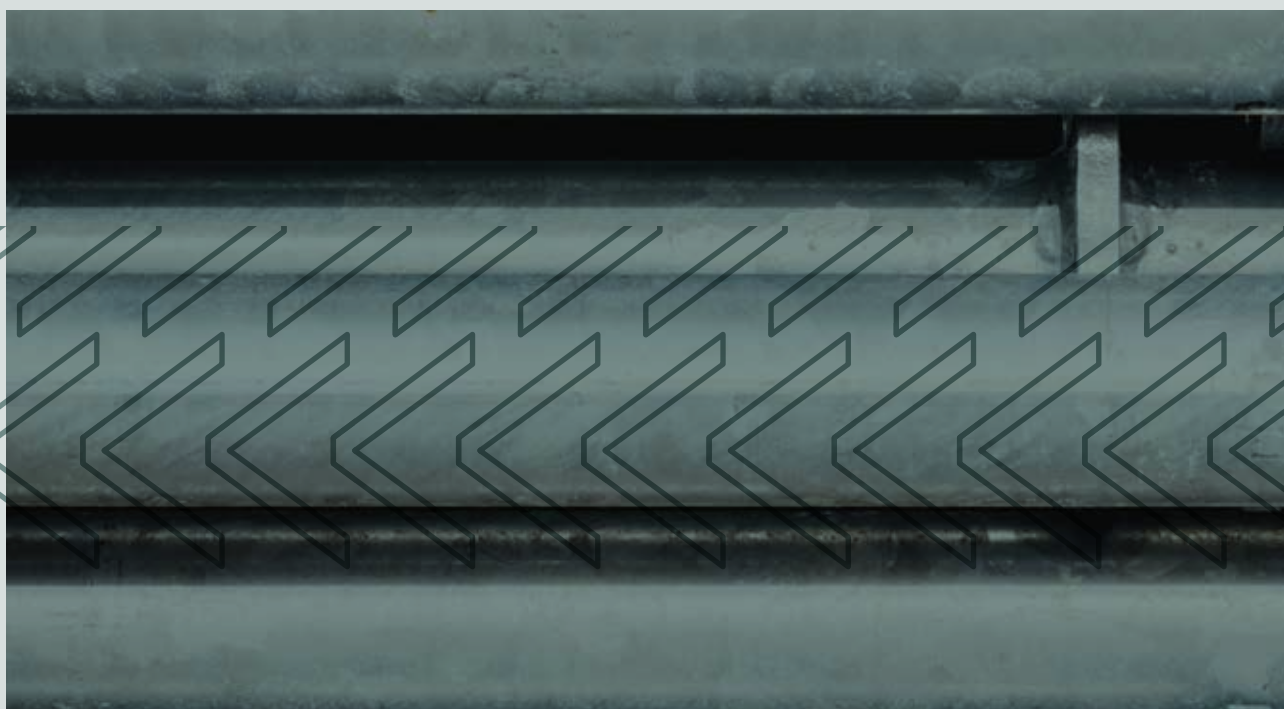
In some cases, demand will increase substantially to facilitate the infrastructure, systems, plant and equipment to operate at net zero emissions.

In particular, the global transition to net zero emissions creates opportunities in Western Australia to produce the minerals required, including lithium (for batteries), copper (needed for electric vehicles) and other rare earth minerals for renewable energy generation and storage.

Industry has identified opportunities to export energy to the wider region such as via hydrogen exports or High Voltage Direct Current (HVDC) transmission to South East Asia, providing, that is, Western Australia develops its potential advantage in low-cost renewable energy.

Cheap, reliable renewable energy could also support new industries. The industry consultations identified potential for WA to lead the development of new zero emissions industrial products such as green ammonia, hydrogen, aluminium, green steel and battery components.

With effective planning and supportive policies, unlocking these opportunities for new value-adding industries could lead to substantial regional growth and jobs. Western Australia could play a key role to support Australia to thrive in a decarbonised global economy.



The initiative creates the space for informed action

To date, the initiative has consulted with over 60 representatives from across the five Australian industry supply chains. It has also engaged with those from major finance and energy corporates, both of which are key to enabling the industrial transition to net zero emissions by 2050. These individuals, representing 40 corporations, attended two workshops, designed and facilitated by ClimateWorks Australia and Climate-KIC Australia, where they identified and discussed the challenges and opportunities for Australian industry. In addition, a series of one-on-one engagements have been undertaken with a focus on industry companies and a broader range of stakeholders.

After commencing in October 2019, the initiative's Establishment Phase will conclude in July 2020, with the publication of this Program Overview and an accompanying Work Program document.

As a collaboration with the Energy Transitions Commission, the initiative has benefitted from the ETC's experience thus far, with the establishment of a coalition of Commissioners representing global industrial companies and key enabling organisations.

Context has been at the forefront of the planning. The delivery plan for the initiative (as set out in the Work Program) focuses on flexibility and adaptability, recognising the ongoing impact of COVID-19 and the uncertainty of the external context. This enables industry partners to decide how and when to engage with the initiative, particularly beyond the initial phase.

What the initiative will do

The initiative facilitates action towards net zero emissions in key industrial supply chains.

Through the initiative, industry partners from hard-to-abate sectors, energy suppliers and investors will establish a network to explore, develop and act towards net zero emissions in key industrial supply chains by 2050. Convened by ClimateWorks Australia and Climate-KIC Australia, the initiative will work with delivery partners including leading Australian and international experts on energy transitions, such as the Rocky Mountain Institute, CSIRO and Energy Transition Commission. The network will develop a shared understanding of how these hard-to-abate sectors can accelerate action towards achieving net zero emissions supply chains by 2050, while developing tangible on-the-ground decarbonisation projects.

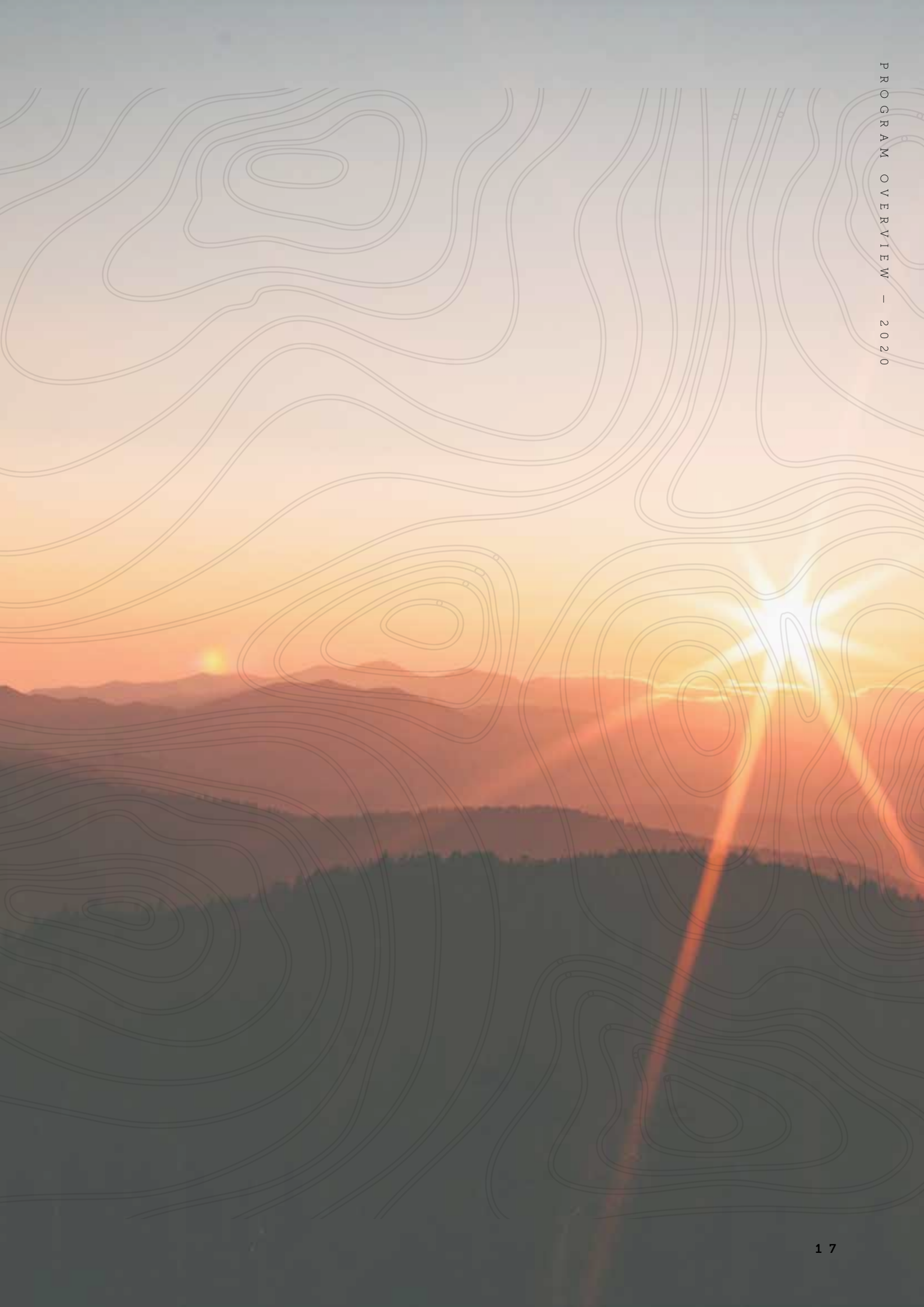
A core group of industry representatives will steer the direction of the work, test analytical insights and, ultimately, endorse findings and recommendations.

With the initial phase of 'Current Situation and Future Possibilities', industry and delivery partners will come together through a series of Steering Group meetings, workshops and learning forums to:

- Identify key technologies and other opportunities that will play a role in reaching net zero emissions
- Analyse the feasibility and potential impact of deploying these opportunities to pursue net zero emissions supply chains
- Deepen an understanding of the innovation ecosystem dynamics of the different supply chains, and the barriers and opportunities for change
- Identify early action and implementation projects that can drive investment and development of net zero emissions industries in Australia
- Develop research findings and insight reports to support industry strategy and business planning
- Coordinate learning, debate and capability building through regular forums and workshops
- Undertake outreach to policy makers, researchers, innovators and the broader business community to share insights and recommendations.

The initiative is designed to develop a credible knowledge base of decarbonisation technologies and solutions specific to hard-to-abate sectors, with publications building on existing literature and studies. Working with other stakeholders, the network of industry partners will fast-track these solutions through an expanding portfolio of actions and demonstration projects focussed on net zero emissions supply chains both nationally and with a regional orientation to Western Australia.

The initiative is funded by a combination of philanthropy, industry partners and the Australian Renewable Energy Agency (ARENA) on behalf of the Australian government.



FURTHER INFORMATION

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Australian Industry Energy Transitions Initiative

An initiative jointly convened by ClimateWorks Australia
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