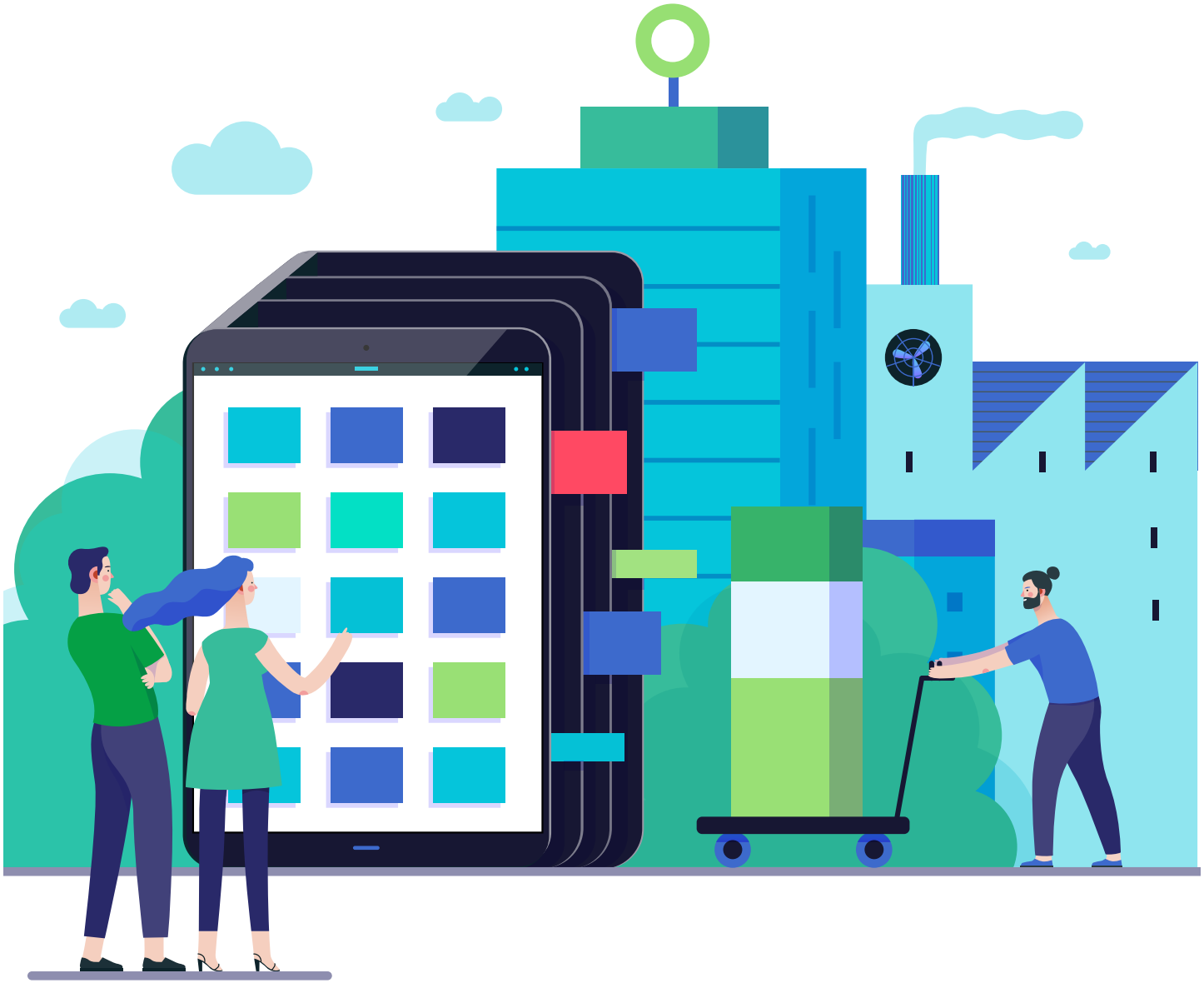
CENTRE FOR
EDUCATION & TRAINING

Skills for a cleaner future

Building the workforce for a clean economy

FEBRUARY 2024



About Australian Industry Group

The Australian Industry Group (Ai Group®) is a peak national employer organisation representing traditional, innovative and emerging industry sectors. We have been acting on behalf of businesses across Australia for 150 years.

Ai Group and partner organisations represent the interests of more than 60,000 businesses employing more than 1 million staff. Our membership includes businesses of all sizes, from large international companies operating in Australia and iconic Australian brands to family-run SMEs. Our members operate across a wide cross-section of the Australian economy and are linked to the broader economy through national and international supply chains.

Our purpose is to create a better Australia by empowering industry success. We offer our membership strong advocacy and an effective voice at all levels of government underpinned by our respected position of policy leadership and political non-partisanship.

With more than 250 staff and networks of relationships that extend beyond borders (domestic and international) we have the resources and the expertise to meet the changing needs of our membership. We provide the practical information, advice and assistance you need to run your business. Our deep experience of industrial relations and workplace law positions Ai Group as Australia's leading industrial advocate.

We listen and we support our members in facing their challenges by remaining at the cutting edge of policy debate and legislative change. We provide solution-driven advice to address business opportunities and risks.

About Ai Group Centre for Education and Training

Ai Group's Centre for Education and Training drives bold new thinking on education and training in the context of work. It explores new ways to build skills and capabilities of companies to succeed now, and into the future.

Our proactive research, policy and advocacy agenda strives to ensure Australia's skill development outcomes are in line with current and emerging economic needs, at the same time linking the real needs of industry with the training, education and career aspirations of individuals.

Foreword

Movement towards a ‘cleaner’ economy is creating a significant economic transition around the world, and Australia is running with this tide. Our policymakers and business leaders are accepting, and rising to, this challenge.

We need Australian companies to be well placed, not just to survive this transition, but to become better, leaner and ‘greener’ as a result.

Right now, Australian businesses, large and small, across all industry sectors, are thinking about what this transition means for them - their business model, market, strategy and workforce. They are doing so in response to a range of factors - policy and regulation, consumer demand, input cost pressures and the demands of their supply and trading partners.

I am very optimistic about the opportunity the clean economy transition represents for Australian businesses. However, as is so often the case, it is people, and their knowledge, skills, capabilities, partnerships and insights that will be the key to our success.

Policymakers must create the right conditions for that success, and businesses must have the right strategy for the conditions.

Australian businesses need to forge into these uncharted waters with skill and confidence. This will require strong leadership and strategy, but also the flexibility to change tack when required, and the agility to respond swiftly to new developments, opportunities and constraints.

There’s no time to waste.

Innes Willox
Chief Executive
Australian Industry Group

Contents

About this research

This research explores how everyday Australian businesses are experiencing the transition to a clean economy.

We wanted to understand more about the drivers of change, and their relationship to emerging skills and workforce needs.

For the businesses already on this journey, we sought to understand how skills and workforce needs were changing. We also wanted to uncover examples of best practice to help others and inform policy directions and support.

For those less advanced, we wanted to learn more about any potential barriers to change, and if a lack of skills and capabilities was playing a part.

Overall, we wanted to provide a 'real time' snapshot of Australian businesses navigating this transition, including the factors driving their decisions and business strategies, and what that might mean for jobs, skills and workforce capabilities going forward.

We conducted 31 semi-structured interviews with a range of Australian businesses. The detailed interviews were conducted in July and August 2023, and provided both quantitative data and qualitative insights.

Interview participants were drawn from a broad range of industries including manufacturing, construction, engineering, health, food, electrical and packaging. There was only one business from the clean energy sector.

We interviewed 8 small businesses (19 or less employees), 22 medium sized business (20-199 employees) and 1 large business (employing more than 200 employees). Participating businesses were drawn from across the country, with 12 located in Queensland, 10 in Victoria, 5 in New South Wales, 3 in South Australia and 1 in Tasmania.

Summary

The transition to a clean economy is being driven by a range of factors – global emissions reduction targets, national legislative and regulatory requirements, advances in technology, conscious consumer choices and values-driven investing.

These multiple forces are coming together with the stealth and inevitability of a river system making its way to the sea. Ultimately, they are all pushing us in the same direction – towards a world in which we do business, live and consume much more sustainably.

Economies around the world are taking action to drive this change. As well as ushering out outdated technologies, this is also unleashing a plethora of new industries and opportunities. Demand for new forms of cleaner energy, new financial products, innovative technologies and expertise in environmental management and sustainability are resulting in a range of new jobs and skills.

Some countries have been thinking about this for years, decades even, and have been putting in place the infrastructure – physical, economic and social – to scaffold this journey. This includes getting the right skills and workforce in place.

So how is Australia travelling on this front?

We wanted to know more about the effect this transition is having, and is likely to have, on the skills and workforce needs of Australian companies. We were interested, not so much in those at the pointy end of the transition, such as those in the energy sector, but everyday small and medium businesses right across the economy.

So, we asked businesses about this transition - the drivers of change, where they see the challenges and opportunities and what this means for their strategy going forward.

What did we hear?

Among the businesses we spoke to, there was a very broad spectrum of knowledge, engagement and action.

It is also fair to say that many were only in the early stages of engaging with and planning for this change. It is likely that many Australian companies have not engaged with the clean economy transition to date because they haven't had to. The 'stick' has not been there like it has perhaps been in other countries. But that's changing, and this report paints a picture of an economy with some work to do.

For some businesses we spoke to, a 'sustainability mindset' was deeply ingrained, and underpinned all aspects of their operations. One small subsidiary of a German-based company said:

> 'We are driven by a high level of altruism, underpinned by a culture of producing the best that can be bought environmentally. Our altruism and company policy drove our early uptake of the clean energy transition preceding political engagement'.
>
> Small flexible film, textile coating and construction adhesives manufacturer

Whereas others were more squarely focused on the bottom line. As one business said:

> 'My only driver to adopt any clean economy practices is whether it works economically for me.'
>
> Privately-owned metal fabrication business in regional Australia

Overall **81%** **said their business had implemented changes** related to the transition to a clean economy.

Of those who said they had made changes, **42%** said those changes were the result of efforts to reduce waste from their operations. **35%** said they had made changes to transition to cleaner forms of energy and **23%** said they had taken steps to adapt to or mitigate the effects of climate change on their business.

61% **said the transition to a clean economy was having a moderate to significant impact** on their business.

90% of the businesses said they were somewhat or very informed about the transition to a clean economy. Around half considered themselves very informed.

Changing customer demands was the strongest factor driving businesses to engage with the clean economy transition. **77%** of the businesses cited this a driver of change. The next most influential drivers were government policy and government programmes/subsidies.

81% **viewed the transition to a clean economy as an opportunity** for their business. Among small businesses, that figure rose to **100%.**

76% of businesses saw it as an opportunity to reach new customers.

For those who saw it as a threat, there were concerns about increased costs and reduced profitability. Although the threat was perceived as being more in the short to medium term, with the opportunity seen as ongoing, and increasing into longer term.

42% of the businesses expected the clean economy transition to **drive emerging or increased skills needs** over the coming year.

Half the businesses expected that the **skills or tasks in their existing jobs would change**, and half **expected completely new jobs to emerge**. Around a third thought that existing roles would be eradicated.

When we asked businesses whether they had the skilled employees or teams to navigate the clean economy transition, results were mixed, **55% said yes**, **45% no**.

39% felt their workforce had circular economy skills, **33%** felt they had clean energy skills and capabilities, and **29%** felt they had climate adaptation skills.

Among those businesses who considered that their skills needs would increase, **48%** considered this would be in skills related to the circular economy and **45%** considered this would be skills in relation to clean energy.

What can we do?

A successful and smooth transition to a cleaner economy will depend on having the right skills and capabilities. This will require clear policy objectives driving effective policy instruments, strong leadership and genuine collaboration. To achieve this we need policymakers, business leaders and the education and training system on the same team.

Policymakers need to set clear national policy objectives, provide the right pathways and incentives, and to communicate them clearly. This will give businesses the confidence to invest and take action for the medium to longer term.

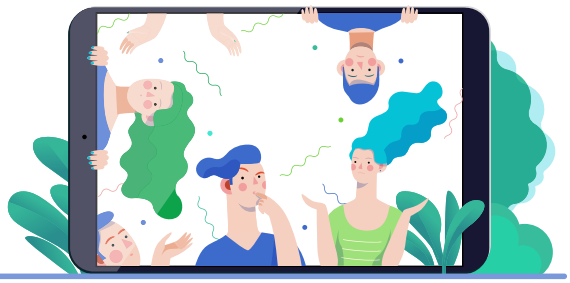
Business leaders will need the capability and foresight to see what's over the horizon, to understand the regulatory and policy framework and formulate their strategies accordingly.

The **education and training system** needs to work as an effective partner in developing the skills and capabilities needed to get us there.

Together, we need to **build the capability to navigate this significant transition**. This means continuing to develop data and modelling at the national level and enhanced support for businesses to undertake workforce planning and connect with others to share insights. This may mean thinking of new platforms to share information and solutions.

We need to **build the education and training system to take us there**. This means a better-connected, more integrated tertiary education system encompassing both VET and higher education, implementing the recommendations of the Noonan review of the Australian Qualifications Framework and strengthening and extending the apprenticeship system. It also means incentivising greater collaboration between education and training providers and industry, including stronger research linkages between universities and businesses and more opportunities for work integrated learning.

We also need **to assist existing or 'at risk' workers to gain the skills and capabilities needed to thrive in a transitioning economy**. This means embedding clean economy literacy across all qualifications, increasing access to short form training and developing generic skills and capabilities like collaboration and communication which are becoming more important than ever.



Towards a cleaner economy: The challenge

The need to reduce our impact on the planet is nothing new. The drive to tackle our greenhouse gas emissions, energy consumption and waste has been a factor, to a greater or lesser extent, in political and business decisions for decades. However, it's fair to say that Australia has not been a world leader on this front.

Yet, regardless of the comings and goings of the politics, the problem has not gone away with the passing of time – indeed the impetus to act has only become more urgent. In simple terms, we need to do more with less, cut waste, and reduce our material 'footprint' on the environment. Globally, this is translating into a significant economic transition – the transition to a clean economy.

What do we mean by 'clean economy'?

This report deliberately chooses the transition to a 'clean economy' to define its scope. This is much broader than the 'clean energy transition', although moving to new forms of energy is a key component.

The 'clean economy' is a relatively new term with broad implications. A recent clean economy workforce study[1] defined the concept as comprising three pillars:

- Climate change mitigation and adaptation
- Renewable energy
- Circular economy

Climate change mitigation and adaptation

This means all activities related to limiting the extent of climate change, as well as the steps taken to respond to, or anticipate the effects or risks associated with climate change related events.[2]

For the businesses in our study, this included activities and planning related to adapting plant, machinery, offices and infrastructure to increase their resilience to growing climate change risk.

Renewable energy

This refers to the development and utilisation of forms of energy which harness the environment to generate low carbon and replenishable sources of power. The most common sources are solar, wind and hydro but other technologies such as hydrogen, bioenergy and geothermal are also relevant.[3]

For the businesses in our study, this could mean considering their energy needs and

sources, seeking out renewable forms of energy in the marketplace, or taking steps to generate energy from alternative sources themselves.

Circular economy

The term 'circular economy' refers to a state whereby a business, community or larger system is designed to extract the maximum value and usage from available resources and minimise the waste generated.[4] A portion of this could be through minimising waste generation from the outset, often through servitisation.[5] This approach is underpinned by three principles: eliminate waste and pollution, keep products and materials in use, and regenerate natural systems.[6] A PwC study in 2021 valued the circular economy at around $1.9 trillion dollars in Australia over the next 20 years.[7]

For the purposes of this project, we asked businesses to focus on the steps they have taken to reduce waste, including increasing recyclability and redesigning products to maximise utility throughout their life.

Where are we on the journey?

In 2022 the Australian Government strengthened Australia's Nationally Determined Contribution (NDC) under the Paris Agreement, increasing the targeted greenhouse gas emission reductions to 43% below 2005 levels by 2030 and affirming the target of achieving net zero emissions by 2050.

This landmark commitment has put the Australian economy - and workforce - on a pathway for structural change, with policymakers and business leaders now forced to look to ways to rethink operations, investments and strategy to meet these national objectives.

The policy landscape

Decarbonisation

At least since the introduction of the Renewable Energy Target (RET) in 2001, a series of new policies and reforms has focused on decarbonising the Australian economy.

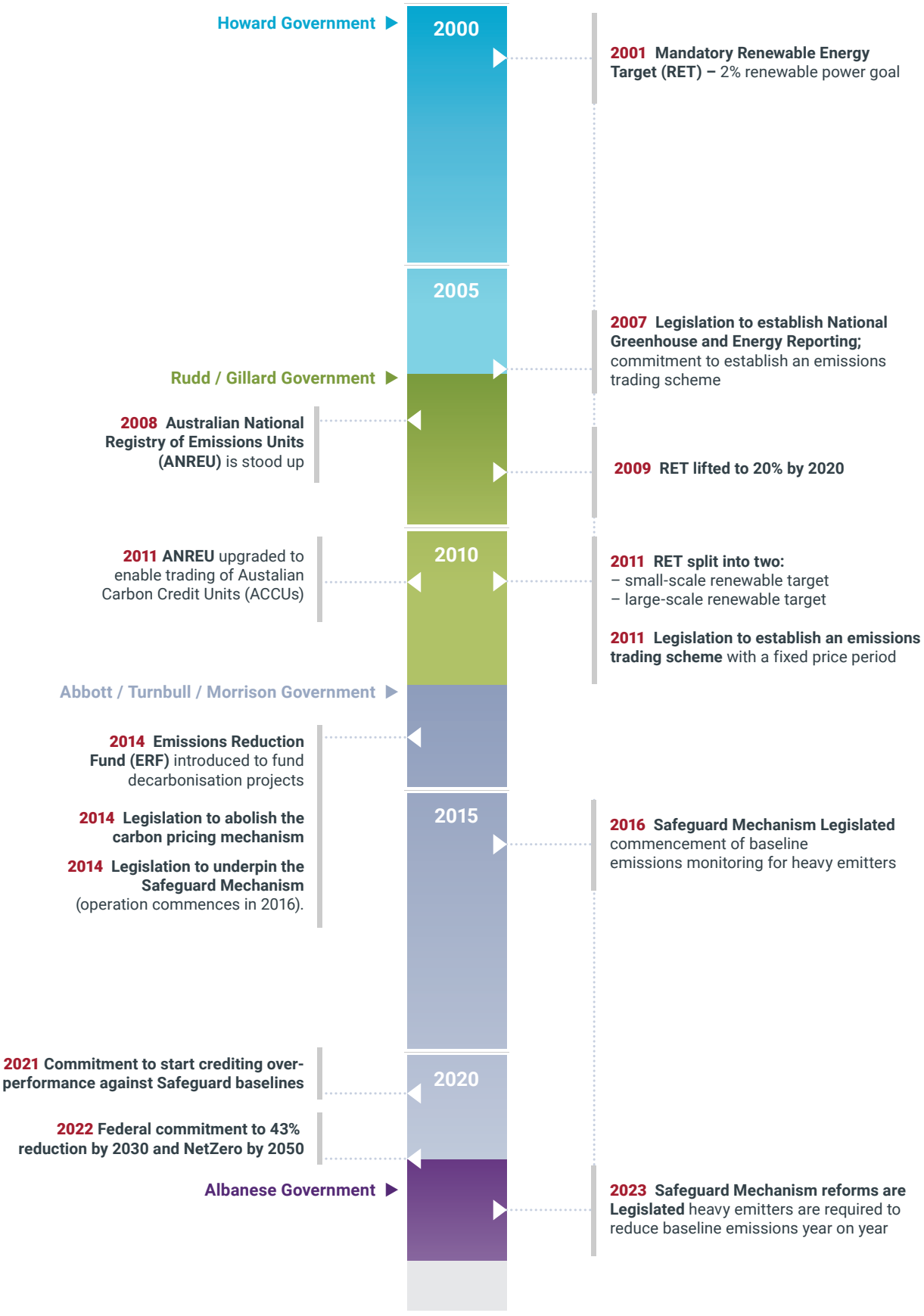
Much of this effort related to the policy foundations for an efficient carbon market that rewarded efforts to remove carbon from the atmosphere and businesses that reduce the emissions generated from their operations. While one form of formal carbon pricing was abolished following the 2013 election, another form was established in 2016 through the Safeguard Mechanism and its relationship with Australia's carbon credit market. Recent reforms to the Safeguard Mechanism establish a strong regulatory incentive for heavy emitters to decarbonise in line with national commitments.

In early 2023, the passage of the Safeguard Mechanism Reforms legislation marked a turning point for regulating activities that generate carbon emissions. From 1 July 2023, businesses emitting 100,000 tonnes of CO2e in their scope 1 emissions are now required to reduce their carbon footprint in line with the Australia's national climate targets.[8] This will begin to reduce the allowable carbon emissions these firms can produce each year.[9]

Although Australia is still in the early stages of carbon footprint regulation, there are signals that decarbonisation policy has its sights set on economy-wide emission reduction activity.

The reforms currently only impact 215 facilities across the country,[10] however businesses of all sizes in the Australian economy will be engaged over the coming decades to achieve the national goal of 'net zero' by 2050.

Timeline of national decarbonisation policy development in Australia



Further decarbonisation policy is likely. The Federal Government is considering options for a Carbon Border Adjustment Mechanism that might expand carbon price signals. The Productivity Commission has proposed expanding the Safeguard to medium sized facilities by lowering the coverage threshold from annual emissions of 100,000 tC02e to 25,000 tCO2e[11]; adding electricity generation; and upstream coverage of liquid fuel combustion.

The Commonwealth Treasury is also developing climate-related financial disclosures for Scope 1, 2 and (to a lesser extent) 3 emissions for larger businesses (ultimately extending to those with greater than $50 million in revenue, $25 million or more in assets or 100+ employees).[12]

Carbon credits and emissions trading

To deliver on emission reductions, emitters can arbitrage the cost of removing carbon emissions from their operations against the prevailing market price of equivalent carbon credits, including both Australian Carbon Credit Units (ACCUs) offsets and Safeguard Mechanism Credits (SMCs) issued to facilities that beat their emissions baselines. In this landscape, businesses with more expensive or limited emissions reduction options can leverage the efficiencies of other firms and market agents who have lower cost of emissions reduction through emissions trading.[13]

This nascent carbon price market is currently split in two parts – the compliance offset market and the voluntary offset market.[14]

- **The compliance offset market**, including ACCUs and SMCs, serves the firms required by law to abate or offset their emissions against their defined baselines.
- **The voluntary offset market**, including ACCUs and various forms of international carbon units, caters to firms that voluntarily opt to reduce their emissions and can purchase offsets in the marketplace. This market is soon likely to be smaller than the compliance market.

Circular economy

Some experts estimate moving to renewable energy sources and implementing energy efficiency measures can address 55% of global greenhouse gas emissions, leaving the remaining 45% of the problem left to be solved.[15] Tackling the remaining 45% of emissions requires a revision of how we design, make, and use products and materials, as well as the way we use land.[16] This is the circular economy opportunity.

In 2018, China implemented import restrictions on recyclable materials through its National Sword Policy.[17] Australia, along with other countries, had been exporting waste and recyclables to China. This quickly disrupted the ways we dealt with waste in Australia and highlighted the lack of capacity to process and recycle materials locally.

With export opportunities for unprocessed Australian recyclables curtailed, and a national imperative commitment to net zero, there is change afoot as the government and the regulatory landscape is reformed to build our circular economy capacities.

Landmark Circular Economy Legislation

- National approach to waste regulation
- Develops circular economies
- Encouraging environmentally sound recycling and recovery of products
- Regulates the export of waste products

- E-Stewardship policy development - 2023
- Recycled content traceability draft framework - late 2023
- Mandatory Packaging Reform - 2024/25, APCO
- ACCC Greenwashing Guidance - 2023

What effect is this having on jobs and skills?

In the most recent Ai Group Skills Survey *Listening to Australian businesses on workforce and skills*[18] 24% of businesses reported emerging and increasing skills needs as a result of the transition to a clean economy.

Over a third (36%) of businesses also reported that they had to re-skill existing staff on the job as a result of the transition over the previous 12 months.

Figure 1. How has the transition to a clean economy affected skill needs over the past 12 months?

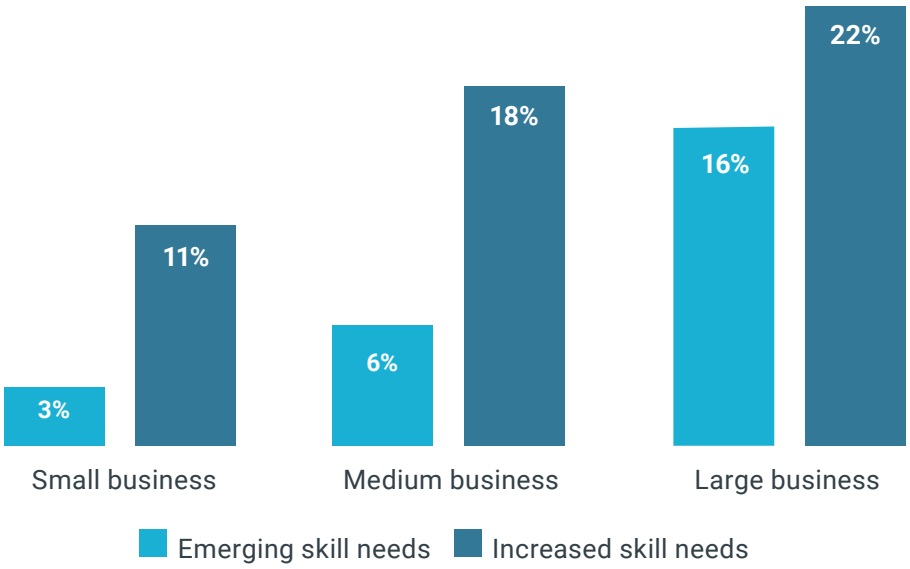
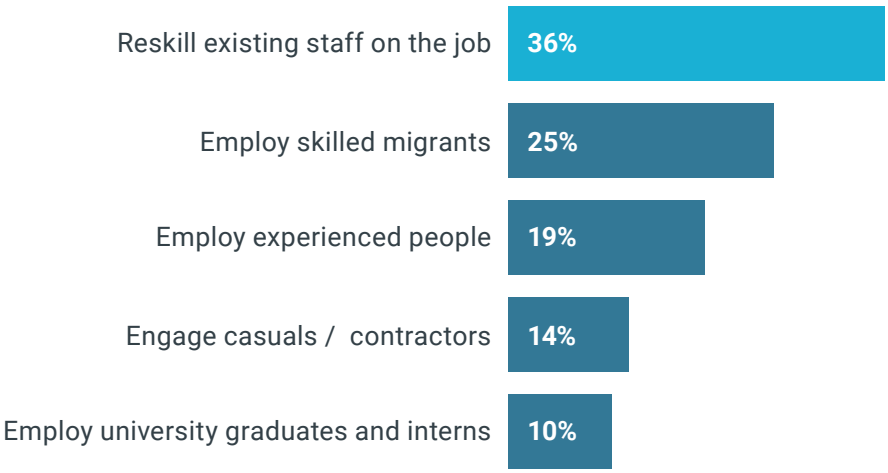


Figure 2. If your skill needs for the clean economy have increased, what action will you take to meet them?



This shows businesses' skills needs are changing, and they are taking a range of actions in response. We need to understand more about which strategies are successful, and why, to support more businesses to identify and find the skills they need to meet this challenge.

What are 'clean economy' jobs and skills?

Understandably, the first stages of work to understand the implications of the clean economy transition have focused on definitions. However, the definition of a 'clean' or 'green' job is dynamic and subject to change as new technology and roles are created to support the development of a clean economy. Emerging 'green' developments and the consequent skill demand are fluid and evolving. What is 'green' today could very easily become 'brown' tomorrow.[19]

The OECD found that green jobs are 'less routine-intensive and higher-skill than non-green occupations' and require high-level analytical and technical skills related to technology. Green jobs also tend to involve more high-level abstract skills, and require more education, work experience, and on-the-job training'.[20]

Collaborative research centre *RACE for 2030*, suggests there will be a growing demand for skilled tradespeople and energy professionals with specific technical skills (acquired through rapid upskilling programs) and a mix of cross cutting skills (such as collaboration, communication and project management) that augment the technical skill sets.[21]

The new roles needed for the clean energy industry are distinct, with Jobs and Skills Australia modelling that there are 38 critical occupations to the energy transition.[22] In the foreseeable future, it is expected that the demand for these occupations (such as Electrical Engineers, Metal Fitters and Machinists, technician roles and Production Engineers) will be strongest across the economy throughout the energy transition. Building up the pipeline of these skilled workers will rely heavily on the vocational education and training system to deliver new workers with these skills to the market and also top up the skills of existing workers as they adapt to new practices in the transition.

How might jobs change?

The effect of the clean economy transition will not be consistent across occupations. As a result, studies often group expected 'green jobs' into three evolving categories.[23] We also need to consider declining jobs.

'New' green jobs

These are often called 'new and emerging' green occupations. For example, **solar technicians** must be able not only to install new technology but have the knowledge to provide expert advice on applying new technology on specific sites. This worker also needs to be able to competently carry out sun mapping, understand battery integration and be capable of maintenance and cleaning.

'Green renovated' jobs

'Green renovated jobs' or 'green enhanced skills occupations' are those likely to experience significant change in the methods, materials and ways of working due to the clean economy transition.[24]

For example, for **boilermakers**, new technology has increased the knowledge requirements to work with a more diverse range of materials and increased the skill required to complete tasks at a high level. The essential purposes of the occupation remain the same, but tasks, skills, knowledge, and external elements, such as credentials, have been altered.

Green 'increased demand' jobs

Green increased demand occupations will experience increase in employment demand, but not significant changes to the work itself.

For example, as the clean energy transition occurs, there may be an increased demand for energy transmission infrastructure development and maintenance as these

upgrades move through the system. This is an existing occupation and skill set from the fossil fuel era and will not require significant changes to the work patterns within this occupation.

Declining jobs

Some industries and their associated jobs will decline or exit through the clean energy transition. This is most obviously the case with the ongoing closure of old coal fired power stations and their associated mines. However successful global efforts to restrain climate change are also expected to reduce global demand for coal, oil and – ultimately – natural gas, with substantial likely impacts on Australian exports thereof.

For example, the International Energy Agency's 2023 update of its Net Zero Emissions Scenario, where the world follows an efficient path to keep global temperature increases to no more than 1.5°C, models world fossil fuel demand falling from around 500 exajoules (EJ) in 2022 to around 80 EJ by 2050.[25] Results from other modelling exercises vary in detail but project a similar megatrend of greatly declining fossil demand.

Declining demand for fossil exports will have some impacts that are broadly distributed, but many that are specific to the regions most closely associated with these industries today.

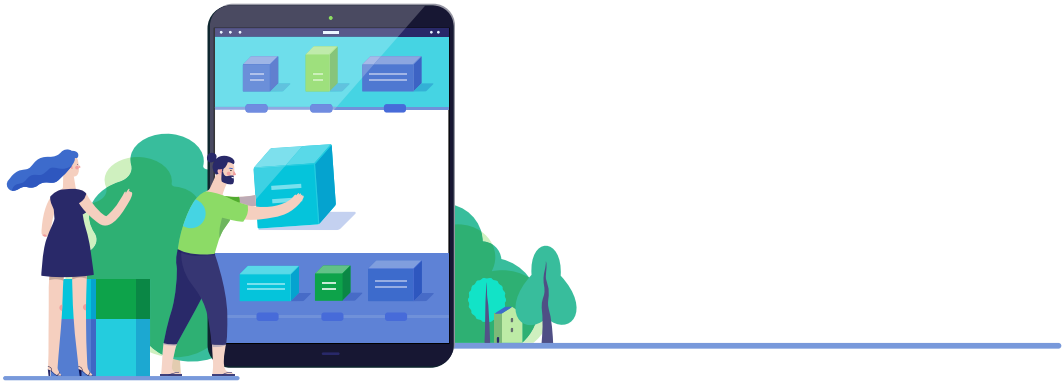
Forecasts and modelling

Strategic planning for the workforce needs of the clean economy is an essential step as we work towards overhauling our fossil-fuel economy. However, the multi-faceted nature of the clean economy transition – encompassing clean energy, the circular economy and climate adaptation/mitigation measures – has meant that modelling encompassing the collective 'clean economy' is scarce.

Instead, researchers have generally focused on how the transition will affect specific regions, or narrowed in on certain aspects of the transition, particularly the changes in the clean energy industry.[26]

For example, a 2023 report in Victoria found that the clean energy transition will drive the creation of an estimated 10,000 new jobs per year until 2030.[27] Over the same period, 500,000 existing Victorian jobs will require upskilling to support the transition.

At the national level, Net Zero Australia's study of the national skilling needs found that, to achieve net zero we would need to grow our skilled workforce from about 100,000 to as much as 800,000 by 2060, depending on the extent and mix of global demand for Australian clean exports.[28] An Accenture report found that renewable energy exports could create up to 395,000 new jobs across Australia by 2040, and our emerging renewable energy export sector has the potential to generate $89 billion of gross value added (GVA).[29] This is larger than the GVA of Australia's entire fossil-fuel export industry today.[30]



What's happening around the world?

Some countries are further down the road on this journey, providing Australia with an opportunity to learn from their experience.

Clean economy literacy training - France

As a result of its advanced green labour market information service, Onemev, France has been able to keep abreast of skill needs throughout the development of a clean economy.[31]

The education and training system is charged with delivering targeted lifelong vocational education and training in this area. This was achieved by mainstreaming clean economy knowledge by including it throughout training packages and providing more focused training for workers in disrupted occupations. The dual pathways are:[32]

- **General awareness modules** of the greening economy for training packages where roles are unlikely to experience significant disruption through the green transition. These modules are designed to familiarise and normalise green knowledge as a backdrop to working lives.
- **Targeted reskilling modules** that help individuals in roles that are or are expected to be significantly disrupted. These programs focused on applied training for emerging clean economy industries in the region. The training was designed to equip at risk workers with the skills, knowledge and techniques in demand by clean economy industries.

Closing clean economy skills gaps with specialised regional skills training - Spain

Since first installing renewable energy in 1994, the unemployment rate in Spain's third largest economic zone Navarra dropped from 12.8% to 6.8% by 2001. Over the 7-year period, the local government joined forces with businesses to establish CENER and CENIFER.[33] These two public agencies had two separate tasks – CENER was dedicated to conducting high level research into renewable technology and CENIFER was designed to actively provide training to develop the skills and technical abilities to power the local renewable industry.

Since its inception, CENIFER was given a specialised role as a public provider of education and training for in demand clean energy skills.[34] With a significant public training provider for clean energy skills in the region, the rapidly expanding renewable industry has been able to consistently source a pipeline of appropriately trained workforce to underpin its growth.[35]

Transitioning disrupted workers to in demand cleantech roles – Canada

On the back of the pandemic, the Future Skills Centre in Canada began researching ways to transition disrupted workers to the rapidly expanding clean energy sector. The project analysed the profile, skill sets and capabilties of disrupted workers and sought to understand the emerging skillsets in demand by the growing clean economy sector.[36] In its consultation with businesses driving the demand for a clean economy workforce, the Centre found that the workforce needs of businesses were connected by two common threads:

- **Employees need a basic understanding of climate change and sustainability** to aid cultural fit and alignment to the objectives and goals of the organisation.

- **In general, clean economy skills needs are more generalised than specialised**. Businesses in the clean economy need the same skills as other industries, albeit applied differently to solve clean economy problems.

Given the lower demand for highly specialised clean economy skill sets, the study found that for the most part, "with a bit of retooling" disrupted workers could be upskilled into clean econony roles.[37] As a result, the policy outcomes from the study target lifelong learning education and training pathways that are responsive to the demands of growing industries, like the clean economy. They also emphasise work-integrated learning components that arm transitioning workers with knowledge and practical skills required to successfully secure employment.

RES-SKILL project to transition coal workers to secure renewable roles – European Union

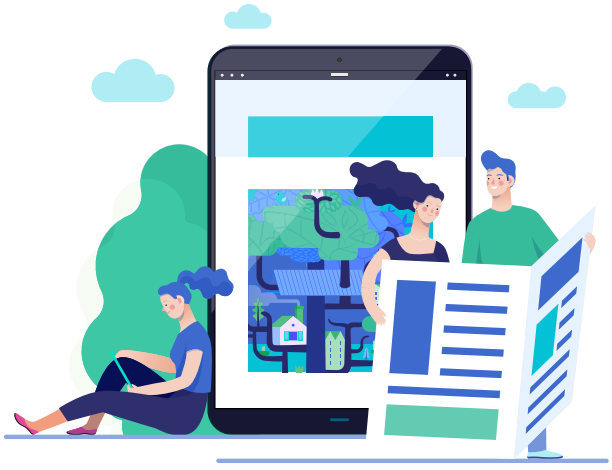
In order to provide rapid and consistent pathways for coal workers to transition to renewable energy, the European Union developed the VET focused RES-SKILL project. The project followed a three-step methodology to profile and match workers with renewable energy employment pathways:[39]

1. Profile occupations
2. Document soft/technical skills and knowledge
3. Develop transition profiles

The outcome of this mapping was a set of 'transition profiles' that matched current (fossil fuel based) occupations to emerging (clean economy) occupations. Each individual occupation pathway identifies training requirements to prepare workers for the new roles (based on the skill sets for their current occupation) and indicative timelines for retraining.

A key part of the success of this project was the tailoring of VET courses and delivery to align with the displaced coal workforce. There was a process of recognising prior learning and established skill sets and identifying overlapping skills and licences to minimise the time spent in upskilling programs.

Recognising prior learning (such as high-risk licences) in the profiles enabled coal workers to bypass lengthy reskilling timeframes (often 2 years) and instead participate in shorter on the job training or short courses as part of their transition pathway.[40] Another key to success was the inbuilt flexibility of the European Qualification Framework (EQF). This framework has the inbuilt ability to recognise prior learning, informal education, and formal skills, knowledge and competence accumulated throughout the working lives of those in the EU.



What are Australian businesses telling us?

We spoke with a range of Australian companies to ask how the transition to a clean economy was affecting their operations, strategy and in particular, workforce and skills.

The overall picture was diverse, illustrative of an economy experiencing a transition, with some companies much further advanced than others. Some companies are embracing change, innovating and thinking proactively about their changing skills needs. However, many others are not.

The businesses we spoke to varied in their level of knowledge, engagement and action. Some businesses had a deep awareness and commitment to act, including sophisticated engagement with international accreditation standards; while others had a very limited understanding of key issues.

When discussing the concept of the clean economy transition as a global issue, most of the businesses felt it was necessary to do something, but when it came to adaptation or change in their own business, cost was a key focus.

It was clear that the rising cost of energy has been a strong driver in the uptake of new practices, and in embracing renewable alternatives – particularly the addition of solar power.

Overall, larger companies were more strategic and focussed on governance, whereas small and medium businesses were more likely to be focussed on the bottom line.

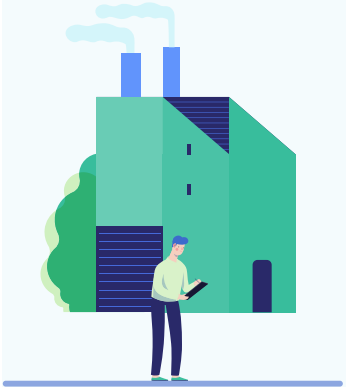
Businesses with head offices in other countries such as Norway, Spain, Sweden and Germany were quite advanced in their approach to clean economy principles and practices. New and emerging businesses were more likely to have conducted international environment accreditation such as Ecovardis, BCorp or ISO quality environmental audits.

Even those proactive companies in terms of the clean economy transition have not commenced thinking about the workforce changes that may need to be made. Most had not begun implementing the change management that may be necessary to navigate the transition. Further, new skill development and knowledge was generally seen as an issue for professional roles rather than operational or production staff.

A common theme was frustration about the perceived lack of government direction and the lack of a ‘source of truth’. Many businesses, of all sizes, expressed that the lack of a coherent and communicated policy framework impeded definitive action. At the same time, a number expressed concern about the risk of increased ‘red tape’ resulting in increases in cost and productive time lost to meeting regulatory requirements.

Most of the businesses we spoke to gained information from general sources such as social media, blogs or informal industry networks. Only a few well -informed businesses stated their approach was based on evidence or research.

What impact is the transition to a clean economy having on Australian businesses?



81%

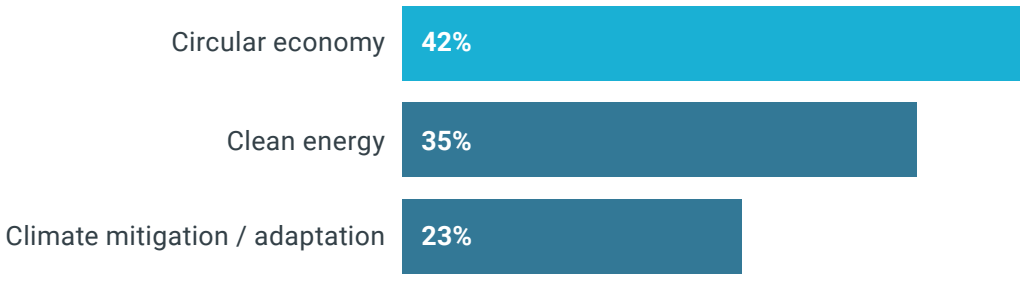
of the companies we spoke to said their business had implemented changes as a result of the transition to a clean economy

Of those who said they had made changes, nearly half (42%) said those changes were the result of efforts to reduce waste from their operations.

35% said they had made changes to transition to cleaner forms of energy and 23% said they had taken steps to mitigate the effects of climate change.

Small and medium businesses were more likely to have implemented changes to reduce waste. Small businesses were the least likely to report having made changes to mitigate the effects of climate change.

Figure 3. If you have made changes to your business, which aspect of the clean economy transition do those changes address?



From our conversations it was clear that the drive to reduce the cost of electricity is a key factor for businesses of all sizes. This had driven 65% of the respondents to reduce their energy costs by moving to alternatives, mainly to solar, and in some cases, steam driven machinery and batteries.

There were some great examples of taking action to reduce waste and costs.

‘We have a stringent recycling process and do not waste anything including the separation and disposal of additives.’

Small high precision component manufacturer business

'We operate a 24 hour production cycle. This is driven by steam, mechanical dewatering - half the product is water. We consume 1m kw hours and our energy costs are very high, so this saves us considerably. Carbon tax doubled the price of coal for us. We are also working with biogas created by our sewage ponds which has reduced our coal consumption by 50%.’

Medium sized food manufacturing business

How big is the impact?

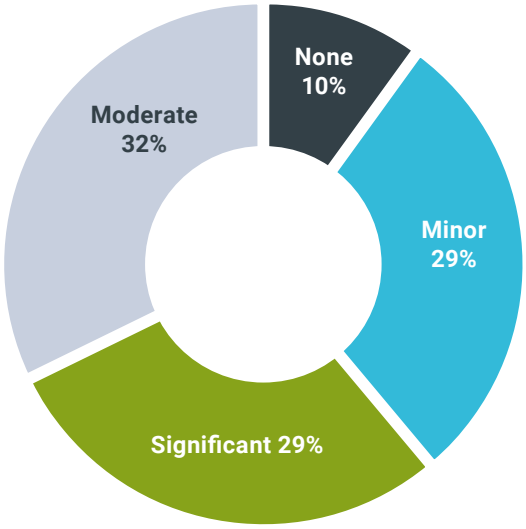
The impact of the transition to a clean economy was considerable for the majority of businesses.

61% said the transition to a clean economy was having a moderate to significant impact on their business

Around a third said it was minor, and a small minority reported ‘no impact’.

We also found that the impact was being felt more by medium and large organisations than small businesses.

Figure 4. How would you quantify the current impact of the clean economy transition on your business?



For some very engaged businesses, the principles underpinning the transition to a clean economy were integrated across all aspects of their operations.

For example, a food manufacturer considered that they had strong altruistic aims underpinning their operations. This business reported that it finds solutions to achieve clean economy goals as well as deliver financial performance. It is not a case of one or the other.

The company is acutely aware of the clean economy transition across all dimensions. Management has begun to implement a far-reaching strategy that includes making investments in clean energy supply. The company has joint ventures and owns large solar farms which powers 100% of their operations. It also works with its supply chain to help communities build their resilience.

How informed do businesses feel about the transition?

90% of the businesses we spoke to considered themselves somewhat or very informed about the transition to a clean economy.

Around half considered themselves very informed.

Although many reported that knowledge and awareness was concentrated at the management and leadership level. As one participant said:

‘Senior and middle managements are somewhat informed, but we still need to inform the floor.’

Medium sized carpet manufacturer

Others felt they were very well informed, and it was the policy and regulatory environment that was lagging behind.

‘We 'live it, breathe it' - we are abreast with international practices, Australia is years behind Europe...The problem is that Australian is not set up with recycling. We are years behind Europe in recycling and kerbside collection.’

Medium sized packaging manufacturer

Despite a majority of respondents reporting that they felt informed about the clean economy transition, there was a recurring comment that there was a lack of a single ‘source of reliable truth’. Most said they got their information from social media, newspapers, media and informal networks.

Several expressed a desire for more easily accessible, practical information on what’s changing (such as clarity on the new clean economy policy initiatives that affect their operations) and examples or support to implement new practices in response to new guidelines.

From our interviews it seemed that businesses were perhaps not as informed as they considered themselves to be, particularly in relation to the physical impacts of climate change and the types of adaptation strategies available.

What’s driving change?

What’s driving these businesses to act and make changes?

Our results backed up what we already know from the current business environment – that there are multiple and overlapping factors pushing companies to adapt and change.

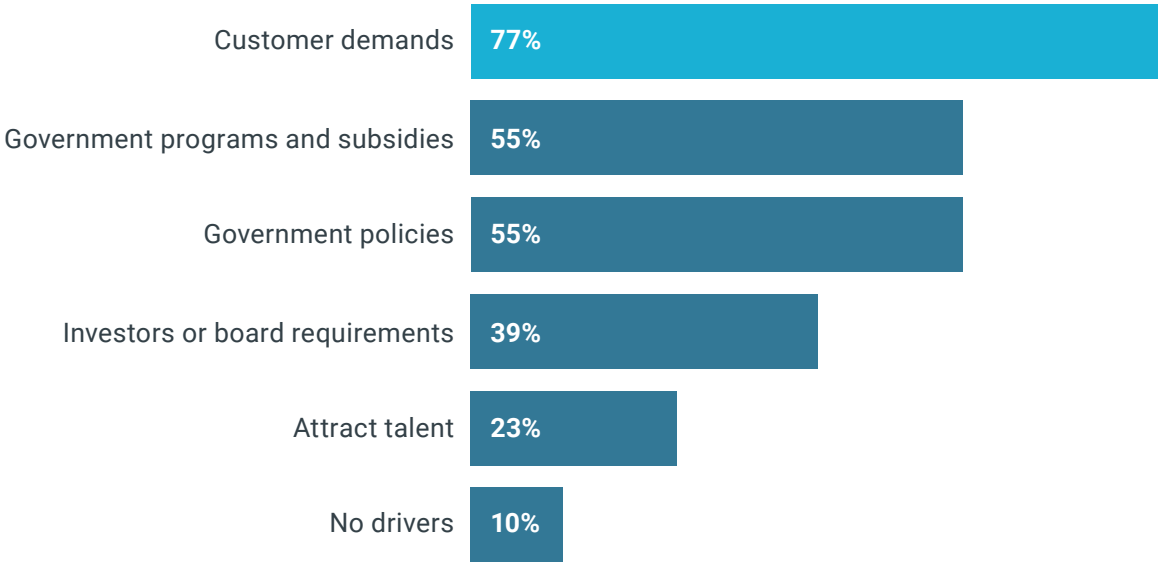
The strongest factor driving businesses to engage with the clean economy transition was changing customer demands.

77% of the businesses cited this as a driver of change.

The next most influential drivers were government policy and government programmes/subsidies.

Businesses were allowed to nominate more than one option.

Figure 5. Which of the followings factors are driving you to do things differently as a result of the clean economy transition?



55% nominated government policies as a driver of change, and 55% cited government programs/subsidies. Fewer companies cited investors/ board requirements and some said 'to attract the best talent'.

Perhaps unsurprisingly, government programs/subsidies were more influential with small and medium sized businesses.

Interestingly, 'attracting the best talent' was a stronger driver of change amongst small businesses. This shows that some companies consider progress towards sustainability goals plays a role in competing for skilled workers.

There was general positive sentiment about government policy and government programmes/subsidies as drivers of change. However, many respondents also expressed frustration with government policy and/or a perceived lack of investment. The frustration was usually expressed as irritation with 'red tape', confusing policy, a lack of clear information and onerous requirements of policy frameworks.

The majority of respondents cited greater government investment, clearer policy frameworks and a reputable source of information as key to a successful uptake.

'We view the clean economy as a theme that is driven completely by policy and regulation. Our outlook is to react to the external policy landscape. When the carbon tax was introduced, we made lots of progress in this space. Then we shelved these innovations when the focus shifted with the Liberal government, and now we're back on the pathway to respond to the new commitments.'

Small steel fabrication and technology manufacturer

‘Government spends too much time on policy with 'no teeth'. We need a roadmap with clear directions. There appears to be a fear of implementation - a fear of change.’

Small flexible film, textile coating and construction adhesives manufacturer

A large number of respondents, across all organisations of all sizes, expressed frustration at the lack of definitiveness and tardiness of government policy. A number expressed concern about the increased red tape and resultant cost and time wasting of meeting these requirements. A few respondents referred to the investments being made by European countries and the United States.

Some of the businesses talked about ‘altruistic’ drivers to early engagement with clean economy transition, and had implemented significant strategies in energy and waste reduction.

For example, a small subsidiary of a German-based company in the early stages of the supply chain saw that it could influence and model to a larger market than their size would suggest.

‘Our altruism and company policy drove our early uptake of clean energy transition preceding political engagement. We installed 59 solar panels. We water harvest and reuse effluent, we have a solid liquid package.’

Small flexible film, textile coating and construction adhesives manufacturer

Is the transition to a clean economy seen as an opportunity or a threat?

The transition to a clean economy was overwhelmingly seen as an opportunity.

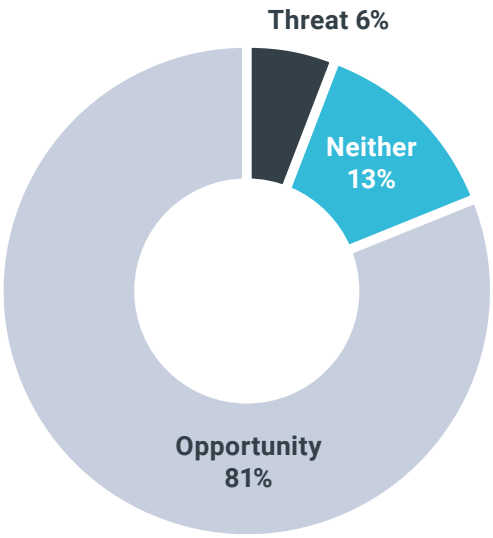
81%

of businesses viewed the transition to a clean economy as an opportunity for their business.

Among small businesses, that figure rose to

100%.

Figure 6. Do you see the clean economy transition as an opportunity for your business?



Only 6% of respondents saw the clean economy transition as a threat. These responses were largely based on concerns about the bottom line – increased competition and reduction of product range.

Where do businesses see the opportunities?

The businesses viewing the transition as an opportunity were then asked to nominate where they saw that opportunity. Respondents were able to nominate more than one option.

76% of businesses saw the transition as an opportunity to reach new customers.

These were the companies that saw their product as fitting neatly into supporting others in their clean economy transition. Many were already developing products in a way that met higher ESG standards. Among the businesses we spoke to, this included manufacturers of batteries, food and beverage and commercial lighting.

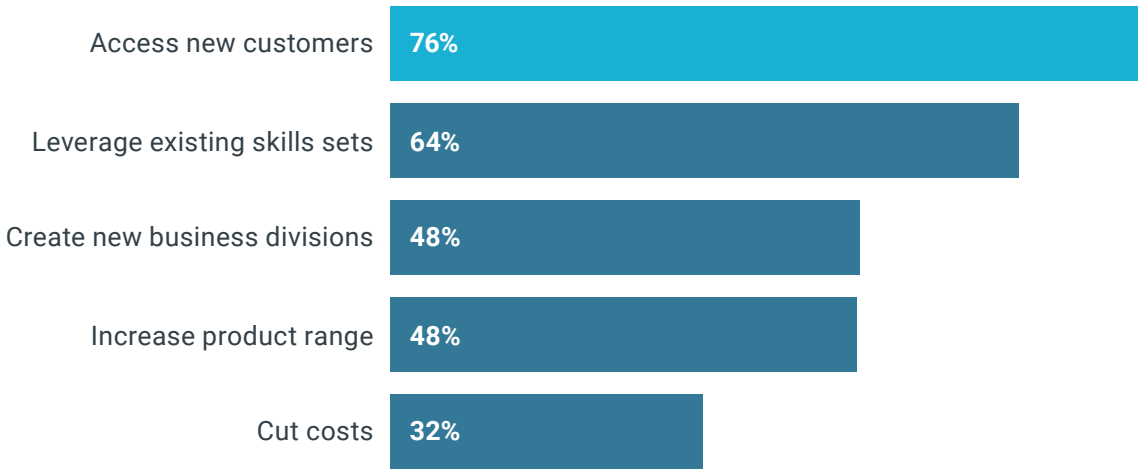
64% of the businesses saw opportunity in the potential to **leverage their existing skill sets** to grow and evolve the business.

This speaks of businesses in the early stages of thinking and planning about the skills implications of the transition, as none of the businesses in the sample had done the strategic planning to identify what those skills might be, or how they would be leveraged.

Around half of the businesses saw potential upside in the opportunities to **increase their product range**, and around half saw the potential to **create new business divisions**.

Some also saw opportunities to cut costs.

Figure 7. How is the clean economy transition an opportunity for your business?

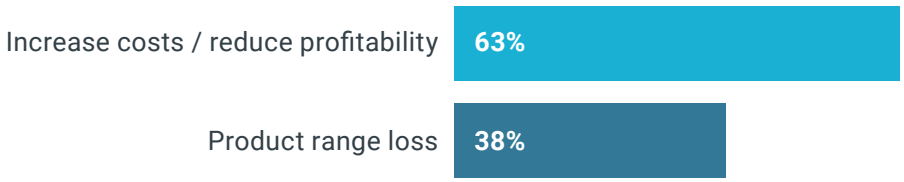


Where do businesses see the threats?

We then asked those businesses that considered the transition a threat to nominate where they saw that threat.

The responses on this question were all about the increased costs, particularly of energy inputs, and the resulting impact on the bottom line. Some also saw a potential reduction in product lines as demand reduces or they became otherwise unviable.

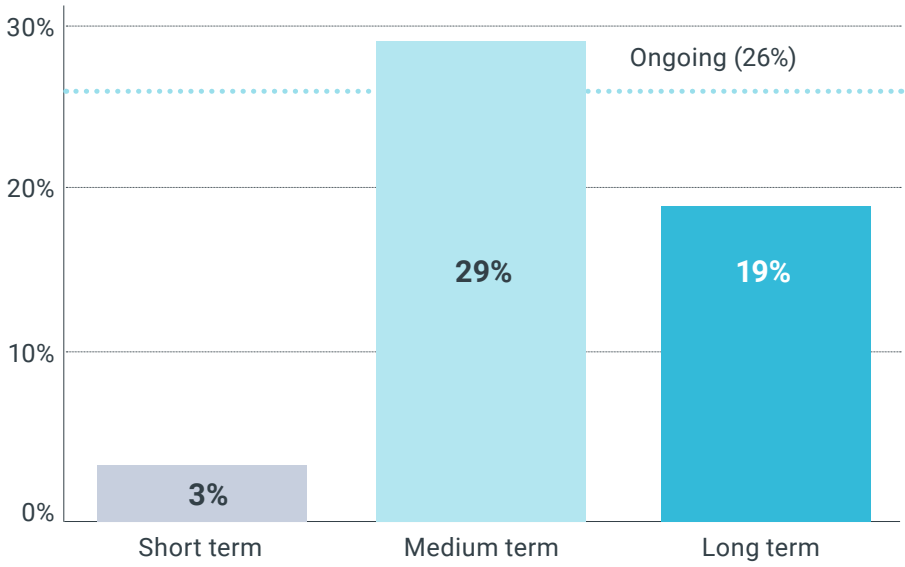
Figure 8. How is the clean economy transition a threat to your business?



Timeframe for opportunities and threats

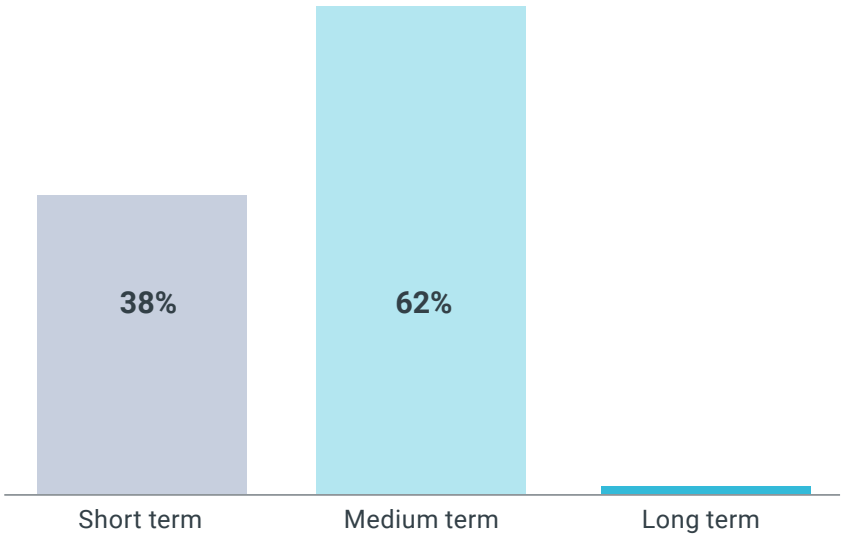
We asked those businesses that viewed the transition as an opportunity when they saw that opportunity arising. They either saw it as 'ongoing' (26%) or more in the medium to longer term.

Figure 9. Over what timeframe do you see this as an opportunity to your business?



When we asked the same question to those who viewed the transition as a threat, they saw that threat concentrated more in the short, and particularly the medium term, lessening in the longer term.

Figure 10. Over what timeframe do you see this as a threat to your business?



It is fair to say that these responses were top of mind estimates from this subset of businesses. Most had done little thinking or strategic planning on this front.

However, the more informed senior executives we spoke to were concerned about how far behind Australia already is globally.

One medium sized manufacturer was acutely aware of the time and planning required and referred to the significant time lag between beginning to act on the clean economy transition and outcomes being embedded in the business. This respondent stated this could be a matter of years.

'...there is a chance for us to be global leaders, but the doors are closing – the US is investing enormous amounts of money...'

Small boutique chocolate manufacturer

What impact is the transition having on skills and workforce?

Overall many of the businesses we spoke to were only at the early stages of thinking about the skills and workforce they might need to progress or navigate the clean economy transition.

Further, when considering the emergence of new roles and skills the general feeling was that these new and emerging skills will mainly be at a higher level, in designing, managing and co-ordinating the responses to the three components of the clean economy transition – clean energy, circular economy and climate adaptation. The training or retraining of more operational or floor staff was much less prominent in businesses' thinking.

The skills that might be needed to navigate the clean economy transition had generally not been a major consideration in recruitment and retention to date.

In fact, planning for such a workforce had not been undertaken in any proactive way. 23% of the businesses had a workforce plan, but none of those plans were focussed on skills required for the clean economy transition.

'I work in the building industry and the current focus is on rapid product delivery and acute skills shortages for trades, as well as designers/engineers for custom project design. These skills would be essential for the transition, but they are in short supply for BAU activity and would impede any transition once it commences for this business.'

Small structural steel manufacturer

Do businesses see skills needs changing in the next 12 months?

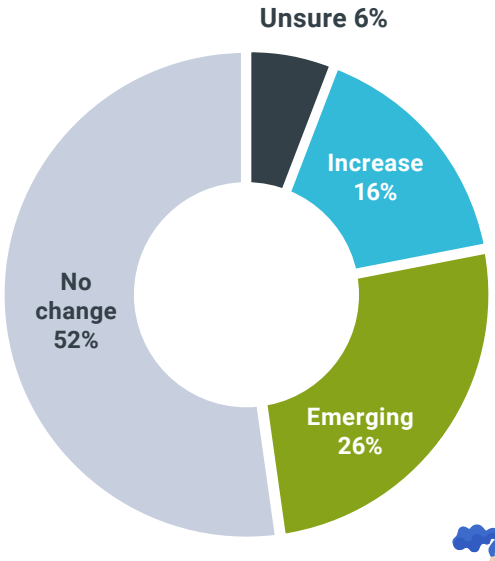
Businesses are expecting changes to skills needs in the coming year, but for many, these changes are in the early stages and are still emerging.

42%

of the businesses expect the clean economy transition to drive either emerging or increased skills needs over the coming year.

Around half said they didn't foresee much change, and a few were unsure. None of the businesses predicted that their skills needs would decrease as a result.

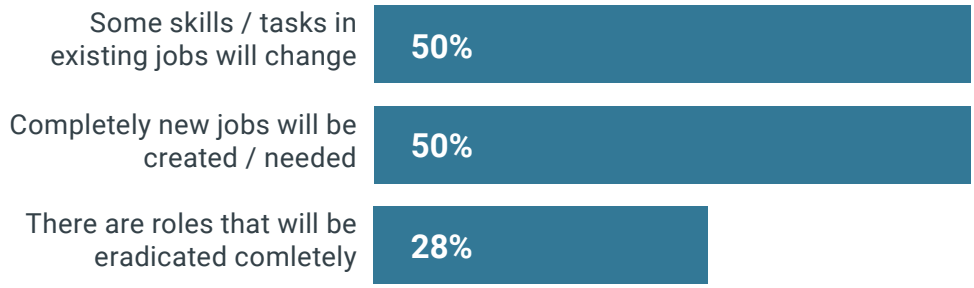
Figure 11. Do you think that your business skill needs will change as a result of the clean economy transition in the next 12 months?



How will skills needs change?

When asked how their skill needs might change, responses were mixed. Half the businesses expected that the skills or tasks in their existing jobs will change and half expected completely new jobs will emerge. Around a third thought that existing roles would be eradicated.

Figure 12. If skill needs are expected to change, do you think this is because...?



What seems to be a standout in terms of the clean economy transition, when compared to the digital transition for example, is the strong sense that much of the skills impact will be felt within existing jobs.

Of course, the businesses we spoke with for this research were companies across a range of existing industry sectors. As a result, they are not feeling the impact of the 'pointy end' of this transition, as we would expect to see in the energy sector for example.

How do businesses feel about their existing workers' ability to navigate the transition?

When we asked businesses whether they felt they had the skilled employees or teams to navigate the clean economy transition they were fairly evenly split.

Again, these results likely reflect an economy and a workforce in transition, and a general feeling of uncertainty about what lies ahead.

Figure 13. Do you have skilled employees/teams that can navigate the clean economy transition in your business?

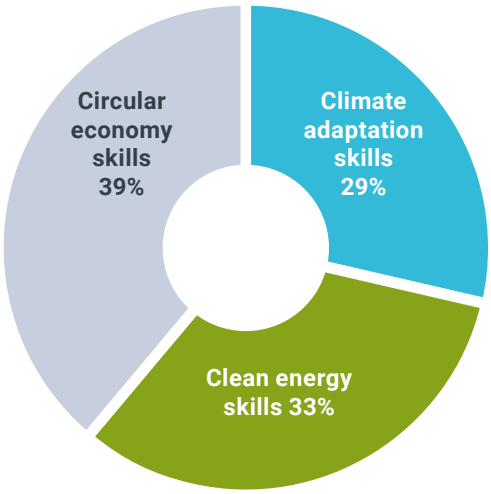
55% said yes

45% said no

In which aspects of the clean economy are those skills and capabilities?

Among those businesses that felt that they had the capabilities and skills to navigate the transition to a clean economy, there was a fairly even spread of skills across the three aspects of that transition.

Figure 14. If you do have skilled employees, in what area of the clean economy transition are their skills?



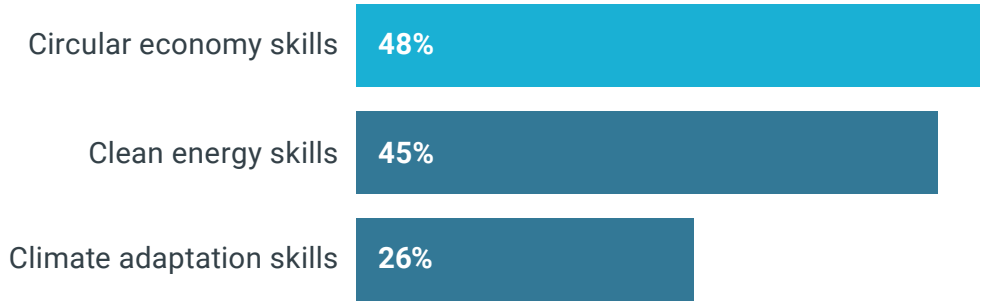
39% felt their workforce had circular economy skills, 33% felt they had clean energy skills and 29% felt they had climate adaptation skills.

This reflects a pattern seen throughout our interviews for this project – businesses feel most confident about their capabilities and ability to make changes in relation to embedding the principles of a circular economy. They feel least confident about their capabilities to adapt to climate change.

Where do businesses see their skills needs increasing?

Among those businesses who considered that their skills needs would increase, 48% considered this would be in skills related to the circular economy and 45% considered this would be skills in relation to clean energy.

Figure 15. If yes, in what area do you expect your skill needs to increase?



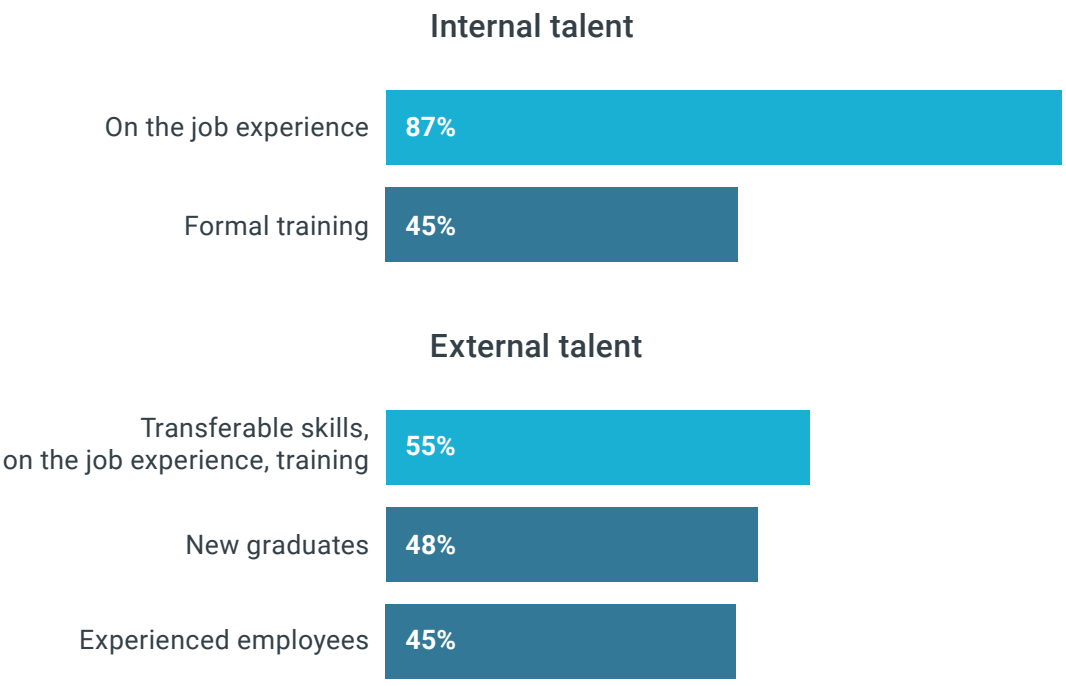
Training strategies and preferences

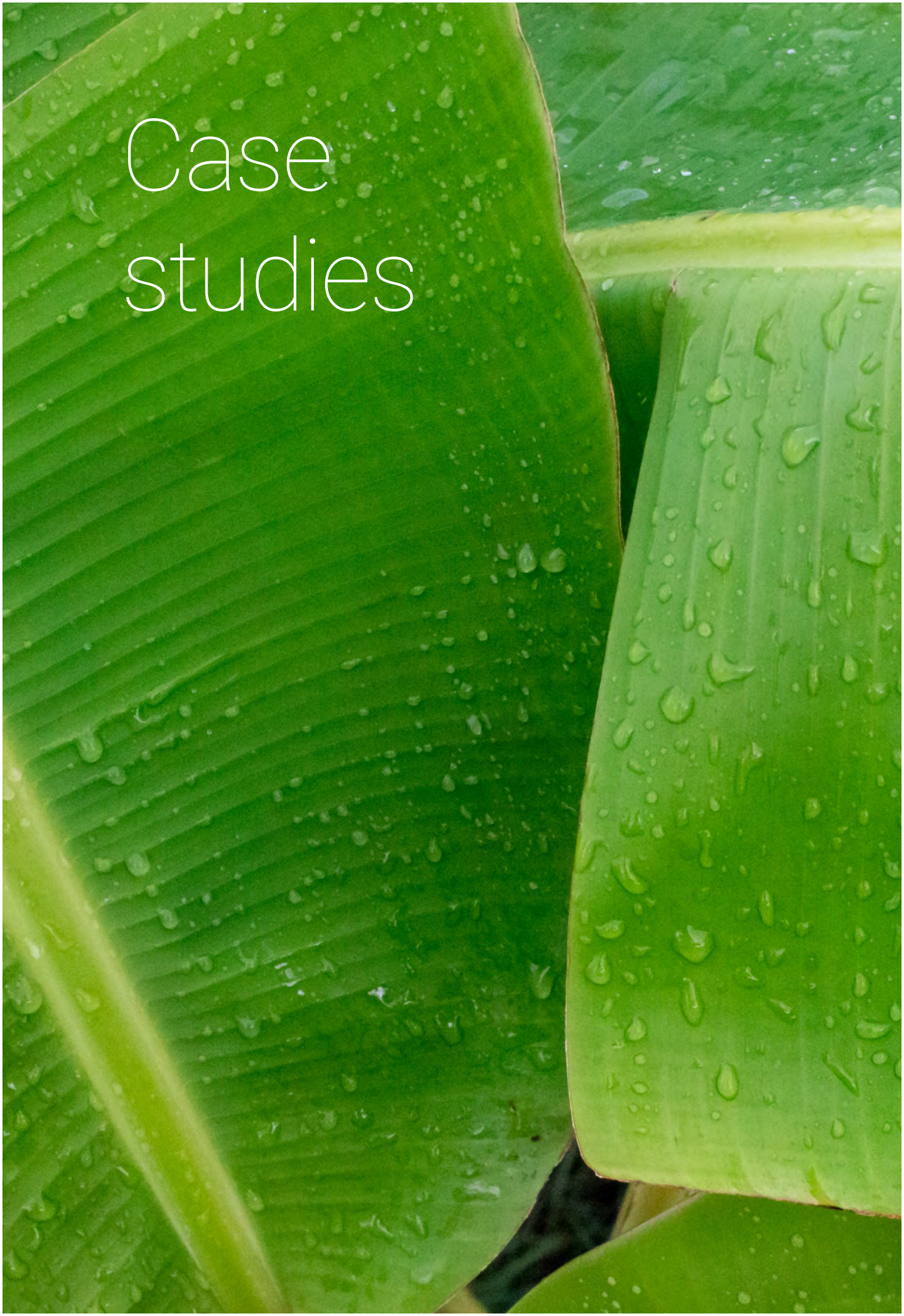
When we asked respondents about their strategies for skilling and training the majority (87%) of respondents preferred drawing on internal talent and providing on the job experience to develop the skills required for the clean economy transition – a continuation of their normal training practices.

Over half said they would look to utilise a combination of external transferable skills hire and on the job experience/formal training.

Again, businesses were able to nominate more than one option.

Figure 16. If your staff have the skills required, how did they acquire them? Or, if they don't have the skills, where will you acquire them?




Case
studies

SAGE Automation

An engineering company that has been providing smart manufacturing and automation solutions for businesses for nearly three decades. With offices across Australia and a team of more than 720 specialists, SAGE has built a reputation for leading the design, delivery and support of industrial and electrical control systems.

In recent years SAGE has increased its focus on upskilling and broadening the exposure of its engineers to emerging clean energy challenges, in response to growing customer demand for clean economy solutions (particularly clean energy) that connect to and build on existing control systems and machinery.

Although the core skills of their engineers remain founded in automation and control, there has been a coordinated effort to upskill the workforce and teams servicing clean energy and net zero projects and clients. This has focused primarily on the regulatory and system specific challenges or "gotchas" that come with projects feeding into the grid.

"We've noticed short term spikes in our upskilling need when we started on new clean energy projects, particularly a recent project we delivered with South Australia Water and the Zero Cost Energy Future plan. To deliver these large-scale projects and solve new clean energy problems, we collaborate with our experienced talent to identify the types of training or recruitment we need to explore."

Danny Smith, Head of Business Development

A number of their clients have installed renewable energy sources such as rooftop solar and battery systems to their buildings. Through their experience and expertise with these systems, SAGE engineers have developed data analytics tools that draw upon both plant and market information (such as the spot prices of energy and the periodic inflow of incentives throughout the day) to increase the efficiency of these. This expertise allowed SAGE's clients not only to reduce their demand from the grid, but to extract maximum value form their investment in new sources of energy.

Developing these market leading solutions and reliable expertise is the result of an organisational commitment to prioritise learning and development for in-house talent.

The People and Culture function of the business is tasked with ensuring

that their workforce (across all levels from entry level technicians to senior leaders) are consistently developing their skills, knowledge and capabilities in the specific contexts needed to meet client expectations and company standards. This is a key focus of their recruitment and staff retention strategy to attract and retain high performing engineers.

SAGE has a 70/20/10 approach to learning and development. This means its workforce is provided with challenging new work where 70% of the learning occurs through on the job experience. 20% is provided through direct engagement with leaders and one on one mentoring. The remaining 10% is achieved through formal training programs. This approach to learning and development has enabled the business to continually develop in house talent through consistently updating skills, particularly in the emerging clean energy space. This allows them to meet evolving demand from clients for clean energy solutions and deliver on their purpose of creating a Smarter Future, Better World.

Natural Evolution Foods

Second generation farmer Robert Watkins and his wife Krista are among Australia's largest banana growers, suppling grocers with Lady Finger bananas. Despite the labour and resource intensity of growing this variety (up to 30% more labour than other varieties) a large proportion of their crop each year doesn't meet the colour and shape requirements of retailers. Sadly, for many years, tonnes and tonnes of these delicious and nutritious bananas would end up in waste piles in back paddocks for the local wallabies and other wildlife to graze on.

However, all that changed when, thirteen years ago, Rob accidentally drove over a waste pile of these bananas and noticed a fine powder was created in the process.

Rob's problem-solving brain went into overdrive as he began to investigate whether his banana waste could be turned into a banana flour.

"What we're beginning to realise is that so many solutions to the world's problems are just sitting in waste piles across Australia."

This accidental discovery kicked off a five-year quest, involving connecting with universities and researchers to determine the nutritional benefits, as well as developing an automated production line that cut out backbreaking production and increased volumes to 1 tonne per shift.

They say the two keys to their success were working with research universities to explore the health benefits of the product and getting the production technology and machinery right.

Engaging with universities - entirely new ground for the business - was vital to discovering the clinical benefits of banana flour for those with gut health issues. As a result of persisting with incredibly capital and time intensive clinical trials, medical referrals are now one of the key reasons people are buying their flour.

With an eye on reducing their waste and increasing the simplicity of their manufacturing process, Rob and Krista developed the designs for the new manufacturing facility in house. They relied on their passion to see their project succeed and applied practical problem solving along the way to refine their processes. Developing these skills in house was a practical and strategic decision.

Throughout, they found that there was a lack of multi-skilled people that were able to traverse the blend of technical machinery skill and the nutritional and chemistry knowledge required to create their new equipment – especially where they are in the Tablelands Region, Queensland.

After five years of development, the result was a world first (and now patented) flour processing facility that cut production time and continues to underwrite the commercial success of their operation. As well as cutting waste from their banana growing operations and developing an entirely new business (and revenue stream) from their flour products, the new machinery reduced the physicality of the tasks in the business and broadened the range of people and skill sets needed in their business. Rob and Krista focused heavily on the design of their control systems, to ensure that human error was minimised and to enable them to easily onboard new staff to operate the line.

"If we had just kept doing what we've always done, we would have achieved the same things we always had. Our principle is that when you get a block of dirt, you've to find ways to make it better than when you got there."

When recruiting new staff, the team now look for the right attitudes and open mindedness to keep learning and grow with the job. With the digitalisation of the production line, they're also finding that they need some technology skills to understand software programs that run the automated facilities.

Looking forward: Policy directions

A successful and smooth transition to a cleaner economy will depend on having the right skills and capabilities. This will require clear policy objectives, strong leadership and genuine collaboration. To achieve this we need policymakers, business leaders and the education and training system on the same team.

Policymakers need to set clear national policy objectives, provide the right pathways and incentives, and to communicate them clearly. This will give businesses the confidence to invest and take action for the medium to longer term.

Business leaders need the capability and foresight to see what's over the horizon, to understand the regulatory and policy framework and formulate their strategies accordingly.

The **education and training system** must work as an effective partner in developing the skills and capabilities needed to get us there. This may mean thinking differently, including finding ways to foster a level of clean economy 'literacy' among new and existing workers.

Build capability to navigate the transition

Continue national data analysis and workforce modelling

The enhanced data analysis and workforce planning functions of Jobs and Skills Australia and the Jobs and Skills Councils will play a key role in navigating the skills needs of the transition. This will be accompanied by the continuance of the Australian Energy Employment Report. This work must continue to develop and be widely shared with policymakers and business leaders to develop a shared understanding of workforce trends and predictions.

Enhanced support for businesses to undertake their own skills and workforce planning

A clear message from the research was that businesses need support to conduct workforce planning as they prepare to navigate the clean economy transition. Many businesses, particularly smaller firms, may lack the capital and time to invest in sophisticated workforce planning.

Helping businesses to connect with other businesses and industry associations to share best practice and insights

As part of this research, Ai Group has developed a resource for its members to understand more about the workforce and skills implications of the transition. This will help them to develop strategies for building their workforces and skill sets to work through the disruption and seize the opportunities. We have also facilitated a number of workshops for members to share strategies and solutions.

Better platforms for accessing and sharing reliable information

Respondents said they lacked a reliable source of credible information about the clean economy transition and what they needed to do to respond and adapt. Access to simple, consistent, and clear information would be a very useful first step to engagement in the process. This could take the form of a website, resource, or a program of business advisers. The priority should be to build trust and a sense of partnership, helping companies to understand how adopting new practices and processes will enable it to thrive in a net zero future.

Build the education and training system that will take us there

There are a number of 'whole of system' reforms to the education and training system that, if implemented, will leave it much better placed to develop the right mix of skills and capabilities needed to navigate this transition. These include building a better-connected, more integrated tertiary education system encompassing both VET and higher education, implementing the recommendations of the Noonan review of the Australian Qualifications Framework and strengthening and extending the apprenticeship system.

One tertiary system

Industry increasingly requires the development of skills, knowledge and capabilities in an integrated way. This is at odds with the way we currently divide the system into two sectors - VET and higher education. We need one, integrated, cohesive tertiary education system offering a diversity of qualifications in a range of settings.

Implement recommendations of the review of the Australian Qualifications Reform

Implementing the recommendations of the Noonan Review of the Australian Qualifications Framework will enable the development of skills, knowledge and capabilities in a more integrated way across all qualification levels. This will allow for more flexible acquisition of knowledge and skills throughout working lives. A reformed AQF is also essential for enabling more work-integrated learning and other innovative forms of applied learning better suited to rapidly changing workplaces.

Prioritise the development of more employment-based training models

The transition to a clean economy will benefit from an effective and enhanced apprenticeship system. In times of rapid change and transition, employment-based learning models are even more relevant and effective, as industry benefits from workers experiencing change and learning at the same time.

The apprenticeship system needs to be extended to include higher apprenticeships and degree apprenticeships that combine the 'hands-on' higher-level skills industry increasingly needs. Pilot programs, including those managed by Ai Group, show what can be achieved in this space, but these models need to be funded and facilitated at scale. The right incentives for commencement and completion are also needed along with mentoring and support programs.

Existing pilots highlight the tension between university models based on full time study and the modes of learning needed for employees. Different approaches to curriculum design, regulation and funding between the two sectors also present enduring barriers to developing qualifications that span the two sectors.[41]

Incentivise greater collaboration between education and training providers and industry

Effective collaboration between the education and training system and industry is key to delivering the required mix of job ready skills, capabilities and knowledge needed to navigate the transition. Some of our members have experienced considerable success solving complex problems in their business by way of working closely with education and training providers – including high schools, vocational education providers and universities. However, developing these fruitful connections requires significant and consistent investment of time and capital. As a result, many businesses are unable to collaborate in depth with the education and training system.

Closer partnerships between industry and education and training system providers allow for co-design and co-delivery of qualifications, unearth opportunities for work integrated learning, foster collaborative research ventures and encourage more graduate research students.

Develop stronger research linkages between universities and businesses to drive innovation and grow talent pipelines

Expanding mutually beneficial partnerships between businesses and universities allows us as a nation to capitalise on our national investment in education and training. Successful models implemented in other countries, such as the example in Spain, show that a partnership approach to research centres and targeted training programs can be very effective in developing skills that meet the needs of emerging industries. With appropriate support, businesses can engage in meaningful collaboration with the tertiary system to commercialise new technologies and collaborate in the development of skilling programs designed to build pipelines of appropriately skilled workers.

Create more opportunities for work integrated learning

Work integrated learning serves the dual purpose of improving the work readiness of graduates and creating opportunities for businesses to shape and collaborate in the development of job ready talent. Increased engagement in work-based learning and work-integrated learning programs can be pursued through placements, projects, cadetships and new higher apprenticeship models that provide specialised skills and capabilities beyond the traditional work-based Certificate III and IV level qualifications. Innovative models of education and training will rely on employers embracing pathways that deliver new combinations of skills, knowledge and capabilities in an integrated way.

Create skill profiles to assist the transition of ‘at risk’ workers

It is emerging as international best practice to develop skill profiles for ‘at risk’ occupations as part of a strategy to create successful pathways for disrupted workers as we shift into the clean economy. A dedicated service tasked with building occupation profiles specific to the Australian clean economy context would enable workers and employers to first understand which roles and occupations are at risk throughout the transition, and subsequently identify sustainable employment opportunities that use similar skillsets that require minimal investment in upskilling and training. The consultation announced in the 2023 Employment White Paper for developing dual sector skills passports is a welcome step in the right direction to enabling lifelong learning and skill development.

Mapping existing skills sets and developing accurate profiles will require appropriate frameworks that recognise formal qualifications earned across both sectors of the education and training system and the informal on the job skills and capabilities acquired throughout the varied working lives of Australians.

Develop hubs specialising in targeted reskilling programs for disrupted workers

The modelling in Jobs and Skills Australia's *Clean Energy Generation* suggests that the clean energy transition alone is expected to drive significant growth in employment opportunities in the sector.[42] However these opportunities may not be well matched geographically to the areas experiencing the greatest disruption and negative jobs impacts in the short term i.e. (regional coal generation hubs), medium term (i.e. export coalfields) and long term (i.e. export gas fields). The biggest long term clean energy employment opportunities appear to be in north west Western Australia and north Queensland - a long way from disrupted regions such as Hunter and Latrobe.

As well as geographical challenges, many workers across other parts of the economy are set to be disrupted by the transition and will require some form of 're-tooling' to bridge into new occupations.

The specialised hubs set out in the 2023 Employment White Paper are designed to focus on the clean energy sector specifically. It may be fruitful to broaden the focus to the broader 'clean economy' as disrupted workers may have skill alignments across the broader gamut of clean energy, circular economy, and climate mitigation sectors.

Given the national coordination required, this should be a priority for the Net Zero Economy Agency, soon to be authority.

Incentivise universities to prioritise industry linked clean economy research and skill development

The clean economy transition has the potential to reshape the global economy as businesses develop new practices. While this will cause disruption, there is also enormous upside potential. It is in our national interest that no stone is left unturned to maximise the growth in the clean economy, particularly in areas where there are natural comparative advantages that can grow our exports. Given this, funding frameworks should incentivise research and development efforts that focus on clean economy technologies and solutions.

Develop clean economy literacy across all qualifications

It was clear from our research that a general understanding of sustainability and clean economy objectives was a key enabler of success. All workers need to understand how their day to day activities are linked to clean economy goals. Universities and vocational education and training providers should embed general clean economy awareness into all courses. The education and training system must prepare learners with basic clean economy literacy, regardless of area of study.

Generic skills and capabilities, like collaboration and communication are more important than ever

Our research found that businesses expect tasks within jobs to change and new jobs to emerge. This means both entry level programs and programs for transitioning workers must be underpinned by generic transferable skills and capabilities that equip workers for adaptability when facing future changes to work roles and tasks.

Increase access to short form training

Close to half of the businesses interviewed felt they did not have the skilled employees to navigate the transition to a clean economy. The skills needs were spread across the circular economy, climate adaptation and clean energy skills. Increased access for employers to short form training will be needed to rapidly develop the clean economy knowledge and skills required.

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