Department of Planning, Industry and Environment

Net Zero Industry and Innovation Program

Driving a clean industrial revolution

October 2021

NSW GOVERNMENT

www.dpie.nsw.gov.au

Published by NSW Department of Planning, Industry and Environment

www.dpie.nsw.gov.au

Title: Net Zero Industry and Innovation Program

Subtitle: Driving a clean industrial revolution

Department reference number: EES2021/0477

ISBN 978-1-922715-83-8

Cover Image: Cranes moving containers at dusk, Port Botany, Sydney. Photo iStock.com/Kokkai.

Contents

Minister's Message

Many governments around the world are taking strong action to address climate change. The NSW Government is committed to taking decisive and responsible steps to reduce the State's emissions in ways that grow the economy, create jobs and reduce the cost of living and doing business.

In March 2020, I released the first stage of the NSW Government's plan to achieve net zero emissions by 2050. It is the first of its kind in Australia. The Net Zero Industry and Innovation Program (the Program) is a cornerstone element of the NSW Government's *Net Zero Plan Stage 1: 2020-2030*.

Businesses in NSW are well placed to prosper in a low carbon world. They have the advantage of tapping into our world-leading research and innovation, our bountiful renewable energy resources and our mature links to global markets.

To realise this vision, the Government must support our scientists, researchers and businesses to develop new clean technologies, establish new world-leading centres of research, development and innovation and help industries future-proof and grow their operations. The Program does exactly that, by investing $750 million to 2030 to realise the full opportunity of a low carbon NSW economy.

Almost 30% of carbon emissions in NSW are created by the top 55 industrial facilities, important contributors to the NSW economy. Supporting their modernisation to cleaner equipment, technology and processes will significantly reduce emissions, while helping to protect jobs and maintaining a resilient economy.

Ultimately, this Program will improve our environment, our economy and the lives of families in NSW. As technology advances and industry experience grows, the cost of low emissions technologies will fall. Those benefits will be passed onto the people of NSW through cheaper bills, cleaner fuel and cars, and the creation of tens of thousands of new, future-fit jobs.

By basing our climate action in science and economics, and collaborating constructively with industry and business, NSW can position itself as an energy, economic and export superpower and drive a clean industrial revolution that will benefit future generations for decades to come.

The Hon. Matt Kean MP
Minister for Energy and Environment

Executive Summary

The NSW Government is leading the way in the race towards net zero emissions. Its *Net Zero Plan Stage 1: 2020-2030* (Net Zero Plan) sets out the State's ambitious agenda to reduce emissions by 50% by 2030 and achieve net zero by 2050.[1] This Net Zero Industry and Innovation Program (the Program) builds on the Net Zero Plan and focuses on major opportunities to reduce emissions across NSW industry and business.

As global demand for low emissions technologies and modernised industrial processes grows, NSW has an opportunity to position itself as a world leader in the manufacture and export of low emissions products and services. This Program will support industry and business in NSW to capitalise on that opportunity.

By accelerating the development of clean technology and industrial decarbonisation, we will grow the economy, support jobs and significantly reduce emissions. This will pave the way for a sustainable future for our State. This Program will drive the next wave of low emissions technologies and innovation and ensure industry in NSW remains resilient and competitive in a low carbon global economy.

The Program has three areas of focus:

1. **Clean Technology Innovation** - supporting the development and continued innovation of emerging clean technologies in NSW.

2. **New Low Carbon Industry Foundations** - laying the foundations for low emissions industries by building enabling infrastructure and increasing the capability of our supply chains in NSW.

3. **High Emitting Industries** - deploying low emissions technologies and infrastructure to reduce the emissions associated with existing, high emitting industrial facilities in NSW.

The strategic principles that have guided the design of this Program include reducing the State's emissions consistent with our 2030 and 2050 emissions reduction ambitions, supporting the economy, positioning NSW as a global clean technology leader and laying the foundations for new industries across the State.

This Program offers a number of investment and support opportunities. The aim is to attract new players in the low emissions technologies industry, enable existing players to update their plant and equipment with low emissions alternatives and encourage research and development (R&D) in innovative, clean technology.

The NSW Government will consult and collaborate widely with interested parties to develop detailed delivery plans for the three focus areas. Information on how you can register your details to get involved can be found in **How to get involved.**

Background

Introduction

Governments, businesses and community groups around the world are working to reduce greenhouse gas emissions and respond to climate change. This brings opportunities to develop new clean technologies and build resilient, low emissions industries.

Given our resource-rich economy and mature global market links, Australia is well positioned to embrace those opportunities by:

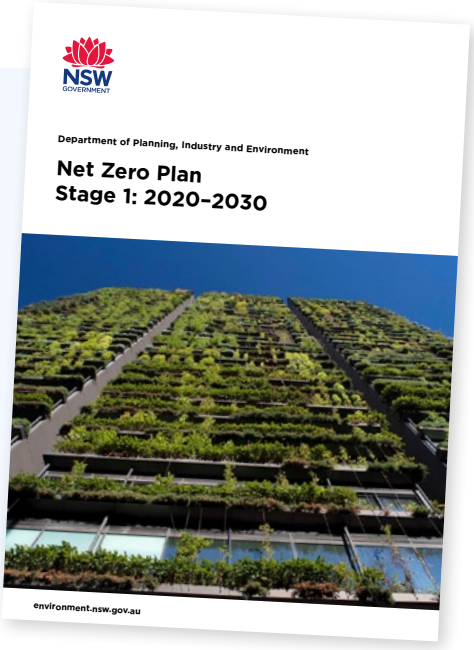
- **creating new, decarbonised products and services** for both domestic and international customers
- **attracting private and public investment** for low emissions infrastructure, technology and business
- **growing resilient decarbonised industries and communities** that can support the efficient decarbonisation of the economy
- **establishing NSW as Australia's leading growth centre** and premier exporter of clean technologies.[2]

Through its Net Zero Plan, the NSW Government is working to achieve net zero emissions by 2050.[3] By 2030, it is the NSW Government's objective to achieve a 50% reduction in emissions compared to 2005 levels.

In order to reach those targets, it is critical that clean technologies are developed, innovative new industries are encouraged, and existing industrial centres are supported in becoming clean manufacturing precincts.

In November 2020, Deloitte Access Economics in their report *A New Choice: Australia's Climate for Growth* estimated that with a strategic plan in place to decarbonise our industry and invest in a low-emissions future, NSW will experience a two per cent increase in Gross State Product by 2070. It also estimated that at least 50,000 new jobs will be created across the manufacturing, services, transport and tourism sectors.[4]

> By 2030, it is the NSW Government's objective to achieve a **50 per cent reduction** in emissions compared to 2005 levels.



International decarbonisation commitments are accelerating

Governments around the world are increasingly prioritising decarbonisation in their policy agendas. This comes after the *2015 Paris Agreement*, which saw 196 countries commit to limiting global warming to between 1.5 and 2 degrees Celsius.[5] The Agreement's 'ratchet mechanism', which requires each signatory to set progressively more ambitious national goals every five years, ensures progress will continue.[6]

Many governments are going further by committing to net zero emissions. Countries, cities and regions that collectively account for more than 50% of global Gross Domestic Product (GDP) have now adopted net zero targets.[7] It is expected the Conference of the Parties meeting in late 2021 in Glasgow will further accelerate action on the *Paris Agreement*.

Australia's current target is a 26 to 28 per cent reduction in emissions by 2030 on 2005 levels. Australia's three biggest trading partners, China, Japan and South Korea, have all committed to net zero emissions targets. The Biden Administration has also set out its intent to commit the United States of America to net zero emissions.[8] Once this is done more than 70% of Australia's two way trade will be with countries committed to net zero emissions.[9]

These commitments to reduce carbon emissions are resulting in policy changes. In the United Kingdom, the Johnson Government has announced that it will ban new petrol and diesel cars from 2030.[10] South Korea has announced that it will commit to achieving carbon neutrality by 2050.[11] China recently established an emissions trading scheme that will cover coal and gas fired power plants.[12]

Global ambitions appear to be increasing and it is important for the State's economy that our businesses and industries are positioned to prosper as governments make new emissions reduction commitments and implement policies to achieve them.

> **More than 70%** of Australia's two way trade will be with countries **committed to net zero emissions**.[9]

Photography
Smoke stacks at Port Kembla, Wollongong, NSW.

The private sector is also committing to reduce its emissions

Globally significant corporations and financial businesses are committing to reducing their emissions in line with limiting global warming to 2 degrees Celsius. More than 1,500 companies with a collective revenue of over US$12.5 trillion have now set or pledged to commit to net zero targets.[13]

Commitments from the private sector include:

- **Microsoft:** is aiming to be carbon negative by 2030 and remove its historical carbon by 2050.[14]
- **BHP:** has committed to net zero emissions from operations and energy use by 2050 and to reduce operational emissions by at least 30% by FY2030 (on FY2020 levels).[15]
- **Rio Tinto:** has set an ambition of reaching net zero emissions from its operations by 2050 and is targeting a 15% reduction in absolute emissions by 2030. It has committed to spend $1 billion on climate related projects from 2020-24.[16]
- **Shell:** has committed to be a net zero emissions business by 2050.[17]
- **BP:** is targeting net zero emissions by 2050 from its operations (on an absolute basis) and to halve the carbon intensity of its products.[18]
- **Toyota:** aims to reduce the emissions from its new vehicles by 35% by 2030 and 90% by 2050. It is also aiming to reduce the emissions from its global plants by 35% by 2030 and be net zero emissions from its global plants by 2050. Toyota aims to reduce the carbon emissions from the entire vehicle lifecycle by 25% by 2030 and to ultimately achieve net zero emissions on a vehicle life cycle basis.[19]
- **Volkswagen:** aims to become a balance sheet carbon neutral business by 2050. They also intend to reduce their emissions by 30% by 2025. These targets have been set on a vehicle lifecycle basis, from its supply chain through to the way its vehicles are used.[20]
- **General Motors:** has committed to carbon neutrality across its global production and operations by 2040 and aspires to eliminate tailpipe emissions from new light vehicles by 2035.[21]
- **NAB:** which achieved carbon neutrality from its operations in 2010, is aiming to reduce its scope 1 and 2 emissions by 51% by 2025 (against its 2015 baseline). It will also provide $70 billion of financing to low carbon activities by 2025. NAB has also committed to align its lending portfolio to a net zero economy by 2050.[22]

Capital is also increasingly being directed to low carbon investments. Globally, new investment in energy transition grew from US$109 billion in 2006 to US$501 billion in 2020.[23]

These trends are being driven by demand from consumers and investors for low carbon products.

Another driver is risk. The Australia Prudential and Regulatory Authority is encouraging "regulated entities to consider climate risks within their risk management frameworks"[24] noting that the physical and transition risks associated with climate change "also give rise to liability risks".[25] These sentiments are consistent with the opinion of Noel Hutley SC and Sebastian Hartford Davis who have advised that "company directors who fail to consider climate change risks now could be found liable for breaching their duty of care and diligence in the future".[26]

> "
>
> More than **1,500 companies** with a collective revenue of over US$12.5 trillion have now set or **pledged to commit to net zero targets**.[13]

Substantial investment is needed to achieve net zero

Substantial investment is needed to achieve a net zero emissions economy, and this will create opportunity for growth in clean industries.

Mark Carney, the UN global envoy for climate change and finance, estimates that investment of US$3.5 trillion per year for 30 years is required in global sustainable energy and infrastructure. Other jurisdictions targeting net zero emissions, including the United Kingdom, are reporting annual required investment in low emissions technologies and infrastructure in the order of one per cent of gross domestic product (GDP).[27]

This increase in investment will create substantial new opportunities for NSW businesses. This includes supporting renewables and other clean power generation in Australia that could underpin a $385 billion opportunity from 2020 onwards. Green hydrogen is expected to be the next largest opportunity at $350 billion in current dollars.[28] Additionally, new technologies such as electric vehicles will create demand for new products and services domestically and overseas. It is important that NSW businesses are well positioned to take advantage of these opportunities.

> “
>
> Renewables and other **clean power** generation in Australia that could underpin a **$385 billion opportunity** from 2020 onwards.

NSW is well placed to leverage opportunities from decarbonisation

To support the development and commercialisation of emerging clean technologies, we must take advantage of the State's existing strengths, while also developing our capabilities. Our existing strengths include abundant and globally competitive renewable energy resources, Sydney as a global financial centre, as well as world-class research and development capabilities.

It is also important for the State to support existing businesses in reducing their emissions so they are well positioned to compete in markets demanding low carbon products. In this respect, some of the biggest carbon emitters in NSW are also some of the biggest employers and contributors to the NSW Gross State Product (GSP).

They are central to the NSW economy. Investment that supports the future-proofing of existing industrial players is critical to ensure the economy remains resilient and jobs are protected.

NSW already has plans in place to support economic growth in a low carbon world. The *Electricity Infrastructure Roadmap* sets out a plan to deliver new energy generation, transmission, and long duration storage and firming.[29] The Office of the NSW Chief Scientist and Engineer (OCSE) *Decarbonisation Innovation Study* provides guidance on the most effective decarbonisation technologies and services for NSW into the future.[30] The *Net Zero Plan* paves the way for near-term emissions reductions that achieve net zero emissions by 2050. It is built on four priorities (Figure 1).[31]

1. Drive uptake of **proven emissions reduction technologies** that grow the economy, create new jobs or reduce the cost of living.
2. Empower consumers and businesses to **make sustainable choices.**
3. Invest in the **next wave of emissions reduction innovation** to ensure economic prosperity from decarbonisation beyond 2030.
4. Ensure the NSW Government **leads by example.**

Figure 1
Net Zero Plan Stage 1: 2020-2030.

Strategic Principles

Principles for success

The NSW Government is focusing on three key areas to support clean technology innovation and low emissions industry development.

Six principles underpin the actions required to deliver this support and maximise the benefits for NSW (Figure 2). These principles ensure the Program's three focus areas complement each other and operate with common objectives.

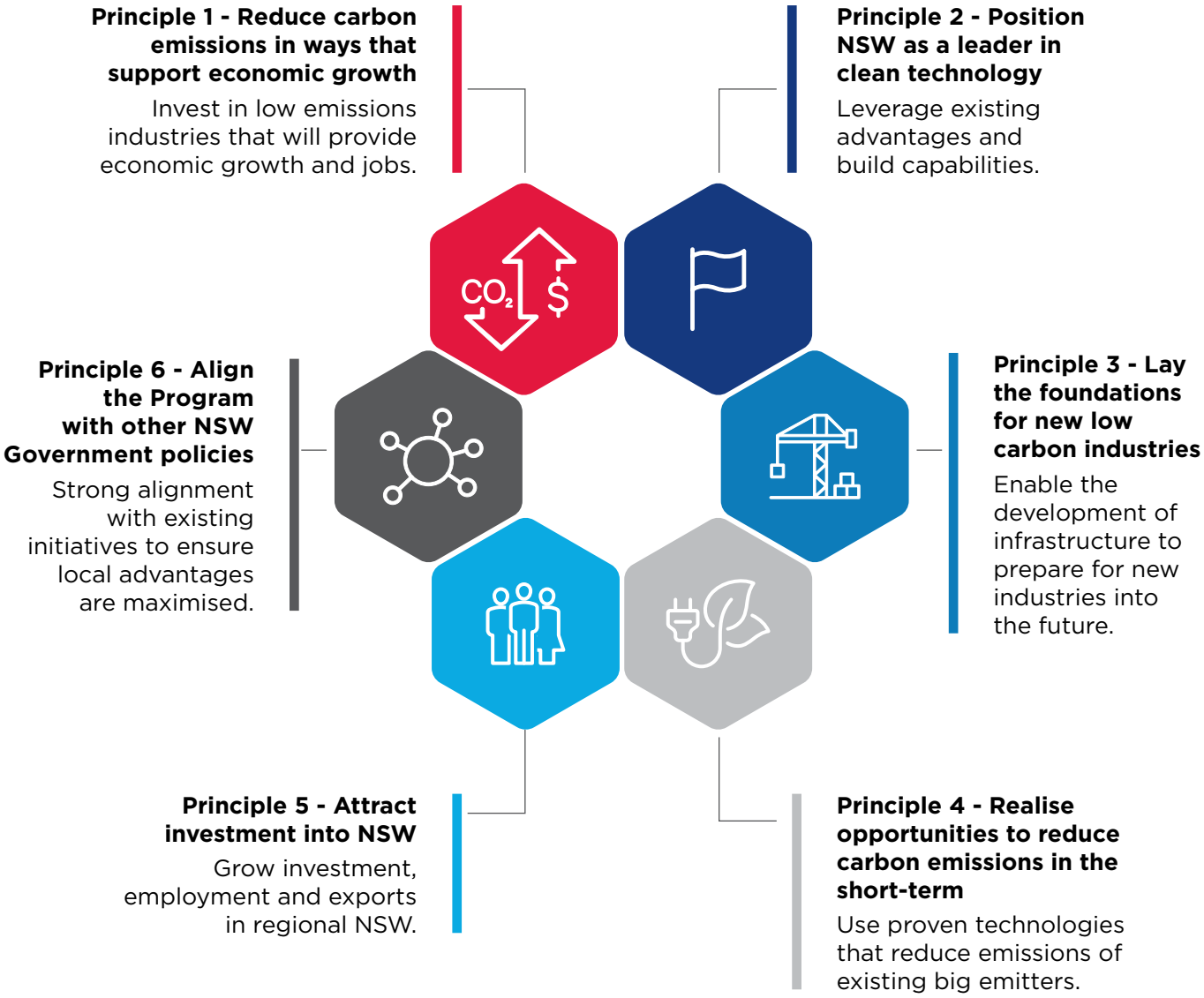


Figure 2
Six principles underpinning this Program.

Principle 1 – Reduce carbon emissions in ways that support economic growth

Reducing emissions will strengthen industry resilience and accelerate technological innovation, while providing significant long-term economic benefits for the people, environment and economy of NSW. Investment in clean technologies and low emissions industries must be delivered in a way that supports economic growth and creates new jobs and export opportunities.

With this in mind, the Program must be responsive to market conditions, technology developments and stakeholder needs, to ensure the NSW economy maximises its opportunities to take advantage of global decarbonisation.

Principle 2 – Position NSW as a leader in clean technology

NSW has competitive advantages in the financial, business and R&D markets. This puts the State in a strong position to create a prosperous clean technology industry and establish itself as Australia's premier technology exporter.

Opportunities within our domestic heavy emissions sectors will drive demand for clean technology. The technology priority areas will be supported and reviewed by the biennial OCSE *Decarbonisation Innovation Study*. They will focus on solutions that deliver on the commitments of the *Net Zero Plan*.

Technologies at different stages of maturity and in different fields will be supported. This is because a diverse range of technology options will allow us to develop capability and continue innovating. This will also increase the chances of the cheapest and most effective solutions being available in the long term. Additional priorities will be informed by international markets and export opportunities.

Principle 3 – Lay the foundations for new low carbon industries

To ensure the long-term growth and resilience of low emissions industries in NSW, it is critical to get the foundations right. Enabling the development of infrastructure, for example in green hydrogen and technology, will help prepare for new industries into the future. Creating an ecosystem of economic activity around new, low emissions industrial facilities will attract new players. It will also help establish NSW as a leader as low emissions practices are adopted globally.

Principle 4 – Realise opportunities to reduce carbon emissions in the short-term

While supporting the development of new, low emissions technologies and industries, it is important to ensure jobs are protected and existing players are not left behind. It is essential that technology is used at a scale that significantly reduces the emissions of existing high emitters. This will help to future-proof jobs, while simultaneously reducing a substantial portion of NSW's total emissions.

Principle 5 – Attract investment into NSW

To achieve a prosperous low carbon economy, we must protect jobs and create new, sustainable jobs for workers. All initiatives developed to deliver the Program will accelerate the development of clean technology, create new industries and position existing industries in a way that helps attract investment to NSW. Funding will be allocated in a way that helps communities and regional industries benefit from low carbon economic opportunities.

To maximise these opportunities, the Program will leverage co-investment from the private sector and knowledge sharing with industry players. In doing so, the NSW Government can play a leading role in helping to remove barriers to attracting national and international capital to low emission investments.

Principle 6 – Align the Program with other NSW Government policies

Investment through the three focus areas of the Program will complement and support other NSW Government objectives and activities in the move to net zero emissions. For example, low emissions industrial development will align with the planned Renewable Energy Zones (REZs) under the *Electricity Infrastructure Roadmap*, hydrogen hubs and the identified Special Activation Precincts (SAPs), which are set to become thriving business precincts. This will ensure local advantages are harnessed, including access to renewable energy and energy infrastructure, access to water, proximity to markets, or access to ports and logistics capabilities.

Overview

Areas of focus

The Net Zero Industry and Innovation Program will ensure NSW is ready and able to expand the economy, significantly reduce emissions to 2050 in line with our targets and create sustainable jobs of the future.

By focusing on the three key areas outlined in the Program, we will boost local innovation and position NSW as a global leader in the export of low emissions products, technologies and services (Figure 3).

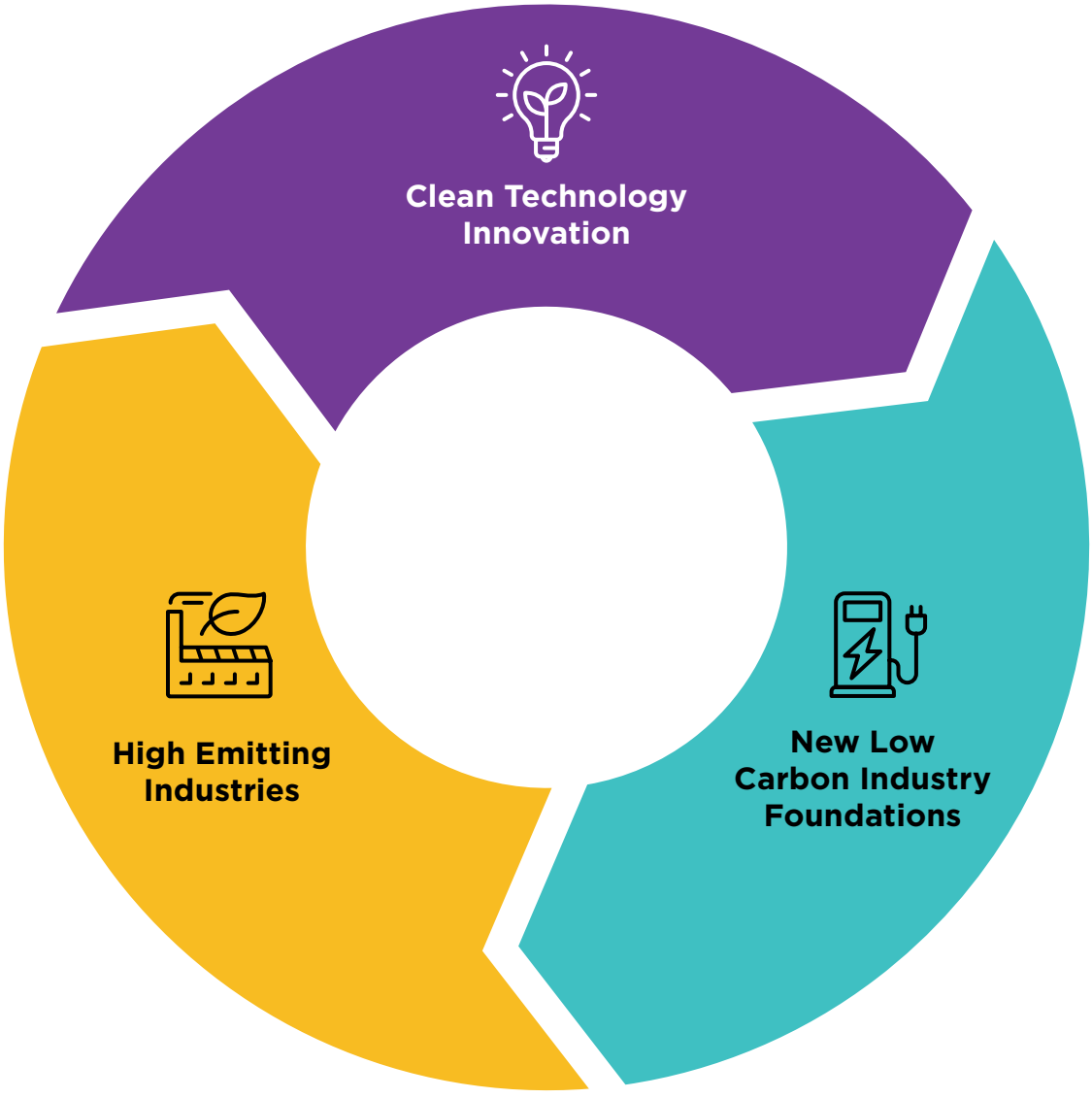


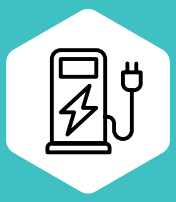
Figure 3
The three focus areas of the Program.

Clean Technology Innovation

Supporting the new wave of development of low emissions technologies and businesses will lay the foundations for new industries and help achieve significant emissions reduction into the 2030s and 2040s.

One of the priorities in the *Net Zero Plan* is to invest in the research, development and commercialisation of low emissions technologies, especially in industries where they do not yet exist. This will enable technology to be used at scale in future decades.[32] The Clean Technology Innovation component of this Program delivers on priority three of the *Net Zero Plan*.

New Low Carbon Industry Foundations



To secure a decarbonised industrial base in NSW, we must provide the right conditions for new industries. By focusing on laying the foundation for new low carbon industry, the Program aims to establish capability within existing industry and support emerging technologies. It will also make it easier for new, low emissions industrial facilities to enter the market. This aligns with industry opportunities identified through the *NSW: A Clean Energy Superpower Report*. It draws heavily on the OCSE's *Decarbonisation Innovation Study* as a guide for developing new low emissions industries. This focus area delivers on priority one and priority three of the *Net Zero Plan*.

High Emitting Industries

This area of focus is designed to support existing, high-emitting facilities to significantly reduce their emissions and strengthen their resilience into the future. Funding will be allocated to facilities undertaking major capital upgrades of plant and equipment. This will drive the uptake of proven technologies to achieve large emissions reduction under priority one of the *Net Zero Plan*.

Delivery streams

Together, the three focus areas of the Program and their delivery streams cover the technology lifecycle from research through to deployment (Figure 4). Over the course of the decade, there is an expectation that these delivery streams will evolve into more sophisticated forms of delivery to meet changing market conditions. Across all focus areas of the Program, there will be important investments in green hydrogen initiatives. These will meet the legislative commitment to invest $50 million before 2030 to develop the green hydrogen sector.

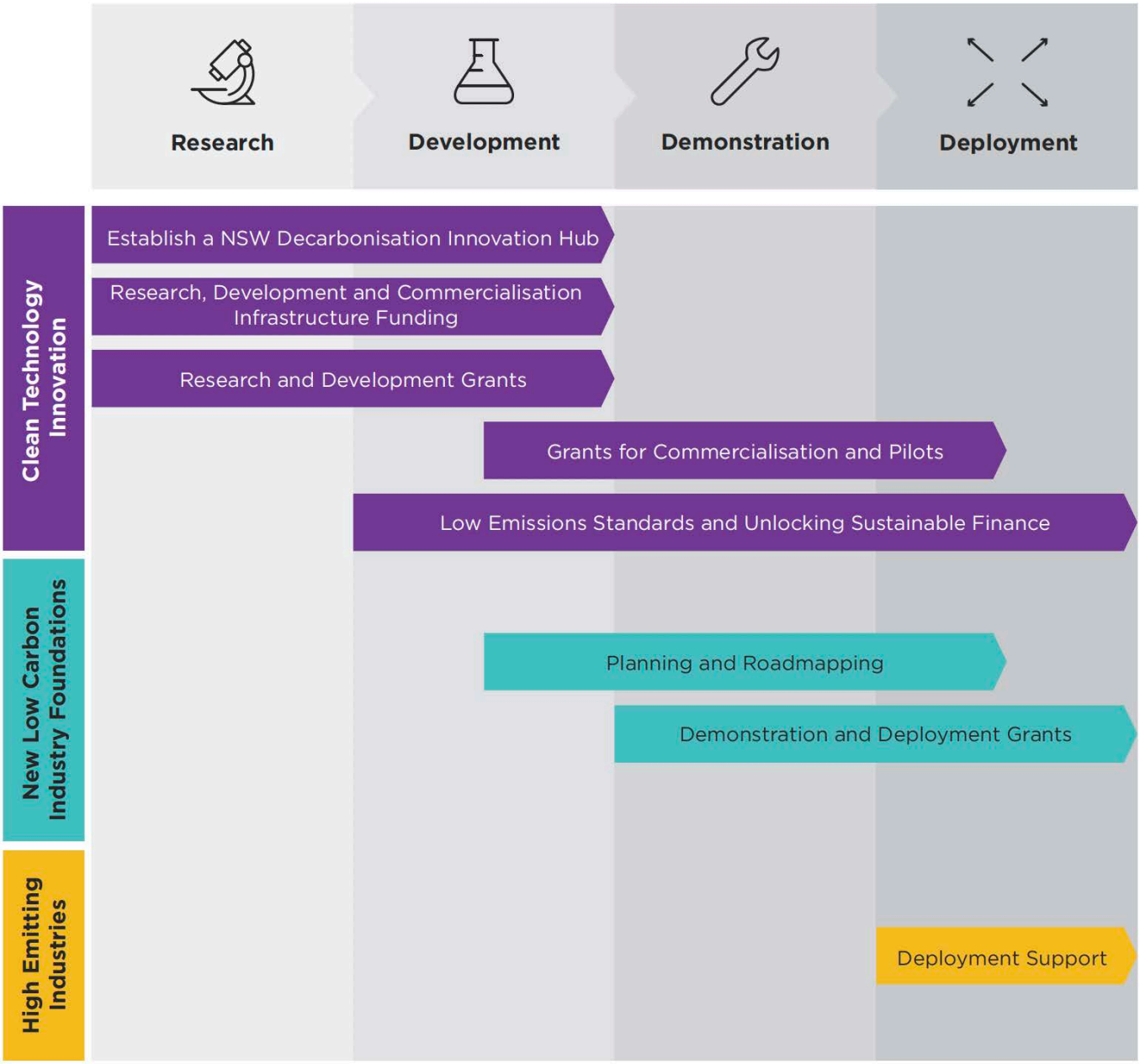


Figure 4
Delivery streams of the Program's three focus areas.

Clean Technology Innovation

Overview

Focusing on Clean Technology Innovation will create an environment where innovation is supported so new technologies are domestically developed, tested and used in the market. Support will include helping the next wave of low emissions technologies overcome technical and commercial barriers to growth.

This positions NSW as a leading investment destination and unlocks export opportunities in coming decades. Supporting the development of emerging clean technologies is essential for NSW to reach net zero emissions by 2050 and delivers on priority three of the *Net Zero Plan.*

Building capability to repeatedly develop new low-emissions technologies

With strong technology research and a world-leading financial sector, NSW is ideally positioned to create an ecosystem where clean technologies are rapidly developed, repeatedly innovated and scaled-up to meet our emissions targets.

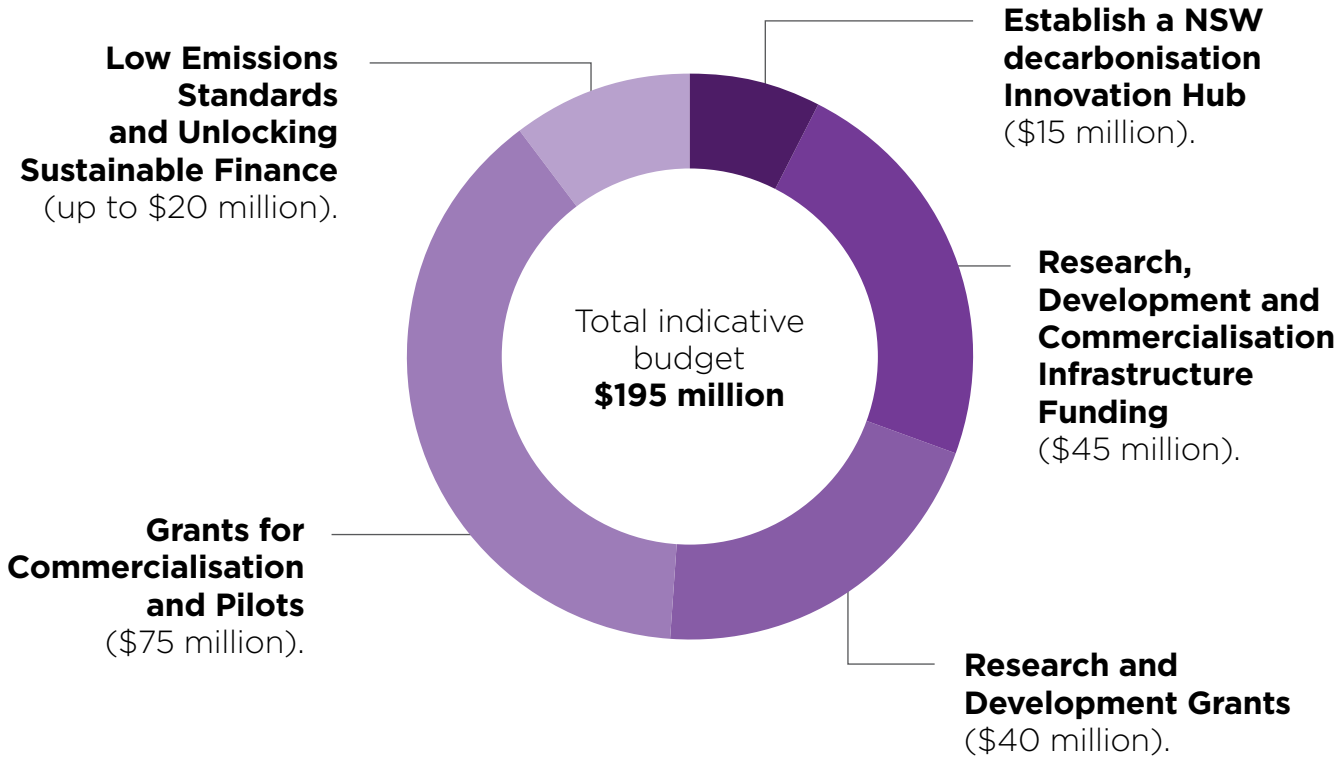
This area of focus will enable knowledge sharing, capacity building and collaboration between researchers, industry and government.

NSW has a proud history in the development of new, world-class, low emissions technologies. For example, the School of Photovoltaic and Renewable Energy Engineering at the University of New South Wales (UNSW) has achieved multiple breakthroughs since its establishment.

Back in 1989, it created the first solar cell with 20% efficiency. Since then, UNSW's scientific breakthroughs in the sector have been directly linked to reducing the cost of solar power. Through its pioneering R&D, it continues to make real, positive change for communities and the environment around the world.[33]

This is just one example from the evolving ecosystem of researchers, entrepreneurs, investors and start-ups that are developing and commercialising the next generation of low emissions technologies in NSW. These are technologies that will enable future emissions reduction and lay the foundations for future industries and exports from across the State.

This area of the Program is designed to further nurture the growth of this ecosystem so it can develop the capability to drive repeated innovation. It is proposed that support will be delivered through five streams until 2030, with a total indicative budget of $195 million allocated as follows:



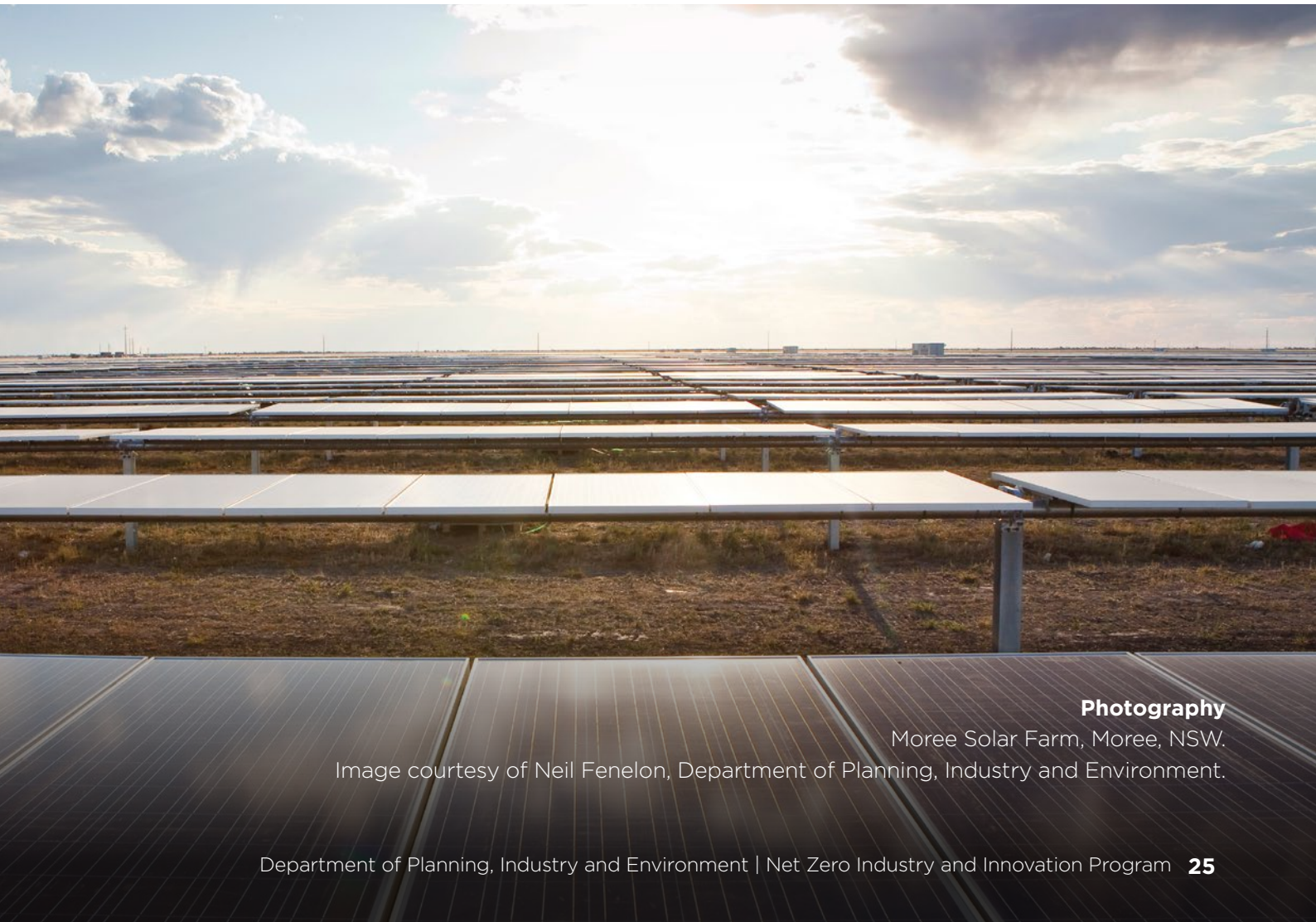
Supporting 'new technologies' and their priority areas

The reference to 'new' technologies should be considered broadly, and includes:

- the research phase – developing proof of concepts that can be tested
- the viability/demonstration phase – toward scale-up and product engineering in real world environments
- the commercial viability phase – toward application and demonstration of financial competitiveness
- the commercialisation and distribution phase – to establish markets, competition and adoption of new technology into industry or operational environments
- technologies not yet used in NSW but used elsewhere in domestic and international markets.

The technology innovations supported through this focus area will be guided by the OCSE *Decarbonisation Innovation Study*. The priority areas for the NSW Decarbonisation Innovation Hub (the Hub) will be:

1. **Electrification and Energy Systems** – accelerating renewable energy solutions and supporting the uptake of electrification in other sectors.
2. **Land and Primary Industries** – coordinating and aligning efforts in the next wave of sustainable primary industry practices as the sector contributes significant proportions of NSW emissions.
3. **Power fuels including hydrogen** – growing an environmentally sustainable NSW hydrogen industry and unlocking decarbonisation opportunities for many hard to abate sectors beyond 2030.



Photography
Moree Solar Farm, Moree, NSW.
Image courtesy of Neil Fenelon, Department of Planning, Industry and Environment.

Priority areas will be reviewed every two years as the OCSE *Decarbonisation Innovation Study* is updated. Support for technology within these priority areas will be delivered through the following five streams (Figure 5).

Further information on the Clean Technology Innovation focus area can be found at Appendix A: Details of Clean Technology Innovation. Information on how to register your interest in the Program and its delivery can be found in **How to get involved.**

Stream 1 Establish a NSW Decarbonisation Innovation Hub	**A coordination of research, government and industry efforts across three priority areas: energy systems and electrification, land and primary industries and power fuels including hydrogen.**	*Example: Connecting inventors, investors and end users to identify and address barriers to clean technology uptake through workshops, events and seed funding.*
Stream 2 Research, Development and Commercialisation Infrastructure Funding	**Investment in Research, Development and Commercialisation infrastructure to accelerate the deployment of low emissions technologies.**	*Example: Grant funding for new equipment to test next generation battery storage technologies.*
Stream 3 Research and Development Grants	**Competitive Research and Development grants for the early stage development of low emissions technologies, services and intellectual property.**	*Example: Grant funding for renewable energy Research and Development, similar to UNSW's six grant funded projects in the areas of advanced silicon, tandem silicon and end of life solar PV.*
Stream 4 Grants for Commercialisation and Pilots	**Direct or recoverable grants to fund the scale-up of new technology that is already proven.**	*Example: Grant funding to build and operate a demonstration scale hydrothermal liquefaction reactor to upgrade renewable crude oil into renewable diesel, paving the way for large scale commercialisation.*
Stream 5 Low Emissions Standards and Unlocking Sustainable Finance	**Investigate emissions standards relating to the design and installation of energy consuming equipment and facilitating increased flow of sustainable finance to NSW low emission projects.**	*Example: Investigate the voluntary uptake of low emissions standards in priority industrial processes undertaken in NSW. Unlocking new investment streams that can increase the impact of NSW Government Net Zero Initiatives.*

Figure 5
Five streams supporting Clean Technology Innovation.

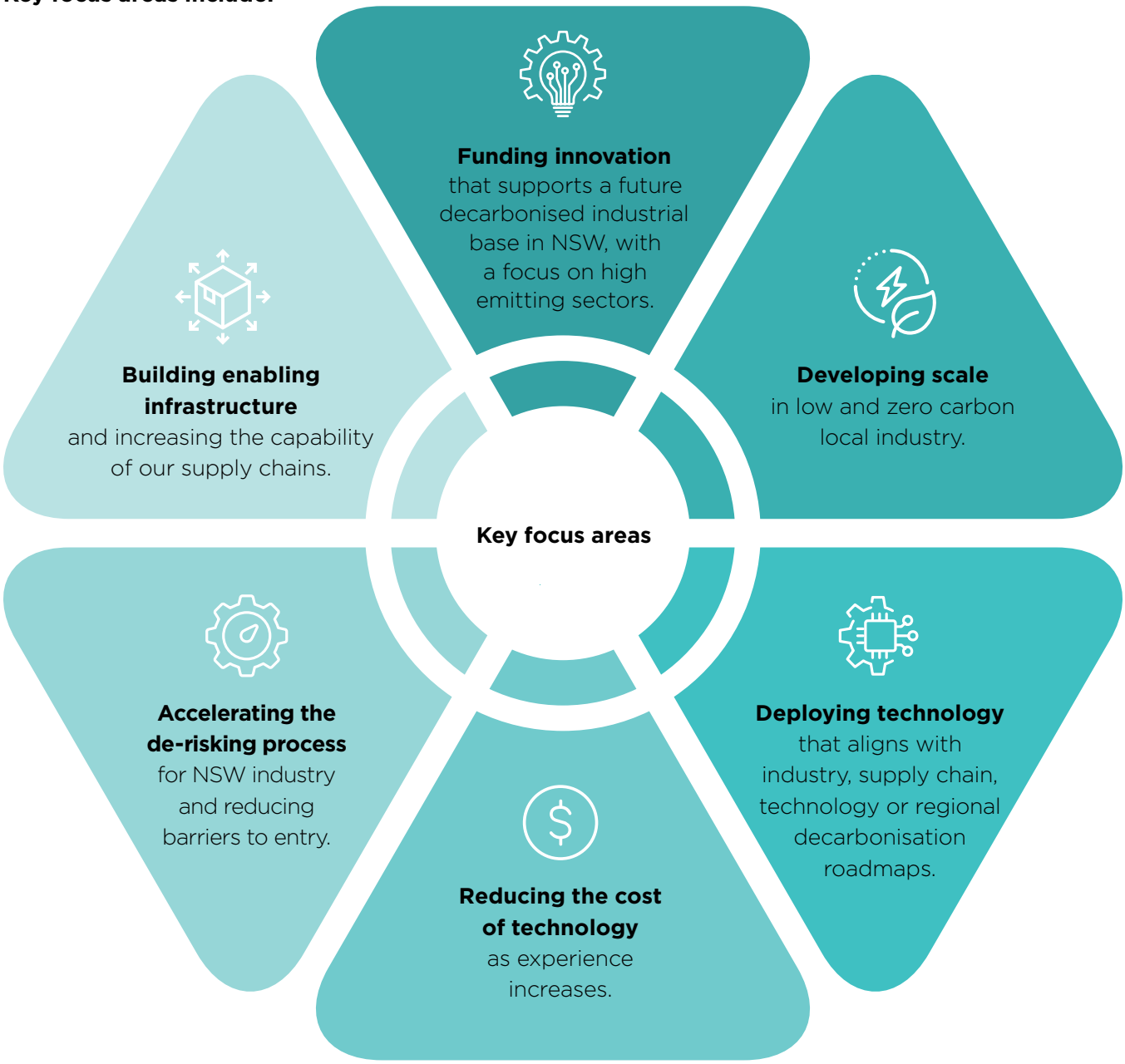
New Low Carbon Industry Foundations

Overview

Advances in technology and growing global momentum for climate action are driving a clean transformation of the industrial sector.

There are great opportunities for NSW to benefit from this transformation and become a major global player in the production and export of low and zero carbon industrial products. By focusing on New Low Carbon Industry Foundations, this area of the Program is designed to deliver emissions reduction through to 2030 and beyond at a total budget of $175 million.

Key focus areas include:



This will ultimately position NSW as a competitive player in global markets into the future. It will encourage industry in NSW to take advantage of disruptive technologies and harness the State's renewable energy resources.

Key objectives

A combination of traditional and recoverable grant funding will be made available. This funding will support the demonstration and deployment of innovation that has the potential to benefit multiple, new and existing industrial businesses in NSW.

Recoverable grants include a mechanism for the NSW Government to recoup some or all of the funding over time, subject to the achievement of certain agreed performance criteria. Funding applications may come from individual business, consortia, not for profits or development authorities.

Like Clean Technology Innovation, New Low Carbon Industry Foundations seeks to build on, and align with, existing and future State initiatives and priorities. These include Renewable Energy Zones (REZs), Special Activation Precincts (SAPs) and proposed hydrogen hubs. It is expected that the Program will contribute at least $70 million to support the establishment of hydrogen hubs in the Hunter and Illawarra.

This will foster and support the emergence of Clean Manufacturing Precincts (CMPs) in NSW. There will be benefits where multiple industries co-operate in their decarbonisation strategies. Those benefits include reducing costs, skills and training barriers, as well as reducing risks associated with new technology platforms like hydrogen.

While demonstration and deployment are elements of New Low Carbon Industry Foundations, the NSW Government recognises that some parties may require earlier stage support to proceed with these activities. This includes offers for funding of roadmapping and project planning activities for the Clean Manufacturing Precincts. It is expected roadmaps from interested parties will outline the journey to achieving low/zero carbon emissions for the precinct, with project plans outlining subsequent delivery and implementation.

The focus of the New Low Carbon Industry Foundations funding priorities will be informed by the work of the OCSE and consultation with industry.

> “
>
> The program will contribute at least **$70 million to support** the establishment of hydrogen hubs in the Hunter and Illawarra.

Project success factors and criteria

The NSW Government will consult and collaborate widely with interested parties to develop detailed delivery plans for the New Low Carbon Industry Foundations. Figure 6 outlines the proposed project success factors, eligibility criteria and funding approach, with further details available in Appendix B: Details of New Low Carbon Industry Foundations.

Information on how to register your interest in the Program and its delivery can be found in **How to get involved.**

Key project success factors	• Building local capability that enables industry to evolve and remain competitive in the global market for low carbon products. • Supporting and aligning with other strategic regional initiatives, which may include SAPs, REZs, or proposed hydrogen hubs. • Establishing Clean Manufacturing Precincts and the enabling infrastructure needed for the decarbonisation of high emitting industry and their supply chains.
Proposed eligibility criteria	• Project will be delivered prior to 1 January 2030 in NSW, with any equipment or plant purchased using grant funding to remain in NSW. • Technologies align with NSW's advantages based on scientific and engineering principles identified by the OCSE, and with roadmaps for deploying technologies in line with supply chain, technology or regional decarbonisation roadmaps. • Co-investment opportunities must be demonstrated.
Proposed funding approach	• Direct or recoupable grant funding for enabling infrastructure and technology implementation. • Funding for roadmaps and plans for strategic Clean Manufacturing Precincts. • Funding approaches will be further refined based on evolving market needs.

Figure 6
Key elements of New Low Carbon Industry Foundations.

CASE STUDY

Developing hydrogen hubs to pave the way for a new, clean hydrogen industry

It is both a State and Commonwealth desire to develop hydrogen hubs (see the *National Hydrogen Strategy*). Not only are hubs cost-effective, they foster innovation, encourage collaboration and are more efficient because of their scale. Hubs will be created around clusters of large-scale demand. In NSW, locations could include ports, in particular Newcastle and Port Kembla, and the regional Special Activation Precincts.

Example scenario for hydrogen hub development

STEP 1:

The NSW Government identifies potential opportunities to use hydrogen in its operations to stimulate initial demand at scale for a clean hydrogen supply (using hydrogen to power fuel cell electric buses could be such an opportunity).

STEP 2:

To make the most of the opportunity, government works with industry to identify other potential hydrogen consumers in order to stimulate hydrogen hub development areas. These are targeted to ensure there is a maximum amount of hydrogen demand in each hub location. Potential hydrogen consumers may include:

- fleet operators, including waste trucks, buses, passenger vehicles, logistics and freight
- existing hydrogen users in the industrial sector, including steel manufacturers, ammonia producers, oil refiners and food processors
- greenfield projects using hydrogen in industrial feedstock applications, or as a green gas alternative for process heating
- export supply chain demonstration or commercialisation projects
- Remote Area Power System (RAPS) operators
- gas consumers who want to boost existing supply for process heating with a green gas alternative.

STEP 3:

The NSW Government works with potential providers of hydrogen production and distribution to facilitate investment. This involves providers and operators of hub infrastructure, including electrolysers, refuelling stations, gas liquefiers and reticulation networks. This initial government support gives the private sector confidence to invest in the hydrogen infrastructure and technology listed above. It is expected that this will ultimately deliver competitive fuel and operation prices.

STEP 4:

As the hydrogen hub grows, research bodies and innovation hubs are introduced and embedded. New technologies and business models are brought into the supply chain, further cutting costs and identifying new applications and markets.

STEP 5:

Scale of production means the price of hydrogen becomes globally attractive and new export markets are established.

This hub development model aims to maximise demand to achieve economies of scale.

Project examples

In Australia and abroad, technology that supports decarbonisation is increasingly being used to reduce emissions and create new low emissions products and services. The table below provides some applied examples of how New Low Carbon Industry Foundations under the Program could be applied to support industry to reduce emissions.

Example scenario	Potential outcome
1 An existing industrial precinct, where multiple businesses use natural gas for various industrial heating applications, has done a feasibility study into the optimal low or zero carbon alternatives. These alternatives may include, for example, bioenergy, water heat reuse, renewable electricity, renewable hydrogen and solar thermal. The industrial precinct is now seeking to install new equipment and infrastructure.	✓ After a successful funding application, the Government supports the precinct in its deployment of the new equipment and infrastructure, requiring co-investment from the end-users. ✓ Funding is provided through a recoverable grant, where a mechanism exists for the NSW Government to recover some or all of its funding over time, subject to the achievement of certain agreed performance criteria. ✓ The funding helps to overcome critical barriers for the end-users and enables the precinct to proceed with the first-of-a-kind project in NSW. The equipment and infrastructure grows local capability, acts as an example for other precincts and reduces technology costs.
2 A coal-fired power station is seeking to build the infrastructure needed to collect, process, store and distribute its fly ash by-product. This fly ash by-product can be used by cement manufacturers in the production of 'green' cement. Establishing this infrastructure may support new, 'green' cement manufacturing and create a circular economy where the by-product from a coal-fired power station can be used as input by an industrial facility.	✓ The Government supports the construction of infrastructure to attract new, low emissions industry. ✓ In this case, the coal-fired power station may attract cement manufacturing industry partners and support the development of 'green' cement that uses fly ash in the production of environmentally friendly cement.
3 A hydrogen plant is planned to produce hydrogen using a grid connected alkaline electrolysis electrolyser. The facility includes a hydrogen turbine and fuel cell which will additionally provide balancing services to the grid and a decentralised green ammonia facility.	✓ The commercialisation of Australia's first clean hydrogen plant will additionally support broader renewable energy development, e.g. two new solar farms and a nearby micro-grid to be used by local aqua agriculturists who have been affected by ageing back up power generation. ✓ The project will also allow universities and research groups to access a range of hydrogen technologies in an operating commercial environment, paving the way for future developments.

High Emitting Industries

Overview

The biggest opportunity for decarbonisation in NSW industry sits with a relatively small number of existing high emitting industries.

At least 29% of emissions in NSW are created by the top 55 industrial facilities, all of which are in the mining and manufacturing sectors (Figure 7).[34]

The drive to net zero emissions needs action from, and presents opportunities for, these high emitting industries. To achieve both corporate and government net zero targets they will need to reduce their emissions intensity and shift to low emissions plant and equipment. Large industrial facilities are often bespoke, have long lifetimes and have significant capital invested in them. With this in mind, financial and commercial planning to replace or upgrade these facilities to reduce carbon emissions must start many years in advance.

This voluntary initiative will be open to NSW high emitting manufacturing and mining facilities that have a threshold emission greater than 0.09 megatonnes of carbon dioxide equivalent emissions per annum (0.09 Mt CO2e pa).[35]

Key objectives

By focusing on High Emitting Industries, this area of the Program supports the development and implementation of individual projects. Those projects must be wholly based in NSW and focus on the State's highest emitting facilities in hard-to-abate sectors. Hard-to-abate sectors include those where specific industrial processes (such as high-temperature heating) rely on fossil fuels because few commercial low emissions alternatives exist. Examples of high emitting sectors include steel, cement, aluminium, chemical, pulp and paper manufacturing and metal ore mining.

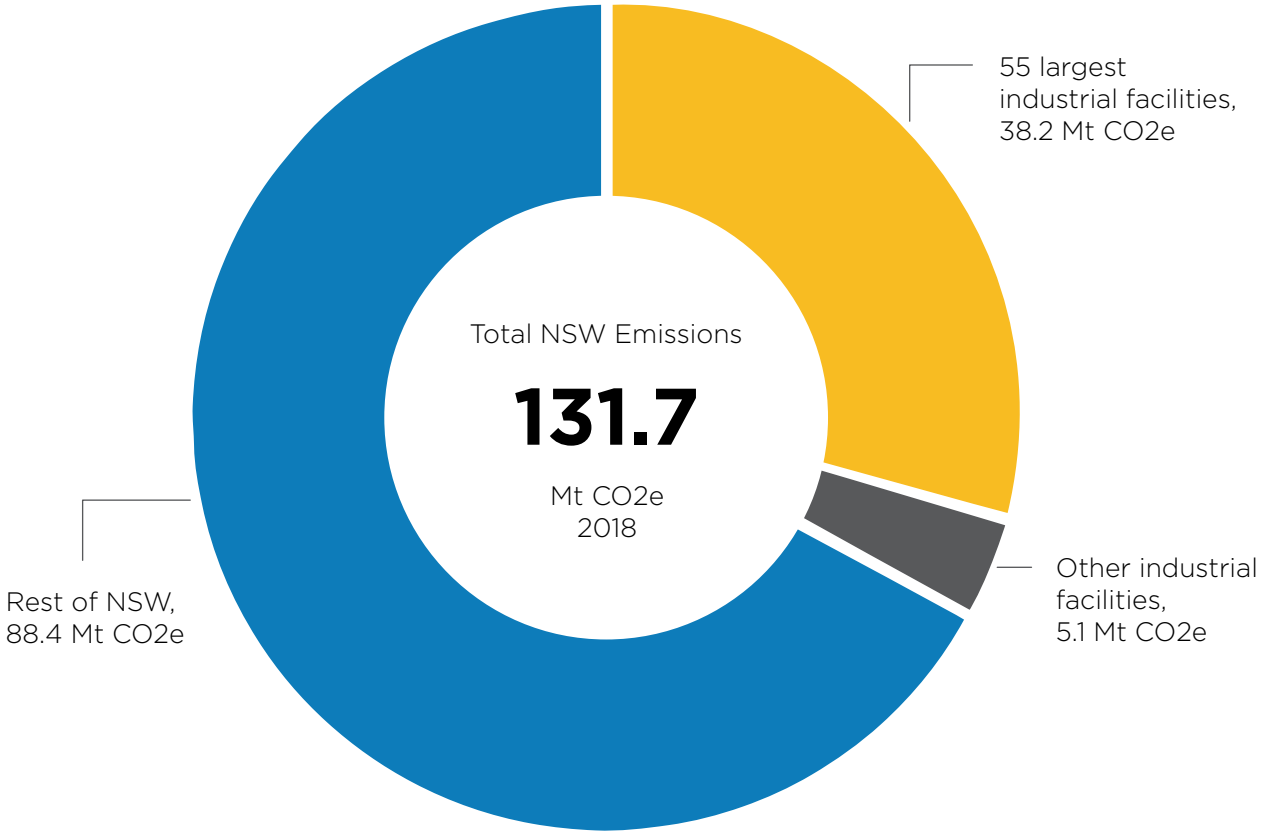


Figure 7
Breakdown of NSW emissions.

> This part of the Program has a total budget of **$380 million** and will deliver **emissions reduction** by 2030.

Funding allocations are intended for high value grants that support major capital upgrades for plant and equipment. This will align with business investment cycles while achieving the lowest cost emissions reduction.

Project success factors and criteria

To apply for funding, proponents must first satisfy eligibility criteria in order to ensure success. For eligible projects, transparent assessment criteria will be used to consider applications.

The NSW Government will consult and collaborate widely with interested parties to develop detailed delivery plans for the High Emitting Industries focus area.

Figure 8 outlines the key elements of High Emitting Industries with more information available in Appendix C: Details of High Emitting Industries.

Information on how to register your interest in the Program and its delivery can be found in **How to get involved.**

Key project success factors	• Cost effective emissions abatement from high emitting industries by 2030. • Protecting existing jobs and creating new jobs in resilient industries of the future. • Supporting and aligning with other strategic regional initiatives, which may include SAPs, REZs, and hydrogen hubs.
Proposed eligibility criteria	• NSW based facility that emits more than 0.09 Mt CO2e p.a.* • The organisation is classified under the ANZSIC codes of Manufacturing or Mining. • Project will take place in NSW, with any equipment or plant purchased using grant funding to remain in NSW. • Project to be delivered prior to 1 January 2030. • Co-investment from partnering organisations.
Proposed funding approach	• Funding may be delivered through direct or recoverable grants or other financial mechanisms subject to relevant conditions being satisfied. • Funding will seek to align with business investment cycles. • A regular funding approach will be published to inform the assessment of future projects in the pipeline.

*The emissions threshold of 0.09 Mt CO2e p.a. will be reviewed regularly based on the evolving capability of industry to deliver decarbonisation projects.

Figure 8
Key elements of High Emitting Industries.

Project examples

In Australia and abroad, decarbonisation technology is increasingly being used in facilities of high emitting industries. Examples of real-world projects are provided below.

Example scenario	Potential outcome
1 A joint venture aiming to develop the world's first fossil fuel-free, ore-based steel manufacturing technology has received financial support from the Swedish Energy Agency. Hydrogen Breakthrough Ironmaking Technology (HYBRIT) is a joint venture owned by the steel manufacturer SSAB, the mining company LKAB and the energy company Vattenfall.	✓ The initiative has the potential to reduce Sweden's total carbon dioxide emissions by 10%. It could make Sweden the first country to produce fossil fuel-free, ore-based steel. ✓ A pre-feasibility study was performed in 2016-17. The pilot phase runs from 2018-2024, and a pilot plant reached operational phase in 2020.
2 Ventilation Air Methane (VAM) projects capture the fugitive methane emissions from underground coal mining within the mine's ventilation stream. BHP developed the West Cliff VAM Project (WestVAMP), becoming the world's first commercial scale VAM-to-power project. It was also the world's first commercial VAM project operating from 2007-2017. Situated at BHP Billiton Illawarra Coal's West Cliff Mine in NSW, the WestVAMP plant consisted of VOCSIDIZER RTOs manufactured by B&W MEGTEC Systems.	✓ The plant reduced greenhouse gas emissions by 2 million metric tonnes of CO2 equivalent (tCO2e) during its project life. It did this by generating 6 megawatts of electricity using a steam turbine generator that produced 300,000 megawatt hours. ✓ This addresses fugitive methane emissions from coal mining, which currently accounts for 5% of Australia's CO2 emissions.
3 Incitec Pivot is considering building a green ammonia and hydrogen plant at its Moranbah ammonia facility in Queensland. This follows a feasibility study completed in 2020, which received funding from the Australian Renewable Energy Agency (ARENA).	✓ The Moranbah facility currently operates an ammonia plant that employs up to 110 people and manufactures more than 360,000 tonnes of ammonium nitrate annually. ✓ Green ammonia plant and equipment will future-proof the industry and protect existing jobs into the future.

Photography
DPE compliance team members, Newcastle office.
Image courtesy of Jeremy Piper, Department of Planning, Industry and Environment.

How to get involved

The Net Zero Industry and Innovation Program marks the beginning, under the Net Zero Plan, of joint efforts between the NSW Government, researchers and industry to support a prosperous low emissions future.

We will consult with interested stakeholders on the detailed delivery plan for the three areas of focus to support clean technology development, lay the foundations for new low carbon industries and reduce the emissions of existing industries.

A collaborative approach will help maximise benefits for the people, communities, economy and environment of NSW. We look forward to working with industry, business groups, investors, academics, researchers, entrepreneurs, community, interest groups, environmental Non-Governmental Organisation (NGO)s and the general public.

How we work with stakeholders

The NSW Government will follow several guiding principles while it develops and ultimately delivers initiatives to decarbonise industry across NSW. These principles include:

We recognise that strategic investment cycles are critical to business continuity and productivity.

Proposals of clearly established outstanding merit (e.g. those that deliver significant emission reductions at very low cost) that demonstrably cannot fit within standard program funding cycles may be considered for funding on an exceptional basis by the Department. Consideration would be in strict accordance with strong probity, evaluation and governance procedures.

Immediate next steps

The NSW Government will be conducting a series of consultations including workshops over the coming months and will be launching a confidential Registration of Interest process by April 2021.

To be the first to receive updates on the Net Zero Industry and Innovation Program visit **www.energysaver.nsw.gov.au/netzeroindustry** and register your details.

Focus area	Next steps
Clean Technology Innovation	• Confidential Registration of Interest open by **April 2021**.
- NSW Decarbonisation Innovation Hub*	• Stakeholder Expression of Interest by the Office of the NSW Chief Scientist and Engineer expected **third quarter 2021**.
- Research, Development and Commercialisation Infrastructure Funding	• Confidential Registration of Interest open by **April 2021**. • Stakeholder consultation during **second quarter 2021**. • Program availability expected **fourth quarter 2021**.
- Research and Development Grants	• Stakeholder engagement during **second quarter 2021**. • Program availability expected **fourth quarter 2021**.
- Grants for Commercialisation and Pilots	• Stakeholder consultation, program guidelines and program scope expected **late 2021**. • Program availability expected **fourth quarter 2021**.
- Low Emission Standards and Unlocking Sustainable Finance	• Targeted industry consultation and further program scoping will be undertaken by **mid 2021**.
New Low Carbon Industry Foundations	• Confidential Registration of Interest open by **April 2021**. • Stakeholder consultation commencing **May 2021**.
High Emitting Industries	• Confidential Registration of Interest open by **April 2021**. • Stakeholder consultation commencing **May 2021**.

*The Office of the NSW Chief Scientist and Engineer is leading the establishment of the NSW Decarbonisation Innovation Hub. Interested parties can find out more about this Hub at www.chiefscientist.nsw.gov.au/decarbonisation-innovation-hub

Further reading

The following resources, referenced throughout this document, may be useful for interested parties to read:

NSW Government
Net Zero Plan Stage 1: 2020-2030

This is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. It outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions over the next decade.

NSW Government
Electricity Infrastructure Roadmap

Building on the 2019 NSW Electricity Strategy and the 2018 NSW Transmission Infrastructure Strategy, the Roadmap is a plan to transition the electricity sector into one that is cheaper, cleaner and more reliable.

NSW Government
Turning Ideas into Jobs: Accelerating R&D in NSW Plan

Released in January 2021, the Turning Ideas into Jobs Plan recommends a range of priority actions and supporting actions that will accelerate the rate at which ideas are translated in NSW into new industries, jobs, products and services.

KPMG and The Office of the NSW Chief Scientist and Engineer
NSW: A Clean Energy Superpower Report

Electricity and energy are fundamental inputs to all households and industry. There are significant current and emerging opportunities for industry growth and development. The report identifies industry opportunities in NSW over the long term enabled by cheap, clean and reliable electricity.

The Office of the NSW Chief Scientist and Engineer
NSW Decarbonisation Innovation Study Final Report

The report details the final list of economic opportunities associated with decarbonisation and climate adaptation across all sectors of the NSW economy and the next steps to realise them. It includes information on NSW's technical and commercial readiness along with its research and development capabilities in decarbonisation and climate adaptation, and approaches to effective decarbonisation.

Department of Industry, Science, Energy and Resources
Australia's National Hydrogen Strategy

Australia's National Hydrogen Strategy sets a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians. It aims to position our industry as a major player by 2030. The strategy outlines an approach that equips Australia to scale up quickly as the hydrogen market grows.

Department of Industry, Science, Energy and Resources
First Low Emissions Statement 2020

Annual low emissions statements like this one are key milestones of the roadmap process. These statements prioritise low emissions technologies with potential to deliver the strongest economic and emissions reduction outcomes for Australia. They focus government investment on new and emerging technologies.

Appendix

Appendix A: Details of Clean Technology Innovation ($195 million)

Stream	Description	Funding Approach	Proposed Deliverables
1. Establish a NSW Decarbonisation Innovation Hub ($15 million)	The NSW Decarbonisation Innovation Hub will establish collaborative networks between key stakeholders to maximise innovation and leverage private co-investment. The priority areas are: 1. **Electrification and Energy Systems** – accelerating renewable energy solutions and supporting the uptake of electrification in other sectors. 2. **Land and Primary Industries** – coordinating and aligning efforts in the next wave of sustainable primary industry practices as the sector contributes increasing proportions of NSW emissions. 3. **Power fuels including Hydrogen** – growing an environmentally sustainable NSW hydrogen industry and unlocking decarbonisation opportunities for many hard to abate sectors beyond 2030.	Continuous funding with private co-investment to 2030, covering coordination and facilitation activities, access to infrastructure, primary research, data capture, collection and analysis and associated salaries.	• Physical and/or virtual networks of research institutions, government agencies and industry established by the OCSE. • Showcase NSW R&D in local, national and international clean technology platforms. • Establish partnership agreements between members whereby academic and industry communities co-develop and commercialise decarbonisation technologies for the increasingly emissions intensive primary industries. • Support the growing hydrogen industry to accelerate emissions reduction in heavy manufacturing.
2. Research, Development and Commercialisation Infrastructure Funding ($45 million)	Funding R&D infrastructure in NSW will support the development, commercialisation and uptake of the next wave of low emissions technologies. This may include piloting or testing facilities and will support long-term planning for a thriving, low emissions NSW economy.	Periodic funding rounds that prioritise technology areas of the NSW Decarbonisation Innovation Hub, aimed at facilities with demonstrated technology R&D capabilities. This stream will also allow for other technologies to bid through alternative proposals. The focus will primarily be on innovations that support priority technologies and clean manufacturing precincts.	• Use testing equipment in an existing facility to enhance the R&D efforts of proposed technologies. • Support the development of new research, testing and development facilities. • Develop NSW-based intellectual property (IP) for novel methods of data capture, analysis and validation in the low-emissions and clean technology space.

Stream	Description	Funding Approach	Proposed Deliverables
3. Research and Development Grants ($40 million)	Targeted R&D grants will support the research ecosystem needed to develop and prove clean technology solutions. This grant program will be a flagship for clean technology research in NSW. It will focus on sectors and technologies where the potential for emissions reduction is high in the medium to long term. While grants will be available across all sectors of the economy, the initial high priority areas will align with the three focus areas of the NSW Decarbonisation Innovation Hub. Priority areas will be reviewed and adjusted over time, in line with other government programs.	Competitive funding rounds up to 2030 with a focus on sectors and technologies where emissions reduction potential is high in the medium to long term. First round assessment grant payments will be smaller compared to subsequent payment stages, aligned with progress in commercialisation stages.	• Fill funding gaps for research and innovation that accelerates the introduction of new technologies to the market. • Identify joint funding opportunities with initial priority grant funding areas that align with the Commonwealth's *First Low emissions technologies Statement*.[36]
4. Grants for Commercialisation and Pilots ($75 million)	Proven new, clean technologies will require support to scale-up and maximise emissions reduction outcomes. This grant program will provide direct or recoverable grants for pilots, product tests, demonstration projects, the expansion of accelerator or incubator programs. Co-contribution funding models will also be leveraged to maximise government contributions.	Competitive funding rounds up to 2030 with a focus on those technologies which are proven and have an ability to be scaled-up. First round assessment grant payments will be smaller compared to subsequent payments. The NSW Government may also partner with private enterprise to deliver investment products that maximise value for the NSW Government.	• Piloting proven technologies in a real-world operational context to validate effectiveness and opportunities for scale-up. • Integrate private investment and set up new opportunities for funding proven technologies that can be driven by the private market. • Sell prospective technologies overseas and establish a thriving clean technologies export sector.
5. Low Emissions Standards and Unlocking Sustainable Finance ($20 million)	This will investigate low emissions standards design to support consistent improvement of energy consumption and installation standards in NSW. Low emission standards will be investigated for voluntary adoption. The use of those standards may then be actively promoted. This stream will also leverage the rapid growth in sustainable finance and position NSW as a key sustainable investment destination. It will facilitate the distribution of sustainable capital in NSW by developing standards and methodologies that give markets the confidence they need to invest in low emission projects in NSW.	Funds will be used to partner with industry to develop and harness low-emission standards.	• Partnership projects with key industry sectors, for example, the housing construction sector. • Industry-agreed low-emission voluntary standards and approaches to uptake. • Industry-agreed methods and data supported by NSW Government that help investors to identify and verify low emission investments.

Appendix B: Details of New Low Carbon Industry Foundations ($175 million)

Proposed eligibility criteria	• Project will wholly take place in NSW. • Collaboration occurs with other NSW businesses, research organisations, academic institutions or public sector organisations. • Project will be delivered prior to 1 January 2030. • Access to transmission network connections or renewable energy resources exist. • Access to a skilled workforce exists. • Connections to logistical networks and/or proximity to end users, and hydrogen hubs exist. • Co-investment from partnering organisations.
Key proposed deliverables	• Provides value for money, including the cost to the program of delivering the emissions reduction ($/tonne CO2e). • Proposed project strengthens a competitive, low emissions, industry or sector in NSW. • Develops new, low emissions strategic technologies such as green hydrogen. • Builds local capacity and skills, shares knowledge and experience with the broader industry. • Supports and aligns with existing NSW Government initiatives such as SAPs, REZs and hydrogen hubs. • Aligns technologies with supply chain, technology or regional decarbonisation roadmaps.
Proposed funding approach	• Participation is voluntary for eligible industry participants. • Support in the form of cash grants or other financial mechanisms, subject to relevant conditions being satisfied. • Grant funding or other support mechanisms for Clean Manufacturing Precinct roadmaps. • The cost of implementation of technologies will change over the life of the program, meaning regular funding updates will be published to inform assessment of future projects in the pipeline.

Appendix C: Details of High Emitting Industries ($380 million)

Proposed eligibility criteria	• Facility where project will occur emits more than 0.09[37] Mt CO2e pa. • Project is wholly based in NSW. • Organisation is classified under the ANZSIC codes of Manufacturing or Mining. • Project will be delivered prior to 1 January 2030. • Project involves large investment in infrastructure, plant and equipment, and contributes to decarbonisation. • Project does not involve the closing or scaling back of business operations in NSW. • Co-investment exists from partnering organisations.
Key proposed deliverables	• Achieves sustained emissions reduction by 2030 and onwards. • Improves the competitiveness of the applicant's business, protecting jobs into the future. • Provides value for money, including the cost to the program of delivering the emissions reduction ($/tonne CO2e). • Supports and aligns with existing NSW Government initiatives such as SAPs, REZs and hydrogen hubs. • Builds local capacity and skills, shares knowledge and experience with the broader industry. • Develops new, low emissions strategic technologies such as green hydrogen.
Proposed funding approach	• Participation in the program is voluntary for eligible industry participants. • Support may be in the form of cash grants or other financial mechanisms, subject to relevant conditions being satisfied. • Program seeks to align with business investment cycles while achieving the lowest cost emissions reduction through a staged process, where potential funding is identified early and reserved (subject to future negotiation) to provide a level of certainty for long term investment decision making. • The cost of implementation of technologies will change over the life of the program, meaning regular funding updates will be published to inform assessment of future projects in the pipeline.

References

1. NSW Government, March 2020, Net Zero Plan Stage 1: 2020-2030
2. The Office of the NSW Chief Scientist and Engineer (OCSE), August 2020, Opportunities for Prosperity in a Decarbonised and Resilient NSW: Decarbonisation Innovation Study
3. NSW Government, March 2020, Net Zero Plan Stage 1: 2020-2030
4. Deloitte Access Economics, November 2020, A New Choice: Australia's Climate for Growth
5. United Nations, December 2015, Paris Agreement
6. Carbon Brief, January 2016, Timeline: the Paris Agreement's 'ratchet mechanism'
7. SYSTEMIQ, December 2020, The Paris Effect: How the Climate Agreement is Reshaping the Global Economy
8. S&P Global, January 2021, Biden to Use First 100 Days to Jump-Start Climate Change Agenda
9. Sydney Morning Herald, 28 October 2020, Australia Defies International Pressure to Set Emissions Targets
10. BBC News, 18 November 2020, Ban on New Petrol and Diesel Cars in UK from 2030 Under PM's Green Plan
11. International Institute for Sustainable Development, November 2020, South Korea Commits to Reaching Net-Zero by 2050
12. International Energy Agency, June 2020, China's Emissions Trading Scheme
13. NewClimate Institute & Data-Driven EnviroLab, October 2020, Navigating the Nuances of Net-Zero Targets
14. Microsoft, January 2020, Microsoft will be Carbon Negative by 2030
15. BHP, 2021, Operational GHG Emissions Reductions
16. Rio Tinto, February 2020, Rio Tinto to Invest $1 Billion to Help Meet New Climate Change Targets
17. Shell, 2021, Our Climate Target
18. BP, February 2020, BP Sets Ambition for Net Zero by 2050, Fundamentally Changing Organisation to Deliver
19. Toyota, 2021, Environmental Challenge 2050
20. Volkswagen, December 2019, Borneo, Green Energy & Co.: What Volkswagen is doing for the environment
21. General Motors, January 2021, General Motors, The Largest U.S. Automaker, Plans to be Carbon Neutral by 2040
22. National Australia Bank, 2020, Sustainability Report 2020
23. Bloomberg New Energy Finance, 19 January 2021, Energy Transition Investment Hit $500 Billion in 2020 – For First Time
24. Australian Prudential Regulation Authority (APRA), 20 March 2019, Climate Change: Awareness to action
25. Australian Prudential Regulation Authority (APRA), 20 March 2019, Climate Change: Awareness to action
26. Centre for Policy Development, 19 March 2019, Climate Change and Directors' Duties: Supplementary Memorandum of Opinion
27. Monetary Authority of Singapore, December 2020, The Future of Finance is Green
28. Sydney Morning Herald, 12 October 2020, A Net Zero Target Would Unlock Investments Worth Billions
29. NSW Government, November 2020, Electricity Infrastructure Roadmap
30. The Office of the NSW Chief Scientist and Engineer (OCSE), KPMG, August 2020, Opportunities for Prosperity in a Decarbonised and Resilient NSW: Decarbonisation Innovation Study
31. NSW Government, March 2020, Net Zero Plan Stage 1: 2020-2030
32. NSW Government, March 2020, Net Zero Plan Stage 1: 2020-2030
33. University of NSW, February 2019, Pioneering Solar Energy
34. Scopes 1 and 2 inclusive of onsite combustion, fugitive emissions and process related emissions captured under the Industrial Processes and Product Use category. Scope 1 emissions refer to greenhouse gas emissions released as a direct result of facility activity; scope 2 emissions refer to greenhouse gas emissions released from the indirect consumption of energy such as an industrial facility's use of electricity produced by the burning of coal by a generator; Department of Industry, Science, Energy and Resources, January 2021, Australian Greenhouse Gas Emissions Information System.
35. Thresholds for abatement will be reviewed throughout the life of the program, based on sector ability to participate.
36. Department of Industry, Science, Energy and Resources, September 2020, First Low Emissions Technology Statement
37. Thresholds for abatement will be reviewed throughout the life of the program, based on sector ability to participate.

dpie.nsw.gov.au