



# Shaping Western Australia's low-carbon future

Developing sectoral emissions reduction strategies  
to transition the economy to net zero



December 2021

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December 2021

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Cover image source: Nomadic Energy Solar Farm, Carosue Dam Gold Mine  
– Northern Star Resources

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## Minister's foreword



Reducing our emissions and contributing to the critical goals of the Paris Agreement will safeguard Western Australia's environment, community and our state's long-term prosperity.

The McGowan Government is committed to a prosperous and resilient low-carbon future for Western Australia.

The *Western Australian Climate Policy*, released in November 2020, outlines key government actions for a climate-resilient community and the transition to net zero emissions. The policy underscores our government's pledge to work with all sectors of the economy to achieve net zero emissions by 2050. One of the core policy commitments is to identify low-cost abatement pathways and develop sectoral emissions reduction strategies.

Harnessing the opportunities of the low-carbon transition will ensure the ongoing competitiveness of Western Australia's existing industries and support new industries focused on green manufacturing, and clean energy exports and supply chains.

The pace and scale of change is accelerating as the economic cost of inaction becomes increasingly clear, and global policies and markets mobilise around the low-carbon transition. The cost of doing nothing is too great.

Fortunately, Western Australian businesses and industries are already taking steps to reduce emissions. More than 90 per cent of the state's mining and energy companies, which

contribute about half of the state's emissions, have set targets for net zero emissions by 2050 or earlier. Many are pursuing investments and plans to make these goals a reality.

The transition of our energy system is well underway. Large-scale renewable generation in the South West Interconnected System has more than doubled in the past two years, with record uptake of rooftop solar photovoltaics (PV) on homes and businesses.

We are also supporting innovative clean energy projects through the Clean Energy Future Fund to stimulate innovation and scale-up low-carbon technologies.

We have more work to do to support the transition of our energy-intensive industries and set Western Australia on a pathway to net zero carbon emissions. We recognise the importance of significant action this decade to leverage green capital, transition key industries and protect the state's economy.

The McGowan Government will set targets to reduce emissions from government agencies and trading enterprises in the coming months. In consultation with industry, we are also considering interim targets for the broader economy to enhance uptake of existing abatement technologies, accelerate innovation and encourage new investment.





As Minister for Climate Action, I am pleased to launch this program of work to deliver the sectoral emissions reduction strategies. The strategies will include new initiatives to underpin robust and credible emissions reduction pathways aligned to government targets.

The outcomes of the Glasgow climate summit will accelerate the transition to net zero emissions. Jurisdictions are working together to build on the goals of the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) for curbing deforestation, phasing out coal and supporting zero-emissions vehicles. Western Australia is joining other jurisdictions as a founding member of the Net Zero Emissions Policy Forum to drive collective solutions to the challenge of climate change.

Through the development of the sectoral emissions reduction strategies, our state will join the momentum on climate action building around the globe and ensure Western Australia reaps the benefits of the global net zero transition.

The Department of Water and Environmental Regulation will coordinate development of the sectoral emissions reduction strategies. The government will work collaboratively, and through industry partnerships, to ensure policy development is informed by stakeholder needs.

A clear pathway for the state's net zero transition will underpin critical action this decade and ensure all Western Australians can look forward to a more sustainable future.

**Hon. Amber-Jade Sanderson BA MLA**  
**Minister for Environment; Climate Action**

## Opportunities for Western Australia in the low-carbon future

Global momentum for the net zero transition has galvanised around COP26 in Glasgow this year.

Nations, states, territories and corporations are lifting their ambitions for decarbonisation to accelerate action on the Paris Agreement and support the goal of limiting warming to well below 2°C above pre-industrial levels.

Net zero commitments by ASX200 companies have more than tripled in the past year, with a quarter now making commitments to net zero emissions<sup>1</sup>. Of Western Australia's top-10 trading partners, eight have pledged net zero carbon emissions by mid-century, representing over 90 per cent of exports across that group.

Other jurisdictions have developed plans and strategies to support the transition of their economies toward net zero emissions, and generate clean energy jobs and investment. (Victoria's *Climate Change Strategy*<sup>2</sup> and 'sector pledges', along with New South Wales' *Net*

*Zero Plan 2020–2030*<sup>3</sup>, align with the high-level ambitions of those states and set out initiatives to support interim targets based on modelling and analysis.)

A low-carbon future presents risks and challenges as well as substantial opportunities for Western Australia.

Achieving net zero emissions across our economy will require ongoing changes to the way electricity is supplied, changes to our transport systems, and changes to the technologies used in our industries, businesses and homes.

While the clean energy transformation is underway, we need to accelerate action to ensure the goal of the Paris Agreement remains within reach and our economy remains resilient and competitive into the future.

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1. [Business Council of Australia 2021, Achieving a net zero economy paper](#)
  2. [State of Victoria 2021, Victoria's Climate Change Strategy](#)
  3. [State of NSW 2021, Net Zero Plan Stage 1: 2020–2030](#)





The net zero transition is not a choice between our environment and our economy. Modelling by Deloitte Access Economics underscores the benefits of a coordinated transition to a net zero emissions economy, showing an \$890 billion increase to GDP and 195,000 additional jobs by 2070, with significant benefits for regional Australians<sup>4</sup>.

The risks of not moving quickly are also becoming increasingly apparent, as frameworks for international trade and global finance move to penalise carbon-intensive economies, businesses and sectors.

It is critical that Western Australia carves out a space in the low-carbon future, with the opportunities for our state being both substantial and unique. Our critical minerals wealth, abundant land, renewable resources and manufacturing capacity create great potential for economic growth as the world transitions to low-carbon commodities, services and supply chains.

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4. [Business Council of Australia 2021, Achieving a net zero economy paper](#)

### ► Objectives of the sectoral emissions reduction strategies

- To provide robust and credible emissions reduction pathways for Western Australia with tangible actions for reducing emissions consistent with the government's target of net zero emissions by 2050.
- To recognise the importance of significant action this decade to reduce emissions, transition emissions-intensive industries and protect Western Australia's economy from carbon transition risks.

The development of a clear plan for emissions reduction, along with core industry partnerships and consistent policy frameworks, will drive uptake of existing abatement technologies, accelerate innovation, and ensure Western Australians continue to prosper in a low-carbon world.





## Western Australia's emissions by sector

The Commonwealth Department of Industry, Science, Energy and Resources compiles Australia's National Greenhouse Accounts to meet Australia's reporting requirements under the United Nations Framework Convention on Climate Change (UNFCCC). This includes state and territory greenhouse gas emission estimates.

Western Australia's emissions are 21 per cent higher than in 2005 due to strong growth in mining and exports and increased emissions from stationary energy and fugitives from oil and gas development. The long-term growth in the state's population and vehicle fleets has also underpinned a steady increase in transport emissions from 2005 levels.

The largest contributor to Western Australia's emissions is direct combustion associated with energy, mining and manufacturing industries, including liquefied natural gas, iron ore and alumina (stationary energy other than electricity generation). Emissions from these sources

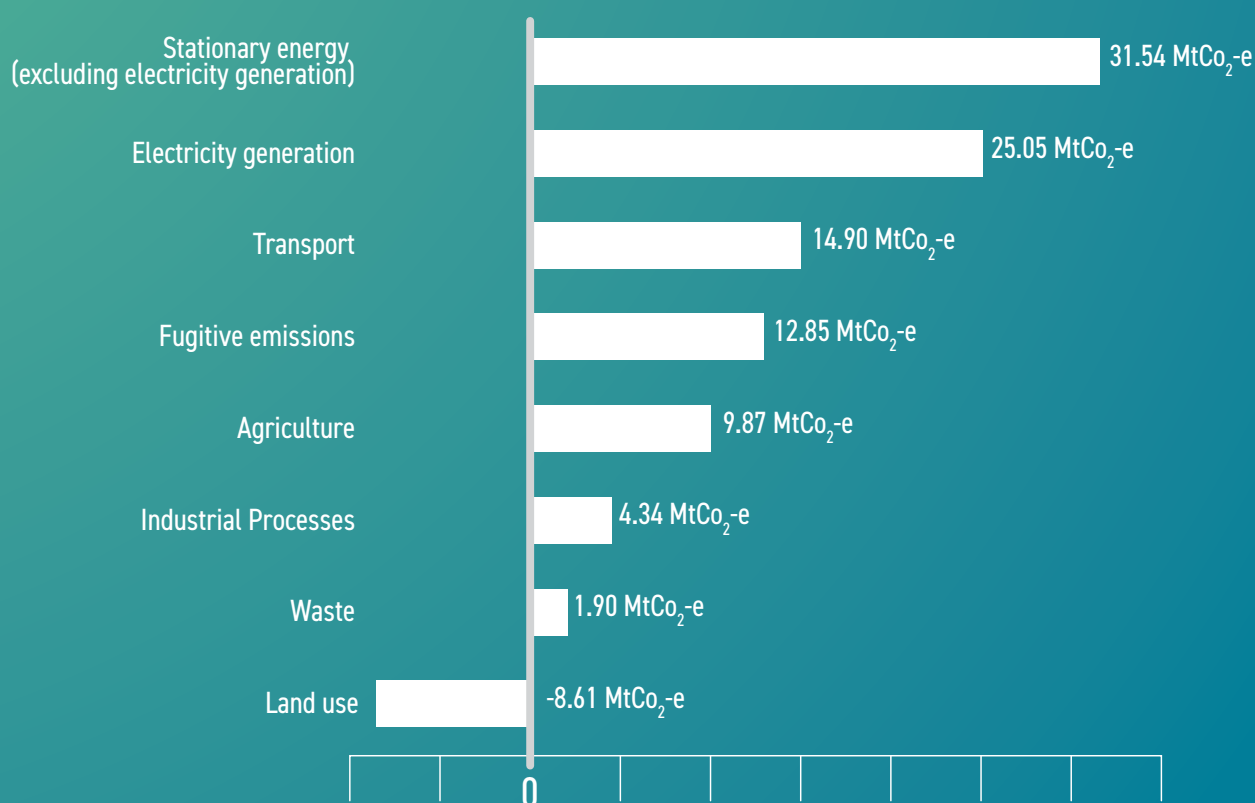
account for about 31 million tonnes carbon dioxide equivalent (MtCO<sub>2</sub>e), or 33 per cent of total emissions.

Western Australia's electricity emissions contribute about 25 MtCO<sub>2</sub>-e, or 27 per cent, of total emissions. Roughly half of this is from the South West Interconnected System and half from off-grid sources and the North West Interconnected System.

Transport contributes about 15 MtCO<sub>2</sub>-e or 16 per cent of emissions, with around half of this from cars and light commercial vehicles.

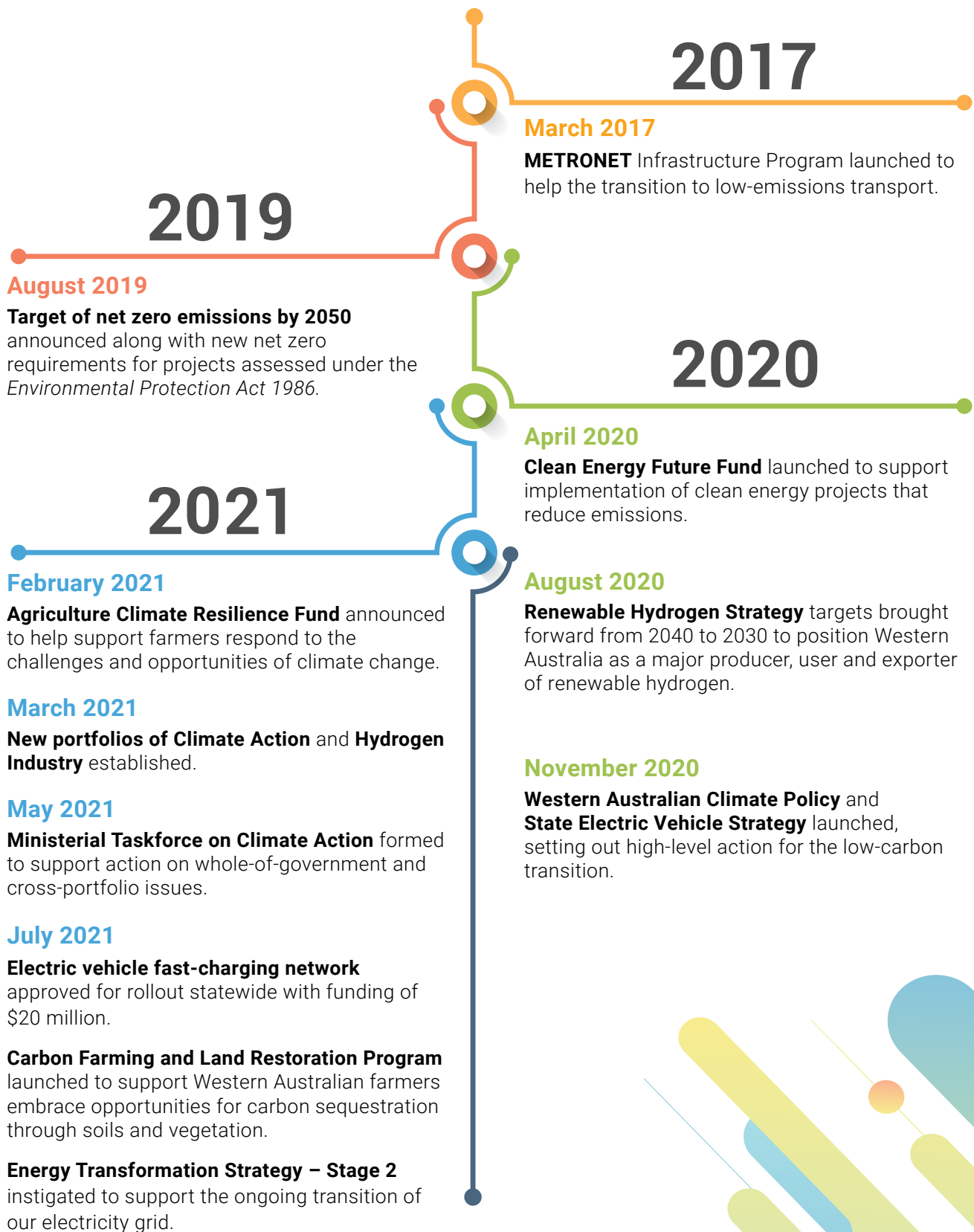
Emissions from agriculture, comprising methane and nitrous oxide emissions from livestock, crops and agricultural and forest soils, contribute about 10 MtCO<sub>2</sub>-e. Emissions from this sector have declined 14 per cent from 2005 levels. Western Australia's land sector has transitioned from a net source of greenhouse gas emissions to a net sink, reducing the state's emissions by 8.6 MtCO<sub>2</sub>-e in 2019.

Figure 1. Western Australia's emissions by sector in 2019 (MtCO<sub>2</sub>-e)



## Action to date: laying the foundations of a low-carbon economy

The Western Australian Government has taken significant steps to lay the foundations for a greener, more sustainable future and cleaner industries.



## Case studies

### Transitioning our industries with renewable hydrogen

#### Yuri Hydrogen Project

Yara and ENGIE have partnered to develop the YURI Green Hydrogen to Ammonia Project, located on the Burrup Peninsula in the Pilbara region. The YURI project will use onsite solar PV to produce renewable hydrogen through electrolysis, which it will convert to green ammonia for export to global markets. Initially a 10 MW renewable hydrogen plant will be constructed to feed into its existing ammonia plant, with phased plans to significantly scale up to GW level.

Renewable hydrogen and renewable ammonia can serve as renewable feedstock and as fuel, for a variety of industrial uses with huge potential for export. Yara's Pilbara site accounts for five per cent of the world's ammonia production, providing a unique opportunity for Western Australia to demonstrate the potential of green hydrogen at an industrial scale. The Western Australian Government has provided a \$2 million grant from its Renewable Hydrogen Fund for the YURI Green Hydrogen to Ammonia Project. ARENA has provided a \$1 million grant for feasibility study in 2020 and will provide a \$42.5 million grant for the construction of the plant.



#### Christmas Creek Hydrogen Mobility Project

Fortescue Metals Group (FMG) has begun a \$32 million renewable hydrogen mobility project aimed at decarbonising segments of its fleet. Ten full-sized hydrogen coaches will be deployed to replace the existing diesel fleet. A refuelling station will be installed to harness renewable electricity from the Chichester Solar Gas Hybrid Project, which will generate renewable hydrogen onsite. FMG's mobile fleet consumes 400 to 450 million litres of diesel per year, presenting a significant opportunity for hydrogen as a replacement fuel source to accelerate emissions reduction.



The project is a first for an Australian mining operation and supports FMG's commitment to achieve net zero operational emissions by 2030. FMG has received \$2 million in funding through the Western Australian Government's Renewable Hydrogen Fund for support of this project.



## Driving innovation through the Clean Energy Future Fund



### Nomadic Energy – Carosue mine redeployable solar

Nomadic Energy is installing a 5 MW redeployable solar farm at Northern Star's Carosue Dam gold mine, 120 km north-east of Kalgoorlie. The project is supported by a \$1 million grant from the State Government's Clean Energy Future Fund.

**CleanEnergy  
FutureFund**

The installation uses innovative mobile infrastructure to allow the solar farm to be moved to a new site when needed. Nomadic Energy owns and operates the solar farm, with whom Northern Star has made an agreement for the power it needs for the life of the mine (thereby retaining capital for mining activities).

The flexibility to redeploy the solar panels removes a key barrier to using green energy at mine sites, where a mine may cease operating before the cost of the solar installation has been recovered.

The project will generate 8.2 GWh per year and reduce 141,000 tonnes of carbon dioxide emissions by displacing diesel and gas for power generation over the 25-year life of the assets.



# Developing a pathway for net zero emissions

Achieving net zero emissions will require policies to support outcomes across all the key pillars of emissions mitigation, from avoidance and reduction of greenhouse gas emissions to emissions offsets (known as 'carbon offsets').

## Key pillars of decarbonisation



Energy  
efficiency



Hydrogen and  
hydrogen-based  
fuels



Low emissions  
electricity



Non energy  
emissions



Electrification  
and  
fuel switching

In partnership with industry and the wider Western Australian community, the State Government will develop sectoral emissions reduction strategies to set a pathway for the state's transition to net zero emissions.

A framework to develop the sectoral emissions reduction strategies will need to consider several complex factors including:

- the significant capital required for Western Australia's net zero transition, including enabling infrastructure and key technologies
- the share of emissions from off-grid sources and issues related to shared infrastructure
- the challenges associated with increased penetration of distributed energy resources and new approaches to maintaining system stability
- the exposure of key sectors and industries to tariffs or trade barriers
- the role of government in stimulus for new industries and economic diversification
- the importance of a skilled and agile workforce to drive the transition.

### ► Achieving 'net' zero emissions through a sectoral approach

Transitioning our economy to net zero emissions by 2050 does not require all sectors to decarbonise at the same pace. Some sectors will be able to readily reduce emissions, while others may face constraints in the short term from technical limitations, existing infrastructure or slow stock turnover.

The International Energy Agency's [\*Net zero by 2050: a roadmap for the global energy sector\*](#) (IEA 2021, 4th revision) acknowledges that emissions from industry, transport and buildings will take longer to reduce, and decarbonisation in these sectors requires significant effort to build new infrastructure.

Achieving 'net' zero emissions means that emissions to the atmosphere from activities in the state must be balanced by removals. Carbon dioxide can be removed through sequestration in vegetation and agricultural soils, storage in geological formations or utilisation in industrial processes.

Carbon sequestration will be critical for the net zero transition as it provides a mitigation option for industries or sectors where technologies to abate emissions are not currently available.

# Principles for the sectoral emissions reduction strategies

The government will adopt the following principles to ensure the sectoral emissions reduction strategies align to strategic objectives for effectiveness, resilience, fairness, business certainty, prosperity and collaboration.



## Government leadership

Take concrete action on emissions from government operations to demonstrate leadership and leverage action in the broader economy.



## Business certainty

Provide policy stability, continuity and clear signals for clean energy adoption, investment and climate risk management.



## A 'bottom-up' approach

Develop strategies for each sector based on options and approaches tested with key stakeholders and relevant expert bodies.



## Economic resilience

Ensure commodities and supply chains remain resilient in the face of emerging international policies, consumer preferences, and global finance trends.



## Job creation and regional development

Maximise opportunities for new job creation and development in Western Australia's regions.



## Energy security and reliability

Ensure Western Australia's power systems remain secure and reliable in the context of rising electricity demand and an increased penetration of renewable and distributed energy generation.



## Collaborative action

Mobilise action across government, the community, business and industry, and unlock private sector finance to drive the transition.



## Fairness

Support lower-income individuals where possible and aim to distribute the costs of emission reductions fairly.



## Alignment with the mitigation hierarchy

Prioritise emissions avoidance and reduction over offsets, and acknowledge the need for offsets by 'hard to abate' sectors in the short to medium term.



## Working in partnership

Government cannot act on climate change alone. Coordinated and collaborative action will be required across industry, business, research institutions and households to significantly reduce emissions and transform our economy.

The Western Australian Government has a strong track record of building industry partnerships to support strategic outcomes, including the LNG Jobs Taskforce, the Mineral Research Institute of Western Australia's *Net zero emissions challenge for the mining sector*, and the Renewable Hydrogen Council. The government also has strong collaborations in the agricultural sector.

Working with industry to develop the sectoral emissions reduction strategies will identify:

- examples of how to achieve net zero emissions including showcasing private sector leadership
- barriers to emissions reduction and possible solutions including research and development, incentives and information
- models for collaboration and opportunities to leverage private sector investment.

### ► Livestock Carbon Project

The Department of Primary Industries and Regional Development is supporting livestock producers and the wider industry to achieve carbon neutrality by 2030 through the new Livestock Carbon Project.

The project will measure, research, develop and demonstrate carbon emissions mitigation and abatement through the Katanning Research Facility Carbon Neutral 2030 Demonstration Farm. This will support an adoption program for carbon neutral/ low-carbon production by producers, and build better information and technologies for WA production systems through a coordinated program of research and development, including on-farm activities.

### ► Net zero emissions mining challenge

MRIWA's net zero emissions mining challenge aims to reduce the Western Australian mining sector's carbon footprint, lower overall energy costs and improve energy efficiency. It will harness collective efforts to enable decarbonisation to become an opportunity for the sector, not a cost.

Through a program of targeted investment in minerals research and focused stakeholder engagement, the challenge aims to deliver collaborative research leadership and impactful research. This will be achieved through a series of initiatives that prioritise the solutions needed to achieve net zero emissions mining. Initial actions will focus on three priority themes: data-driven decisions, mining and processing technology, and energy utilisation.





The State Government will build partnerships with industry across the Western Australian economy and regions to leverage private sector investment and develop initiatives to support the transition to net zero. We will also work with other jurisdictions to share information and collaborate on new ideas.

By sharing the accumulated knowledge, experience and solutions, we can foster collaboration, leverage private sector expertise, and inspire economy-wide change.

We have a crucial role to identify and address regulatory barriers and deliver the policy stability and continuity necessary for business to transition to low-emissions technologies and infrastructure.

We also have a part to play to:

- support breakthrough technologies from demonstration through to commercialisation
- drive adoption of existing low-carbon technologies through incentives and standards
- stimulate markets for low-carbon or energy-efficient products
- provide common use infrastructure to attract low-carbon industry investment.

Finally, government agencies and trading enterprises are directly responsible for about six per cent of the state's emissions via energy and water utilities, and provision of services in key portfolios including health, education, justice and police. In this area, we will lead by example through setting targets and implementing new requirements for emissions reduction in the public sector.



## Delivery of the sectoral emissions reduction strategies

The McGowan Government will develop and implement the sectoral emissions reduction strategies in consultation and partnership with business, industry, research institutions and the community.

The sectoral emissions reduction strategies will need to collectively address all sources of emissions consistent with UNFCCC and Intergovernmental Panel on Climate Change reporting guidelines.

While the government has set the high-level ambition for decarbonisation, the strategies for emissions reductions will be developed through consultation and in partnership with relevant stakeholders. Collaboration and co-development are critical to leverage the deep understanding within the business community and key industry sectors on practical and technically feasible abatement solutions.

### Governance

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The Ministerial Taskforce on Climate Action will oversee the development of the sectoral emissions reduction strategies to ensure whole-of-government coordination. The relevant Ministers, in collaboration with lead agencies, will identify achievable sectoral contributions to emissions reductions.

The Department of Water and Environmental Regulation will coordinate emissions projections and economy-wide modelling to evaluate abatement opportunities and emissions reduction pathways.

Modelling will include base case emissions projections based on current data and abatement options and external factors affecting state emissions. These include global and local technology, energy and market trends; projected climate impacts; changes to land use management; consumer preferences and sector trends; economic growth forecasts; and changes to national policy settings.

Electricity will be critical to decarbonising the state's economy through the electrification of key sectors. Energy Policy WA, in consultation with key portfolios and stakeholders, will undertake electricity modelling for the sectoral emissions reduction strategies.

Analysis will support consideration of emissions reduction pathways for different sectors, future targets, and priority areas for government support.

Coordinated and collaborative development of the sectoral emissions reduction strategies will help identify least-cost pathways to net zero emissions that optimise social, environmental and economic co-benefits, while minimising unintended outcomes for exposed regions, industries and communities.

### Outcomes

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The sectoral emissions reduction strategies will deliver a robust plan to achieve Western Australia's emissions reduction targets. Outcomes will include evaluation of abatement options for different sectors, and analysis of the costs and benefits of emissions reduction, including implications for economic growth and diversification, employment, regional development and Aboriginal engagement.











Achieving net zero emissions across the economy will require all the tools in the decarbonisation toolbox, from energy efficiency, renewable energy and zero emission vehicles, to carbon sequestration and carbon capture, utilisation and storage. Analysis and modelling will consider the full suite of options in the Western Australian context, and critical scales and timeframes for deployment.





The strategies will guide whole-of-government and private sector decision-making, set out a clear role for government, and identify opportunities for industry partnerships.

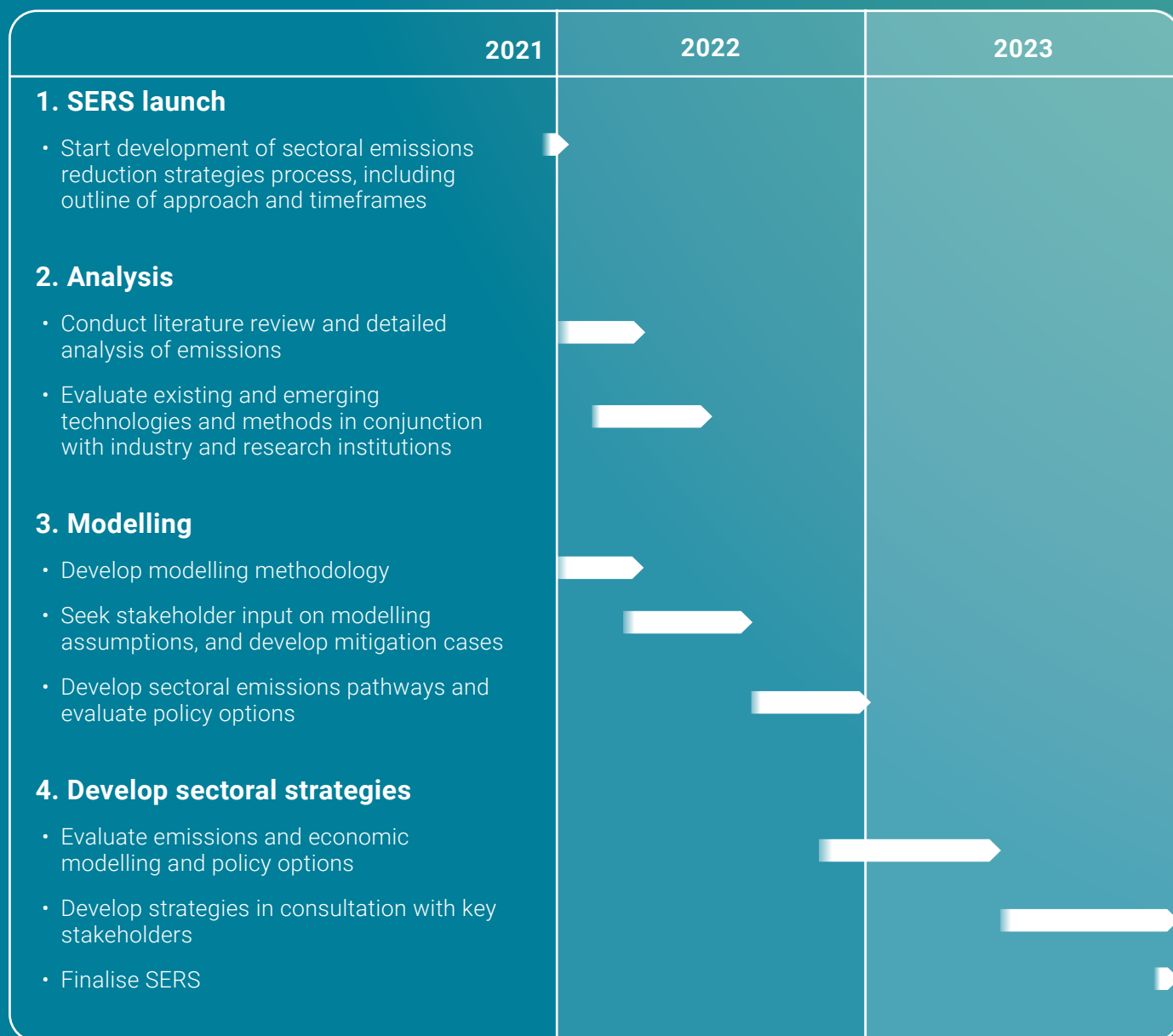
The development of the sectoral emissions reduction strategies will draw on existing work across government on economic diversification, carbon offset market participation, electricity regulatory reform and green industry transformation. Consultation will seek to further clarify issues including:

 <p>how the electrification of transport will impact electricity demand and the transition of the electricity grid</p>	 <p>how to reduce emissions from the built environment</p>
 <p>how to facilitate shared use of common electricity infrastructure</p>	 <p>ways to support reduced emissions from off-grid electricity generation</p>
 <p>how to harness our world-class skills, expertise and export infrastructure to become a global leader in renewable hydrogen</p>	 <p>the role of carbon capture, utilisation and storage in the transition to a low-carbon economy</p>
 <p>implications of the increasing global focus on supply chain emissions and demand for 'green exports'</p>	 <p>opportunities to sequester carbon through existing and new carbon farming methods, including soil carbon</p>
 <p>how to reduce emissions from waste, water and urban services</p>	 <p>ways to overcome key regulatory or information barriers to emissions reduction in Western Australia</p>

The structure and content of the sectoral emissions reduction strategies will be informed by future modelling and analysis, and have regard to opportunities for emissions reduction across industry, electricity, transport, agriculture, waste, water and land use.



# Timeline for the sectoral emission reduction strategies





## Next steps

Stakeholder engagement will underpin the success of the sectoral emissions reduction strategies. Engagement with key industries, sectors, institutions and expertise will aim to identify opportunities, barriers and stakeholder needs for the net zero transition.

The government will:



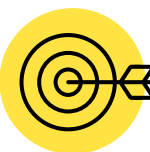
► **Start consultation**

to support development of the sectoral emissions reduction strategies in early 2022.



► **Engage with key stakeholders**

at critical steps in the modelling and analysis process, and the development of new initiatives.



► **Adopt a structured and targeted approach**

to consultation on industry and technology-specific issues.



► **Develop industry partnerships**

to develop and implement the sectoral emission reduction strategies.

**We will release further information on the timing and consultation approach in early 2022.**



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