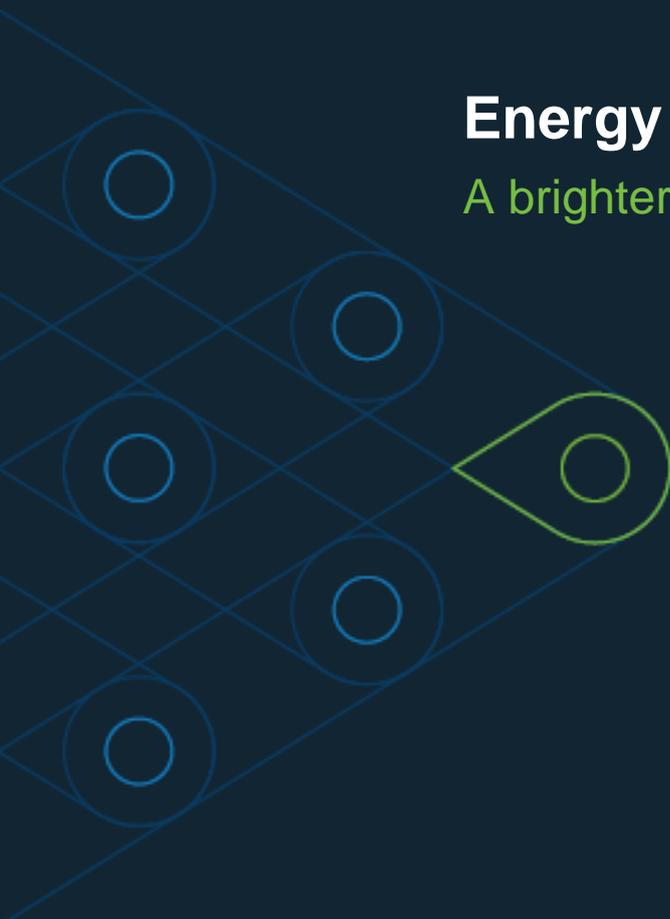




Government of **Western Australia**  
Department of **Treasury**

# Energy Transformation Strategy

*A brighter energy future*





## Minister's foreword

Here in Western Australia, our energy sector has been changing for some time. Whether we realise it or not, the way we generate electricity, the way we consume electricity, and the cost of producing electricity is transforming.

Today more than one in four households in Western Australia have solar photovoltaic (PV) systems on their roofs, generating a huge amount of clean energy and helping households and businesses manage their energy costs.

In our main electricity grid in the South West of the State, renewable generation from rooftop solar PV and large-scale renewables now accounts for 16 per cent of all electricity generated. That number is only set to grow, with the amount of large-scale renewables expected to double in the next two years alone and more households and businesses installing solar PV every day. Traditional thermal generation on a centralised electricity grid is no longer the default energy option for our State.

In Western Australia, we are blessed with world-class solar and wind resources, abundant gas supply, a wealth of battery metals and a highly-skilled workforce. We have a genuine opportunity to establish a cleaner, brighter and more resilient energy supply for decades to come. It truly is an exciting time, and one that offers tremendous opportunity for Western Australia, including maximising the benefits of our State's energy transformation and the chance to become world leaders in energy technology research and application.

This transformation will also present challenges, as new energy technologies change the way we maintain a secure and reliable electricity supply. We need to urgently update our rules and systems to enable the uptake of new, clean technologies.

We must also carefully consider the impacts on those affected by the transition away from coal, and manage those impacts in a compassionate way.

That is why the McGowan Government is establishing an Energy Transformation Taskforce to deliver this Energy Transformation Strategy, which aims to improve the way we plan and access our power system, while embracing new generation technologies and storage systems.

We will take a considered approach to transforming our energy sector, founded on coordinated planning, a strategy to support system security, and staged and sensible displacement of traditional generation. I look forward to working with energy sector participants, innovators and the community to deliver a shared vision for our State.

I believe this is the way we adapt to the change that is happening all around us and set Western Australia up for a brighter energy future.

A handwritten signature in black ink that reads "Bill Johnston". The signature is written in a cursive, slightly slanted style.

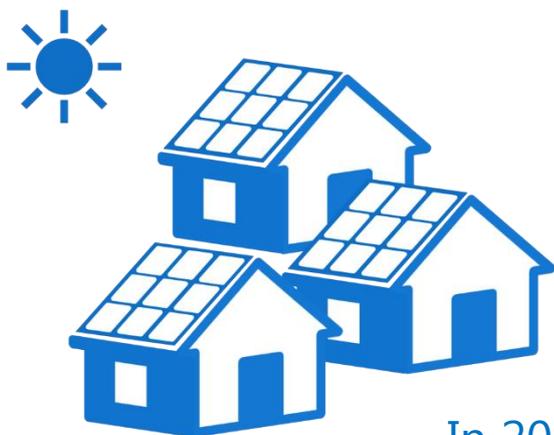
Hon. Bill Johnston MLA  
Minister for Mines and Petroleum; Energy;  
Industrial Relations

# Our changing energy sector

## The Western Australian energy sector is undergoing unprecedented change

- Energy technologies are rapidly improving, with renewables becoming more cost competitive with traditional sources of generation
- Many consumers are now supplying their own electricity, by installing their own rooftop solar PV systems – the most common form of distributed energy resources, or ‘DER’, in Western Australia
- Battery systems are rapidly improving their performance and becoming more cost effective, providing an opportunity to store energy efficiently for use when renewable energy sources are not available
- Microgrids and local generation solutions are becoming increasingly workable options, reducing the need to expand the traditional central network
- Western Australians are increasingly savvy about what they expect from their energy provider, with access to more data and a desire for more control over their energy costs
- Energy regulation and legislation have become outdated and require modernisation to harness the opportunities and manage the risks of the ongoing energy transition

## Rooftop solar PV has grown rapidly in the last decade.



In 2017/18 there were **2,300** solar PV installations per month (over 50 times the rate seen a decade ago).

We are making the transition from a traditional, centralised power system that is heavily reliant on fossil fuels and makes limited use of data, to a system that is cleaner, smarter and consumer-focused. For the over 1.2 million homes and businesses connected to the main electricity grid in the South West corner of our State, change is already evident. Renewable energy from wind and solar now accounts for around 16 per cent of electricity supply in the South West Interconnected System (SWIS), up from around 4 per cent a decade ago.

The rapid uptake of solar PV by Western Australian households and businesses is a big part of this change, with solar PV already installed on over a quarter of all households in the State. Though traditional coal and gas-fired generation will remain an important part of our supply mix for the next decade and beyond, newer, cleaner energy technologies will make a much greater contribution than they do today.

With improvements in technology and falling costs, this growth in renewables is now inevitable. Even without an emissions target or stronger renewable energy target, we expect generation from renewable sources to more than double, to account for over one-third of annual electricity generation in the SWIS by 2030. Solar PV and batteries are also becoming a feature of electricity supplies in regional and remote parts of the State, reducing our reliance on diesel and other traditional electricity sources.

When it comes to Western Australia’s energy future, there is no doubt that large scale renewables, DER and other new technologies have changed the picture dramatically. These technologies offer the opportunity for a clean, secure and affordable electricity supply into the future.

However, we should not assume that renewables and DER are a simple solution or an ‘easy win’ for our State. Like any transformational technologies, DER brings its challenges. There is an urgent need for us to make strategic decisions on how best to apply it in our system and manage the challenges.

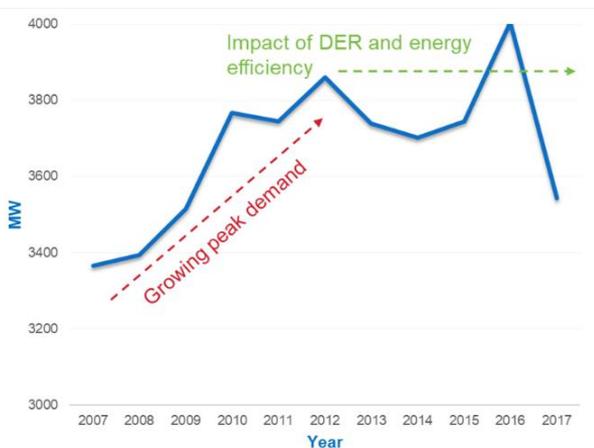
For example, in some parts of Western Australia, including the SWIS, solar PV systems are generating so much energy that on some days the daytime demand for traditional thermal generation is minimal – certainly below what the system was designed to accommodate. Historically, traditional coal and gas-fired power is what has been, and still is, used to maintain system security by ensuring the system operates within its technical limits (i.e. for frequency and voltage). But if growth in unplanned solar PV uptake continues, we are likely to see more and more thermal generation displaced, along with the essential system security services they provide.

It is a similar story with wind and other forms of non-traditional large-scale generation – different forms of generation have different impacts on our power system, and we must manage those impacts.

Renewable generation and energy storage are a big part of our energy future, so it is vital we are in the best position to harness their potential. But we cannot simply dispense with traditional generation – it will continue to play an important role throughout this transition, albeit at a potentially lesser scale.

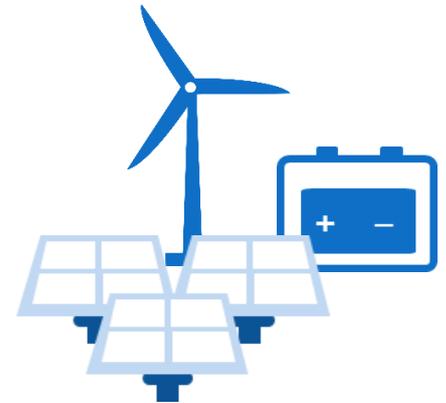
Improvements in energy efficiency and new technologies have also contributed to changing patterns of demand for electricity. One of the most interesting changes to our electricity system is that delivering energy to meet peak demand is no longer the main challenge. For years we focused on building new capacity (network and generation) to meet what we believed was an ever-growing peak demand.

SWIS peak demand



However, peak demand growth has slowed in recent years – largely due to the impact of DER and energy efficiency.

## 800 MW of large-scale renewable energy projects (wind, solar and waste-to-energy) are currently under development in the SWIS.



While system peak will always be important, it is no longer the most pressing issue when it comes to planning our power system.

Today, our main challenge is to enable the transition to new low-cost and low-emissions energy sources – both large-scale and DER – while maintaining a secure and reliable electricity supply.

Improving our energy sector is essential and overdue. We need to make sure we have a full picture of our generation mix and that we manage the transition to large-scale renewables and DER in a structured, responsible and sustainable manner.

As we transition to these clean energy technologies, we are also conscious of making sure the many people whose livelihoods depend on the traditional generation industries, particularly coal, are treated fairly and compassionately, and that they are supported during the transition.

We must also consider change right across our State. Though the most pressing challenges exist in the SWIS, regional customers also need affordable and reliable electricity, and new microgrid and standalone power system technologies are providing greater opportunities to achieve this.

That is why we will take a considered approach to achieving our energy vision and have developed this Energy Transformation Strategy, which includes a suite of actions to help us transition to a brighter energy future.

## Our vision and objectives

**Our vision** is to provide safe, secure, reliable, low-emission power to Western Australian households and businesses at the lowest sustainable cost, while allowing new technology to connect and giving people more control over their electricity use.

**Our objectives** are to:

- Maintain a secure and reliable electricity supply
- Ensure affordable electricity for households and businesses
- Reduce energy sector emissions
- Transition affected workers in the Collie region
- Promote local jobs and growth

Our electricity supply is changing, driven by new technologies and customer preferences. This transition presents great opportunities for affordable, low-emissions energy. However, it also presents challenges for maintaining a secure and reliable power supply, and for affected workers and communities as we move away from traditional electricity sources.

The 2015 Paris Agreement also put the world on notice that it must do something to reduce greenhouse gas emissions. Here in Western Australia we want to do our part. We have world-class renewable energy sources, a secure and abundant gas supply, a highly skilled workforce, and the opportunity to make meaningful change.

That is why we have set a new vision for our power system, with a set of objectives to support that vision.

Many exciting activities are already underway. For example, Horizon Power's low-emission microgrid project in Onslow seeks to reduce the town's dependence on fossil-fuels by 70 per cent. Western Power and Synergy's PowerBank community battery trial in Mandurah, along with trials of standalone power systems by Western Power and Horizon Power in regional and fringe-of-grid areas, look at alternatives to simply building more poles and wires to cater to increasing energy demands.

These are just some of the ways we are applying innovation, with a view to meeting our energy challenge and becoming world-leaders in sustainable energy solutions. We are taking steps that will help Western Australia seize the opportunities presented by this transformation, lower emissions and maintain prices at the lowest sustainable level.

We are making good progress and there is much more to come.





## Our actions and initiatives

Providing cleaner, more reliable and low-cost electricity for Western Australians requires action. As part of our **Energy Transformation Strategy**, we are looking at a range of options to evolve our power system and markets, and make best use of Western Australia's natural advantages.

These include introducing **whole of system planning** as well as progressing changes to our arrangements for **network connection** and the provision of **essential system services**.



### Energy Transformation Strategy

The Government's Energy Transformation Strategy includes the following actions.

- Establish an Energy Transformation Taskforce and implementation team to deliver the Government's Energy Transformation Strategy
- Develop a Whole of System Plan to help shape the most appropriate generation mix and network configuration into the future
- Produce a DER Roadmap to identify ways to maximise the benefits provided by DER in the power system of the future
- Modernise network connection and market arrangements to allow more low-emission energy technologies to connect to the network
- Plan for an orderly retirement of coal-fired generation

### Supporting actions

The Government will also undertake the following important activities that complement the Energy Transformation Strategy actions being delivered by the Energy Transformation Taskforce.

- Deliver and implement a 'Just Transition' plan for workers and communities that rely on the coal industry
- Roll out standalone power systems in areas where they offer a more reliable and cost-effective supply option
- Enable advanced metering to deliver the smart energy solutions of the future
- Continue to trial new technologies
- Consider the recommendations of the Economics and Industry Standing Committee's inquiry into microgrids and associated technologies
- Seek funding from the Commonwealth Government to support the transition to a lower-emissions electricity sector in Western Australia.

# Our actions in more detail

## Establish an Energy Transformation Taskforce

The Government has established a dedicated taskforce to deliver the Energy Transformation Strategy, including the development and implementation of key initiatives to enable the connection of large-scale renewable generation and DER to our electricity system. The taskforce will be supported by some of our State's leading energy specialists, bringing the necessary engineering, economic and policy expertise to ensure the transition to a clean energy future is managed in a low-risk and fair way at the lowest sustainable cost.

The Energy Transformation Taskforce is responsible for:

- delivery of the first Whole of System Plan;
- delivery of the DER Roadmap, and
- critical changes to our network connection and market arrangements to enable and manage the transition to low-emissions and DER.

## Whole of System Plan

Whole of system planning is precisely as it sounds. A structured, coordinated approach to planning, developing and investing in our power system, bringing together key players to deliver a shared vision for our system and network in the South West of the State.

Whole of system planning will produce a number of credible, detailed scenarios for how the power system of the future may look. Scenarios will include consideration of generator type and location, changing demand profiles, the proliferation of DER and network configuration. They may also include consideration of the impacts of important policy considerations, such as different emissions reduction policies.

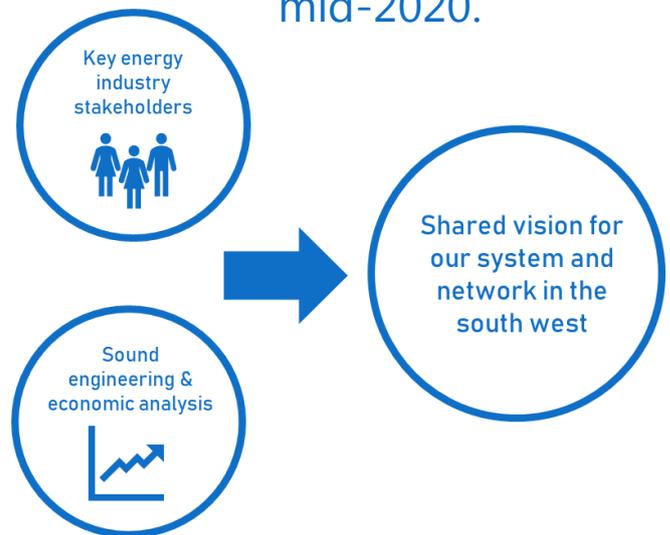
Combining sound engineering and economic analysis, the Whole of System Plan will identify the best approach to manage the security and reliability of the system by informing future investment and regulatory decisions, as well as policy and market development.

The transition to a more renewable, decentralised, low-emissions generation mix is inevitable and already well underway. Planning for continued change will help us to identify the best investments in energy infrastructure and make the best use of private generation investment (such as DER), at the lowest sustainable cost, while keeping the lights on.

This may all sound like common sense – and the good thing is that we are already looking at many of these things. Whole of system planning will expand on work already being undertaken such as Western Power's annual planning processes, the Australian Energy Market Operator's (AEMO) Electricity Statement of Opportunities and the generation mix modelling commissioned last year by the Public Utilities Office – bringing a level of coordination to these projects and forming a coherent view of our energy future.

Many pieces of the puzzle are there. Whole of system planning is a way of putting them all together.

The first Whole of System Plan will be developed by mid-2020.



- Led by:** Energy Transformation Taskforce
- Supported by:** AEMO and Western Power
- Informed by:** Engagement with energy industry stakeholders and market participants

## DER Roadmap

The most common form of DER in Western Australia is the solar PV system. Over the past decade, hundreds of thousands of PV systems have been installed on people's roofs. Combined, these systems can generate more than 1,000 MW, almost three times as much as our State's largest single power generating unit – the 340 MW Collie Power Station.

While solar PV should continue to be supported, we need to take a structured approach to installing it. Solar PV is meeting so much of the daytime energy demand in Western Australia that, on some days, there may be few traditional thermal generators running. Problems can arise when the sun starts to go down (or disappears behind cloud cover) and the PV systems stop producing as much energy, as this leads to a sudden demand for the 'dispatchable' generation currently provided by traditional power stations.

However, unlike large-scale generators, the system operator (AEMO) does not have the ability to control DER to help manage system security. This means AEMO has to turn to the traditional power stations to make up for this sudden shortfall. This is where the problems arise. Many traditional thermal generators, such as coal-fired plant, are not designed to be turned on and off again quickly, and doing so causes significant wear and tear, resulting in high repair bills and generation costs.

While solar PVs, battery systems and other small-scale DER are a cleaner and potentially cheaper substitute for traditional power, there needs to be a balance of both to manage our energy transition.

We therefore require a DER Roadmap to guide the integration of solar PV and small-scale renewables more broadly into the power system, particularly onsite generation, battery storage and energy management systems. We need to understand what types of DER to connect, where to connect it, and how we can use it to operate our power system more efficiently and reliably.

Importantly, we are not looking to inhibit connection of solar PV systems and other forms of DER. Rather, we aim to produce guidelines, technical requirements and incentives to encourage a more strategic take up and controlled use of DER, including battery storage.

The DER Roadmap will provide guidance on how these energy sources can best be managed to ensure system security and provide benefits to customers who have invested in them.

## Modernise network connection and market arrangements

In Western Australia we have a steady stream of new renewable generation projects waiting to connect to the grid. The problem is that, under existing network access arrangements, there is not sufficient spare capacity available in the areas of the network they want to connect to.

In most cases this network constraint is contractual rather than physical, with a number of large, long-established generators having a contractual right to the network capacity, even if they do not use it all. This means that new parties cannot access the network unless they pay for expensive and often unnecessary upgrades.

That is why the State Government is changing the network access arrangements to a 'constrained access' model, which provides a more level playing field for all generators seeking access to network capacity. All generators will be required to share network capacity and bid for the right to supply power through the network.

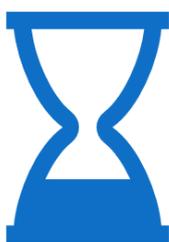
Introducing this constrained access model will enhance utilisation of existing network capacity, meaning cleaner and potentially cheaper generation sources can connect – without the need to spend billions of dollars on new poles and wires to increase network capacity that is not actually needed.

The rules that govern how our electricity market operates will also be updated. Vital changes are required to enable new technologies to participate more fully in our electricity supply and ensure essential system security services are provided at the lowest sustainable cost.

## Plan for an orderly reduction in coal-fired generation

The age and cost of our coal-fired generators, combined with competition from cleaner, cheaper electricity produced by both large-scale wind and solar farms and rooftop solar PV, means Western Australia’s coal-fired power stations will need to be retired within the coming decades.

The State Government is committed to a planned and orderly transition from coal-fired generation over time. Early engagement on future plant closures will promote a prudent transition to alternative energy supplies, while providing opportunities to support affected workers and the local community.



Western Australia’s oldest coal-fired generation unit is almost **40 years** old.

## Deliver and implement a Just Transition Plan

Collie has been at the heart of the Western Australian electricity sector for decades, producing the coal that powers our State’s largest and oldest electricity generators.

Given the challenges facing coal-fired generation and the need to plan for their future retirement, the State Government, together with the coal mining and electricity companies, unions and community leaders, is developing a Just Transition Plan to support the affected workers and the Collie community.

We will deliver this alongside an Economic Development Plan for the Collie-Bunbury region, which will identify opportunities for economic diversification and options to lessen the economic impact of the future power station retirements.

## Roll out of standalone power systems

As demonstrated by Western Power and Horizon Power’s recent trials, standalone or ‘micro’ power systems – comprising solar panels, a battery and a back-up generator – can be a viable alternative to replacing ageing poles and wires that serve few customers and often suffer from poor reliability.

Following its successful trial of six standalone power systems in the Great Southern region, Western Power is now rolling out a further 57 systems in the South West, while Horizon Power is installing 13 of these micro power systems in the Esperance region.

The State Government will continue to investigate and support installation of standalone power systems where doing so can improve reliability and reduce our overall costs of supplying electricity across the State.

## Enable advanced metering

The Western Australian Government has supported the deployment of advanced meters and communications infrastructure across the Western Power network – bringing Western Power’s metering into line with the metering used by Horizon Power across regional Western Australia.

The advanced metering program will see homes become ‘smarter’, providing the residents the data they need to give them greater control over their energy use. Network operators and power system managers will also have greater visibility and ability to manage what is happening on the network.

Advanced meters will improve billing accuracy, allow flexible and innovative tariffs, help facilitate energy trading, and allow faster identification of faults and potential system security and safety issues.

## Continue to trial new technologies

To get the most out of our ongoing energy transition, we will continue the prudent approach of trialling new ways of managing and investing in our power systems. Because our power system is not connected to the rest of Australia – and because we are innovators at heart – Western Australia is perfectly positioned to test and push the boundaries of new energy technology applications.

Through its energy businesses, the State Government will continue to investigate how new technologies can support cleaner and more affordable electricity supplies. This includes supporting further trials and pilots to build on the progress of innovations that are currently underway such as the Kalgoorlie-Boulder virtual power plant, Horizon Power's Onslow Microgrid Project and the Community PowerBank trial supported by Western Power, Synergy and the City of Mandurah.

## Consider the recommendations of the microgrids inquiry

In 2018, the Economics and Industry Standing Committee (the Committee) commenced an inquiry into the emergence and impact of electricity microgrids and associated technologies on Western Australia's energy sector. The Committee is looking into the potential for microgrids and similar innovations to contribute to the provision of affordable, secure and sustainable electricity supplies in metropolitan and regional areas.

The Committee is scheduled to release the final stage of its findings during 2019, and we look forward to receiving its findings and recommendations. The State Government will consider the Inquiry's recommendations in the development of the DER Roadmap, Whole of System Plan, and other relevant energy policies.

## Seek funding from the Commonwealth Government to support Western Australia's transition

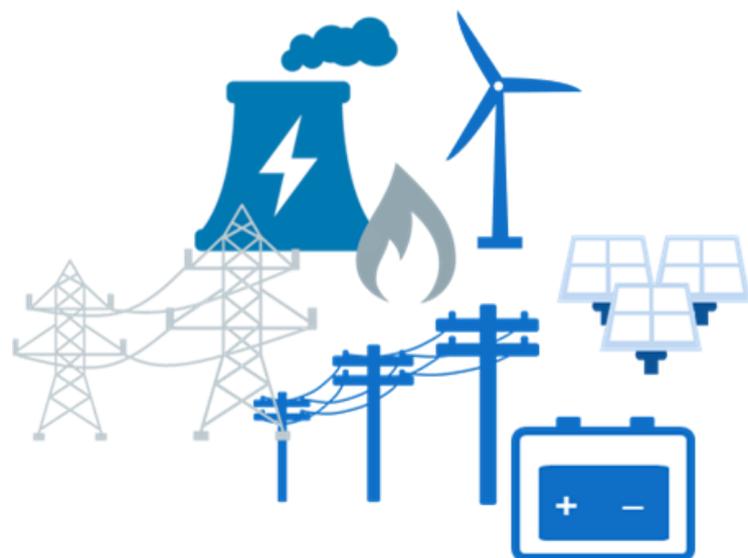
Energy transformation is happening right across the country. Australia's Paris Agreement pledge to reduce carbon emissions to 26-28 per cent on 2005 levels by 2030 requires a contribution from every State.

Over the next two decades more than \$10 billion of investment will be required in the South West, for new generation, storage and network infrastructure, as we transition to the lower-emissions electricity supply of the future.

Even though Western Australia's power system is not connected to the systems in other States, we are doing our part to reduce emissions. It is important that we have a seat at the table and a fair share of funding and support to realise our cleaner energy future.

It is also important that the Commonwealth contributes to the support of transitioning communities.

The State Government will work with its State and Territory counterparts and Commonwealth policy makers to secure a fair allocation of Commonwealth funding, which Western Australian taxpayers contribute to.



More than **\$10 billion** of investment in large scale generation, storage and network infrastructure will be required in the SWIS over the coming two decades.

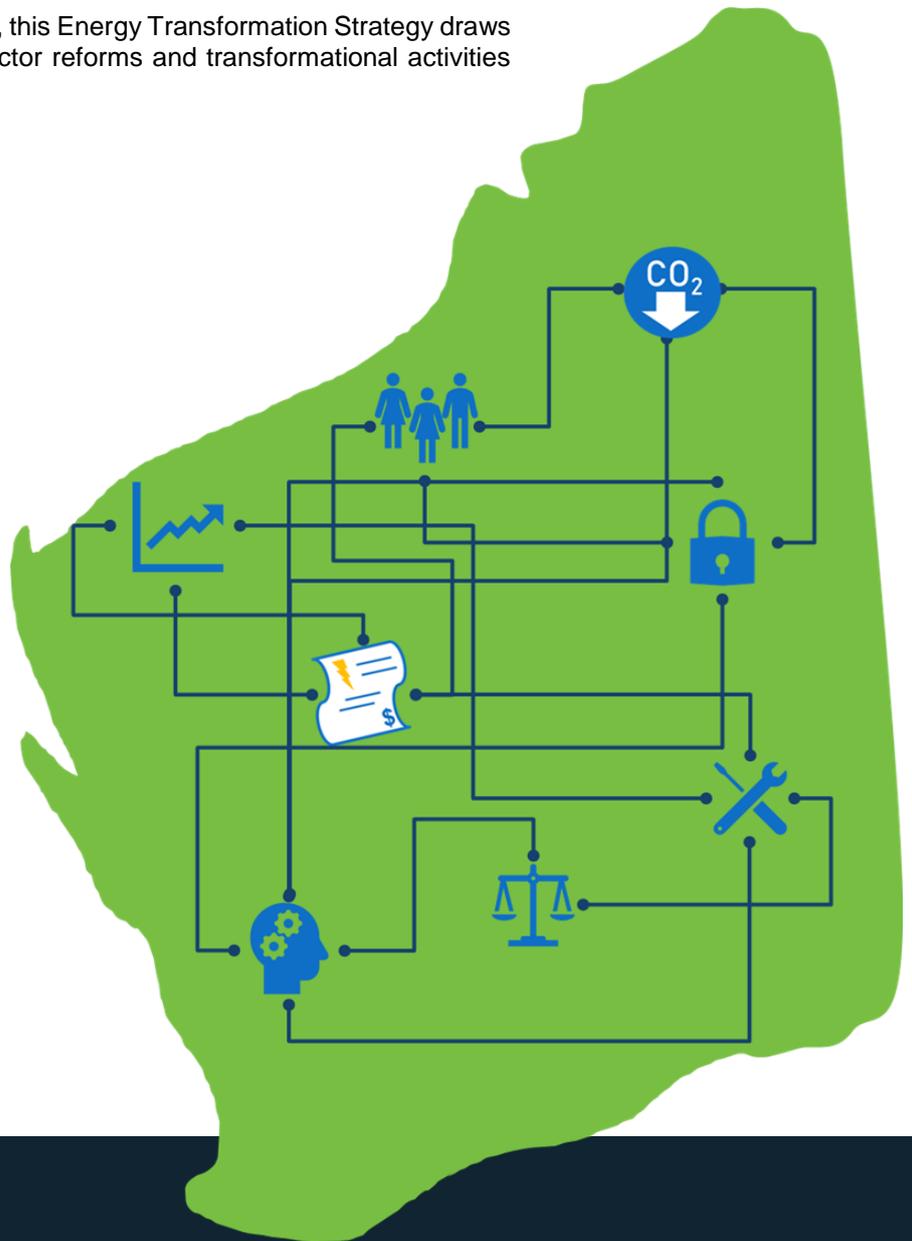


Albany Grasmere Wind Farm (photo courtesy of Bright Energy Investments)

## What this means for Western Australia

Led by the Energy Transformation Taskforce, this Energy Transformation Strategy draws together the current and planned energy sector reforms and transformational activities into a single, coherent program to deliver:

- A lower carbon energy sector
- A sustainable and secure generation mix
- Coordinated SWIS development
- Fit-for-purpose technical standards and regulations
- Opportunities for regional growth
- Opportunities to lead renewable energy technology development
- Lowest sustainable energy costs for consumers



**For a brighter energy future**

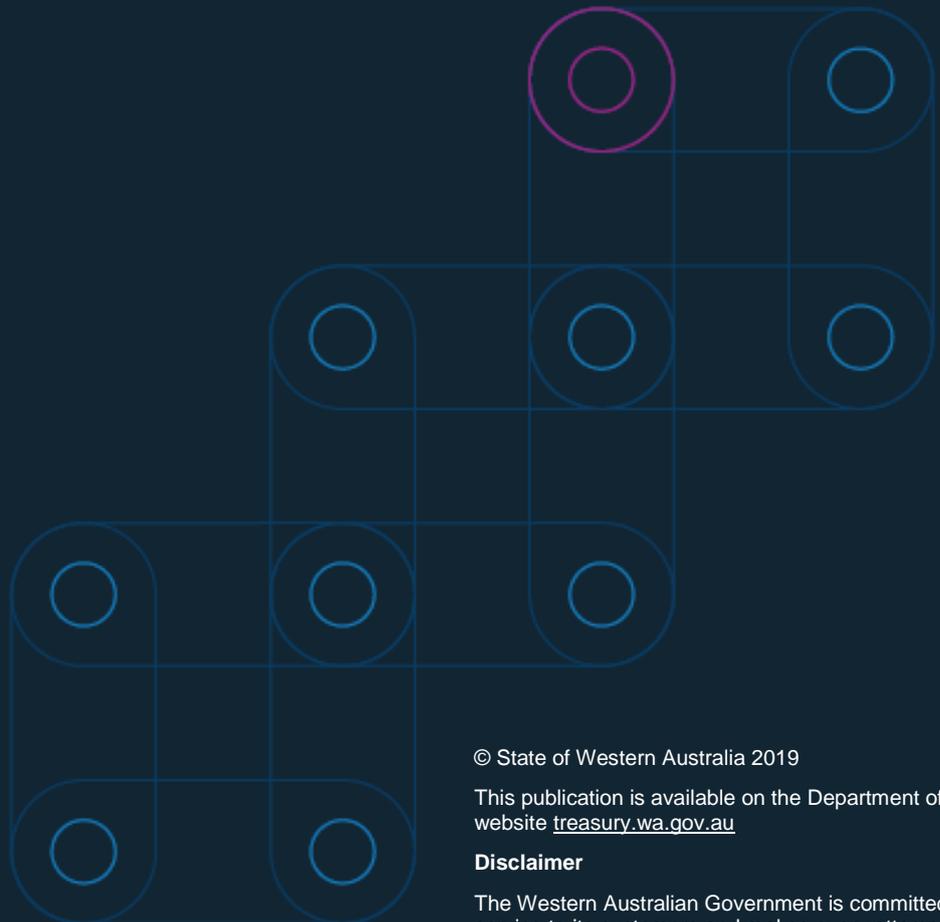
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