



▶ ENERGY



ENERGY

OVERVIEW

Secure, reliable and affordable energy is vital to Queensland communities and businesses. It underpins our economy and quality-of-life, with exciting new technologies paving the way for a sustainable future and creating more jobs in more industries.

Queensland enjoys an enviable energy supply that is supported by significant generation and network infrastructure. The state government plays a major role in the energy industry, owning the vast majority of the network infrastructure and a majority of generation capacity. This provides a strong foundation for delivering reliable and affordable energy, and the delivery of the 50 per cent renewable energy target by 2030.⁵⁵ With our globally significant renewable energy resources, Queensland has experienced a boom in infrastructure investment at both the household and industry level. This has been driven by falling costs, a skilled workforce and industry base, and the state government's stable investment environment, putting us on the path to becoming a renewables and hydrogen superpower.

Queensland reached a significant milestone at the end of 2020, using renewables to supply more than 20 per cent of our electricity demand. The government will continue to leverage its competitive advantage in renewables to support further investment and economic growth across the state, and achieve zero net carbon emissions by 2050.⁵⁶

Queensland's renewable energy zones will unlock the next wave of large investment, creating long-term, sustainable, and diversified employment opportunities, while further decarbonising our electricity network.

Cheap, reliable, and accessible renewable energy will also be an integral part of Queensland's rapidly developing hydrogen industry, which is another vital plank in the state's lower emissions future. Renewable hydrogen can be used to store energy as a transport fuel and as a complementary gas supply for industry.

Renewable energy is a key enabler for other sectors to reduce emissions. As the amount of renewable energy in the system increases, we could see demand rise through the electrification of industry and buildings with renewable power, the uptake of zero-emission vehicles (ZEVs) and the development of new industries, including hydrogen and green metals.

ZEV ownership is expected to grow exponentially over the next 10 years. This will significantly impact electricity consumption, and the requirement for energy infrastructure.

As the uptake of new technologies and renewable energy generation in Queensland continues to increase, we will need to modernise our infrastructure and augment it with storage and other system services. There is a need for both short-term storage – such as small and large-scale battery storage systems – and longer-duration storage – such as pumped hydro – to ensure that renewable energy is available when needed.

Customers are increasing pressure on business and industry, with global investors and markets converting to renewables to reduce emissions. For Queensland industries to maintain and grow their global competitiveness, it is imperative there is support to transition to lower-emission sources of energy. We can achieve this by taking the opportunities presented by our plentiful and cheap renewable energy sector to grow existing and new industries.

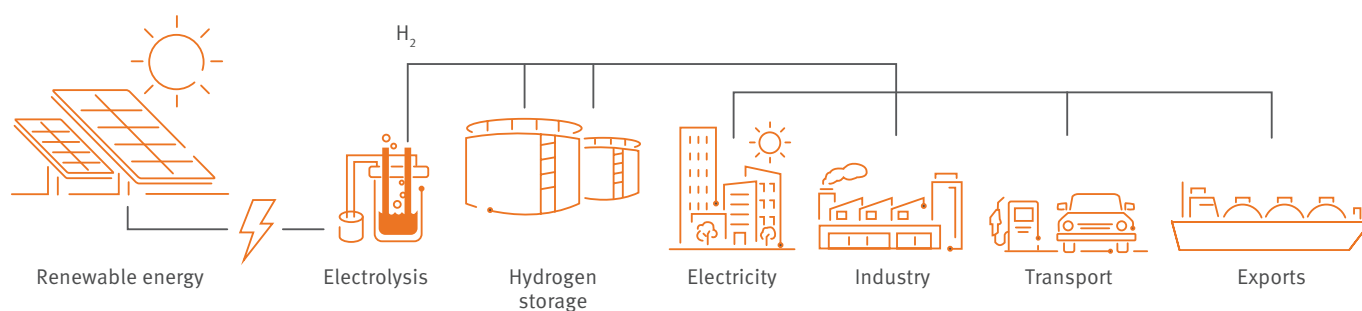
The speed and scope of the transformation of the energy industry means there is a greater need for coordinated planning of infrastructure to ensure the system continues to meet the affordability, reliability, and security needs of Queensland customers. This role is being undertaken at a national level through the Integrated System Plan,⁵⁷ and at a state level through the *Powering Queensland Plan* and network businesses' planning reports.

Current key initiatives

- ▼ **Queensland Renewable Energy Zones**
The government has committed \$145 million for three Renewable Energy Zones, located in the Northern, Central and Southern regions, as part of *Queensland's COVID-19 Economic Recovery Plan*.
- ▼ **Queensland Hydrogen Industry Strategy**
The *Queensland Hydrogen Industry Strategy 2019-2024* released in 2019, sets the direction for sustainable hydrogen industry development, building on Queensland's competitive advantages.
- ▼ **Queensland Renewable Energy and Hydrogen Jobs Fund**
The government has established the \$2 billion Queensland Renewable Energy and

Hydrogen Jobs Fund to support Queensland's energy transformation, by supporting government-owned corporations (GOCs) to increase investment in commercial renewable energy and hydrogen projects, along with supporting infrastructure, including in partnership with the private sector.

- ▼ **Borumba Dam Pumped Hydro Study**
The government has invested \$22 million from the Queensland Renewable Energy Zones to investigate the potential to construct a pumped hydro energy storage facility at Borumba Dam, near Gympie.



Renewable hydrogen and its uses (source: Adapted from Queensland Hydrogen Industry Strategy)

HIGHLIGHTS

The Australian Energy Market Operator (AEMO), responsible for overall National Electricity Market transmission planning, forecasts the generation mix evolving from one dominated by coal-fired generation, to a generation mix dominated by renewable generation supported by energy storage, transmission, hydro power, gas generation, and distributed energy resources.⁵⁸ AEMO also expects the future generation mix to be technologically and geographically diverse, with emerging and new technology costs reducing over time.

The Queensland electricity supply system includes:



Over **15,000 km** of transmission lines in our electricity network⁵⁹



About **207,000 km** of distribution lines in our electricity network⁶⁰



Over **15,000 MW** of existing and committed generation capacity⁶¹



Solar energy on Lady Elliot Island
(Source: Tourism and Events Queensland)

TRENDS



Combined with the growth in rooftop photovoltaic (PV), this increase in large-scale renewable energy has resulted in Queensland's share of renewable energy jumping from **7 PER CENT** in 2016 to **20 PER CENT** in 2020-21⁶²



Queensland has led the way with renewable generation. The state has gone from having no large-scale renewable energy projects in 2015, to **44 committed and operational projects in 2021**.⁶³ These projects contribute more than 5100MW, supporting approximately \$10 billion in investment and around **7000 CONSTRUCTION JOBS**.⁶⁴



The Australian Bureau of Statistics has estimated a **129 PER CENT INCREASE IN RENEWABLE ENERGY EMPLOYMENT** in Queensland to the 10 years to 2018-19⁶⁵

▼ CASE STUDY

Borumba Dam Pumped Hydro

Currently, 20 per cent of Queensland's energy is generated from renewable sources, including solar and wind energy. As the amount of renewable generation capacity in Queensland's energy system increases, the energy grid needs to integrate the variable output of technologies like wind and solar to ensure supply and demand are balanced at all times.

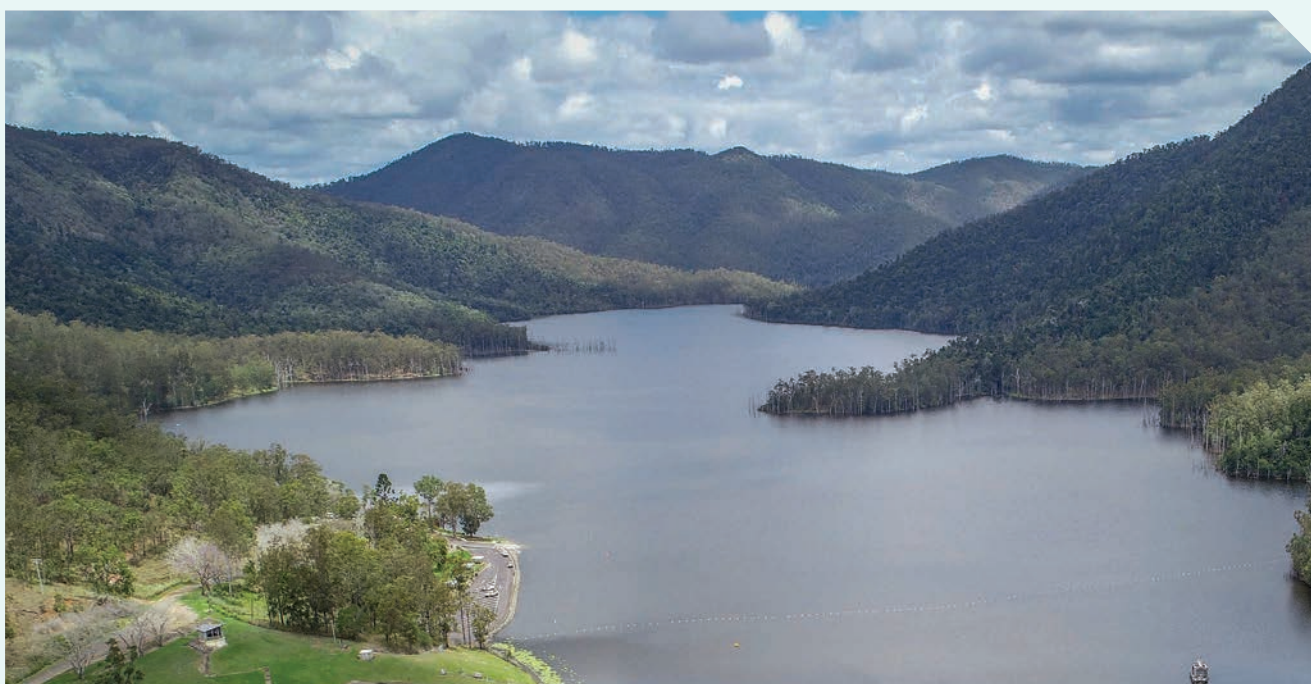
It is likely that large scale pumped hydro energy storage (pumped hydro) will play an important role in the future energy system, by providing the large storage volumes required to replace thermal generation.

Pumped hydro energy storage is a closed water system that moves between two large reservoirs constructed at different heights and uses reservoirs to store bulk energy over several days, weeks, or even seasonally. The ability to store energy in the upper reservoir of the system is why pumped hydro is often likened to a giant battery. Electricity can be generated almost immediately by releasing water back into the lower reservoir, giving pumped hydro fast and efficient ramping capabilities.

Borumba Dam is located approximately 70 km southwest of Noosa in the Sunshine Coast hinterland. With the potential to generate up to 1 GW and deliver 24 hours of continuous output, Borumba Dam has been selected as the first site for detailed cost and design analysis following a state-wide assessment of potential pumped hydro locations.

The site has been identified due to its proximity to the high-voltage transmission network, existing dam infrastructure, and location within the Southern Queensland Renewable Energy Zone (QREZ).

A detailed design and costing analysis will commence in the second half of 2021, incorporating engineering and design analysis, hydrological modelling and an assessment of environmental impacts. The analysis will be undertaken over 24 months, to determine the future development of a pumped hydro site at Borumba.



Lake Borumba (Source: Seqwater)

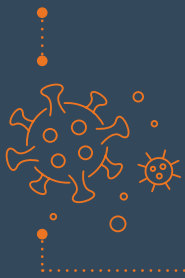


ENERGY

CHALLENGES

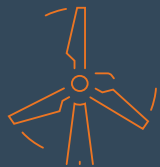
COVID-19 impacts

The pandemic has created key shifts in energy consumption and behaviour brought about from working from home, online shopping and consumer savings. The impact of these in the longer term is not yet clear.



Energy security, reliability, and affordability

The increasing amount of renewable energy generation coming online, as well as changes in consumption and demand, have the potential to impact the reliability of the network, security of supply and the cost for end-users. Renewable generation, variable by nature, needs to be complemented by other technologies such as energy storage. This is being actively managed by Queensland's electricity networks, and the state government through various network, generation, and storage projects.

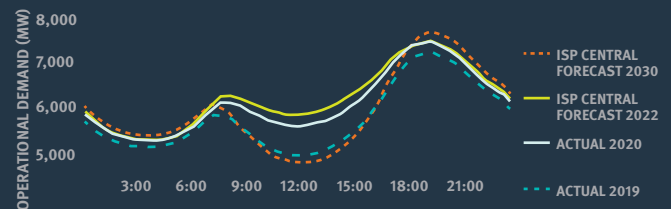


While energy affordability has been of concern across Australia, Queensland has seen consistent decreases in electricity prices each of the last four years, with typical household bills projected to reduce by 7.3 per cent in 2021-22.⁶⁷ Queensland's independent economic regulator, the Queensland Competition Authority, has attributed the general downward pressure on prices to an increase in the amount of renewable generation being supplied to the National Electricity Market, as well as lower domestic gas prices.⁶⁸ Maintaining energy affordability will continue to be a key focus for the Queensland Government into the future.



Managing disruption from new technology and decentralisation of the energy system

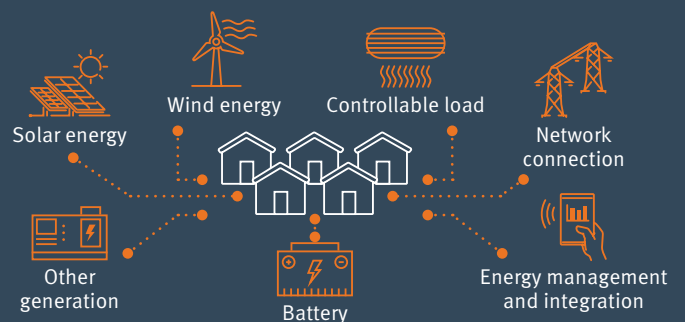
There are more than 689,000 solar PV systems installed in Queensland homes and businesses.⁶⁶ This form of distributed energy resource brings many benefits to customers, but it also presents new challenges for managing the system. Increasing solar uptake reduces load drawn from the grid in the middle of the day, when solar resources are at their highest, as demonstrated in the following graph:



This low system load during the middle of the day, followed by a quick ramp up to meet peak load as the sun goes down, can make it more difficult to keep the system operating smoothly. Work is underway at national and state levels to ensure issues relating to this phenomenon, such as maintaining system strength services and balancing supply and demand in emergencies, are addressed to ensure the system continues to allow greater amounts of distributed energy resources.

Energy in remote communities

Energy supply in remote communities is logistically difficult and can be expensive. These communities are too far from the national energy grid to be connected easily and need to rely on either diesel generators, small-scale distributed generation (e.g. solar, wind, geothermal) or nearby large companies. Nonetheless, Ergon Energy retail customers in these communities pay the same electricity prices as other customers across regional Queensland, due to the Australian Government's Uniform Tariff Policy and Community Service Obligation payment of about \$450-\$500 million per year.⁶⁹

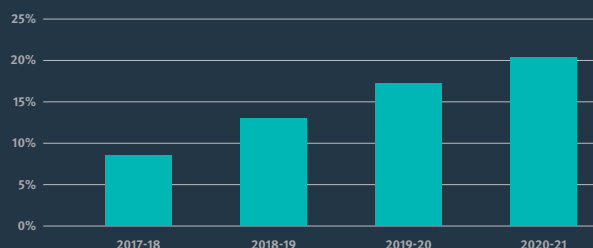


Stand alone power system (SAPS) adapted from Energy Networks Australia⁷⁰

OPPORTUNITIES

Global push towards renewable energy

The Queensland Government is committed to transitioning to a low-carbon energy future by achieving zero net emissions by 2050.⁷¹ An interim target is to reach a 30 per cent reduction below 2005 levels by 2030, while improving affordability and energy security. The state is on track to achieve this, with renewable energy generation increasing its overall share.



The state government will continue to support renewable developers through large-scale project facilitation and planning and network connection assistance. It will also continue to advocate for stable and integrated national climate and energy policies.

Supply chain development

Renewable energy and hydrogen present an opportunity to grow local manufacturing in Queensland and develop a true value chain to become a renewable and hydrogen superpower. The government is supporting the development of locally made renewable and hydrogen production components, providing certainty to manufacturers to set up operations in Queensland through a guaranteed pipeline of work.



Emerging renewable energy enabled industrial hubs

Co-locating industrial hubs, such as renewable hydrogen and ammonia production, metal refining and advanced manufacturing, can be facilitated as renewable energy becomes more readily accessible. Strategic planning will be required to ensure we capitalise on these opportunities.



Industrial decarbonisation

There is scope to reduce the emissions intensity of key industries through demonstrated and mature solutions (e.g. electrification and greater adoption/use of renewables). In the future, emerging solutions such as high-grade heat electrification, solar thermal and hydrogen have the potential to achieve deeper emissions cuts.



Future energy mix

As the state moves towards a more renewable future with greater renewable energy generation, the role of gas, coal, petroleum, biofuels and hydrogen will change. This will provide new opportunities for the gas and coal sectors and develop new ones in industries such as hydrogen and biofuels.

It will also provide opportunities for innovative technologies to enter the market to help address the challenges associated with integration of greater levels of renewables and DER. For example, utility-scale energy storage and pumped hydro can act as a solar soaker to use excess solar PV generation.





ENERGY

PRIORITY ACTIONS



Encourage jobs, growth and productivity



Develop regions, places and precincts



Enhance sustainability and resilience



Adopt smarter approaches

1 50 per cent renewable energy target (DEPW)



Queensland has committed to a 50 per cent renewable energy target by 2030 while improving affordability and security during the transition. This target will assist in achieving zero net emissions by 2050.

2 Developing a 10-year energy plan (DEPW)



The energy plan will position the government to play a strategic and decisive role in Queensland's long-term energy transformation, establishing a pathway to 2030 and beyond to achieve the Government's 50 per cent renewable energy target by 2030 and zero net emissions by 2050. The energy plan will support the reindustrialisation of our state by delivering cheaper, cleaner energy, thus ensuring Queensland is creating jobs for a sustainable and affordable energy future, one that benefits Queensland communities, workers and our economy.

3 Develop Queensland's Hydrogen Industry (DEPW, DSDILGP)



Implement the *Queensland Hydrogen Industry Strategy 2019–2024* so there is a framework for working with private enterprise and government to sustainably develop the industry.

4 Queensland Renewable Energy and Hydrogen Jobs Fund (Queensland Treasury)



Ensure the state capitalises on economic development opportunities for more jobs and more industries through cheaper, cleaner energy. The \$2 billion Queensland Renewable Energy and Hydrogen Jobs Fund will do this as well as power more jobs, more industries and supercharge our resources sector.

5 Energy Storage (DEPW)



Growing Queensland's energy storage through batteries, pumped hydro and hydrogen is key to fully realising our renewable energy opportunities. A detailed study is investigating Borumba Dam as a potential pumped hydro site.

Five locations across regional Queensland will host a large-scale, network-connected battery trial aimed at supporting the state's continual uptake of renewable energy.

The government is also investing in Genex's 250 megawatt Kidston Pumped Storage Hydro Project in north Queensland.

6 Northern QREZ (DEPW)



Unlocking renewable wind energy development in this region has been a logistical challenge due to its location and distance from load centres. Development of the northern QREZ has the potential to resolve some of these challenges, while providing an economic stimulus in sustainable and diversified employment opportunities.

7 Capturing the benefits of Queensland's renewables and hydrogen transformation (DEPW)



As the global economy decarbonises, Queensland's renewable and hydrogen sectors will support the decarbonisation of existing industry and attract new industry powered by low-cost, reliable, clean energy. We will:

- ▶ unlock opportunities to match renewable energy with economic opportunities
- ▶ work with industry in strategic locations to deliver access to cheap energy, including renewable hydrogen and achieving economies of scale for investment and jobs
- ▶ support the establishment of new industries and decarbonisation of existing ones.

9 Central QREZ (DEPW)



Development of the central QREZ will facilitate growth in green manufacturing industries, creating a thriving export economy from the Port of Gladstone. Prospective new industries could include hydrogen production, hydroxide, chlorine polyvinyl chloride, hydrochloric acid, green aluminium and ammonia, new economy minerals and other manufacturing.

10 Southern QREZ (DEPW)



Development of the southern QREZ in the Darling Downs and south west will take advantage of an existing strong network that has spare capacity and good quality wind resources. Renewable energy development will support growth in local agribusiness by diversifying electricity used in agricultural processing facilities, as well as in other industries due to its proximity to the South East Queensland load centre.

11 Stand-alone powers systems (DEPW)



Work is underway to identify strategic pathways that will deliver improved electricity services to customers in regional and remote areas of the grid. This includes supplying customers on the fringes with standalone power systems.

12 Distributed energy resources (DEPW)



Give customers the opportunity to access new value streams from their investment in distributed energy resources, such as rooftop solar, batteries, EVs and demand management using incentives to change behaviours and move to active participation, which in turn enables greater levels of DER to be safely integrated into the energy system.

13 Future energy needs for the North West Minerals Province (DEPW)



Options to reduce the cost of energy in the North West Minerals Province are being explored. This will open up development of new earth and rare earth minerals, providing the cobalt, copper, scandium, nickel, vanadium, and other minerals needed for batteries, zero-emission vehicles and solar panels.

14 Represent Queensland's interests (DEPW)



In the absence of a national energy policy, the Queensland Government continues to work with its state counterparts and the National Energy Market to ensure its renewable energy aspirations are supported.



Ross River Solar Farm, Townsville