2025

Advice on energy productivity and policy

Key points

- Affordable and reliable electricity supply is central to Queensland's economy and living standards. In contrast, high electricity prices disproportionately affect:
  - households with fewer economic resources (for example, low income renters)
  - the competitiveness of electricity intensive industries such as manufacturing.
- Productivity of the electricity industry is poor and has significantly underperformed relative to the broader economy. Had electricity industry productivity remained at its 1994–95 levels, it could have *directly* contributed an additional $2.6–3.3 billion to Queensland's Gross State Product in 2023–24. Further, the *indirect* impacts on broader economic activity would have been much higher.
- While available data limits specific productivity estimates for electricity supply as a whole or each part of the electricity supply chain, evidence suggests Queensland's productivity performance has been affected by:
  - flat to declining productivity in the transmission and distribution sectors over the last two decades
  - the replacement of dispatchable forms of generation with non-dispatchable renewable generation that do not provide comparable system services
  - several government policies, such as subsidies to support renewable energy, have not exposed investors to the full cost of their investment decisions
  - other factors, such as construction sector productivity and related policies (including procurement) have likely contributed to higher capital costs.
- As a result, the electricity system now requires much more capital to deliver the same volume of energy it did 20 years ago.
- The net effect of these changes is that, all else equal, capital costs per unit of electricity supplied have risen substantially. This increases costs for energy users or, where not passed on, a weakened Queensland Government fiscal position (implying higher taxes, higher debt or restricted service offerings in the future).
- Electricity supply can be said to be efficient if:
  - it cannot be more affordable, more reliable, or produce fewer environmental or community externalities without trading off against another objective, and
  - the choice between affordability, reliability, the level of externalities aligns with the community's willingness to pay.
- To ensure Queensland's future electricity system is as efficient as possible, electricity policy decisions should be underpinned by estimates of the *total* costs (including the network costs associated with system stability) that would be incurred *because of* the decision. That is, policy decisions should be made with an increased awareness of the impact they will have on the delivered cost of energy.
- More broadly, to ensure any future emissions policies achieve the greatest emissions reduction at the lowest cost:
  - policies should only target emissions reductions via electricity supply when it represents the next best (least costly) emissions reductions option compared to the other identified emissions reductions activities
  - state-level policies should only be introduced when it can be shown they are necessary and efficient to reduce emissions beyond what would be achieved via existing national instruments
  - policies should not favour particular technologies and should be long-term and attainable.

Introduction

On 5 June 2025 the Queensland Treasurer directed the Queensland Productivity Commission (the Commission) to provide advice on Queensland's electricity and emissions policy settings, including on:

- electricity system productivity and its benefits to electricity users
- the impact of current energy and emissions policy settings on Queensland's competitiveness and productivity outcomes
- the role of government in facilitating economically efficient emissions reduction in the electricity supply industry as part of the net zero transition
- any policy and regulatory barriers impeding efficient private sector investment in electricity infrastructure, including in generation, storage and firming infrastructure.

Approach, scope and methodology

Given the breadth of potential issues and the multiple reviews underway at the state and national level, the Commission has focused its advice on the impact of Queensland Government policies on productivity and system costs, and key factors the Queensland Government should consider in setting energy and emissions reductions policy.

Preliminary quantitative analysis of productivity metrics and a review of the associated literature has been used to inform our analysis.

This is a targeted piece of advice; in its scope and the time available to complete the analysis. As such, the Commission has not conducted detailed quantitative analysis to assess the impact of the current policy framework or impact of adjusting one or more policy settings.

The Commission encourages the use of quantitative analysis to support policy development due to the complexity of the electricity market and economic costs of poorly structured or administered policy and regulatory settings. This should include estimates for different scenarios across the electricity supply chain as each of these components contribute to the electricity prices faced by end-users.

Stakeholder engagement

As this report was commissioned as advice under 9(1)(d) of the *Queensland Productivity Commission Act 2025*, the Commission did not initiate a formal round of consultation or seek submissions. The Commission did hold two informal stakeholder roundtables — one with attendees from electricity industry peak bodies, and the other with attendees from Queensland's energy and financial Government Owned Corporations (GOCs). These discussions focused on the four issues noted in the terms of reference and were conducted on a Chatham House Rule basis.

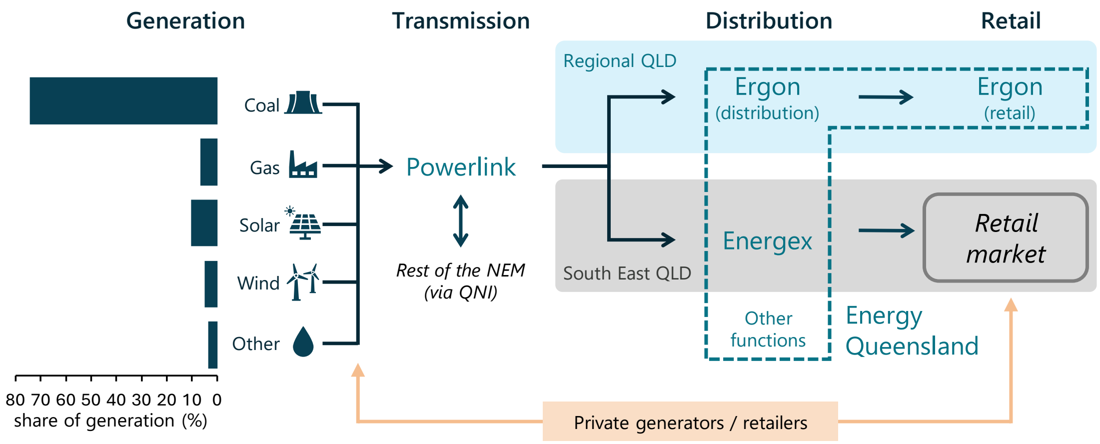
Queensland's electricity system

Reliable and affordable energy underpins Queensland's standard of living and our economic competitiveness:

- Electricity is essential to modern life and household electricity demand is relatively inelastic. As a result, lower income households spend a higher share of their income on electricity and have a comparatively limited set of options available to minimise bills.
- Electricity is a critical input for almost all economic activity. For electricity-intensive industries such as manufacturing, more expensive or less reliable electricity impacts the financial viability of firms and reliability of meeting production commitments.

For over 25 years, Queensland has been part of the National Electricity Market (NEM); one of the world's longest interconnected power systems. The NEM covers both the physical and market elements of supply. Physical as it involves wholesale generation transported via high voltage transmission lines to large energy users or local electricity distributors. Market mechanisms — through a spot market — where the output from generators is aggregated and scheduled at five-minute intervals to meet demand and to provide a price signal for investment. Similarly, decisions to invest in network infrastructure are guided by commercial incentives with economic regulation providing guardrails against the misuse of monopoly power.

Figure 1 Queensland's electricity supply industry



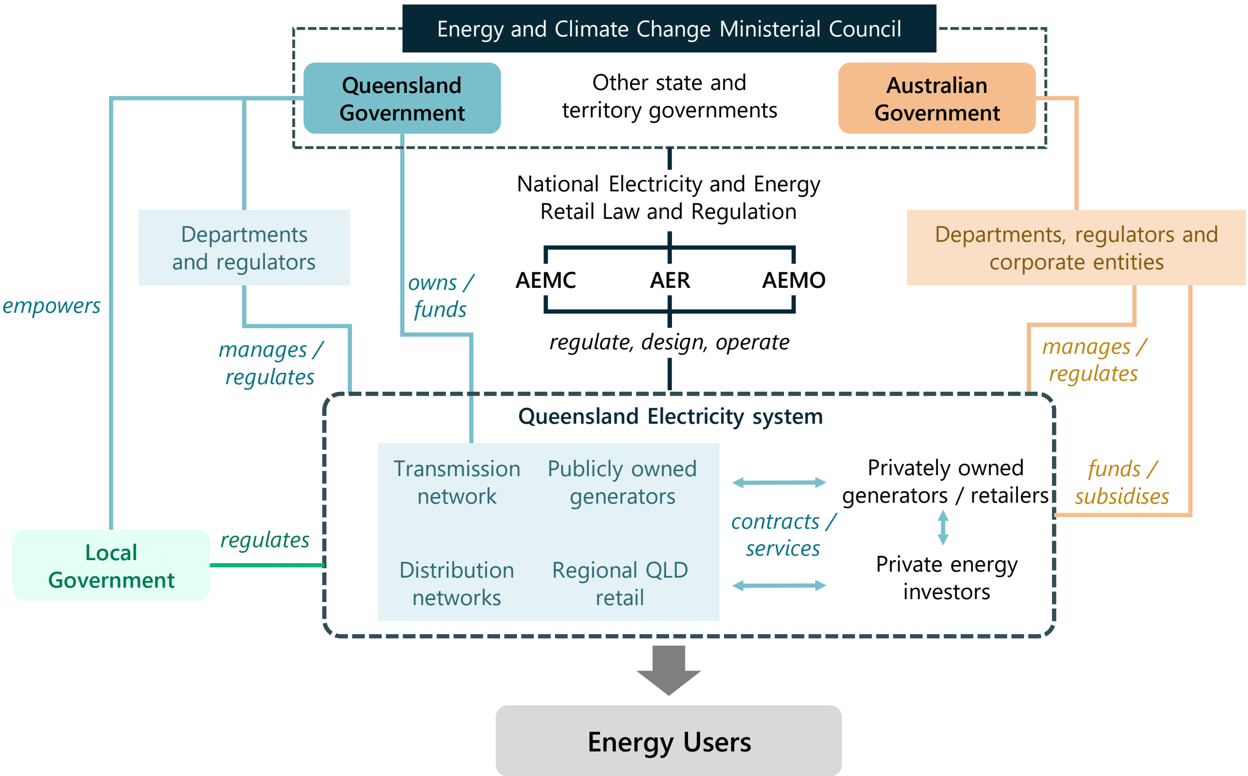
Note: Solar generation share based on utility scale solar and does not include rooftop solar production.

Source: QPC; AEMO; AER.

The electricity supply chain is becoming increasingly complex. For example, the emergence of the behind the meter market segment, represented by households who have invested in solar photovoltaic (PV) systems, and in some instances, battery storage to maximise their consumption preferences.

Governments and government bodies are extensively involved in the electricity system as participants, system regulators, market operators, adjudicators and funding providers – see Figure 2.

Figure 2 Government roles and responsibilities in Queensland's electricity system



Note: Figure is simplified and not intended to be exhaustive.

Source: QPC; AER.

The Queensland electricity system has several distinct features compared to the other NEM jurisdictions (Box 1). These factors have a material impact on the type and effectiveness of policy settings.

Box 1 Distinct features of Queensland's electricity system

1. Queensland's GOCs are responsible for around 65 per cent of the state's generation output.
2. Queensland's transmission and distribution networks are wholly government owned.
3. The main retailer in regional Queensland is government owned.
4. Queensland has the highest level of rooftop solar PV uptake in the NEM and generates around 12 per cent of Queensland's electricity.
5. Queensland is one of the two net exporters of electricity to the other NEM states.
6. Queensland's coal fired generation assets are relatively young compared to those in other NEM jurisdictions.
7. Under the Uniform Tariff Policy, customers of the same class pay no more for their electricity and should be able to pay for their electricity via similar common price structures regardless of their geographic location.

Electricity system and policy is at an inflection point

When the NEM was established, its core focus was security (stable, reliable supply) and affordability (low prices for consumers). This was largely achieved through market signals for generation and investment supported by economic and technical regulation where services could not be directly delivered by competitive markets (such as network investment).

Over time, additional policies and regulatory obligations introduced in Queensland have had significant impacts on prices. For example, between 2008 and 2018, a tightening of reliability standards contributed to large investment in network capital. In turn, increasing network costs were the driver of growth of a near doubling of nominal electricity prices over the period. While demand has since 'caught up' with that investment, the policy contributed to significantly higher prices for over a decade than would have otherwise occurred (Figure 3).

Measures have also been introduced at the national level to change the electricity generation capacity to support emissions reductions. This commenced with the Australian Government's Mandatory Renewable Energy Target in 2001 and was followed by a wide range of direct and indirect Australian and state policies. These policy measures have been funded through fiscal measures and increased retail prices (Figure 4).

Figure 3 Residential cost stack, SEQ

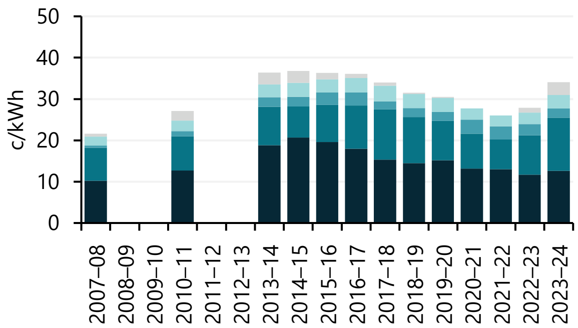
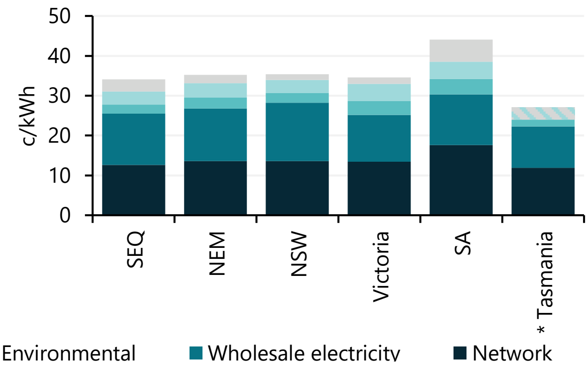


Figure 4 Residential cost stack, 2023–24

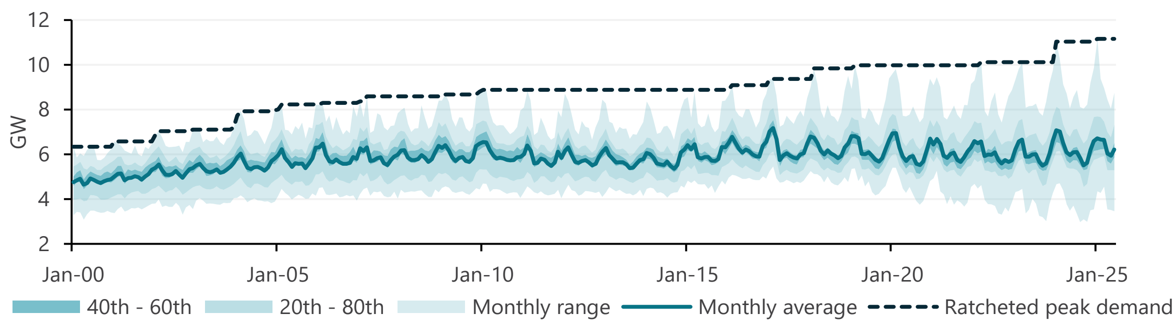


Note: Higher wholesale costs from 2022–23 reflect elevated gas prices. All values are in real $2023-24 and exclude GST. * Tasmanian retail component includes both cost and margin.

Source: ACCC.

Policies targeting emissions reductions have contributed to increased variability in both supply and demand. For example, peak operational demand in 2023–24 was 40 per cent higher than 2003–04, while minimum operational demand was around 4 per cent lower (Figure 5).

Figure 5 Range of Queensland operational demand by month



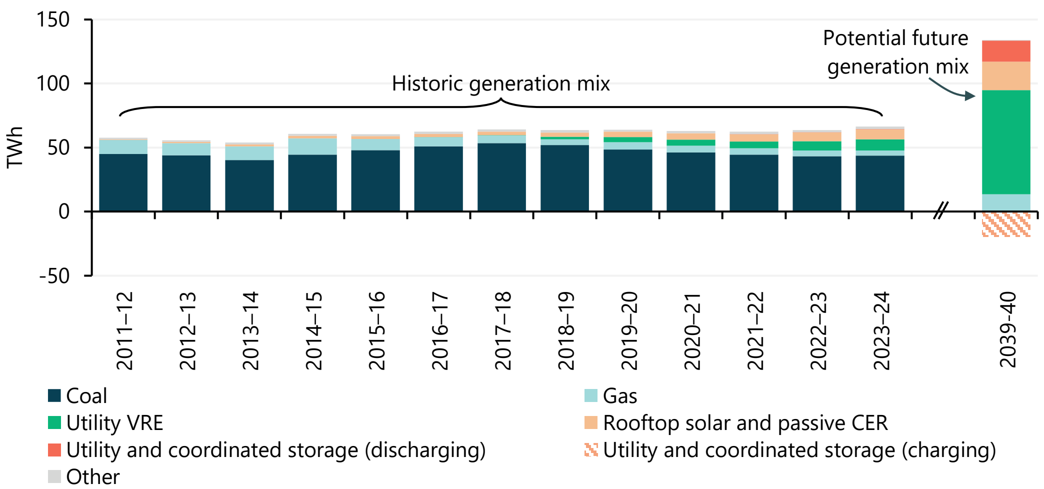
Note: Aggregated demand data are published in 30-minute increments prior to Oct-2010 and in 5-minute increments thereafter. However, resampling 5-minutely data to 30-minute periods does not materially affect the dispersion of the series.
Source: QPC; AEMO.

Similarly, on the supply side, a growing share of Queensland's energy generation is weather-dependent and non-dispatchable. Due to renewable energy being primarily inverter based, it does not provide the essential system services traditionally supplied as a byproduct of the synchronous turbines used in thermal generation.

While Queensland has achieved substantial emission reductions since 2005, they have been almost entirely achieved through land use, land use change, and forestry. In contrast, emissions reductions in other sectors — including energy — have occurred much more slowly despite significant subsidies and interventions.

Queensland is in the initial stages of its projected energy transition (as previously modelled by AEMO). If the modelled trajectory continues (Figure 6), there will be the need for more spare capacity, more generation assets (due to lower capacity utilisation), and more system supports to deliver the same amount of energy output.

Figure 6 Queensland's generation mix, historic and by 2040



Note: 2039–40 mix based on the 2024 ISP step change scenario, noting that the 2024 pathway was based on the policy settings in place at that time. 'Other' includes hydro and other generation technologies. Gas includes natural and future gases.

Source: QPC; AEMO; AER.

The costs associated with the energy transition — for consumers, public and private investors and government — and the speed of the change is impacted by a range of other factors, including:

- productivity of the Queensland construction industry, which has experienced a 9 per cent decline in labour productivity since 2018
- elevated demand from other economies (domestic and international) undergoing similar changes, leading to increased lead times and costs for components of the electricity system. For example, costs and lead times for high power transformers have approximately doubled in the past five years
- protracted approvals processes, with both lengthy approval timeframes and uncertainty around those timeframes contributing to investor uncertainty
- increased competition for capital both domestically and internationally, as other jurisdictions similarly have time bound targets for reduced emissions or changes to the energy mix of their generation assets.

These factors are not specific to Queensland. As noted by Infrastructure Partnerships Australia, the forward investment curve for renewable energy projects, while significant, is continuously being pushed out. However, Queensland's relative performance or attractiveness for investment (via policy and regulatory settings) impacts the likelihood of targets being achieved and/or the source of funding for generation and network reliability assets.

Given the scale of the projected transition and increasing market pressures, ensuring it occurs in an economically efficient manner will be critical to underpinning Queenslanders' living standards. Policy settings should be reviewed to ensure they will deliver the stated objectives, given current market conditions, and in the most efficient manner.

Electricity industry productivity has been poor

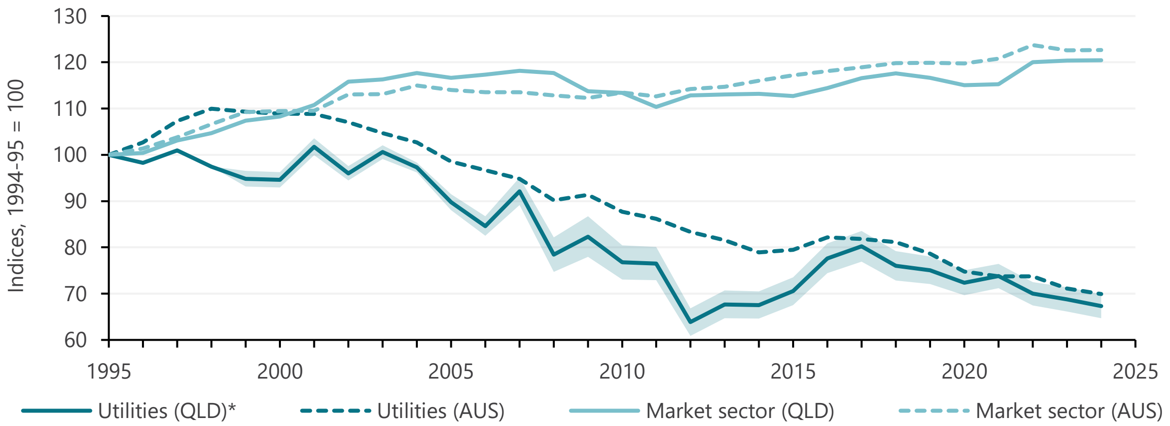
The utilities industry — comprised of electricity, gas, water and waste services — has experienced a material productivity decline over the last two decades. As shown in Figure 7, since 1994–95, as a measure of multifactor productivity (MFP), Queensland's market sector has improved by just over 20 per cent. Over the same period, the Queensland utilities sector has declined by around 30 per cent.

Most of the decline in utilities MFP is the result of growth in capital inputs without a corresponding increase in measured output — since 2000–01, the ratio of capital inputs-to-outputs has grown by around 60 per cent.

While broader utility productivity does not provide point estimates of electricity industry productivity, it is likely to be a reasonable proxy for the overall trend and is strongly suggestive that electricity industry productivity has substantially underperformed the market sector.

Had MFP in the electricity industry remained at its 1994–95 levels it would have directly contributed an additional $2.6–$3.3 billion to Queensland's Gross State Product (GSP) in 2023–24. Given the criticality of electricity as an input across the economy, the additional indirect impacts on broader economic activity would have been much higher.

Figure 7 Utilities industry and market sector MFP indices, Queensland and Australia



Note: * MFP for Queensland are QPC estimates. Shaded area indicates range based on whether net capital stocks or capital consumption are used to apportion capital services. Because state level MFP estimates involve apportioning national data (including by ABS in constructing state-based series) they may understate interstate variation and should be interpreted with caution.

Source: QPC; ABS.

Productivity performance across the supply chain

Generation

The Commission has not identified publicly available estimates of generator productivity applicable to Queensland and has not identified sufficient publicly available information to construct its own robust estimates of generator productivity. A key limitation is the lack of available standardised data.

Notwithstanding this, evidence suggests it may have declined due to systemic factors. For example, growing levels of variable renewable energy has led to falling capacity utilisation and more frequent ramping and de-ramping.

Networks

Productivity in Queensland's transmission and distribution networks has been flat-to-declining over the 2006 to 2023 period.

While Powerlink has exhibited similar productivity levels to the other mainland Transmission Service Network Providers (TNSPs), both its inputs and outputs grew relatively rapidly between 2006 and 2023:

- the largest driver of output growth was circuit length, which grew much more rapidly than the industry average (24 per cent, compared to 9.2 per cent), with other outputs growing more proportionately to the industry average
- reflecting the higher circuit length, Powerlink's higher-than-average input growth was driven by a relatively large increase in overhead lines (29.8 per cent compared to the industry average of 23.5 per cent) and transformers (77.8 per cent, compared to 47 per cent).

Like other TNSPs, Powerlink experienced materially higher growth in ratcheted maximum demand than total energy throughput, reflecting greater variability in electricity use.

Ergon Energy and Energex have both exhibited stable total factor productivity between 2006–2023, with minimal long-run change. Similar to Powerlink, growth in measured outputs is not associated with increases in the total volume of energy distributed, but rather due to ratcheted maximum demand, customer numbers, circuit length and improvements in reliability.

Retail

As with generation, the Commission does not have sufficient evidence available on inputs and outputs to assess trends in retail productivity. However, the available evidence suggests that it has been stable over time, and stable or better than retail performance in other states.

Policies have increased costs and lowered productivity

Policy settings have contributed to declining productivity in Queensland's electricity supply industry. These include policy settings that have:

- had limited regard for lowest cost abatement
- led to investment that is not driven by market signals, system needs or demand from energy users
- created unnecessary regulatory barriers or disincentives to investment.

Limited regard for lowest cost abatement

Historically, subsidies and industry assistance have been delivered at a comparatively high cost to consumers or taxpayers, often with limited environmental benefits. For example:

- Solar rebates to households and small businesses have supported Queensland having the highest level of solar capacity in the NEM. However, these policies had high abatement costs. For example, the combined cost of the small-scale renewable energy scheme and the former Queensland Solar Bonus Scheme was estimated as being between $350–$970 per tonne of avoided emissions (inflated to $2024–25).
- Queensland's electric vehicle (EV) subsidies, stamp duty discount and registration discount, for example, resulted in an overall implied abatement cost of between $282–$4,933 per tonne of avoided emissions (in $2023).
- While there is limited published information on Queensland grant programs, one example of a grant issued under the former Queensland *Manufacturing Energy Efficiency Grant Program* resulted in over $14,000 being spent to avoid one tonne of annual emissions.
- The production and use of 'green hydrogen' as a peaking generator would have been significantly more expensive than gas even over the long term — implying a cost of around $290–$610 per tonne of avoided emissions compared to an open cycle gas peaking plant — and would be more expensive than other zero emissions technologies.

In contrast to the above examples, the Australian Energy Regulator's value of emissions reduction for 2025 is around $80 per tonne of avoided emissions and the price of an Australian Carbon Credit Unit has ranged between $32–$43 per tonne over the year to September 2024.

Investments not driven by markets, system needs, or user demands

Investment in generation and network assets has increasingly been driven by policy rather than by market signals reflecting the needs of the system or the demands of energy users. These policies have contributed to an inefficient allocation of capital:

- Increased inverter-based generation has reduced the availability of system services, requiring increased investment (e.g. network costs) to maintain the operation of the electricity system.
- Increased demand for variable renewable generation (including rooftop PV) and resultant supply variability has contributed to increased network utilisation. There have also been changes to how existing generators operate, increasing capital input costs, operating and maintenance costs and ultimately the cost for each unit of energy delivered.

These policy settings are contributing to transmission network costs, which are rapidly rising. For example, Powerlink's preliminary forecasts presented to their customer panel indicate that real operating expenditure will roughly double by 2032 relative to its stable level between 2018 and 2023, and that real annual capital expenditure in 2028 will be more than triple the 2018 level.

In addition, major directed capital investments by the Queensland Government risk increasing system costs and lowering industry productivity. For example, large-scale pumped hydro energy storage risks imposing high system costs (including network costs) relative to other energy storage or firming options.

As noted in more detail below, industry needs a long-term outlook for investor confidence. This is important for network providers as the location of large-scale renewable energy generation is typically away from higher density populations, thereby increasing the risk profile of investment decisions due to the impact of asset stranding or lower capacity utilisation if the generation project fails to meet its stated objectives. Such situations are ultimately inefficient and increase the delivered cost of energy. Alternatively, they can have a negative financial impact on the network business (and government) through these investments being optimisation from the regulated asset base (via the regulatory regime).

Barriers to investment

Private investment decisions in energy are driven by the same fundamental underlying rationale as any investment, namely, decisions based on risk and return across different asset classes. Private investment is underpinned by an assessment of risk over the life of an asset. Risks are monetised in the form of a premium, which ultimately impacts the attractiveness of the project relative to others or affects the delivered cost of energy.

The largest influence a state government can have is to ensure its broader policy and regulatory settings support sound investment conditions for all industries. Beyond that, the available evidence suggests the following factors may be creating barriers to investment in new energy assets:

- *Planning and approval requirements* — stakeholders noted the complexity and time-taken addressing land use regulations was a barrier to investment in Queensland. They further noted there were inconsistencies in the application of land use regulations for energy investments compared to other land use types.
- *Public ownership mandates* — the public ownership targets that require a minimum share of public ownership under the *Energy (Renewable Transformation and Jobs) Act 2024* can disincentivise private investment as it suggests government could make uncommercial investment decisions (for example, by subsidising generation via a weakened fiscal position) to maintain compliance with the policy.
- *Procurement policies* — while procurement requirements do not apply to private investment, the costs of meeting them for GOCs can increase the cost of delivering energy capital. In turn, this can increase costs for private investment.

- *Government as a market participant* — as the Queensland electricity market is dominated by GOCs, this creates additional uncertainty for long term investment decisions. For example, government dominance and ownership could be seen by the private sector as a risk for uncommercial investment decisions. This also extends to uncertainty in relation to any future 'insurance' role the government may consider adopting to ensure system reliability in a renewable energy dominated grid. For example, investing in additional gas generation to provide system reliability and stability.

Policy principles for an economically sound transition

Policy interventions to achieve emissions reductions can create costs for the community. Therefore, an economically efficient emissions reduction pathway is 'least cost' when the lowest cost emissions reductions options are pursued first.

While developing an emissions reduction pathway for the electricity industry is beyond the scope of this advice, any Queensland Government policies seeking to efficiently reduce emissions in the electricity industry should consider the policy principles set out below.

- Policy should only target emissions reductions in electricity supply when there is no other less costly emissions reductions option available.
- State-level policy should only be introduced when it can be shown they are necessary and efficient to reduce emissions beyond what would be achieved by existing national instruments.
- Emissions reduction policies should not favour particular technologies or firms (that is, not pick winners).
- Emissions reduction policies should be long-term and trend based.
- Emissions policies should be credible, and recognise the physical constraints of the system and incentives of its participants.

In light of current market conditions, Queensland's energy system will require significant investment to meet future needs. Due to the quantum of investment needed, the private sector will need to play an increased role. To encourage private sector investment the government should ensure that any regulatory barriers to investment are the minimum necessary to effectively meet other policy objectives. Beyond regulatory changes, the government may also consider:

- options to limit delay and uncertainty costs associated with regulatory requirements, including in relation to land use regulation
- whether the mandated government ownership requirements of electricity sector assets are having a material impact on private sector investment decisions. This information will also inform the value of a clearly defined set of investment conditions for government initiatives on investor confidence
- setting coal plant retirement targets with reference to a transparent set of pre-conditions or criteria that need to be met prior to retirement.

Suggestions for further work

There were significant limitations on the preparation of the advice, including available information (such as commercial-in-confidence contracts). In addition to the factors above, the Queensland Government may wish to consider undertaking further analysis in relation to the following:

- the construction of robust productivity estimates for Queensland's electricity generation sector, including both GOC generators and private generators, that account for the quality of energy outputs and the provision of essential system services
- the incremental total system costs — including additional investment in networks — of different energy mixes, the volume of emissions they abate, and whether the implied cost of abatement is cost-effective relative to other emissions reductions optionst

- the commerciality of offtake agreements signed by GOCs and, to the extent they are policy related, the implications of the investment they induced
- the parameters governing how the government would operate and recover costs for any 'last resort' firming services such as (long-duration pumped hydro or gas peaking plant held in reserve) such that it provides reliability insurance without deterring private investment in other generation, storage, or firming assets.