THE CONSUMER COST OF TRANSMISSION DELAYS

July 2024

About Nexa Advisory

Nexa is a 'for purpose' advisory firm. Our unwavering focus is accelerating the clean energy transition in a way that provides secure, reliable, and affordable power for consumers of all types.

Nexa Advisory is a team of experienced specialists in the energy market, policy and regulation design, stakeholder engagement, and advocacy. We work with public and private clients including renewable energy developers, investors and climate impact philanthropists to help them get Australia's clean energy transition done.

Nexa Advisory stands at the nexus of the energy sector's complex web of stakeholders. We support and direct their dialogue so as to remove the roadblocks to the transition.

We have a track record in policy creation, advocacy, political risk assessment, and project delivery. We are holistic in our approach and deliver solutions with people in mind, and commercial intent.

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Acknowledgments

We would like to acknowledge our partner Endgame Economics for their contributions in providing the data and charts for this project. Endgame Economics is an economics and mathematical consultancy that specialises in energy. Endgame brings expertise in optimisation, quantitative analysis, and critical thinking to bear on complex problems.

Disclaimer:

Nexa Advisory has found that continued transmission delays are driving up consumer electricity bills for households and businesses, threatening energy reliability and risking emissions reduction targets. The costs of inaction to deliver transmission on time must be considered in policymaking.

Context

The pace of the clean energy transition is not meeting expectations or desired timelines. This not only means that Australia will fail to meet its climate targets, but that there is a significant threat to power system reliability and security, and increased costs for consumers both large and small.

In order to connect the renewable generation and storage capacity required to replace ageing coal-fired power stations and transition to a clean energy power system, Australia needs to effectively plan and deliver thousands of kilometres of transmission lines in the next decade[1].

This report aims to highlight the impacts of transmission buildout delays and provide evidence-based insights to elevate discussions about how to solve this problem. It updates and enhances similar work undertaken by Nexa Advisory in 2022[2] – it shows that the problem has worsened.

The factors contributing to the slow transition are many and complex[3]. A key issue is the ongoing delays to new transmission projects, particularly transmission interconnectors.

It is clear that the transmission delays we have experienced over the last decade are slowing the transition. This is slowing investment in renewable generation, threatening electricity reliability, and driving increases in residential and business consumer bills.

In this paper, we have attempted to quantify the consumer impacts of these transmission delays to show the cost of inaction. This cost should be incorporated into federal and state decision-making, including cost-benefit analyses, as an indication of the continued impacts to consumers under a business-as-usual development path. It is critical that these costs are minimised through proactive policy development to support more timely delivery of transmission across the NEM.

In our previous report, we outlined that there are several key roadblocks to transmission buildout:

- A regulatory pathway for transmission that is not fit-for-purpose
- A lack of national transmission planning and coordination to ensure the timely delivery of transmission, whether delivered under either a state-led or national framework
- Further work is needed to build social licence and community acceptance

The analysis of this report focuses solely on the impacts on consumers of delays in transmission infrastructure build. It does not incorporate the costs consumers will bear if the wider energy transition continues in a disorderly manner.

1 AEMO, Draft 2024 Integrated System Plan, December 2023

2 Nexa Advisory, Delays in building new transmission infrastructure will increase consumers' bills, June 2022

3 Nexa Advisory, Removing the Roadblocks to New Transmission to Achieve the Transition, April 2022

Key findings

Our analysis highlights the benefits of timely transmission infrastructure development for consumers, namely the downward pressure exerted on wholesale energy prices and therefore consumers' bills and the improved reliability outcomes for our future energy system.

Below are the key findings derived from the modelling and analysis:

Wholesale Market Prices

Delays in transmission projects cause significant increases in regional reference prices within the wholesale market throughout the modelled horizon. These effects become more noticeable with prolonged transmission delays. New South Wales experiences the greatest price increases, of above $160/MWh by the 2030s under the most severe delay scenario.

Residential customer bills

The increased wholesale electricity costs caused by delayed transmission buildout flows through to consumer bills. This will mostly impact consumers in New South Wales, resulting in almost $1,100 in additional costs if transmission projects are delayed by three years – the average length of delays observed in recent years. Although delaying transmission investment might defer capital costs, the increase in the wholesale electricity price component of consumers' bills will significantly outweigh any savings, with the impact worsening as delays persist.

Business consumers are significantly impacted

Commercial and industrial companies (which includes small and medium businesses) comprise 32 per cent of GDP – this sector will be significantly impacted by increased wholesale electricity prices, which is likely to have broader knock-on impacts across the economy. We found that small businesses in New South Wales with an annual consumption of 40 MWh could pay up to $7,716 more due to three-year transmission delays – representing 23% higher bills than if transmission was delivered on time.

The larger consumption profiles of these users means that increases in wholesale prices have a significant impact on the cost of doing business, impacting their operation and restricting business investment – potentially contributing to higher prices for the costs of goods and services. This highlights the potential for electricity prices to contribute to wider indirect inflationary impacts.

Reliability Impact

Delays in transmission projects are likely to deteriorate reliability outcomes. Without enhancements and expansions of transmission infrastructure supply between regions becomes constrained, limiting the interconnectedness and the ability to deliver electricity generated across the NEM to load centres. Queensland faces the most significant impact, experiencing significant reliability impacts if the Gladstone Grid Reinforcement is delayed. Victoria also experiences substantial effects due to its reliance on transmission augmentations to facilitate electricity being imported from New South Wales and Tasmania as its coal fleet phases out.

New transmission will reduce dependence on gas

Timely transmission upgrades facilitate greater utilisation of lower-cost renewable energy generation and reduce dependence on expensive thermal generators like peaker and mid-merit gas. Delayed transmission buildout will result in greater dispatch of these more costly thermal assets to meet demand, driving increases in wholesale prices and emissions across the NEM.

The modelling

This report updates the previous work undertaken by Nexa Advisory in 2022[4]. As such it reflects recent increases in costs for certain key transmission projects.

To support our analysis, Nexa Advisory engaged Endgame Economics to undertake modelling of the impact of transmission delays in the NEM on wholesale market prices, consumer energy bills and reliability outcomes across New South Wales, Queensland, New South Australia and Victoria[5].

The modelling assesses the impacts of a range of transmission delays, of one to seven years from the current date, on the generation mix and consumer bills. It considers all committed, actionable, and future transmission projects in the NEM from 2025 to 2047.

The modelling maintains consistent generation and storage build profiles across different delay scenarios, simulating sudden or unexpected transmission delays of Integrated System Plan (ISP) transmission projects where alternative projects cannot be developed in time.

Finally, it is worth noting there is no planned transmission build between 2036 and 2045 identified in the ISP, meaning delays during this period have no impact.

See Appendix A for detailed modelling assumptions.

4 Nexa Advisory, Modelling Electricity Bill Impact of Transmission Project Delays, 2022

5 Tasmania has been excluded from the modelled price outcomes due to its regulated pricing arrangements. This is further outlined in Appendix A.

Customers pay the bill when transmission is delayed

Wholesale market price impacts

Delays in planned transmission projects exert upward pressure on wholesale electricity prices. This is because timely network upgrades and augmentations improve network congestion and curtailment, enabling greater penetration of cheaper, renewable energy generation[6].

Figure 1 illustrates the difference in average annual regional reference price (RRP) projected under each delay scenario versus the base case (where all transmission projects proceed as scheduled). The positive axis indicates higher prices in delayed scenarios, while the negative axis signifies higher prices in the base case.

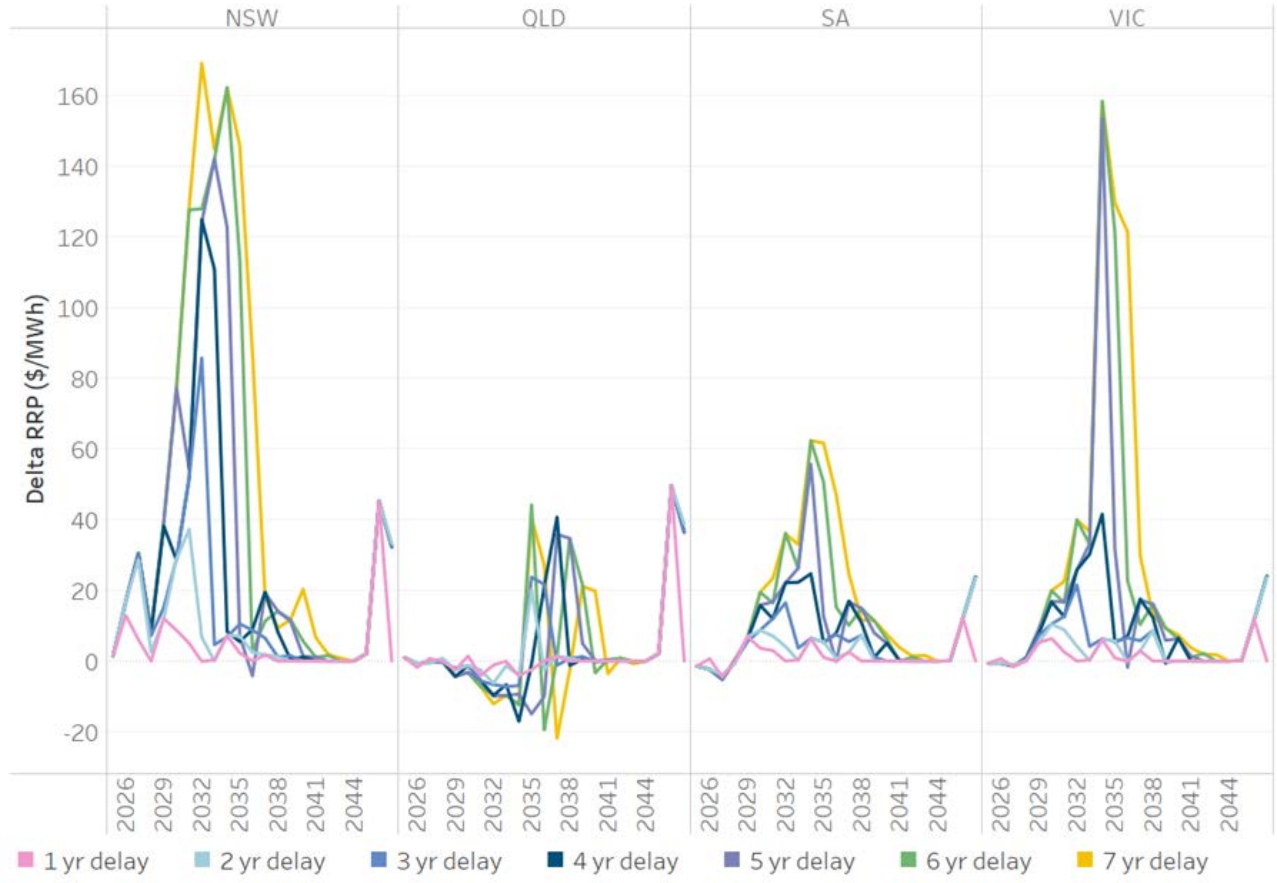


Figure 1: Difference in the average annual Regional Reference Price (RRP) of delay scenarios compared to the base case scenario

Overall, price outcomes deteriorate progressively across scenarios as transmission delays extend from one year to seven years. This is seen most clearly in the early- to mid-2030s. This trend holds true across all regions in the NEM, underscoring the key role of transmission across all states. Queensland, situated in the northern part of the NEM, experiences a relatively muted impact from transmission delays. This is because it is less dependent on transmission interconnection than other states and has sufficient local generation to meet local demand. In addition, QLDs coal fleet is younger and as such currently more reliable than that elsewhere. More than 93 per cent of Queensland's coal-fired generation capacity is not due to close until after 2035, and nearly 38 per cent will still be operating after 2040.

Over time, price gaps between scenarios begin to narrow as transmission projects reach completion. They diverge again after 2045 due to delays in several Renewable Energy Zone (REZ) extensions identified as Future ISP Projects to be delivered during this period.

6 Nexa Advisory, Modelling Electricity Bill Impact of Transmission Project Delays, 2022

Households

Recent research from Energy Consumers Australia found that households are very concerned about cost-of-living pressures and are eager to understand the factors influencing their energy costs[7]. In a similar survey by CSIRO of around 6,700 people, around 41 per cent also said that of all the benefits delivered by the energy transition, affordable energy is the most important[8].

Wholesale electricity prices are only one component of consumers' electricity bills. Another significant component of the bill is network costs, which cover construction, operation, and maintenance of distribution and transmission networks. This represents approximately 35 per cent of the total bill, based on the regulated 'reference' price[9].

Within the modelling, delays in transmission projects result in short-term 'savings' and lower customer bills as these transmission costs are deferred to later periods. These savings are significantly outweighed by an increase in wholesale electricity prices, which are caused by the constraints created for renewable generation projects by transmission delays. This is most significant across Victoria, New South Wales and South Australia. When the network cost 'savings' and wholesale price increases are considered together, there is an overall increase in residential bills when the transmission projects are delayed.

Figure 2 shows these costs cumulatively over the modelled horizon. The combined impact of the wholesale increases (light blue columns) and transmission 'savings' (dark blue columns) are presented in Table 1.

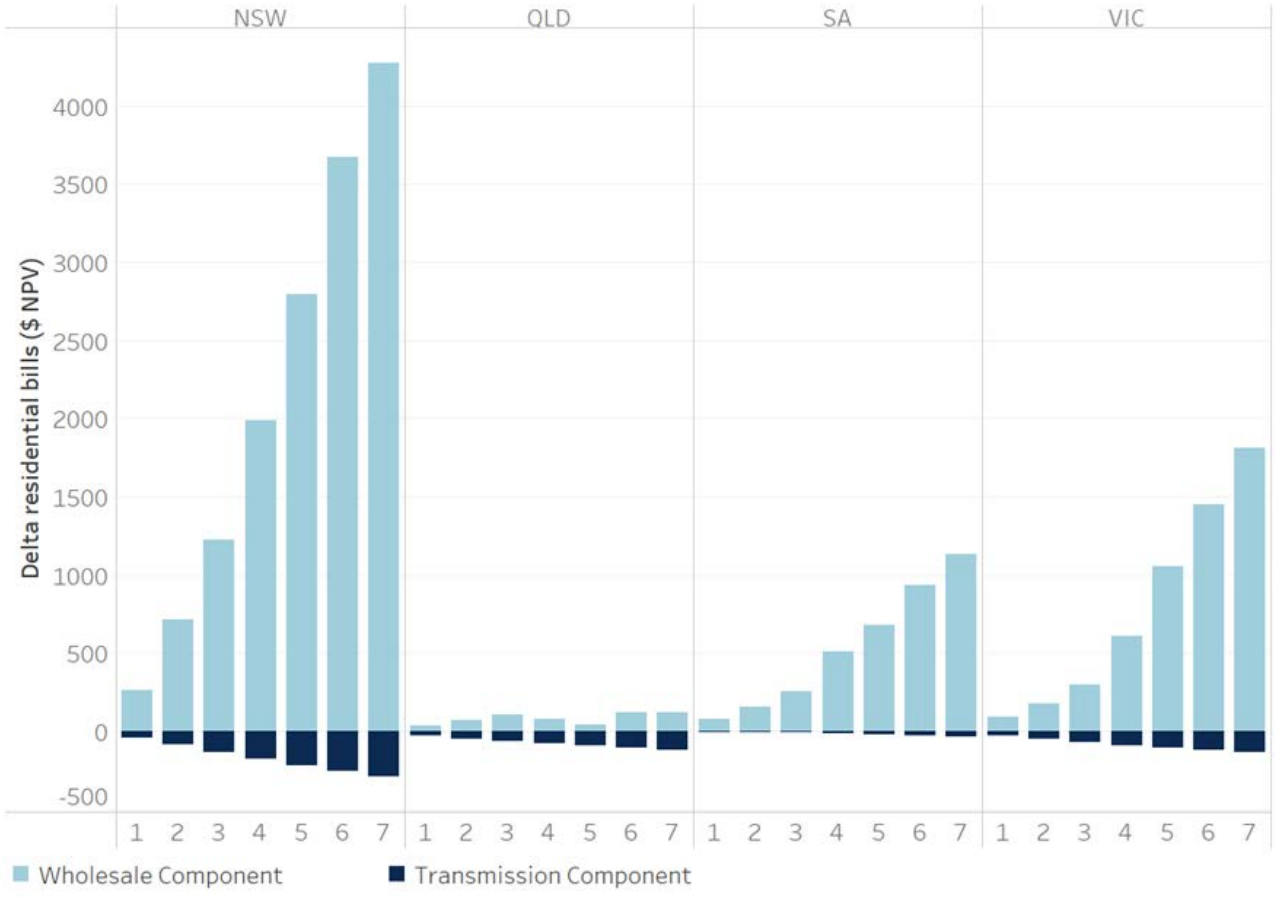


Figure 2: Changes in residential customer bills over the 20 years of the modelling, by state and for delays in building transmission of 1 to 7 years.

7 Energy Consumers Australia, Talking to consumers about energy bill reduction, March 2024

8 CSIRO, Australian attitudes toward the renewable energy transition – Part 1: General attitudes, 2024

9 AER, Default Market Offer 6 2024-25 Draft Determination, Oct 2023

Region	1 year	2 year	3 year	4 year	5 year	6 year	7 year
NSW	$215.18	$631.86	$1,092.22	$1,811.78	$2,574.97	$3,414.90	$3,983.52
QLD	$7.16	$25.14	$40.40	$1.63	-$51.93	$16.07	$2.07
SA	$81.51	$159.63	$249.97	$490.28	$655.44	$904.65	$1,099.94
VIC	$65.39	$127.92	$228.98	$515.68	$945.33	$1,327.20	$1,676.33

Table 1: Changes in residential customer bills over the 20 years of the modelling, by state and for delays in building transmission of 1 to 7 years.

The impact of transmission delays results in an overall increase in residential bills across the NEM, which progressively rise with the length of delays. New South Wales, Victoria and South Australia experience the greatest cost impacts of transmission delays. The impact of delays is notably smaller in Queensland for reasons noted above.

Table 2 presents the increase in costs as an annual percentage averaged across the horizon for each of the seven delay scenarios. This provides an indicative comparison based on current residential bills data from several retailers.

Region	1 year	2 year	3 year	4 year	5 year	6 year	7 year
NSW	3 %	10 %	21 %	36 %	53 %	72 %	88 %
QLD	0 %	1 %	4 %	5 %	7 %	12 %	14 %
SA	2 %	3 %	8 %	16 %	22 %	31 %	39 %
VIC	1 %	3 %	8 %	17 %	31 %	44 %	57 %

Table 2: Annual percentage electricity bill increases for residential customers

In our recent analysis, we found that the average delay of key transmission projects across the NEM has been three years from the delivery date when first identified, compared to the most up-to-date expected delivery date[10]. This reflects the difficulty in planning and delivering these projects on time.

If this trend continues, a three-year delay increases the total bill for the average New South Wales residential consumer by over $1,100 of additional costs, which is equivalent to a 21 per cent average annual increase.

Businesses

The impacts of transmission delays on small businesses have been largely overlooked by targeted government support, yet they constitute a significant portion of the Australian economy, employing 42 per cent of our workforce and contributing 32 per cent of GDP[11]. Research on small businesses has identified that energy prices are considered their top risk[12], with 62 per cent expressing concern over rising energy costs for their operations, as reported by Energy Consumers Australia[13].

10 Nexa Advisory, We plan and then don't build, May 2024

11 Australian Small Business and Family Enterprise Ombudsman, Small Business Matters, February 2024

12 Cyber Wardens, Building a culture of cyber safety in Australian small businesses, March 2024

13 Energy Consumers Australia, Small Business Energy Communications Research, Nov 2023

Although only one of the costs of doing business, increasing energy costs impact the management and operation of businesses. Higher energy bills are either absorbed by businesses or are passed on to consumers, potentially impacting business competitiveness – ultimately impacting their bottom-line. This restricts spending by businesses in other investment areas, including in their workforce[14]. This reflects how the costs of transmission delays – although only one driver of electricity bills – potentially flows through the rest of the economy.

The commercial and industrial (C&I) customer segment, which includes small and medium businesses, are significantly larger electricity consumers than households, but their exact consumption varies depending on the size and the nature of the activities of each specific business. As such, we have assessed the impact of transmission delays on commercial customers using a range of different annual energy consumption values (see Table 3).

The impact of transmission delays on small businesses follows the trend of residential customers, with the cumulative impact worsening with longer transmission delays across New South Wales, Victoria and South Australia. The impact is most severe in New South Wales, where intraregional transmission projects such as HumeLink play a critical role in transporting electricity generation from various regions to the major population centre of Sydney, Newcastle, and Wollongong. As explained above, there is only a small impact in Queensland.

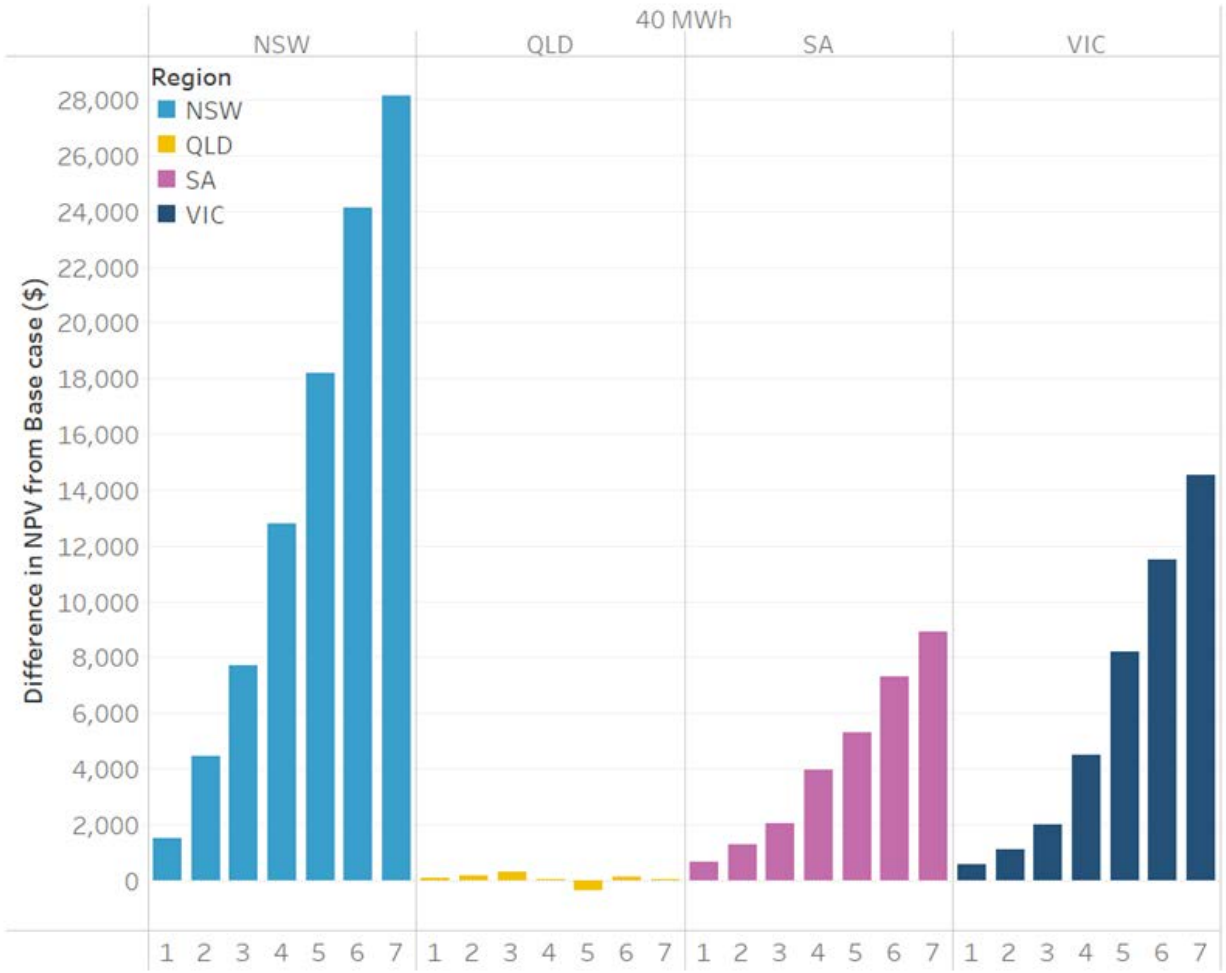


Figure 3: Changes in 40 MWh business customer bills over the 20 years of the modelling, by state and for delays in building transmission of 1 to 7 years.

14 ABB, ABB Energy Insights Survey Report, March 2023

For indicative small business customers with a 40 MWh electricity consumption, a three-year delay in transmission delivery has a cumulative impact on business customer bills over 20-years of $7,716 in New South Wales (see Table 3). This increases to $24,124 with a seven-year delay.

Business consumers' annual electricity consumption					
Region	Delay	40 MWh	100 MWh	1,000 MWh	4,000 MWh
NSW	3-years	$7,716	$19,289	$192,893	$771,572
	7-years	$24,124	$60,309	$603,090	$2,412,361
QLD	3-years	$292	$730	$7,299	$29,195
	7-years	$116	$290	$2,903	$11,612
SA	3-years	$2,020	$5,050	$50,500	$201,999
	7-years	$7,310	$18,276	$182,758	$731,031
VIC	3-years	$1,985	$4,962	$49,618	$198,470
	7-years	$11,503	$28,758	$287,584	$1,150,335

Table 3: Total impact over 20 years on business electricity bills due to a 3-year transmission delay and a 7-year transmission delay (real 2023 dollars)

When considered as a proportion of current bills, the increases to businesses' electricity bills outlined above represent a significant increase in annual cost growth. As seen in Table 4, the bill increase is most notable in Victoria, New South Wales and South Australia. The price increases - as a proportion of current bills - increase in line with longer delays to transmission. For a New South Wales business customer with an annual consumption of 40 MWh, there is a 23 per cent average annual increase in their electricity bills resulting from a three-year delay.

Region	1 year	2 year	3 year	4 year	5 year	6 year	7 year
NSW	6%	15%	23%	36%	50%	66%	78%
QLD	2%	5%	8%	9%	10%	14%	16%
SA	3%	7%	10%	17%	22%	30%	36%
VIC	3%	7%	11%	19%	31%	42%	52%

Table 4: demonstrates the average annual percentage impact on business electricity bills for 40 MWh annual energy consumption due to transmission delays over FY2027-2046 (real 2024 AUD, incl GST)

Reliability impacts of delays to transmission

The modelling indicates that delays in transmission projects exacerbate potential reliability issues compared to the base case scenario. These projects therefore play a crucial role in supporting reliability by facilitating additional generation supply to flow between regions to meet demand requirements.

Transmission lines that facilitate the flow of electricity between regions also enhance resilience to severe weather and geographically diversify supply, which is critical to the transition as our system becomes more reliant on weather-dependent sources like wind and solar.

Delays in key transmission projects compromise the reliability standard and increase unserved energy (USE) as new renewable generation and storage is unable to enter the system and be dispatched as needed as coal-fired generation capacity retires.

We have recently seen this play out in the Update to the 2023 Electricity Statement of Opportunities (ESOO), which outlined a newly identified reliability gap of 1,040 MW for New South Wales in 2025-26 against the Interim Reliability Measure (IRM). This gap is as a result of project delivery and commissioning delays in generation, storage and transmission projects dependent on Project EnergyConnect[15].

Reliability is a key objective in the operation and management of the national electricity system. As a result of this forecast breach, the New South Wales Government announced the extension to the operating life of Eraring Power Station – which was previously expected to retire in August 2025 and therefore contributed to the above forecasted reliability gap. A subsidised underwriting arrangement has been made by the New South Wales Government with the owner of Eraring, Origin Energy, for two years, and now requires deregistration by 2029[16]. This sets a dangerous precedent for further delays of thermal generation closure – including Vales Point and Yallourn in coming years.

This extension highlights the importance of system reliability and 'keeping the lights on' – even if it threatens emission reduction targets. As much as system reliability and 'keeping the lights on' has to be prioritised over emissions reduction targets, this underscores the significance of avoiding adverse reliability impacts caused by transmission delays.

In our analysis, the most significant reliability impact is observed in Queensland, primarily due to delay of the Gladstone Grid Reinforcement transmission project, as shown in the upper panel of Figure 4. This augmentation is critical to supplying industrial loads in the Gladstone area with reliable electricity after the retirement of the Gladstone power station.

After controlling for the delay of this specific project, the next highest impact occurs in Victoria, shown in the lower panel of Figure 4. This is attributed to a heavy reliance on imports from New South Wales and Tasmania as Victoria's coal fleet is retired.

In Victoria, USE reaches approximately 40 GWh by the mid-late 2030s with delays in transmission delivery of four years or more. In the same period, USE in Queensland reaches 10 GWh with transmission delays of four years or more. In New South Wales, USE peaks at 10 GWh around 2032 in the seven-year delay scenario.

15 AEMO, Update to the 2023 Electricity Statement of Opportunities, May 2024

16 NSW Government, NSW Government secures two-year extension to Eraring Power Station to manage reliability and price risks, May 2023

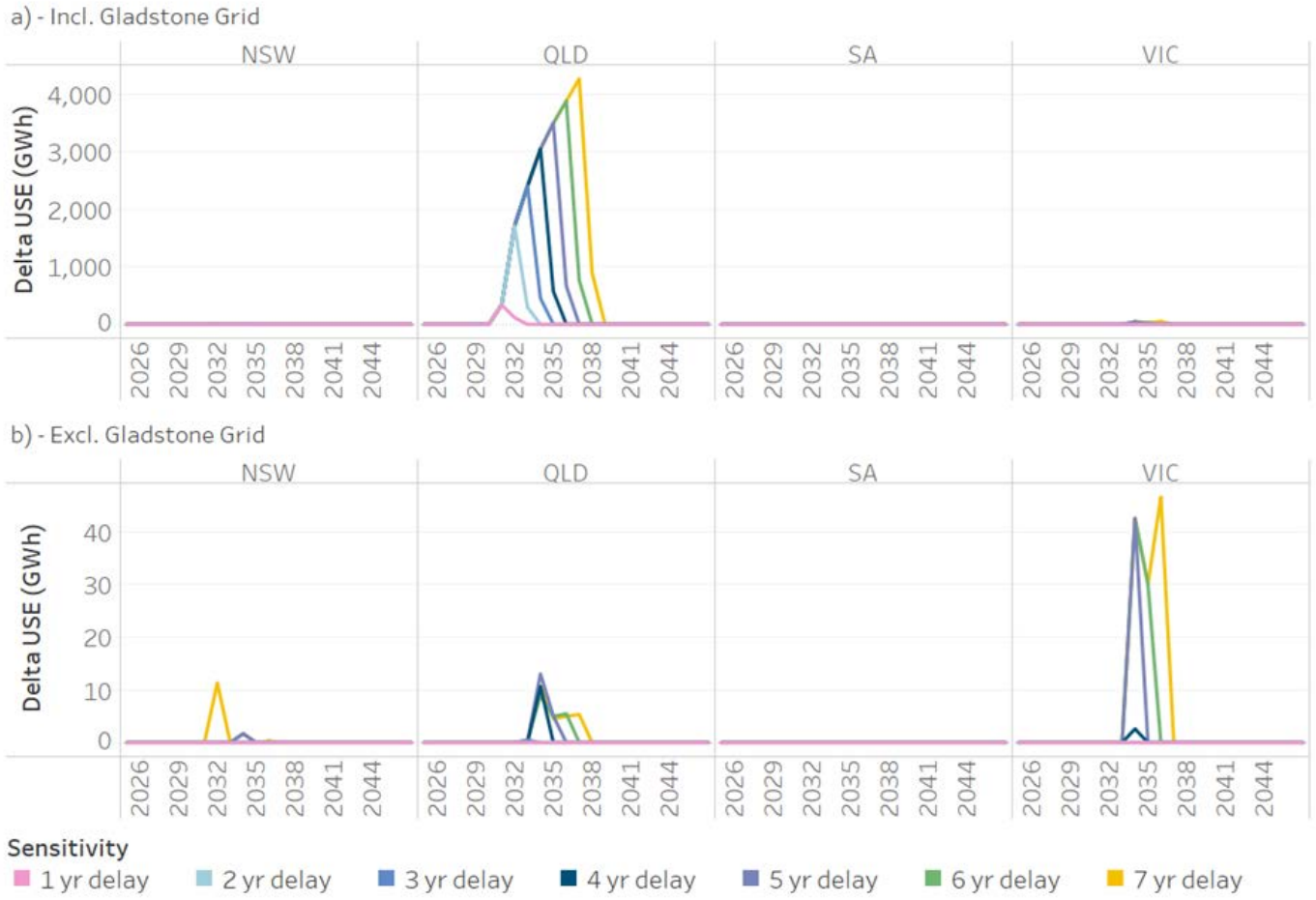


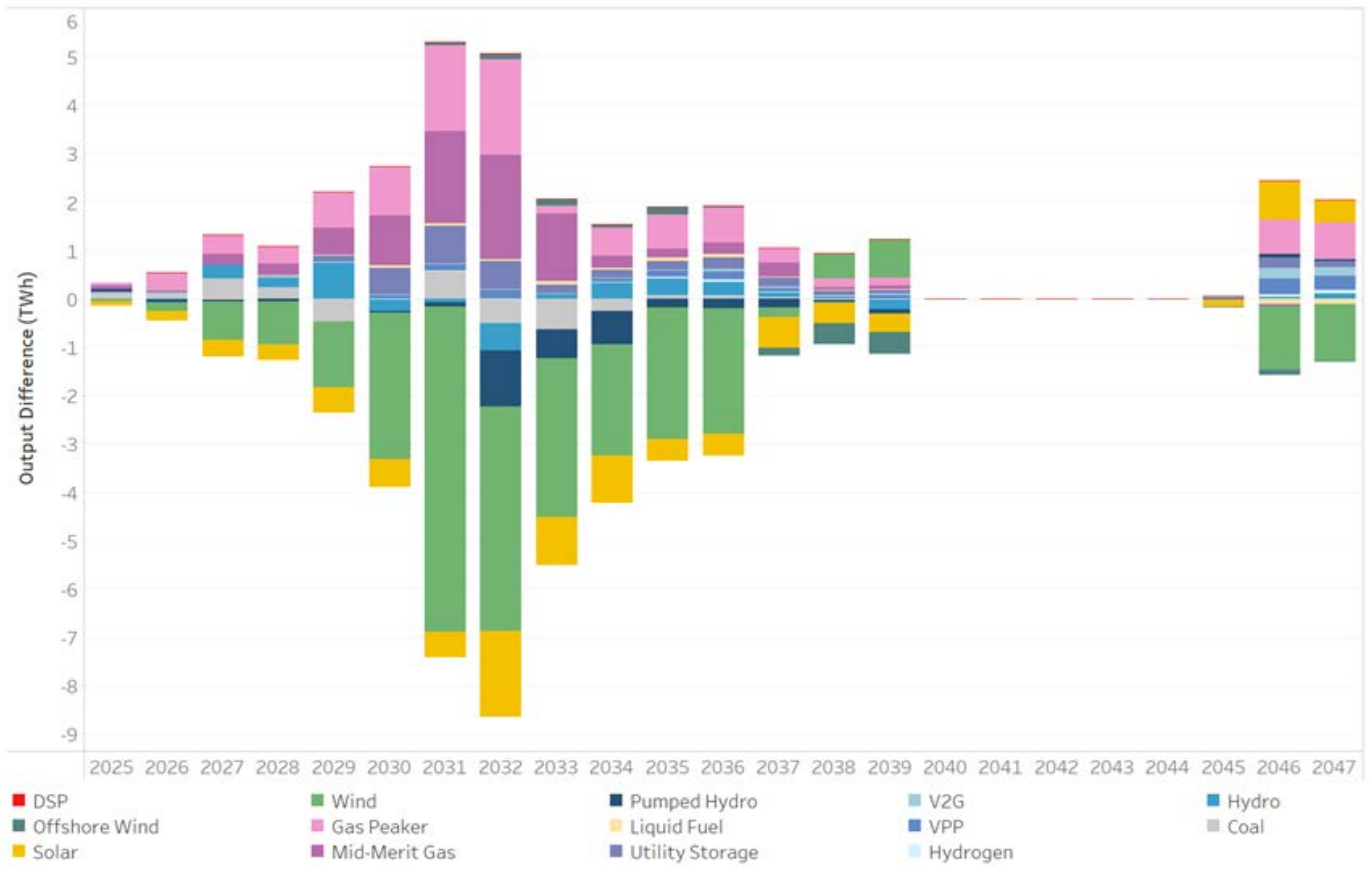
Figure 4: Unserved energy (USE) as a result of transmission delays

While these levels of USE are significant, they are a result of a sudden transmission delay 'shock', and do not reflect any response from new generation or storage. In reality, any forecast reliability impacts would elicit a response from market participants and the Australian Energy Market Operator (AEMO) to deliver the required firm capacity via either market signals or out-of-market capacity reserve procurement, such as through the Interim Reliability Reserve (IRR).

17 AEMO, Update to the 2023 Electricity Statement of Opportunities, May 2024

New transmission will reduce dependence on gas

The absence of new transmission interconnectors and key REZ infrastructure also drives changes in the generation mix dispatched to meet electricity demand. Under a three-year delay scenario, additional gas generation (from peaking and mid-merit sources) totalling 4 TWh by 2032, as well as increased hydro and utility-scale storage capacity will be required to meet demand, shown in Figure 5.



A positive bar (above zero) means more of this type of generation versus the case where transmission is built on time.
A negative bar (below zero) means less of this type of generation versus the case where transmission is built on time.

Figure 5: Change in generation mix in the NEM as a result of a 3-year delay in building transmission, relative to base case

This trend is further pronounced under the seven-year delay scenario, with gas-fired electricity generation reaching 7 TWh by 2032 (Figure 6).

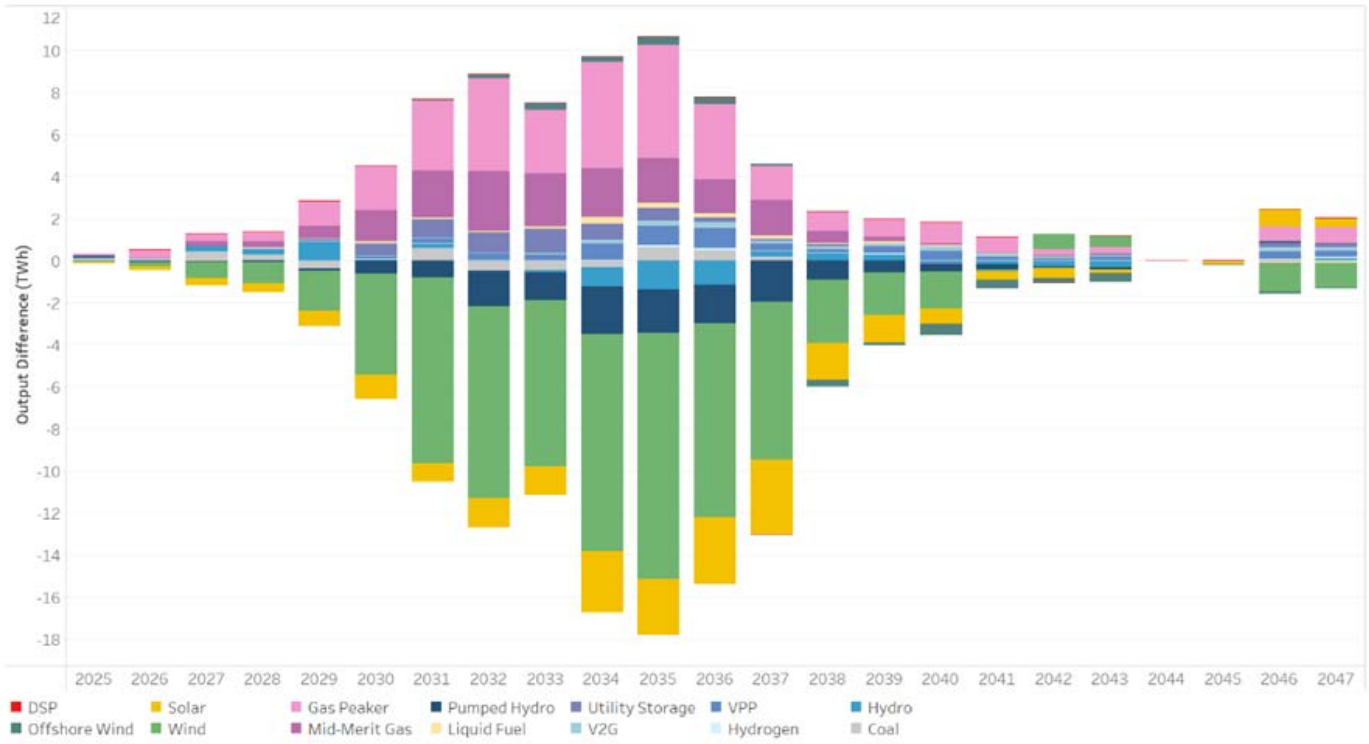


Figure 6: Change in generation mix in the NEM as a result of a 7-year delay in building transmission

Without new transmission, low-cost renewable generation and storage including wind, solar, pumped hydro energy storage (PHES) and offshore wind will be dispatched less, as a result of network constraints, particularly between remote areas of strong renewable resource and urban load areas. Gas plants will therefore operate more frequently and for longer durations, making Australia more reliant on high, and volatile, gas prices.

As such, the replacement of low-cost renewable generation and storage with higher-cost gas generation is a significant driver of higher wholesale electricity prices.

In addition, as a result of these generation differences, all delay scenarios have a negative impact on NEM-wide emissions. Emissions increase in line with the severity of transmission delays, up to a 4 per cent increase under a seven-year delay.

Recommendations

The impacts we have discussed build on our previous report –We Plan and then Don't Build - which outlined several recommendations to overcome transmission delays. These are outlined below.

This is a call to action for Federal and State Governments to act with urgency in accelerating the buildout of this nation-building infrastructure.

Recommendation 1: National coordination with state schemes and targets

The federal and state governments, under the National Energy Transformation Partnership, have established new Renewable Energy Transformation Agreements (RETAs) to ensure delivery of renewable projects to maintain agreed reliability standards and support an orderly transition.

We are calling on the federal and state governments to expand these agreements or other agreements such as the Capacity Investment Scheme to include timely delivery of actionable transmission projects that underpin the success of the transition. This should include:

- Creating incentives to ensure major transmission infrastructure is delivered on time and on budget, under all investment and planning frameworks. This is critical to facilitating confidence in both state policies and AEMO's system planning.
- Where projects are progressing through a jurisdictional scheme, state bodies with planning responsibility must be incentivised to work collaboratively with network companies to deliver projects on time and on budget.
- Clear incentive structures would provide confidence to the market (renewable generation and storage investors) and reduce the risk of state targets being missed.
- Incentivise and coordinate the construction of private (unsolicited) projects identified by investors, renewable developers and/or traditional and non-traditional Transmission Network Service Providers (TNSP).

While the Optimal Development Path (ODP) in AEMO's ISP is focused on the delivery of major interconnectors and state REZs, there is a need for the states to collaborate with industry and incorporate the practical expertise on broader transmission and renewable energy projects that bring forward the governments' ability to deliver on targets for connected renewable generation. This would mitigate the risks arising from the non-delivery of major transmission interconnectors.

As an example, VNI West and Western Renewables Link (WRL) in Victoria are facing major delays, and there are opportunities to progress private transmission projects that would allow new renewable generation and storage to connect, alleviating the risks imposed by these ongoing delays in delivering interconnectors.

Additionally, state governments and their departments and/or institutions must ensure planning and environmental approvals for transmission are streamlined and accelerated.

Recommendation 2: Identifying and funding the gap

Since delays in building transmission have a material impact on the costs that consumers will fund, federal and state energy minister should direct AEMO to deliver a detailed risk analysis on the delays when completing the ISP's ODP. This should include:

- wholesale electricity costs
- achievement of the reliability standards (identifying regions at particular risk)
- delays to emissions reductions
- delays to the connection of firmed renewable generation

Recommendation 3: improve sentiment towards transmission to build social licence

Further work is needed outside of the regulatory process by federal and state governments to improve sentiment about transmission infrastructure, particularly in host communities. This should include:

- Broad awareness and engagement campaigns, developed collaboratively by government and industry, are needed to highlight the role of transmission in the transition. This should focus on the issues that matter to regional communities and the benefits that transmission and renewable developments should deliver to them, such as housing, economic development, jobs, energy poverty and electricity affordability.
- While the AEMC's recent rule change to support community engagement clarifies the role of TNSPs through to the completion of the Regulatory Investment Test for Transmission (RIT-T), there is an opportunity for government to support this work outside of regulatory processes[17]. This could see ongoing, genuine, proactive and long-term engagement with local councils, communities, local environmental groups and Traditional Owners, modelled on initiatives such as the First Nations Clean Energy Strategy.
- State government community benefit schemes must be targeted at legacy benefit projects that support regional community needs. This must be in collaboration with broader industry including developers, transmission and electricity distribution companies to work closely with local councils and community leaders to deliver bespoke legacy projects in the areas where infrastructure is being built.

Appendix A – Endgame Economics Modelling

The analysis aligns with the inputs, assumptions and scenarios of AEMO's Draft 2024 Integrated System Plan (ISP).

Specifically, the modelling is based on the ISP's Step Change scenario, which is considered the most likely future scenario of the NEM – in which adequate replacement generation, firming and transmission infrastructure can be built while also progressing coal-fired power station closures. The Step Change scenario maintains power system reliability and security while supporting Australia's contribution to limiting global temperature rise to below 2°C compared to pre-industrial levels[18].

Throughout the assessment, price outcomes for Tasmania have not been presented due to regulated electricity pricing in Tasmania. Additionally, the model assumes the Tasmanian Renewable Energy Target is achieved on time – which would see 200 per cent renewables by 2040, but delays Marinus Link. Because the state will be highly reliant on exporting energy to Victoria via this interconnector, this results in a notable price separation between Tasmania and the rest of the NEM.

The modelling also considers the reliability impacts of transmission delay, including modelling of unserved energy (USE) – the amount of energy demanded which goes unmet by supply[19].

18 AEMO, 2023 Inputs, Assumptions and Scenarios Report

19 This presents the relative impact of the modelled scenarios and does not reflect a full Monte Carlo simulation as undertaken in energy system reliability forecasting by AEMO.

Assumptions

Assumption	Source
Existing capacity and anticipated projects	AEMO Generation Information October 2023 with adjustments for recent major announcements.
Operational demand sent-out	AEMO Draft ISP 2024 Step Change. POE10 for LT capacity expansion planning. POE50 for ST dispatch modelling.
Transmission augmentations	AEMO Draft ISP 2024 Step Change.
Coal retirement path	AEMO Draft ISP 2024 Step Change.
State and federal policies	• QRET (50% renewables by 2030, 70% renewables by 2032, 80% renewables by 2035), • NSW Roadmap (33.6 TWh eligible renewables by 2030, 2 GW/16 GWh long-duration storage by 2030) • VRET (65% renewables by 2030, 95% renewables by 2035, 2.6 GW storage by 2030, 6.3 GW storage by 2035) • TRET (200% renewables by 2040) • VIC Offshore Wind Target (2 GW by 2032, 4 GW by 2035, 9 GW by 2040) • Powering Australia plan (82% renewables NEM-wide by 2030)
Fuel prices	AEMO 2023 IASR Step Change scenario
Build costs	Draft ISP 2024 – Step Change
Project economic life	AEMO 2023 IASR
Fixed operations & maintenance costs (FO&M)	AEMO 2023 IASR
Variable operations & maintenance costs (VO&M)	AEMO 2023 IASR
New entrant characteristics (including storage round-trip efficiencies, hydro inflows etc)	AEMO 2023 IASR Step Change Scenario
Existing generation characteristics (including marginal loss factors, emissions intensity, ramp rates, minimum stable levels, maintenance rates, average time to repair, seasonal ratings etc)	AEMO 2023 IASR Step Change Scenario
Generator outages	Median outage trace using 2023 IASR generator expected forced outage rates and mean time to repair.
Generator bidding strategy	Time-of-day, seasonal bids by unit calibrated to historical bids and ASX forward prices. Updated quarterly to reflect fuel price forecasts.
REZ Build Limits	AEMO 2023 IASR
Snowy 2.0	Operational in December 2028

Where not mentioned specifically above, all other assumptions are sourced from AEMO's 2023 IASR Step Change scenario.

Source: Endgame Economics

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