Removing the Roadblocks to New Transmission to Achieve the Transition

Discussion paper

April 2022

About Nexa Advisory

Nexa Advisory is a full-service advisory firm supporting clients through their clean energy transition. The Nexa Advisory team is a collaboration of passionate energy specialists, all committed to the successful transformation of Australia's energy markets. The team is focused on helping clients grasp the unpredicted opportunities the energy transformation will bring.

The decentralisation of energy promises, for the first time, to enable a truly democratised ecosystem with people and communities at the centre. We believe in an energy industry where people are at the centre of every recommendation we make. This belief guides our approach to the challenges we solve, and the outcomes we create.

We specialise in new distributed energy ecosystems including solar, batteries, demand response and electric vehicles. We also have experience in Open Data, smart metering, blockchain and peer to peer trading.

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.

We also would like to acknowledge the support of the following peers and partners for their valuable insights and contributions to developing this report.

Dr Jill Cainey, Director at Erne Energy

Tennant Reed, Head of Climate, Energy and Environment Policy at the Australian Industry Group (AiG)

Dr Joel Gilmore, General Manager of Energy Policy and Planning at Iberdrola and Member of the AEMC Reliability Panel

Kate Healey Manager Policy at RE- Alliance

We also have consulted broadly with a range of stakeholders, including but not limited to:

NSW Office of Energy and Climate Change

Clean Energy Investor Group (GEIG)

RE-Alliance

Executive Summary

Energy transition to low carbon emissions is critical to meeting our climate targets, to our energy security and supply stability, and to controlling and abating cost of living pressures on Australians. New investment in electricity transmission infrastructure is essential and is the missing link in Australia's clean energy transition.

The recent decisions to accelerate closure of coal-fired power stations have established a critical need for investment in the construction of replacement supply side resources, including renewable generation and the transmission network capacity to connect these new resources.

Renewable power generation occurs largely in different (and often remote) locations to existing power stations. As such, new transmission infrastructure is required to connect it to the national grid. However, there are two key roadblocks to investment in and construction of new transmission which have yet to be properly addressed.

First, the significant upfront capital cost and economic risks of building this infrastructure are a barrier to investment, even with state and federal government support. This is because, currently, investment in regulated transmission infrastructure is funded solely by electricity consumers and falls to the specific regional Transmission Network Service Providers (TNSP's) to plan and coordinate investments, despite the fact that the benefits of extending the national grid in this way accrue to all Australians.

Second, the current regulatory process for building regulated infrastructure is not fast enough to deliver the given the level of capacity required (we need to build 25% of the current grid in the next 10 years). It does not consider environmental and social costs and benefits, and prior to the Integrated System Plan (ISP) has not been required to take the necessary system-wide planning approach.

The problems are clear, and it is time to work together on solutions. In this paper, Nexa Advisory demonstrates the problems with the current approach and offers potential solutions with the aim of facilitating collaboration on delivering meaningful resolutions.

Roadblock 1- who pays: Governments, state and federal, should develop mechanisms to support investment in the build of new transmission assets, including lower cost funding sources. Alternatively, governments could initially fund these projects and subsequently sell to a transmission asset owner, once the assets are operational and generating benefits in the National Electricity Market (NEM). This would reduce financial risk for investors, reduce costs and economic risks to consumers, share costs with all beneficiaries, and unlock a funding pipeline for asset ownership.

Roadblock 2- approvals processes: The current reliance of the actionable ISP rules on the Regulatory Investment Test for Transmission (RIT-T) presents a fundamental hurdle in delivering new transmission in time. Governments, state and federal, should urgently seek a review of the need for the RIT-T in justifying ISP projects. Any new approach would still need to allow customers the certainty that any new transmission had benefits beyond the costs.

Additionally, state and territory governments have a critical role in expediting state-based planning approvals and can ensure new transmission projects can progress rapidly, potentially through the expansion of the remit for existing institutions.

Introduction

Australia's National Electricity Market (NEM) is undergoing a significant transition. Coal generation is exiting the market faster than expected, pushed out by large investments in cheaper marginal cost variable renewable energy (VRE) resources such as wind and solar, which is entering the system to meet state government renewable energy targets.

More than 125GW of new variable renewable generation, along with 45GW / 620GWh of storage and other low emission generation is required to replace the 23GW of coal generation capacity currently in the NEM[1]. The advancing dates of coal closures, buffered by the three-and-a-half-year notice period, establishes very tight timeframes required to construct the new generation and transmission capacity.

The locations where transmission is required to connect to these new generation resources are changing substantially due to the location of input energy resources for these VRE resources, with decentralised Renewable Energy Zones (REZs) and other geographically suitable locations for VRE generation dominating future transmission planning.

In the past few decades, little investment has been needed in new transmission. In general, both regulated and funded transmission investment arrived in a timely manner. However, recent experience in processing proposals for new regulated transmission investments have taken significant time for planning and approval. Project EnergyConnect (PEC), the most recent large-scale example, has taken more than six years from initiation to regulatory approval, potentially due to ongoing changes made to the projects design during the Regulatory Investment Test (RIT-T) process and significant increases in costs post RIT-T approval, and will take another two years for construction.

Across the political divide, both Liberal and Labor governments have made strong commitments[2] to renewable energy and decarbonisation, which is having a noticeable positive impact, and the proportion of renewable energy in almost every state and territory has increased significantly.

The states have also implemented governance structures such as VIC Grid[3] and the NSW Consumer Trustee[4], to deliver on these policies as the challenges and risks facing the states are present and real.

Building transmission lines is not cheap, quick, or low risk. Aside from sourcing the capital required, planning, assessment, approvals and addressing environmental impacts takes considerable time. Undertaking the necessary community engagement for new easements and transmission lines also requires considerable resources, is taking considerable time and carries substantial risk. The Western Victorian ERZ project, approved in late 2019, has yet to gain social license for its construction.

In addition, the question of 'who pays', what will be significant costs, for regulated transmission continues be a significant roadblock to building new transmission.

Delaying the investment and building of transmission will not only slow the investment in VRE generation, impacting Australia's capacity to achieve net zero emissions, but will also likely result in higher electricity prices than would otherwise be the case, and less reliable supply outcomes.

New investment in transmission infrastructure, either regulated or directly funded, is essential and is the missing link in Australia's clean energy transition. Regardless of whether transmission

[1] Draft-2022-integrated-system-plan.pdf (aemo.com.au)
[2] clean-energy-australia-report-2021.pdf (cleanenergycouncil.org.au)
[3] https://www.energy.vic.gov.au/renewable-energy/renewable-energy-zones
[4] https://www.environment.nsw.gov.au/news/new-electricity-consumer-trustee-to-put-energy-consumers-first

infrastructure is planned nationally via the Integrated System Plan (ISP) or regionally by state and territory governments, very similar delays and obstacles still occur.

Federal and state and territory governments have a critical role in resolving the impasse that we have reached, and in removing the roadblocks in building new transmission. Government fully funding the upfront capital costs, dovetailed with efforts to resolve the approval and social licence roadblocks, is fundamental to ensuring that the required new transmission is built rapidly.

Background

Decarbonisation has become a global imperative and a priority for governments, companies and society at large. Companies across all industries have publicly declared their intention to become carbon neutral before 2050. While Australia has an international commitment to limit global warming to well below 2 degrees, and to pursue efforts to limit it to 1.5 degrees. All Australian jurisdictions have committed to achieve Net Zero emissions by 2050[5] at the latest, and some states have legislated to this effect.

Over the past decade, the NEM has experienced a major investment super cycle, see Figure 1. Large amounts of baseload coal have exited the market and the wholesale electricity price reached a historical high after the retirement of Wallerawang (NSW), Northern (SA) and Hazelwood Vic) coal fired power stations at short notice, combined with the commencement of operation of the Qld LNG export trains and a 60% increase in black coal costs due to rising international coal prices. With VRE generation investments entering the market en masse since that period, and reductions in regulated network costs as well as retailer margins the Australian Competition & Consumer Commission (ACCC) highlights that electricity costs are currently the lowest in years[6].

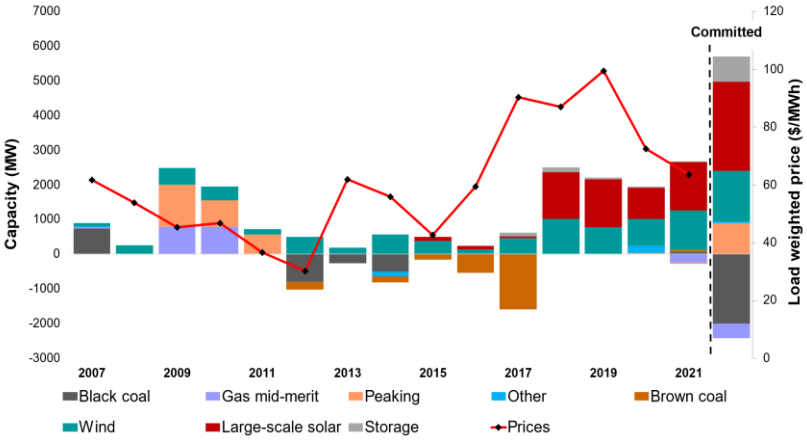

Figure 1 – The last Super Cycle
Source: Endgame Economics

Going forward, coal baseload generation will continue to be replaced by VRE generation as Australia moves towards the net zero emissions target by 2050. However, what is shown as committed new capacity by AEMO,[7] will be dwarfed by what is actually required to achieve this transition.

The federal and state governments have implemented orderly closure rules and processes for the remaining coal-fired plants to mitigate the risk of sudden capacity losses. However, to ensure excessively high wholesale prices do not happen again to the detriment of consumers, new VRE, storage and dispatchable capacity will be needed ahead of closures, supported by transmission capacity, both directly funded and regulated, to carry their output to customers.

[5] https://www.industry.gov.au/sites/default/files/October%202021/document/australias-long-term-emissions-reduction-plan.pdf
[6] Inquiry into the National Electricity Market - November 2021 report - Copy.pdf (accc.gov.au) chapter 3, pages 23-24)
[7] https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information

The early exit of coal

The pace of change in the power system is accelerating at a much faster rate than expected, with the Draft 2022 ISP Step Change scenario anticipating all coal generation will retire by 2040 and up to 14 GW by 2030[8]. In its modelling, the Australian Electricity Market Operator (AEMO) shows that all brown coal in Victoria, as well as over two-thirds of black coal generation (in Queensland and NSW), could exit the market by 2032.

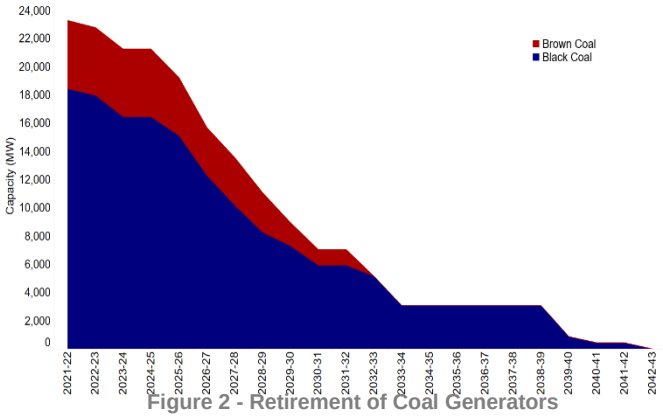

Figure 2 - Retirement of Coal Generators
Source: Endgame Economics

Over the past decade, coal-fired generators have withdrawn from the market before their announced dates, and we continue to see announcements by thermal coal generators of potential early closures.

Victoria's Yallourn coal power station has announced it will close four years early in 2028[9]. Since the Draft 2022 ISP was published in December 2021, AGL's Loy Yang A is now set to close three years early in 2045; and Bayswater no later than 2033[10]. Origin Energy has also confirmed it intends to close the 2880 MW Eraring power plant in 2025, seven years earlier than previously announced[11]. These recently announced closures are consistent with the Step Change scenario trajectory. As a result, the build-out of transmission projects described in the Draft 2022 ISP are now more critical and some may need to be brought forward[12] to ensure we keep the lights on and prices down for consumers.

Box 1: AEMO's 2022 Integrated System Plan

AEMO produces a whole-of-system development plan (the Integrated System Plan, or ISP) for the NEM and transmission network every two years. The ISP provides a roadmap of how the NEM and transmission system could change over the next three decades to 2050 to support the decisions of government, market participants, investors, policy-makers and consumers.

The ISP examines a collection of future-looking scenarios[13] on the required development of electricity generation and transmission network using least-cost optimisation modelling. The most recent ISP focuses on the 'Step Change' scenario as being the most likely, selected using a voting process with industry and key stakeholders.

The key highlights of this scenario include:

1. The electricity delivered to the grid would need to double from 180TWh per year to 330TWh per year by 2050, given electrification of much of the Australian economy.
2. Nine times today's utility-scale renewable energy connected and online by 2030 would be needed to replace these aging coal units to manage reliability.
3. 45GW/620GWh of energy storage would be needed in batteries, hydro, and other forms.
4. The installation of more than 10,000 km of new transmission is needed to connect geographically and technologically diverse, low-cost generation and firming capacity with the consumers who rely on it.
5. The need to pursue these actionable ISP transmission projects on a pathway that is low cost and low regrets for consumers, with work commencing on their earliest planned schedule.

Managing the supply chain and social licence risks for investments of this scale.

[8] AEMO Draft 2022 Integrated System Plan.
[9] Energy Australia press release, March 2021 p.45.https://www.energyaustralia.com.au/about-us/media/news/energyaustralia-powers-ahead-energy-transition
[10] AGL Half year results announcement, Feb 2022 https://www.agl.com.au/content/dam/digital/agl/documents/about-agl/media-centre/2022/220210-agl-energy-fy22-half-year-results-announcement.pdf
[11] Origin Energy press release, Feb 2022 https://www.originenergy.com.au/about/investors-media/origin-proposes-to-accelerate-exit-from-coal-fired-generation/
[12] New actionable Projects outlined in the Draft 2022 ISP- New England REZ transmission link and the Sydney ring (reinforcing Sydney, Newcastle and Wollongong supply), which were both to be delivered by July 2027
[13] Draft-2022-integrated-system-plan.pdf (aemo.com.au) p25

What do we need to replace coal generation?

We currently have 23GW of coal generation in the NEM. Five gigawatts of coal generation will need to be replaced by at least 15GW of VRE generation, plus storage, by 2030. These new VRE generation resources will need to be connected to the system with new transmission.

In the ISP Step Change scenario, as the existing 25 GW of coal fired generation retires, a total of 125.5GW of new VRE generation capacity will enter the NEM by 2050, supported by approximately 45GW / 620GWh of dispatchable storage capacity, 7GW of existing dispatchable hydro and 9GW of gas-fired generation[14] to efficiently firm that VRE generation.

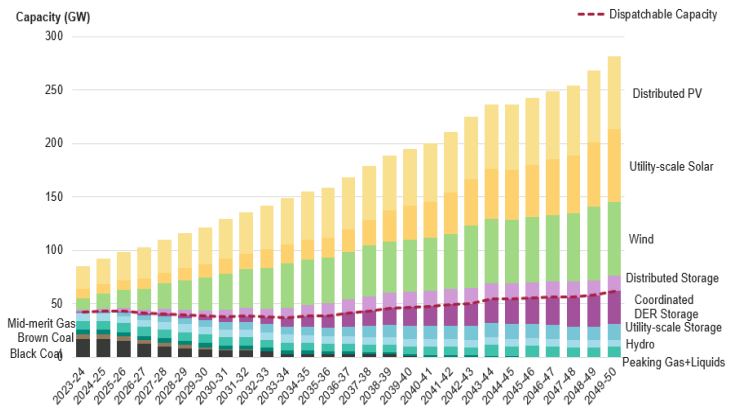

Figure 3 - Forecast NEM Capacity to 2050, Step Change scenario, with transmission

Many VRE generation projects that were yet to be committed less than three years ago have now been constructed and commissioned. Investment in VRE generation projects has been progressing rapidly and, in some jurisdictions, exceeding expectations.[15] There is a long and robust list of advanced projects on AEMO's website[16] and more projects are preparing to come online over the next decade.

The speed at which new generator connections have occurred in recent years is unprecedented, creating challenges for the grid and reinforcing the need for better coordination of generation and transmission investment.

State and territory policies are accelerating the transition

The states and territories took the lead in introducing a range of ambitious policies to accelerate Australia's renewable energy transition. Most positively, these policies occurred across the political spectrum, with both Liberal and Labor governments making strong commitments[17] to renewable energy and decarbonisation. This is already having a noticeable impact on the electricity system, with many states and territories setting records for VRE generation commissioning and output throughout the year. The proportion of VRE generation in almost every state and territory has increased significantly.

The states and territories are also looking at implementing governance structures such as VIC Grid[18] and the (NSW) Consumer Trustee[19], to deliver on these policies as the challenges and risks they face are real and immediate.

[14] Draft 2022 ISP
[15] The Clean Energy Council project tracker notes there are (as of 25 May 2021) 98 large scale renewable energy projects and 21 large scale battery storage projects in construction, accounting for 11,761MW, 13,502 jobs and over $19.6B in capital investment. See: https://www.cleanenergycouncil.org.au/resources/project-tracker
[16] AEMO | Generation information
[17] clean-energy-australia-report-2021.pdf (cleanenergycouncil.org.au)
[18] https://www.energy.vic.gov.au/renewable-energy/renewable-energy-zones
[19] https://www.environment.nsw.gov.au/news/new-electricity-consumer-trustee-to-put-energy-consumers-first

However, these governments have become frustrated at the slow transition to a low carbon economy and are now taking additional steps to ensure they have reliable and secure electricity to support their economies (see Table 1 below), including providing funding to support the delivery of new transmission. For example, in response to Origin Energy's announced early closure of the Eraring coal power station, the NSW Government has committed to support the construction of an additional big battery which is expected to come online by 2025.[20] This new battery is expected to enable the existing transmission network between southern and central NSW to be used more efficiently than is currently the case. Opportunities for the creation of virtual transmission exist in all states.

There is, however, a risk that this uncoordinated investment outside the ISP, in both VRE generation and transmission, on a state-by-state basis will not result in the same efficient, low-cost outcomes as a nationally coordinated planning and investment approach. Regardless of whether the transmission is planned nationally via the ISP or regionally by state and territory governments, very similar delays and obstacles still occur.

Table 1: NEM States Transmission Initiatives

Government	**Initiatives**	**Funding**
NSW Government	NSW Government has developed an Electricity Strategy [21]and the Electricity Infrastructure Roadmap[22] which sets out a plan to deliver the State's first five REZs as well as developing the NSW Transmission Infrastructure Roadmap[23] with the support of the Federal Government[24].	Yes
Victorian Government	The Victorian Government is supporting the development of REZs[25], the Western Victorian Transmission Network Project[26] and Victoria-NSW Interconnector project.	Yes
Queensland Government	Queensland Government is establishing three REZs[27] and supporting the development of CopperString 2.0 and the Queensland-NSW Interconnector (QNI)	Yes
South Australian Government	The South Australian Government is supporting project EnergyConnect which will open renewable energy zones, with support from the Federal Government[28]	Yes
Tasmanian Government	The Tasmanian Government has developed a draft renewable energy coordination framework which includes proposed Renewable Energy Zones[29] and is developing the Marinus Link[30]	Yes
Federal Government	HumeLink, VNI West[31], CopperString 2.0[32], Project EnergyConnect, Marinus Link[33]	Yes

[20] https://www.energy.nsw.gov.au/nsw-response-to-closure-of-eraring-power-station#:~:text=Announcement%2017%20February%202022%3A,Eraring%20Power%20Station%20in%202025.
[21] NSW - Electricity Strategy
[22] NSW Government's Electricity Infrastructure Roadmap
[23] NSW - Transmission Infrastructure Strategy
[24] NSW - MoU
[25] The Victorian Government is developing Victoria's Renewable Energy Zones (REZs)
[26] West Vict NP
[27] Qld - Renewable Energy Zones
[28] Ministers Taylor Media Releases - South Australia
[29] Draft Renewable Energy Coordination Framework
[30] Marinus Link
[31] VNI West Transgrid
[32] CopperString 2.0 2021
[33] Marinus Link April 2022

It is worth noting that over the years an emerging theme is the value of adding an environmental objective to the National Electricity Objective (NEO) – essentially a recognition of the driver to achieve net zero emissions by 2050. ACT Minister Shane Rattenbury committed[34] to leading the work towards incorporating emissions reduction into the NEO. All states and territories have a goal of achieving net zero emissions by 2050 at the latest, and this means rapidly reducing emissions from Australia's electricity sector. Reflecting these goals in the NEO will help to ensure national coordination and appropriate investment certainty as we make this transition.

The risks of failing to act

Delaying the investment and build of both funded and regulated new transmission needed for the transition to clean and cheaper electricity has several implications for energy consumers and Australians more broadly.

Net zero emissions

VRE generation output is Australia's cheapest electricity to achieve a net zero emissions target[35]. The 2022 Draft ISP sets out the least cost, coordinated way to deliver the new transmission that is needed to ensure Australia has the low carbon electricity needed to allow Australians to live and work in comfort and to allow Australia's economy to grow and thrive. By further delaying the investment and building of new transmission we slow the investment in VRE generation, slowing the introduction of more lowest cost generation and the reduction in the emissions that cause climate change.

Potential for higher electricity prices

Delays in progressing and commissioning the actionable transmission projects could result in higher electricity prices than would otherwise be the case and may impact the reliability of supply of energy if coal generators retire without the necessary alternative supply side resources connected to take their place. The ACCC recently highlighted[36] that retail electricity costs are the lowest in eight years and that lower wholesale costs are one of the contributors to the overall decrease in retail electricity costs in the past two years. The ACCC attributes the fall in wholesale electricity costs to the growth of VRE generation assets (solar and wind). These VRE generators have connected into the existing transmission network to drive down wholesale spot prices but are running out of space on the transmission network and urgently need new transmission capacity.

It is important to note there was a period of increasing spot market prices from 2014–15 to 2018–19. While there were many factors contributing to the multi-year trends such as higher fuel costs for both gas and coal fuelled generators following the commencement of LNG exports in Queensland and increases in export prices for coal, planned and unplanned generation and transmission outages, and weather-driven high demand. One of the key contributors to price shocks in wholesale electricity prices was the tighter supply-demand balance as coal fired power stations exited the market. This included the closure of major coal-fired plants in NSW (EnergyAustralia's 1,000 MW Wallerawang C in April 2014), South Australia (Alinta's 540 MW Northern Power Station in May 2016) and Victoria (Engie's 1,600 MW Hazelwood in March 2017).

After the closure of Hazelwood in particular, more expensive black coal and gas plants began to set the spot price more often[37]. These closures were not signalled to the market ahead of time and came after a period of oversupply of capacity where spot prices were at unsustainable lows (and generator

[34] Saying no to 'CoalKeeper' - Chief Minister, Treasury and Economic Development Directorate (act.gov.au)
[35] Renewables still the cheapest new-build power in Australia - CSIRO
[36] National Electricity Market – November 2021 report – Copy.pdf
[37] Australian Energy Regulator, State of the Energy Market – 2020, Commonwealth of Australia, June 2020, p 13

losses). With earlier signalling of these closures, VRE generation construction could have been brought forward – prices would still have been higher, but not at the extreme levels observed.

Should failure to build new transmission result in increasing network congestion, access to the lowest priced electricity and opportunities for new VRE generation capacity to enter the market would be reduced, potentially keeping electricity costs higher for consumers.

Energy Security

The recent war in Ukraine has put the energy security risks Australia faces front and centre with high oil and gas prices filtering through the economy putting pressure on supply chains and consumers at the bowser and supermarkets.

The answer to higher oil and gas prices may not lie in shoring up domestic supply, as Australia's coal, oil and gas prices are linked to the international market. Rather, Australia must become energy self-sufficient through electrification where this is possible and the domestic production of renewable fuels like green hydrogen and ammonia for heavy transport and other hard to abate sectors.

Furthermore, building the enhanced transmission network required to electrify Australia can also reduce the risk of single points of failure in the transmission network and can allow sharing of other essential power system services (ESS) for ensuring power system operational security such as inertia and frequency control. For example, EnergyConnect will give South Australia two alternating current network connections to the transmission network of other NEM regions, reducing the risk of electrical islanding (and hence duplicating ESS resources again in South Australia just in case)

The transition problem

The NEM was designed around centrally planned, large-scale, dispatchable generators located at long-term fuel resources (such as coal mines), with strong network assets connecting these generators to load centres based on the legacy of state-based electricity systems. The state systems, while interconnected, operated independently.

With the commencement of the NEM, flows between regions increased, at times highlighting the shortcomings in the capability of the intra-regional networks to service flows across the interconnectors. Transmission planning was largely vested in the individual state-based network service providers, with AEMO's annual National Transmission Network Development Plan (NTNDP) providing the only guidance for system planning.

Improvements in transmission capability to facilitate flows between regions is governed by the benefits of new transmission investment exceeding the costs incurred. Historically, in most instances the costs incurred were assessed as exceeding the benefits provided.

The nature of generation investment has changed from the earlier years of the NEM, with a larger number of small-scale, decentralised VRE generators, often in remote geographical locations, looking to connect more often. This makes coordination with transmission increasingly difficult, because:

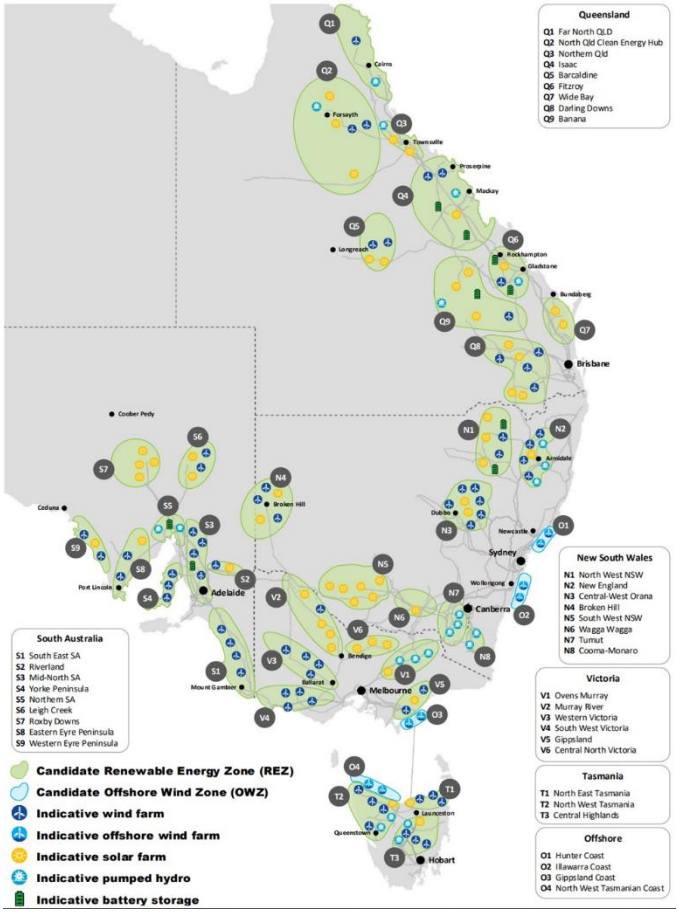

Figure 4 -
Source: AEMO 2022 Draft ISP

(i) the best renewable resources are often found in areas with little spare transmission capacity; and

(ii) new generation facilities are being constructed in much shorter timeframes than traditional thermal generation.

Recent state government announcements of Renewable Energy Zones (REZs) have provided some guidance on where new transmission investments are needed. However, overall system planning and the implementation of new regulated transmission to create interconnectors between regions is still subject to significant market-wide debate and local anxiety. The threat of new transmission lines cutting across productive farmland has received significant pushback from affected landowners and the communities in these areas.

Scale of transmission needed

The combined value of the Regulatory Asset Bases (RABs) for the electricity networks regulated by the Australian Energy Regulator (AER) is more than $100 billion. This comprises seven transmission networks valued at $21.7 billion and 14 distribution networks valued at $78.8 billion. The networks comprise almost 790,000 kilometres of transmission and distribution lines and deliver electricity to more than 10 million customers[38].

The construction of the current transmission network that forms the backbone of the NEM was completed in discrete sections over a 50-year period, starting in 1959 with the interconnection of Victoria and NSW to accommodate the Snowy Hydro Scheme[39]. Basslink, which was a privately funded as opposed to a regulated network investment, was the last major inter-connector transmission investment linking Tasmania to Victoria, commencing operation in 2006[40]. Construction of the network was primarily undertaken on a consumers' needs basis.

The committed, anticipated, and actionable ISP 2022 transmission projects will all need to be delivered by 2030 to ensure a smooth transition. For this to be achieved we need to invest in and build the equivalent of 25% of the size of today's transmission grid in less than 10 years.[41]

While Distributed Energy Resources (DER) are an important contributor to the system, they are not a substitute for transmission. AEMO's Step Change scenario predicts an additional wind and solar output of 138.5TWh by 2035 and 197TWh by 2042[42]. Even with large uptake of DER, there is still a significant need for large-scale VRE generation investment and the transmission lines to support this.

As VRE generation penetration increases and coal fired generation retires, reliability and security will increasingly become dependent on better interconnection. The greater the level of interconnection, the greater the geographical diversity of sources of VRE generation supply. The NEM covers a large geographical area, ensuring that electricity can be supplied from a broad range of intermittent weather dependent generation resources, reducing the impact of the weather in any one region. Additional transmission investment is critical for the sharing of electricity between regions.

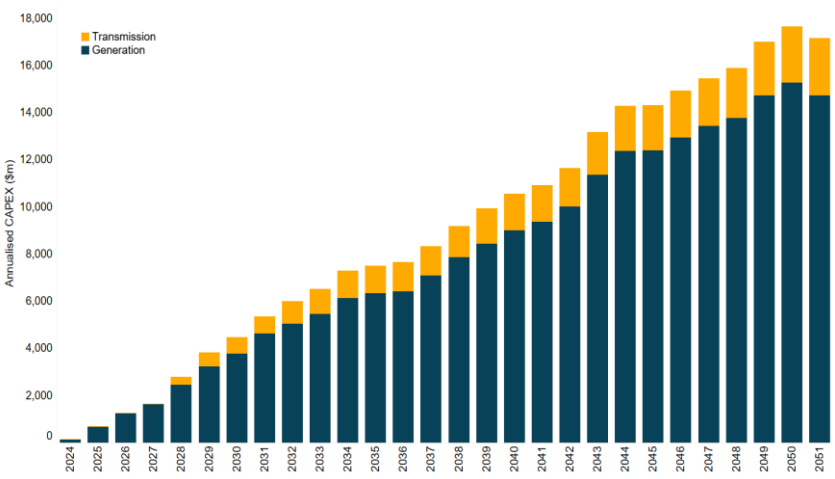

Figure 5 – Generation and transmission annualised CAPEX
Source: Endgame Economics

[38] State of the Energy Market 2021 page 128
[39] A Dictionary on Electricity – Contribution on Australia – CIGRE, page 9
[40] AER Chapter 2 National Electricity Market 2009, page 74
[41] The Draft 2022 ISP refers to 10,000 km of new transmission being required, compared to the current NEM "The National Electricity Market (NEM) which incorporates around 40,000 km of transmission lines and cables" https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/about-the-national-electricity-market-nem
[42] Calculated from FY2022 generation forecasts and data from the AEMO Draft 2022 ISP Results Workbook - Step Change.xlxs

The 2022 Draft ISP suggests an investment of at least $12.5 billion is needed in actionable and committed transmission over the next 8 to 10 years to support the investment in renewable generation. Figure 5 shows annualised capital expenditure for both generation and transmission as of June 2021. The size of each bar is indicative of the projected capital allocation to each of these two projects in a future financial year. Blue bars correspond to generation capital expenditure (CAPEX) and yellow bars to transmission CAPEX. The chart shows that annualised generation CAPEX always exceeds annualised transmission CAPEX[43].

In other words, based on the current forecast of locations of VRE generation investment and consumer demand, without sufficient investment in transmission, consumers will need to pay for more expensive forms of generation assets such as gas, storage and off-shore wind. AEMO estimates $29.5 billion of market benefits if we deliver on the ISP optimal development path (ODP).

[43] *The data for this chart was sourced from the draft 2022 ISP step change results under Candidate Development Path (CDP) 12. Marinus Link, New England REZ Transmission Link and Sydney Ring are all potentially actionable projects under CDP12 and VNI West and HumeLink are staged projects. Transmission CAPEX is the sum of 'REZ Augmentation' and 'Flow Path Augmentation' costs and generation CAPEX was derived from 'Generator Capital' costs.*

Transmission build is too slow

The 2017 Finkel Review[44] into the causes of the September 2016 South Australian 'system black', called for investment in new transmission to improve resilience to shocks. The Finkel Review also led to the inception of the ISP. However, in the five years since the publication of the Finkel Review and the publication of the first ISP in 2018, no new major transmission lines or interconnectors have been completed. A number of projects identified in the 2018 ISP to improve flows across the network have been completed or are close to commissioning.

In AEMO's 2021 Transmission Cost report, Table 4 lists the projects that were expected to have commenced 'preparatory works' by June 2021. These are shown in purple colour in Figure 6. AEMO anticipates that majority of these projects are expected to take 10 plus years to design, plan, gain regulatory and social license approval and be in operation with commissioning extending into the mid 2030's.

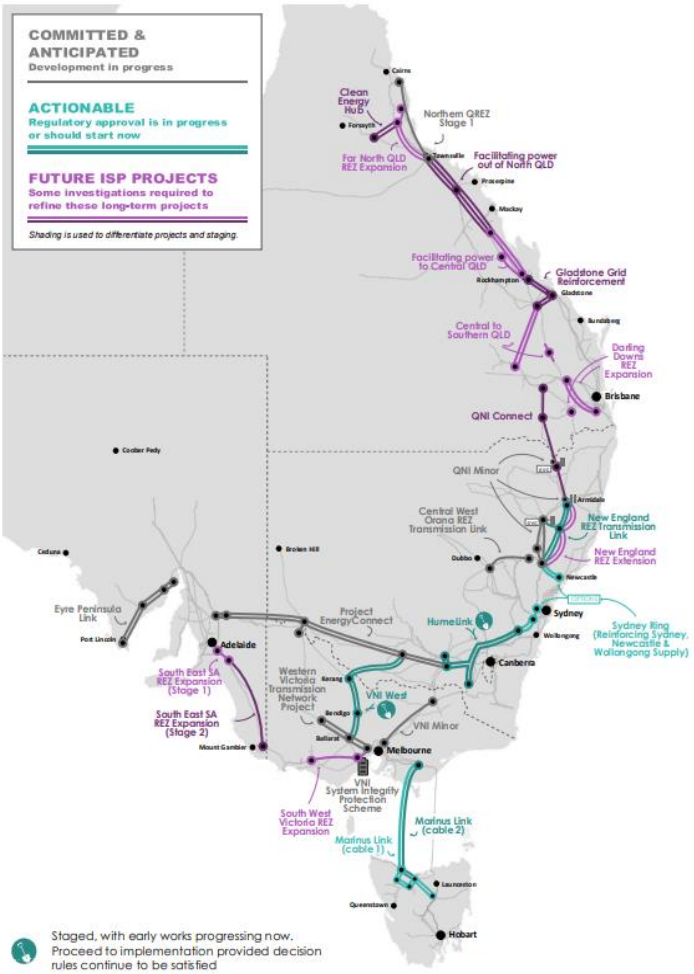

Figure 6 - Transmission Projects defined in the Draft 2022 ISP

Over the past two decades, transmission companies have primarily focused on maintaining the large existing electricity grid. Historically new regulated transmission investment is determined on the basis of increases in consumer load requirements, which over the last 10 years has been falling, rather than increasing. New transmission investment to connect new generation has primarily occurred via funded network projects to connect to the existing regulated network. Failure to deliver operational new regulated transmission investment, due to the speed of generation investment and delays in TNSPs identifying the need and completing the regulatory approval process, has resulted in state governments taking further steps to drive the transition to low emissions electricity by adopting policies to support REZs. However, the key questions as to who will fund this REZ transmission infrastructure remains to be addressed.

REZs allow state and territory governments to coordinate investment in both VRE generation to make low emissions electricity and the necessary new transmission to get that clean electricity to the boundary of the existing network. However, once the capacity of the transmission infrastructure within a REZ, and connecting it to a location on the existing transmission network, are fully utilised, additional new transmission will need to be built if the generation hosting capacity of the REZ is to be increased. REZs are only a short-term solution to a long-term coordination problem.

[44] Independent Review into the Future Security of the National Electricity Market – June 2017
https://www.energy.gov.au/sites/default/files/independent-review-future-nem-blueprint-for-the-future-2017.pdf

What's stopping us?

Building transmission lines is not cheap, quick, or low risk. Aside from sourcing the capital required, planning assessment, approvals and addressing environmental impacts and gaining social license takes considerable time and expense.

Undertaking the necessary stakeholder and community engagement for new easements for transmission lines and significant substations requires considerable resources and carries substantial risk.

However, the question of 'who pays' for this new transmission, noting that transmission can be built as regulated transmission approved via the regulated investment path, or by government or private funding, continues be a significant roadblock to building new transmission. To date, most transmission has been built as regulated infrastructure paid for solely by electricity consumers.

Who should pay for transmission build and expansion?

Concerns about who should pay for the new transmission infrastructure are not new and can result in significant delays in investment in regulated transmission infrastructure and has done so for years. Today, there is only one pathway to capital investment in regulated transmission investment paid for solely by consumers - using Transmission Network Service Providers' (TNSP) capital via the Regulatory Investment Test for Transmission (RIT-T) approval process. This regulated investment method results in the entire cost of each investment being carried by the TNSP(s) involved, with costs recovered solely from energy consumers with the vast majority of costs recovered from consumers located in the investing TNSP(s) region(s) through the RAB. This is the case, even if the construction of new transmission results in broader benefits to consumers in other regions of the NEM, or the wider economy.[45] Current methodology places the cost of transmission infrastructure on energy consumers through energy bills based on energy consumption used. This may mean consumers who are unable to invest in efficiency measures could potentially pay disproportionately more.

Alternatively, transmission infrastructure may be funded by government, TNSP's or private entities who may then recover costs incurred from load or generators connecting to their infrastructure. Existing or new network service providers may provide new transmission infrastructure as non-regulated or negotiated transmission services, as well as regulated infrastructure where the objectives of the RIT-T have been met. It is worth noting that a significant new load seeking to connect to the network is required to fund the total costs of any new transmission infrastructure and any existing transmission system augmentation required. Funded augmentation of the network has been occurring for many years.

AEMO's ISP is a plan designed to assess benefits of linked transmission infrastructure projects in the NEM. Projects in the ISP are assessed by AEMO based on their overall benefit in meeting the proposed optimal development path. However, the cost recovery method for ISP-promoted transmission infrastructure is still being considered.[46] Ultimately, the cost recovery for EnergyConnect may not align with what section of the project sits in which state boundary. In contrast, the regulatory decision to approve the construction and costs of new individual transmission projects as regulated transmission infrastructure based on the ISP is made on an individual project basis. This may create a potential mismatch between the theoretical benefits of the optimal development path identified in the ISP

[45] https://www.marinuslink.com.au/wp-content/uploads/2021/06/Wholesale-Pricing-Report-How-do-customers-benefit-from-Project-Marinus.pdf

[46] AEMC Transmission Planning and Investment Review

compared to that assigned to an individual project in the RIT-T process, which could be assessed as not providing an overall net market benefit.

There are many reviews underway on the transmission investments process, including the AEMC recent *Transmission Planning and Investment Review* currently in progress. But none of these seek to directly address the question of who should pay the significant costs associated with the transmission investment that will be required to complete the transition to a net zero emissions future. As an example, in 2016, the COAG Energy Council recognised the RIT-T process required a review and update to better co-ordinate investment between generation and transmission. In 2019, after almost three years of attempted reviews, the AEMC proposed the Coordination of Generation and Transmission Investment (COGATI), Transmission Access Reform (TAR) mechanism which proposed a new methodology for the allocation of transmission access to individual generators which was critically received by the industry. Whilst requests were made by numerous parties to address the question of who pays, this was not addressed as part of the review. Since then, debate on apportionment of individual generator transmission access and the allocation of costs of the new transmission infrastructure has continued with little or no sign of reaching a successful conclusion.

To speed up the development of transmission infrastructure and reduce the overall cost of new transmission investment, there may be a role for contestable provision of the new transmission infrastructure which will be required to achieve the target of net zero emissions by 2050, by allowing parties other than regional TNSP's to develop transmission infrastructure.

These parties could then provide access either via direct negotiation with connecting parties or through seeking a regulated return through application of the RIT-T. Data from the US markets indicates that allowing non-incumbent TNSP's to invest in transmission construction has resulted in significant cost saving when compared to only allowing investment by incumbent network service providers.

The current role of the TNSP encompasses planning and design, investment and construction, ownership and operation of transmission networks. In Victoria, AEMO undertakes the planning role, with investment design and construction being contestable, but the local TNSP owns and operates the network. While some aspects of transmission may be easier to make competitive than others, such as building and ownership, others are best placed with a single entity like planning, design and operation to ensure secure operation of the system.

Resolving the question of who pays for the new transmission infrastructure to ensure capital costs do not carry undue risk components is one possible way to ensure cost and economic risk is not borne by energy consumers alone.

Community support and social license are critical

While trust in the electricity sector sentiment has improved, up 36%[47] from a low in 2017, securing community trust and social licence are critical for successfully securing the support for any activity that affects communities. New transmission infrastructure not only has an investment cost but has real and perceived environmental, social and economic impacts on the surrounding communities.

The growth of VRE generation has meant communities have experienced a very different engagement process than is typical for transmission projects. Renewable developers had issues with gaining social licence in the early years but invested a lot of time in working with communities that host VRE

[47] Findings in Energy Consumers Australia's latest **Energy Consumer Sentiment Survey**- A record 70% of Australian household consumers now rate the value for money of electricity positively, up 13% over the last year and up 36% since the lowest point in December 2017. Summarised in this article- Satisfaction surges among energy consumers but future still holds concerns (energyconsumersaustralia.com.au)

generation projects to understand community needs. This level of engagement is new for TNSPs, because relatively little new transmission has been needed to be built since the 1990s. Communities are now both more knowledgeable, connected and active thanks to digital media and have higher expectations based on their experiences with renewable developers[48].

Additionally, the community benefit model that has worked so well for renewable developers has proven difficult to be accepted by incumbent TNSP's. While the Rules and AER Guidelines allow for benefits that can be considered for the securing of easements for new transmission infrastructure to date there has been little adoption of commercially negotiated options for community and landowner benefit schemes. [49].

The differences in approach between VRE generation, and regulated transmission infrastructure planning and construction also apply to the way investment is recovered once the transmission infrastructure is operational. The renewable generator is rewarded by selling electricity to customers via the market, while regulated transmission infrastructure investment is rewarded by a fixed, regulated return on the value of the transmission infrastructure, regardless of the utilisation of the infrastructure. However, the VRE generator is not able to be rewarded for their investment if their low emissions electricity is not able to get to the market because there is no transmission line or the transmission line is constrained.

The regulatory framework is too slow

The current regulatory process is:

- Not fast enough given the level of capacity required
- Does not consider environmental and social costs and benefits
- Not consistent with a system wide approach

Transmission investment decisions have been made on an as-needed basis, driven by defined consumer needs, and so investment in regulated transmission to facilitate the connection of new generation resources has been uncoordinated at best. The revised RIT-T commenced in 2009 and was intended 'to optimise the decision-making process in relation to regulated transmission planning as well as improve the consistency and transparency across transmission investment assessment'[50] and to ensure consumers' interests were placed first.

The RIT-T was designed to facilitate evaluation and approval of transmission infrastructure upgrades and extensions including large transmission projects on the basis of delivery of a net market benefit. Thus far, it has not been used to facilitate a program of multiple significant new major transmission build infrastructure projects as defined in the Draft 2022 ISP. Notwithstanding, the National Electricity Rules (NER) do not prohibit such an outcome and a RIT-T may be used to justify multiple transmission projects which connect together as a single project for RIT-T purposes. To date TNSP's have not undertaken such an outcome preferring to complete the RIT-T on a project-by-project basis. This may be due to the significant cost that such a super project may incur and concerns that such a project may not deliver a net market benefit overall. The RIT-T has been shown to be at times a far-from-optimal process, often taking two to three years of planning and regulatory approval for a new regulated transmission project. Most of this time is incurred by the TNSP's own internal design and

[48] RE-Alliance (2021) Building Trust for Transmission: Earning the Social Licence needed to plug in Australia's Renewable Energy Zones available at: https://assets.nationbuilder.com/vicwind/pages/2620/attachments/original/1637343712/RE-Alliance_July_21_Building_Trust_for_Transmission_compressed.pdf?1637343712

[49] https://www.aer.gov.au/system/files/AER%20-%20Final%20Decision%20-%20TransGrid%20-%20Project%20EnergyConnect%20Contingent%20Project%20-%20May%202021.pdf

[50] https://www.aemc.gov.au/rule-changes/regulatory-investment-test-for-transmission

assessment of the project. Transmission projects need to be carefully designed and costed to ensure all physical requirements are considered and met.

For example, serious work on Project EnergyConnect commenced in mid-2016 when Electranet and Transgrid began identifying options to be included in the RIT-T review. The RIT-T process approval submission was sent to the AER in June 2019 and approval of the RIT-T process was granted in January 2020 following the identification and review of significant issues in benefits claimed by the proponents in the RIT-T which led to a 70% reduction in claimed benefits[51]. Following this, a funding application for a revised and higher cost investment project was submitted to the AER in September 2020 to assess the proposed project costs to ensure they were prudent and efficient. The AER approved Electranet's and Transgrid's final application in May 2021[52]. In the case of Project Energy Connect, a period of approximately five years was needed to gain approval for a project through the current regulatory process, even when the project was deemed by AEMO as essential to the delivery of the benefits identified in the Draft 2022 ISP.

Adding to the above, in parallel with the investment approval, environmental impact assessments have been undertaken, along with extensive community engagement programs. Customer and stakeholder engagement on the RIT-T process alone took more than two years[53]. Whilst the RIT-T process can be lengthy, gaining acceptance of route selection and social license is also proving challenging. As an example, the Western Victorian REZ transmission project was approved as a regulated transmission investment project within two-and-a-half years. However, it has been held up the last two years over final route design and gaining social licence from the community.

Clearly, a faster overall approval process is required to deliver on the transmission build needed, while still being transparent and ensuring rigorous review and cost-efficient outcomes and the delivery of net benefits for all consumers, suggesting it is time to revisit the mechanism and rules that underpin the delivery of the ISP.

During the development of the actionable ISP rules[54], an approval process that was not reliant on the RIT-T was explored with AEMO directing a TNSP to build on the basis of the benefits outlined in the ISP. Ultimately, the final rules and AER guidelines focused on providing strong transparency to customers on the need for any ISP project through the use of the existing RIT-T process.

Relying on the ISP and the RIT-T alone to deliver regulated transmission investment may be insufficient to deliver the level of transmission investment that will be required to facilitate the transition to the net zero emissions world.

[51] [South Australian Energy Transformation] (aer.gov.au) Page 7
[52] These dates have been referenced from various publications from the AER, Electranet and Transgrid.
[53] https://www.aer.gov.au/system/files/ElectraNet%20-%20Project%20EnergyConnect%20Contingent%20Project%20Application%20-%2030%20September%202020.pdf
[54] https://www.aemc.gov.au/sites/default/files/2018-09/Options%20paper.pdf (see page 23)

How do we remove the roadblocks to building the transmission we need for transition?

New investment in transmission infrastructure is essential and is the missing link in Australia's low emissions energy transition. The transition to low emissions energy production is critical to meeting our climate targets, to our energy security and supply stability, and to controlling and abating cost of living pressures on Australians.

The problems are clear. It is time to work together on solutions. We offer some directions to initiate collaborative efforts to removing the roadblocks.

Roadblock 1: resolving the question of who pays

Call to action: Government funding and financing mechanisms to support new transmission build

Governments, state and federal, should develop mechanisms to support investment in the build of new transmission assets, including lower cost funding sources. Alternatively, governments could initially fund these projects and subsequently sell to a transmission asset owner, once the assets are operational and generating benefits in the National Electricity Market (NEM).

Governments should fund the cost of investigation and feasibility of projects as a way of expediting the approval of transmission infrastructure projects under the current RIT-T process.

Governments should ensure that benefit sharing for the communities that host new transmission is funded as part of any new transmission finance mechanism. Governments should also support the exploration of fair cost funding approaches to ensure that those who benefit from new transmission also contribute to the costs.

Contestability in delivering new transmission may deliver projects at a lower cost and governments should support exploratory work on how the various functions of the current TNSPs could be allocated appropriately to support competition, while still ensuring critical system security.

These proposed changes, if implemented correctly, would reduce financial risk for investors, reduce costs and economic risks to consumers, share costs with all beneficiaries, and unlock a funding pipeline for asset ownership.

Roadblock 2: regulatory approval processes are complex, uncertain and lengthy

Call to action: State governments need to facilitate approval processes

The current reliance of the actionable ISP rules on the RIT-T presents a fundamental hurdle in delivering new transmission in time. Governments, state and federal, should urgently seek a review of the need for the RIT-T in justifying ISP projects. Any new approach would still need to allow customers the certainty that any new transmission had benefits beyond the costs.

State and territory governments have a critical role in expediting state-based planning approvals and can ensure new transmission projects can progress rapidly. Where governments have established institutions to expedite the procurement and investments required to deliver on their net zero targets and climate action commitments, these institutions should become the vehicle for all aspects of the project approvals process. This includes assessing funding and contribution models that would address the issues related to both capital contributions, the fair allocation of cost to those that benefit from the transmission infrastructure project and community benefit sharing, as part of securing social licence for transmission projects.

STEPHANIE BASHIR
PRINCIPAL, NEXA ADVISORY
+61 402 060 120
STEPHANIEBASHIR@NEXAADVISORY.COM.AU