TransGrid

Integrated System Plan

Submission

February 2018

Executive summary

Australia is in the midst of an energy transformation characterised by changing consumer expectations, a trajectory to reduce greenhouse gas emissions, significant technological advancement and the progressive retirement of existing large generators. Over the next two decades, the national energy system will be substantially reconfigured as generation shifts from being clustered around coal fields to precincts with high quality renewable energy resources.

In New South Wales alone, around 8,000 MW of coal fired generation capacity is expected to retire over the next 20 years. Significant volumes of new generation will be required to maintain energy security during this transition and large scale renewables represent the lowest cost replacement technology. In some regions with strong renewable resources the transmission network is already congested, with new and existing renewable generators at risk of constraints. Additional network capacity will be needed to facilitate the next wave of generation development. The strategically planned connection of large scale energy zones, supported by greater interconnection, will provide consumers with the lowest priced energy and system security.

The benefits include:

- Connection of the lowest-cost generation in regions with the best quality renewable resources. These large scale generators can operate at higher capacity factors and are able to supply electricity to consumers at lower unit costs than generation in lower quality renewable resource areas
- Efficient transmission connection through economies of scale
- Geographic diversity of renewables across the National Electricity Market (NEM) to provide lowest cost intermittency firming
- Sharing of energy and ancillary services across regions to provide system security and resilience.

The transmission network provides a platform for the lowest cost electricity generation to be connected and dispatched, enhancing energy market competition.

Where possible, energy zones should be located to enable reuse of existing transmission infrastructure (as existing generation retires) to minimise transmission costs and maximise optionality, while facilitating low cost renewable generation.

To achieve this transformation and successfully deliver the objectives of security, reliability, affordability and emissions reduction, a strategic approach is required.

The Integrated System Plan was a key recommendation of the Finkel Review, to provide a long-term and nationally-coordinated approach to connecting new large scale energy resources. The Finkel Review observed that:[1]

"Incremental planning and investment decision making based on the next marginal investment required is unlikely to produce the best outcomes for consumers or for the system as a whole over the long-term or support a smooth transition. Proactively planning key elements of the network now, in order to create the flexibility to respond to changing technologies and preferences has the potential to reduce the cost of the system over the long term"

To ensure that the Integrated System Plan can be effectively implemented:

- The Plan should recommend a single pathway for generation and network development, taking into account future uncertainty and results from AEMO's central and bookend scenarios. The Plan should include a long term direction and specify a short term schedule for the development of priority transmission projects across the NEM for the next ten years
- The RIT-T Application Guideline should be updated to ensure that the RIT-T is not a barrier to delivering strategic transmission projects
- Transmission Network Service Providers (TNSPs) should treat AEMO's single development pathway as the central input to investment tests for Integrated System Plan priority projects.

TransGrid recommends that a two-step process be used to identify potential energy zones across the NEM and then combine and prioritise them for inclusion in the Integrated System Plan.

The nationally consistent framework to identify and prioritise large scale energy zones should consider the following criteria:

- Renewable energy resource quality and diversity to facilitate low-cost generation
- Proximity to firming capacity to improve the utilisation of transmission
- Opportunity to reuse existing network infrastructure where possible
- Proximity to load centres to minimise transmission connection distances and losses
- Cost of network augmentation to minimise connection costs.
- Suitability of geography and existing land uses
- Level of existing connection enquiries from potential project developers
- Level of community support for energy development within the zone.

The combination of energy zones and transmission recommended in the Integrated System Plan should balance economic efficiency, system reliability and emission reductions, along with:

- Robustness of solutions under several different future scenarios
- System resilience to further integrate intermittent generation and withstand shocks as generators retire
- Future optionality, including through the staged development of projects over time towards the most efficient ultimate solution for each large scale energy zone
- Strategic alignment with local, state and Commonwealth government priorities.

Within the national Plan, New South Wales plays an important role. TransGrid has identified large scale energy zones in New South Wales where the wholesale market benefits of connecting lower cost generation more than outweigh transmission investment to connect the zone.

The energy zones in New South Wales that score most favourably across the key criteria include:

1. South-East NSW and ACT
2. Northern NSW
3. Southern NSW

These priority zones have high quality solar and wind resources, compatible land use with low opportunity cost and low transmission augmentation costs. They are located on corridors between major population centres and maximise the use of the existing network.

The delivery of transmission connections to these zones should be staged over time so that lowest cost connections for new capacity in priority energy zones are completed first, new generation connection is enabled ahead of expected thermal retirements, risk of asset stranding is minimised and future optionality is preserved.

There are currently unprecedented volumes of connection enquiries to the New South Wales transmission network, with over 30 GW of wind, solar and pumped hydro projects at various stages of development. Only a fraction of these projects can be accommodated in the current network.

Given the scale and timeframe of expected retirements of existing coal fired coal fired generation, it is critical that frameworks are put in place to facilitate the development of new generation, so that anticipated demand can continue to be met with reliable and secure electricity at the lowest cost to consumers.

1 See Independent Review into the Future Security of the National Electricity Market: Blueprint for the Future, June 2017, pp 123.

Contents

1 Australia's energy system transformation

1.1 Transitioning the NEM to renewables

Over the coming decades, the national energy system will be substantially reconfigured, as generation shifts from being clustered around coal fields to precincts with high quality renewable energy resources.

Australia is in the midst of an energy transformation, characterised by:

- changing consumer expectations and greater demand-side participation
- a trajectory to reduce greenhouse gas emissions in accordance with Australia's international commitments
- significant technological advancement
- progressive retirement of existing thermal generators.

When it was first established, the NEM facilitated competitive trading by generators primarily located in fossil-fuel rich areas, for efficient supply to cities and other load centres. For much of the past decade, wholesale electricity prices in the NEM have been below the long-run marginal cost of new generation. This was due to legacy, low-cost fuel supply arrangements in place for generators and a significant oversupply of baseload capacity. For example, AEMO estimated that in 2014/15 there was up to 9,000 MW of surplus capacity in the NEM. However, generators now face higher fuel prices, with new coal and gas supply contracts being negotiated at prices significantly higher than historical levels, reflecting export competition. The supply-demand balance in the NEM has also tightened as several coal fired power stations have exited the market. In New South Wales, over 1,700 MW of coal fired generation has retired (the Munmorah, Redbank and Wallerawang C power stations). In other states, the withdrawal at short notice of Northern Power Station in South Australia in 2016, and Hazelwood Power Station in Victoria in 2017 has raised concerns about power system security and led to a sharp increase in wholesale and retail electricity prices.

This tightening of supply has occurred in an environment of policy uncertainty for the broader energy sector. A series of policy reversals and false starts over the course of a decade, particularly related to climate policy, created a barrier to new investment in generation. The result has been high and rising prices for consumers, and lower levels of system reliability and security. While the Large scale Renewable Energy Target (LRET) has successfully delivered new investment in renewable energy in recent years, a stable policy environment is required to support new investment beyond 2020 as ageing generation continues to withdraw.

The type of power generation being developed and its location are now changing. The existing thermal fleet is ageing and needs to be replaced. In New South Wales, around 8,000 MW (or 80%) of the existing coal capacity is due to retire by 2036 based on announcements already made and the expected operating lives of the remaining assets. This retirement and refresh is a normal feature of the energy system, but what makes the current transformation unique is a significant shift in the economics of generation technologies, including large scale and small scale renewable energy.

Technology cost trends suggest that renewable energy sources (primarily large scale solar and wind) are already the lowest cost energy options to replace retiring thermal generation and deliver cost-effective electricity to consumers. **Figure 1** presents a possible scenario of how electricity supply in the NEM may change over time, demonstrating the significant role that renewables will play as contributions from thermal generation decline. The existing design of the energy market, optimised to manage the legacy (rather than future) energy system, is not well equipped to manage the connection and operation of a system with increasing levels of renewables.

As generation capacity withdraws from the market, new generation needs to be available to ensure an orderly replacement. It is unlikely that new coal power stations will be developed in the NEM to replace retiring capacity because:

- the timeframe for the approval and construction of a new coal power station (and mine if needed) requires up to ten years, so does not present a timely solution to current concerns about energy prices and system security
- new coal contracts will be struck at market prices, which are well above historical levels. As a result, the levelised cost of energy generated by new coal power stations will be higher than that of competing technologies (see **Figure 2**)
- coal generation typically operates to a baseload profile, and therefore has limited flexibility to complement intermittent renewable generation in the market
- there is a risk that new coal power stations will be negatively affected by climate change policies over their operational lives (40 years or more), which impacts investment certainty and ability to access project finance.

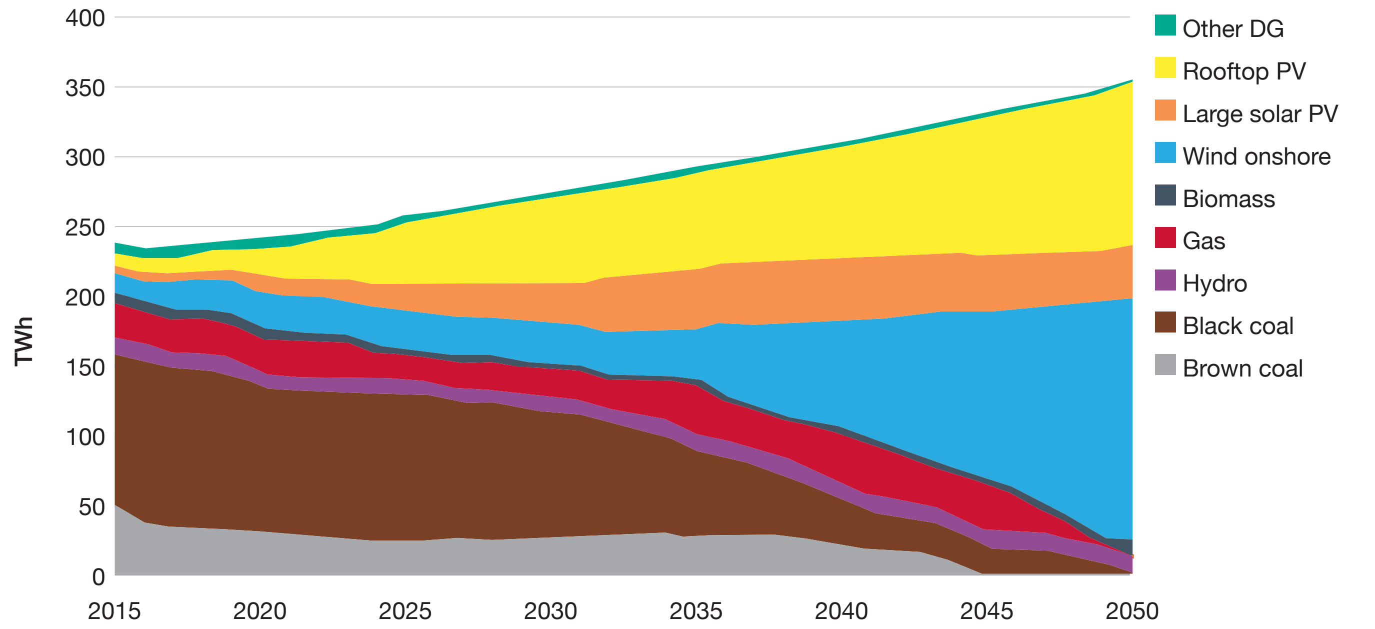
> "TransGrid supports the establishment of renewable energy zones as a way to provide an efficient solution for future power system development."

The transmission network also needs to be ready for new generation to connect as aging power stations reach the end of their operating lives. In the past, new power stations took considerably longer to develop and construct than the associated transmission augmentations. However, modern wind and solar farms can now be constructed in around a year, which is a far shorter timeframe than required for transmission development. While the location of power generation is likely to change, demand centres will continue be located in population centres. In New South Wales energy demand will continue to be centred on the densely populated Newcastle - Sydney - Wollongong regions. As commercial and industrial load makes up around 60 per cent of total electricity demand, delivery of the lowest cost reliable and secure electricity is critical to ongoing economic productivity. Similarly, there is a need to ensure that households and small businesses also have reliable, secure and lowest cost electricity supplies.

Under international climate change agreements, the Australian Government has committed to reducing national greenhouse gas emissions by 26-28% by 2030 (relative to 2005) and to working towards limiting global warming to no more than 2°C above pre-industrial levels. Achieving this target will require significant decarbonisation of the global economy by 2050, and the UNFCCC Paris Climate Agreement therefore includes a mechanism for countries to 'ratchet up' the ambition of their national targets over time. In Australia, electricity generation is the largest source of greenhouse gas emissions, and will therefore play a significant role in delivering abatement.

These economic and climate policy imperatives mean that transmission networks that can incorporate new, large scale renewable generation (and complementary flexible capacity to firm intermittent supplies, including energy storage) should be the primary focus of the Integrated System Plan.

Figure 1: Plausible projection of Australia's changing energy mix to 2050[2]



2 ENA and CSIRO, Electricity Network Transformation Roadmap, 2017.

1.2 Renewable energy will deliver lower unit costs

Large scale renewable energy sources such as solar and wind already offer the lowest-cost options to replace energy generation from traditional power stations reaching end of life. The lowest cost renewable supplies will come from zones with the highest-quality resources.

Large scale wind and solar can supply energy with a lower levelised cost than new coal and gas power stations, in the timeframe required by the anticipated retirement of existing coal fired generation, as shown in **Figure 2**. Over the past decade renewable technology costs have significantly declined, and this trend is forecast to continue as global investment accelerates. CSIRO analysis finds that neither system costs nor firming requirements rise significantly until renewables are providing over 60% of power generated in the NEM, suggesting that even a majority renewable-based system will deliver lower costs in future than a system powered by new thermal generation.[3] Due to planning approval and construction timeframes, as well as the anticipated future cost of thermal coal, refurbished or new coal would require significant government subsidies to compete with large scale renewables.

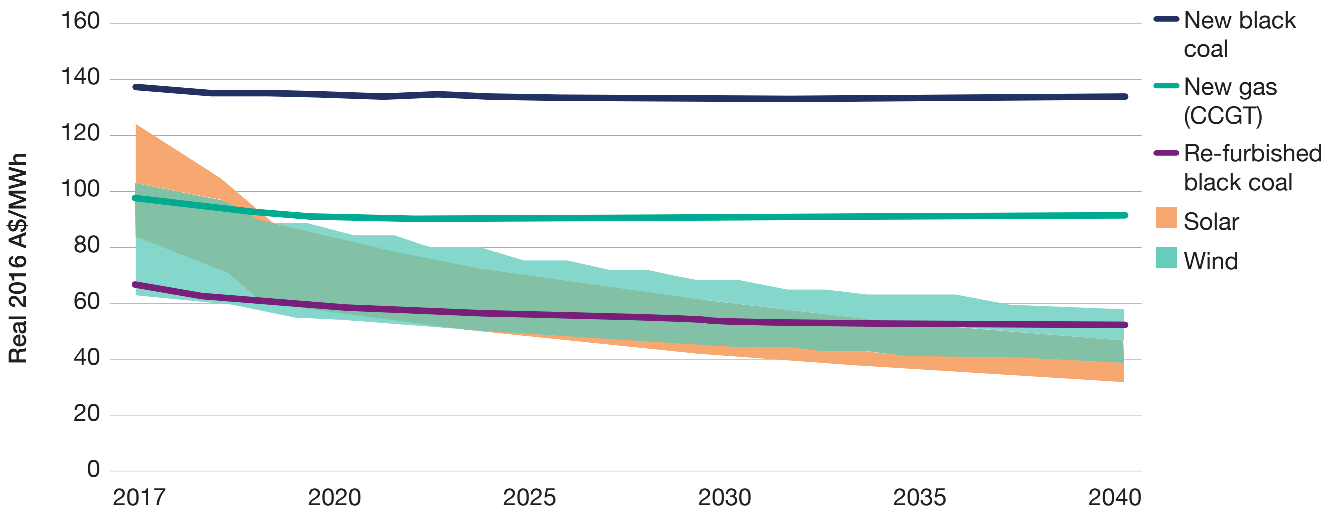
Distributed Energy Resources (DER) will play a growing role in Australian energy markets. Australia already has some of the highest rates of rooftop solar PV penetration globally, and as technology costs continue to decline, uptake of solar, energy storage and other behind-the-meter technologies will continue to grow. In the Electricity Network Transformation Roadmap, Energy Networks Australia and CSIRO forecast that by 2050 around 30-50% of electricity generation could be sourced from DER under some scenarios (up from about 3% currently).[5] However, despite the significant role of DER in many future scenarios, some commercial and industrial energy applications may be challenging for DER to supply in the near future, regardless of cost.

These include energy-intensive industries and densely populated urbanised areas with high demand relative to rooftop area. **Figure 1** demonstrates that even in a scenario with high DER uptake, the volume of electricity supplied from large scale generation and delivered via the transmission and distribution networks does not decline. Contributions from both large scale renewables and DER are needed as existing thermal capacity retires, and the mix of energy supply technologies will ultimately be driven by technology costs, consumer preferences and the design of energy markets and regulatory frameworks.

The future that the Integrated System Plan seeks to prepare for will be influenced by several emerging technologies and the response of energy consumers to them. Many organisations (in Australia and overseas) are currently assessing the potential of DER to deliver benefits to consumers, networks and wholesale markets. Large scale demand-response already delivers market and system benefits, and has the potential to play a greater role in future. TransGrid recommends AEMO account for this uncertainty in developing the Integrated System Plan by:

- Considering the opportunities and challenges presented by DER under a range of different uptake scenarios. In cases where these technologies offer a cost-effective alternative to large scale development they should be included in the Plan
- Placing a high value on optionality in the development of the Plan. This means favouring a least-regrets and benefits maximising approach to prioritising projects, and placing a premium on options that are robust to different scenarios and least likely to become stranded (see section 3.2 for further discussion).

Figure 2: Relative levelised costs of electricity generation technologies[4]



3 Analysis based on data sourced from: Bloomberg New Energy Finance, 2017; CSIRO Low Emissions Technology Roadmap, 2017; CSIRO Future Energy Trends, 2015.

4 Bloomberg New Energy Finance, 2017.

5 ENA and CSIRO, Electricity Network Transformation Roadmap, 2017.

1.3 Transmission can unlock lower energy costs for consumers

Connecting large scale energy zones to the transmission network will enable the development of low cost renewable energy projects and facilitate energy market competition. A coordinated plan to connect these regions, supported by greater interconnection, will help to deliver affordable and reliable energy to consumers.

The establishment of large scale energy zones will provide an efficient solution for future power system development. Proactively identifying regions best suited for renewable energy development, and extending existing transmission networks to connect them, will enable high quality and low cost renewable energy projects to be developed. TransGrid's existing transmission network in New South Wales is already congested in many areas, representing a barrier to the connection of new generation. Developing appropriate network infrastructure will facilitate the delivery of new generation capacity through the effective operation of the competitive market. Establishing energy zones will signal to project developers the locations where renewable projects will be supported, and where network capacity will be developed enabling timely connections and unconstrained energy dispatch.

There are potential energy zones in New South Wales where the benefits of connecting high quality large scale renewable resources to the electricity market more than outweigh the cost of the transmission connection to the zone. This is supported by analysis from Bloomberg New Energy Finance that indicates wind and solar farms in the highest quality resource areas can generate electricity at around half the unit cost of those in lower quality resource areas.[6]

Properly planned energy zones represent the most capital efficient way to connect new large scale renewable generation to the grid, because they:

- connect the lowest-cost renewable energy generation in regions with the best quality renewable resources, in which generators operate at higher capacity factors, and deliver lower energy unit costs to consumers
- minimise transmission costs by reusing existing infrastructure as much as possible, and realising economies of scale where new transmission connection is required
- facilitate renewable generation development in areas with compatible and low opportunity cost land uses and where it contributes to regional development priorities
- minimise the risk of stranded transmission assets by ensuring new transmission lines serve multiple connection points.

Increasing the level of system interconnection will also support the future renewable-based energy system. Interconnection developments offer opportunities to route transmission pathways through renewable resource rich precincts to facilitate greater connection, leverage geographic diversity and promote inter-regional competition and sharing of energy and ancillary services.

Geographic diversity can be a cost-effective method of firming for intermittent generation from wind and solar if different time zones and weather patterns can be captured. AEMO data shows that the correlation of output from current wind generators across the NEM decreases as the distance between the generation sources increases, as shown in **Figure 3**. In other words, the further wind farms are located from one another, the more likely they are to have diverse generation profiles.

New South Wales has relatively low levels of coincident weather patterns with other jurisdictions, making it a good choice for renewables development. The level of correlation between generation from wind farms located in New South Wales and South Australia or Victoria is only 34% and 50% respectively, while the correlation of wind farm output across South Australia and Victoria is 62%.[7] With around 75% of wind generation in the NEM currently in South Australia and Victoria, New South Wales can play an important role in firming intermittency via geographic diversity.

Solar will generate when the radiation from the sun is the greatest, in the middle of the day. This complements average wind generation patterns. Situating large scale solar generation west of major load centres would capture greater solar radiation in more westerly time zones corresponding to evening peak demand in easterly load centres. Geographic diversity of solar generation also mitigates the effect of reductions in output during periods of localised cloud cover.

The International Energy Agency has identified interconnectors as the most cost-effective approach for integrating and aggregating a large share of variable renewable energy and maintaining energy security.[8] This is consistent with AEMO analysis for the 2016 National Transmission Network Development Plan (NTNDP), which found that the cost of interconnection over the next 20 years would equate to approximately 4% of the required investment in generation over the same period.[9] Relative to the cost of regional thermal generation or energy storage investment, interconnectors can provide a cost-effective method of managing intermittency.

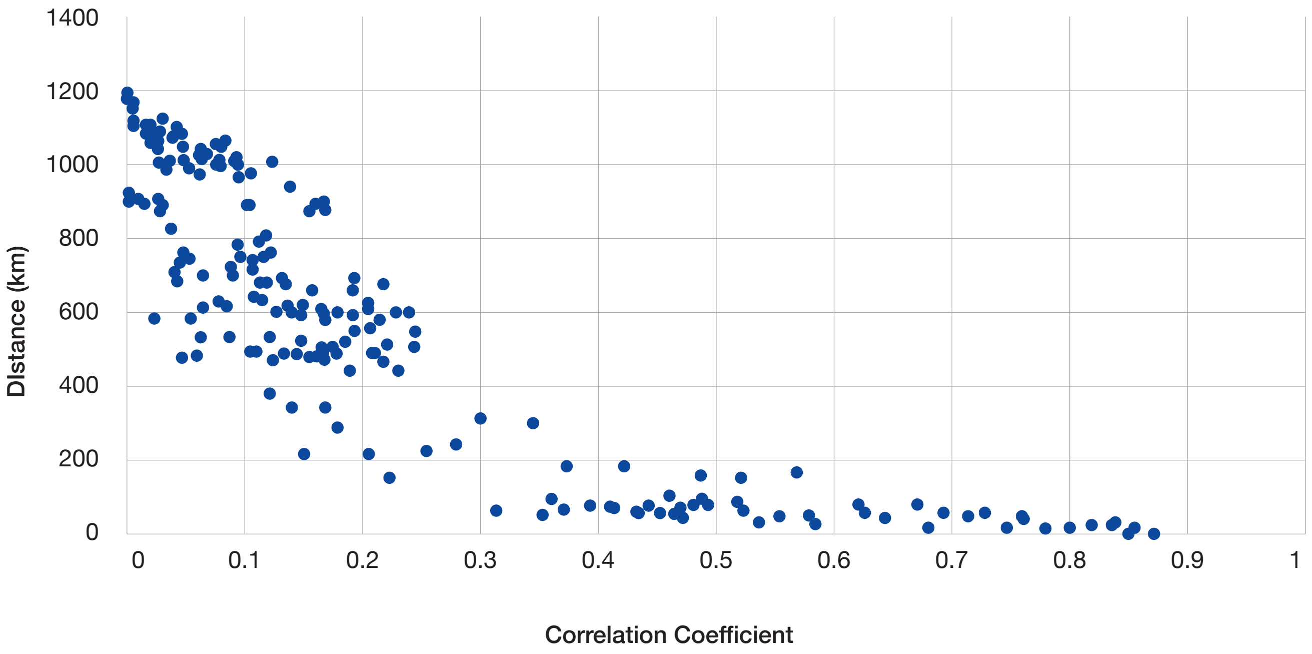
6 Considered on a LCOE $/MWh basis. Briefing by Quong, L. (2017) '2Q 2017 Australia REC Market Outlook', BNEF.

7 ITK analysis of the 12 months to January 2018,as reported by RenewEconomy, *Australia wind and solar projects: 2018 starts with a claret run*, 2 February 2018.

8 International Energy Agency, *Re-powering Markets - Market design and regulation during the transition to low-carbon power systems*, 2016.

9 AEMO, *National Transmission Network Development Plan*, December 2016, p32.

Figure 3: Correlation between installed NEM wind generation during 2015/16[10]



International jurisdictions undertaking a transition to renewable energy are also pursuing greater interconnection as a key tool to support a decarbonised electricity network. For example, the European Union has set a target to have 10% of all European generation capacity interconnected by 2020 (currently around 8%) and 15% by 2030 to facilitate greater market integration and additional renewable energy capacity.[11] Germany, the UK and Denmark are amongst those countries benefiting from strong interconnection to neighbouring energy systems.

10 AEMO Medium Term Projected Assessment of System Adequacy (MTPASA) Review Project Report 2016; Ernst & Young Australia.

11 European Commission, Communication from the Commission to the European Parliament and the Council – European Energy Security Strategy – SWD (2014) 330 Final, May 2014.

2 Rules developed for a mature coal based system will not deliver

2.1 Challenges with existing market-led approach to planning

For Australia to successfully achieve an energy transformation, a structural change to the physical network will be required. Existing market and regulatory frameworks were established to support incremental investment in energy infrastructure, and are not suitable to deliver transformational change across the NEM.

Relying on the existing market-led approach to generation and transmission planning will not deliver a reliable or low cost outcome for consumers in the timeframes in which existing thermal generation will retire. Australian energy markets currently feature failures and inefficiencies which present barriers to timely development of energy infrastructure. These include:

- The regulatory frameworks that currently facilitate investment in transmission typically require new generation to lead network expansion, creating a 'chicken and egg' dilemma: new generation projects in areas with high quality renewable energy resources cannot be committed without transmission access, but proactive transmission expansion is not supported. Investors will only commit to generation once they have assurance of a network they can reasonably connect to, and which will provide sufficient capacity to deliver their generation (i.e. they will not be 'constrained off')
- There is a misalignment of incentives between generation and transmission. Generators are currently incentivised to develop renewable projects near existing transmission lines, where connection costs are lowest, despite often not being in areas with highest-quality resources. Connecting into lower-voltage systems (such as at 132 kV, 66 kV or 33 kV) is lower cost for generators, yet these systems are less able to support intermittent generation and are unable to efficiently deliver the scale of generation required by major load centres. The system costs of inefficiently locating renewable investments are ultimately borne by consumers
- Transmission systems in many areas are becoming increasingly congested, and as new connections occur, new and existing renewable generators face growing risks of being constrained at certain times (raising the unit cost of the generation they can deliver to consumers). The risk of congestion from competing generation projects is visible to TNSPs and the network operator, but less so to prospective generators. This can result in over-investment in under-utilised assets, as well as generators with access to high quality resources being crowded out by those accessing lower quality resources closer to load centres
- Major transmission investment can be achieved at lowest cost due to economies of scale. For example, the cost of installing a 500 kV transmission line to connect a new energy zone is less than double the cost of a 330 kV transmission line, but delivers around three times the capacity. However, the current RIT-T favours incremental just-in-time investments (even at a higher total cost).

Compounding these issues is the challenge that new generation technologies can be constructed in less than a year, considerably faster than the time required to develop the required transmission lines (for example, completing the regulatory investment test process takes a year in itself). Constructing a new coal fired generator requires several years, so in the past the commitment of new generation could effectively trigger transmission development. However today new renewable generation are instead relying on connections to the existing grid. As existing transmission networks rapidly become congested, additional network capacity will be required to facilitate the development and connection of the next wave of generation investment. This capacity should be delivered in a coordinated way under a strategic plan, rather than sub-optimal incremental developments.

The open access regime for generator connections in the NEM could also be a barrier to developing large scale energy zones as intended by the Integrated System Plan. If transmission to an energy zone is built, other generators may wish to connect to the network along that transmission route, but outside of the energy zone and where renewable energy resources are not as good. This generation may be closer to load centres, and more likely to be dispatched first. Over time, if several generators connect in this way, the generation in the energy zone may eventually become constrained, and the consumer benefits of connecting high quality resources could be diminished. The establishment of large scale energy zones should therefore provide incentives for generation development within the zone, and relative disincentives for the development of generation at other locations along the transmission line.

2.2 Current investment tests are not suited for strategic projects

The existing RIT-T represents a barrier for delivering strategic transmission projects.

The regulatory investment test for transmission (RIT-T) is an appropriate test to assess incremental transmission investments and deliver them 'just in time' to achieve net market benefits to existing NEM participants (as it was originally designed). However, this approach is not suitable for assessing priority projects under the Integrated System Plan, which by their definition are strategic in nature, and which will underpin the transformation of the NEM over the long term for the benefit of consumers.

Given the extensive economic modelling and public consultation that AEMO is undertaking in the development of the Integrated System Plan, a requirement for transmission network service providers (TNSPs) to substantially reproduce this work in a RIT-T would add little value, and would delay the development of the strategic projects.

It is essential that the Integrated System Plan act as a 'circuit breaker' to resolve the treatment of uncertainties relating to system developments, generation commitments and other market conditions in the preparation and assessment of the RIT-T.

Issues with the existing RIT-T

The existing RIT-T is not suitable for assessing strategic developments, because:

- **Its consideration of strategic benefits valued by consumers is limited:**
  - It offers limited flexibility to place appropriate weight on scenarios based on strategic objectives, such as potential ability of the electricity sector to reduce emissions reductions more readily than other sectors
  - It does not assign appropriate weight to high-consequence scenarios such as the earlier than expected retirement of generation which are therefore significantly discounted. These events expose consumers to market shocks and high prices during the extended timeframes required to upgrade infrastructure, as was the case with the recent withdrawals of the Northern and Hazelwood Power Stations
  - It does not consider benefits that can be achieved outside the electricity market, for example the impact of lower wholesale gas and electricity prices on other sectors.

  We need an investment test that appropriately considers strategic benefits.

- **It creates a "chicken and egg" dilemma:**
  - The outcomes of the RIT-T are often inconclusive if new generation developments are uncertain
  - However, new generation developments need certainty they will be able to export their power to market via suitable transmission connections to make a financial investment
  - The timeframes to develop transmission are often longer than for wind and solar farms.

  We need an investment test that can lead generation development rather than follow it.

- **The test favours incremental investments in generation and transmission, which are often more expensive for consumers in the long run:**
  - Incremental investments do not provide the same economies of scale as larger investments
  - Marginal investment in generation is likely to minimise capital at risk for proponents, which can result in sub-optimal technology selection, or placement of wind and solar developments, leading to higher unit energy prices for consumers. This is particularly true in the current uncertain policy environment.

  We need an investment test that facilitates generation with the lowest unit cost for consumers.

- **The RIT-T can be delayed by individual interests through the disputes process:**
  - Transmission developments can create "winners" and "losers" amongst existing generators, despite providing overall benefits to consumers
  - The disputes process under the RIT-T can delay or derail beneficial projects, particularly where there is uncertainty.

  We need an investment test that cannot be frustrated by the interests of individual market participants, at the expense of consumers.

2.3 Scale Efficient Network Extensions

Current rules have not delivered scale efficient investment.

The Scale-Efficient Network Extensions (SENE) rule was made by the Australian Energy Market Commission (AEMC) in 2011. The purpose of the rule was to capture the benefits of scale economies by building capacity for a cluster of expected future generation connections. The rule that was made by the AEMC was quite different to the rule that was initially proposed by the Ministerial Council on Energy.[12] TransGrid believes that the current SENE rules are not delivering scale efficient investment and should be reviewed.

The rules that were made by the AEMC include a framework whereby a SENE funder would bear the risk of investing in transmission extensions to accommodate future, uncommitted generation. Investment costs would eventually be recovered through commercial negotiations with generators seeking to connect to the SENE (for 'contestable services') and in accordance with regulation (for 'negotiated services'). The SENE funder (and/or connecting generators) would be exposed to asset stranding risk in the event that forecast connections did not occur. It is currently unclear whether the regulatory arrangements would allow investors to earn a return commensurate with the risks, for the part of the investment that is treated as a negotiated service. As a result, SENE investments are considerably higher risk and potentially lower reward than investments by a TNSP in its prescribed business.

No TNSP has ever successfully established a SENE, and under the current rules, TransGrid considers that this is unlikely to occur in future.

The rule that was originally proposed by the COAG Energy Council allowed transmission capacity to be built by TNSPs in anticipation of future generator connections by requiring consumers to underwrite the cost (and risk) of spare capacity, to be paid back through generator charges as generation connected over time. It was envisaged that AEMO would play a role as part of the National Transmission Network Development Plan in identifying possible geographic zones where substantial scale efficiencies would emerge from the development of extensions in that area. This appears to be similar to the current work AEMO is undertaking in the Integrated System Plan.

TransGrid has experience in following the SENE process which highlights the issues with the current approach as outlined in the case study.

Case Study: New England Renewable Energy Hub

With support from the Australian Renewable Energy Agency and the NSW Government, TransGrid conducted a feasibility study for developing a Renewable Energy Hub in the New England area (REHub). TransGrid facilitated the cooperative framework between generators within the existing connections framework.

At the time, three wind farm projects in the region were in separate negotiations with TransGrid seeking connection to the network. The development of individual, stand-alone connections for the wind farms was found to be possible, but at a cost estimated to be 18% higher than through a shared connection (a REHub). TransGrid considered that establishing a REHub may also attract further energy projects to the region in future.

During this process, a number of commercial challenges were encountered:

- Asset stranding risk: Once the SENE becomes fully subscribed then the economies of scale for the development will deliver cost benefits, however if all connections do not eventuate as forecast the oversized asset may not be fully utilised, resulting in sub-optimal returns
- First-mover disadvantage: Generators connecting early may be expected to fund a greater share of the REHub, bearing excess connection costs and giving rise to cross-subsidies in future connections. All generators would expect that the costs of connecting to the REHub would not be greater than the cost of connecting individually
- Timing: It is unlikely that all potential generators will be in a position to commit to be connected at the time that the REHub is initially built
- Competitive considerations: Under a cooperative framework for sharing connection assets, each generator is essentially facilitating the connection of a competitor at a lower price than they would otherwise pay. Broader considerations may tend to make generators less willing to cooperate with their competitors, or share information, despite the benefit of a lower connection cost and better financial project outcome for themselves
- Regulatory classification of services: The REHub would primarily provide 'contestable' services (cost recovery via commercial negotiation) and 'negotiated' services (for which price must reflect the cost of providing the service), rather than forming part of the 'shared network' in TransGrid's regulated asset base. Upgrades to the shared network to accommodate the REHub and relieve congestion would be subject to a RIT-T. It is unclear whether regulatory frameworks would enable a reasonable rate of return to be earned on the REHub investment, commensurate with the risks.

Ultimately, these challenges could not be overcome, and no investor (including TransGrid, the connecting generators or a third party) was willing to fund the REHub and accept the risks involved. Only two of the three projects have been able to individually connect to the network.

12 The Ministerial Council on Energy is now known as the COAG Energy Council. The original rule change request is available at http://www.aemc.gov.au/rule-changes/scale-efficient-network-extensions.

3 A strategic approach is needed to deliver the energy transformation

3.1 The Integrated System Plan needs to be a 'game changer'

The Integrated System Plan will provide a long-term and nationally-coordinated approach to deliver lowest possible energy costs, maintain system security and connect renewable energy resources.

The Integrated System Plan represents a genuinely strategic planning approach to integrate generation and facilitate timely investment to adapt the NEM for the future and to replace ageing thermal generation scheduled for retirement. It was a key recommendation of the Independent Review into the Future Security of the NEM (the 'Finkel Review'). Considering the scale of change required, the Finkel Review observed that:[13]

"Incremental planning and investment decision making based on the next marginal investment required is unlikely to produce the best outcomes for consumers or for the system as a whole over the long-term or support a smooth transition. Proactively planning key elements of the network now, in order to create the flexibility to respond to changing technologies and preferences has the potential to reduce the cost of the system over the long term"

TransGrid agrees with the Finkel Review's conclusion that a strategic approach is required to coordinate the development of electricity generation and transmission infrastructure as the NEM transitions to a low-emissions future. The failure of existing market mechanisms to deliver orderly development of new energy infrastructure has contributed to high energy prices and system security issues and a more proactive and centrally coordinated approach is warranted. The Integrated System Plan is the appropriate vehicle to identify efficient development of generation and transmission, ensure identified projects are robust across different potential futures and prioritise their development accordingly.

A coordinated jurisdictional planning process will provide the platform to incentivise the most efficient generation and transmission development, and is imperative to achieving the National Electricity Objective. The transmission platform enables the lowest cost electricity generation to be connected and dispatched, enhancing energy market competition and achieving allocative efficiency. It will play an essential role in aligning market signals with long-term system requirements, facilitating future investment and achieving an affordable, reliable and decarbonised energy supply.

3.2 Framework to assess and prioritise projects

TransGrid recommends a two-step process be used to first assess the suitability of potential large scale energy zones, and then to prioritise and combine energy zones and transmission developments for inclusion in the Integrated System Plan to maximise value across the NEM.

3.2.1 Criteria for identifying and prioritising individual energy zones

Each potential energy zone across the NEM should be assessed against the following criteria:

- Renewable energy resource quality and diversity: potential for top-tier renewable energy projects to be developed in the region giving rise to a low cost per unit of generation
- Proximity to firming capacity: the use of technologies within the region to firm intermittency (such as pumped hydro, natural gas, biomass, etc.) will improve the utilisation of transmission connections
- Proximity to load centres: transmission connection distances and line losses will be minimised
- Cost of network connection: energy zones located near the existing transmission network present an opportunity to utilise existing infrastructure, minimising augmentation costs
- Suitability of geography and land use: existing industries and land uses are compatible with renewable energy development, for example land that is not indigenous protected, national park, or high yield agricultural
- Level of connection enquiries: existing interest in network connection from potential project developers
- Level of support from local communities for energy development in the zone: local community support will be critical to the success of any energy zone. Consultation and engagement with local communities will be required as the Integrated System Plan is developed.

The energy zones that perform well against these criteria should be further considered for inclusion in the Integrated System Plan.

13 See *Independent Review into the Future Security of the National Electricity Market: Blueprint for the Future*, June 2017, pp 123.

3.2.2 Principles to consider in AEMO's national assessment framework

Once the potential energy zones across the NEM have been prioritised (using the criteria outlined in section 3.2.1), a least-regrets and benefits-maximising framework should be applied to identify the best combination of projects for inclusion in the Integrated System Plan. The assessment framework for the overall NEM-wide Plan should consider:

- Economic efficiency: the combination of generation and transmission developments that give rise to the lowest overall system cost, and deliver the lowest unit cost of energy to consumers[14]
- Robustness: developments that deliver net benefits to consumers under several future scenarios and sensitivities, including those with the highest likelihood
- System resilience: developments that improve the system's ability to further integrate intermittent generation and withstand shocks (such as the withdrawal of thermal generation units from the market at short notice, without resulting in system security issues or extreme pricing outcomes for consumers). This can be achieved through diversity of energy supply technologies, geographic spread, provision of ancillary services, interconnection and the removal of single points of failure
- Emission reductions: developments that facilitate a progressive reduction in greenhouse gas emissions from the NEM, consistent with Australia's national targets and international commitments, and which can also accommodate a 'ratcheting up' of ambition over time
- Security and reliability: developments that enable the NEM (and each region within the NEM) to meet defined reliability and security standards (for example, under the National Energy Guarantee)
- Optionality: developments that establish the option for further development of the power system as required under different future scenarios. For example, transmission developments which facilitate future network interconnection and the establishment of a 'meshed network', or which can support the development of wind, solar and/or other energy resources depending on the relative economics of technologies in the future
- Strategic fit: developments aligned with broader policy objectives, including local government development plans, state government planning policy and COAG Energy Council and Energy Security Board priorities.

Such a framework will minimise the risks of significant over-build, under-build, stranded assets and higher than necessary consumer costs, while maintaining system security and reliability. In some circumstances, trade-offs may be required between the least-cost pathway (based on modelled benefits), and solutions that offer other benefits, such as robustness, optionality or system resilience. TransGrid recommends that the Integrated System Plan include projects for which development can be staged over different time horizons (the next five years, five to ten years, ten to twenty years, etc.), to recognise the currently announced and anticipated scale of retirement of existing thermal generation. This will minimise the capital at risk for each stage, and preserve optionality to cater for different futures.

It is important that this framework consider a broader range of risks and benefits than the existing processes that assess incremental transmission developments. This is essential to arrive at a 'least regret' outcome, given the long-term and strategic nature of the developments under consideration, and with retirements of traditional generators certain over the planning time horizon. In assessing the costs and benefits of different projects, due consideration must also be given to the counterfactual situation which would occur under current arrangements. In many cases, the cost that consumers would bear as a result of sub-optimal renewable project locations, network constraints, and piecemeal and catch-up transmission investments under the status quo would be considerable.

TransGrid expects that the application of the proposed national assessment framework will support the strengthening of energy flow paths between major population centres in the NEM. For example, greater interconnection between South Australia, Victoria and New South Wales will enable sharing of low cost renewable generation, firming capacity and ancillary services between regions, and remove single points of failure within the system.

14 While this framework describes productive efficiency, we note that energy market design and operation also considers allocative efficiency (to ensure the marginal cost of production is equal to the marginal utility) and dynamic efficiency (as firms become more efficient over time due to innovation and technological and process improvement).

3.3 A clear pathway is required to implement the Integrated System Plan

Regulatory frameworks that recognise and implement the Integrated System Plan in a streamlined and timely manner are required.

The Integrated System Plan will provide a detailed plan for an energy system that maximises benefits for consumers over the long-term. It is essential that the Plan is implemented effectively, and that the priority projects identified are delivered in a timely manner.

As it is currently applied, the RIT-T will not provide the certainty required to assess strategic transmission developments. TransGrid recommends that AEMO and the Australian Energy Regulator (AER) provide clarifications to ensure that the Integrated System Plan can be implemented as intended. These changes are required to address the challenges with applying the RIT-T to an inherently uncertain future.

3.3.1 The Integrated System Plan must provide precision

The AER acknowledges that one of the difficulties that TNSPs encounter when applying the RIT-T relates to the *"material uncertainty over the future market supply and demand conditions and characteristics"* and as guidance the AER proposes that *"this is to be primarily reflected in the choice of the range of reasonable scenarios"*.[15]

It is essential that the Integrated System Plan act as a 'circuit breaker' to resolve the treatment of uncertainties relating to system developments, generation commitments and other market conditions in the preparation and assessment of the RIT-T.

The first Integrated System Plan must:

- Provide a clear set of scenarios and assumptions that can be used by TNSPs as input values when applying the RIT-T (such as forecasts around generation). This will ensure a like-for-like analysis by AEMO (in the Integrated System Plan) and TNSPs in their detailed project assessment
- Recommend a single pathway for generation and transmission development in which priority projects are identified. In preparing this pathway AEMO should consider analysis results across the range of scenarios and sensitives, and balance different criteria as required (see section 3.2 for a discussion of criteria that should be considered). This single, credible future market development path would then be used as the 'base case' by TNSPs when conducting the RIT-T
- Provide a long term direction for system planning and a detailed plan for the next ten years, including scheduling for developments (including capacity requirements and development timeframes). Priority projects will need to be identified by AEMO before 2019 to enable timely development
- Optimise across network and non-network options when recommending priority generation and transmission developments.

3.3.2 Greater guidance required in the RIT-T Application Guideline

The AER is currently reviewing its Application Guideline for regulatory investment tests. The AER's review and the Integrated System Plan must each give consideration to the other, rather than be developed in isolation.

There are two ways in which the AER could improve the guidance that it provides on the operation and application of the RIT-T:

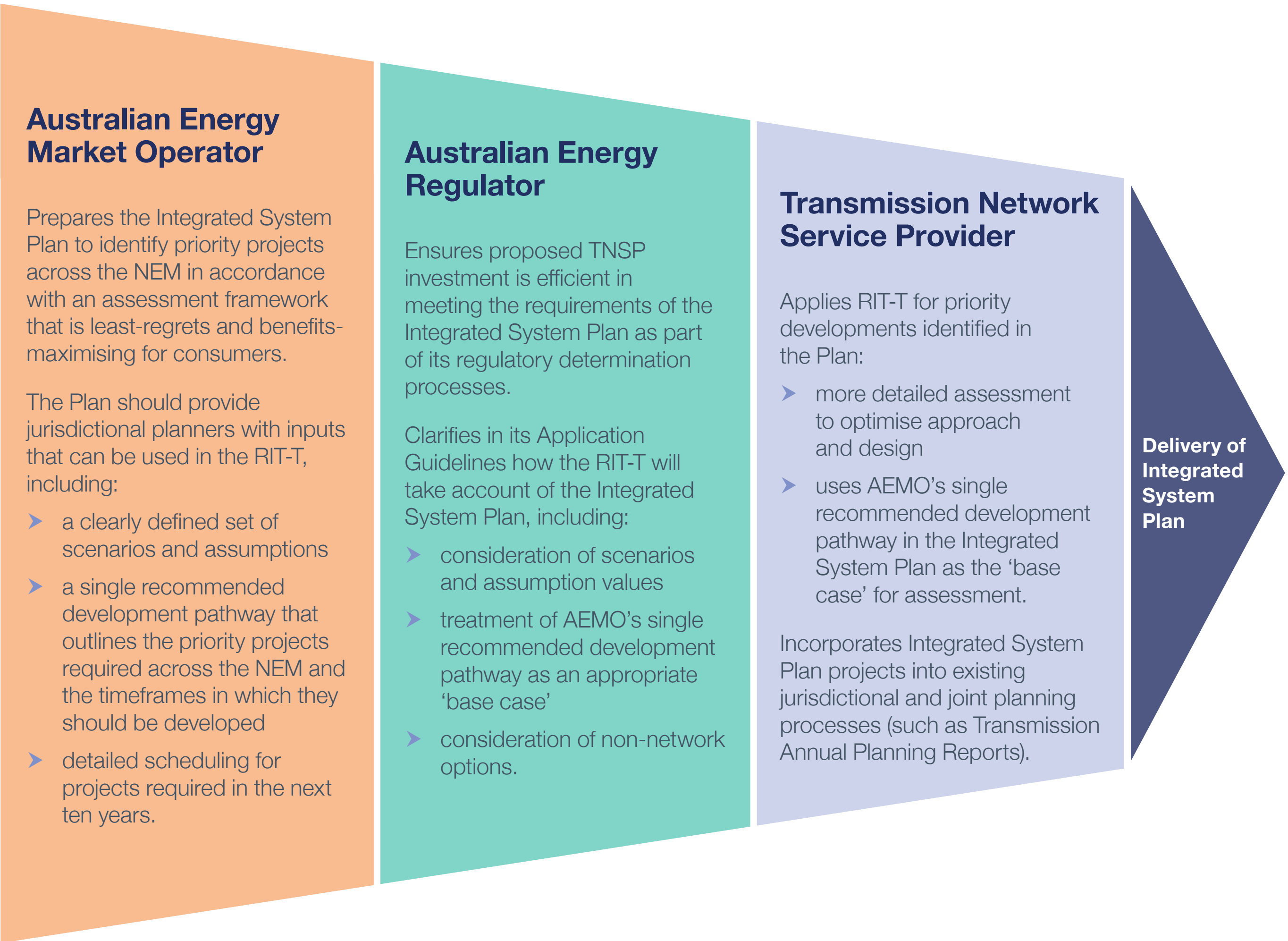
- Provide clarification that the range of scenarios considered in the Integrated System Plan, covers the range of reasonable scenarios that a TNSP should apply in administering the RIT-T, and that AEMO's recommended development pathway represents a suitable 'base case'. TNSPs, and other stakeholders, must be able to rely on analysis and forecasts contained in the Integrated System Plan when conducting the RIT-T
- Provide clarification that the consideration of needs and options by AEMO in the development of the Integrated System Plan is appropriate to satisfy the requirements of the Project Specification Consultation Report (PSCR) of the RIT-T. For timely delivery of projects under the Plan, TNSPs could rely on the consultation carried out by AEMO to satisfy the PSCR consultation and commence the RIT-T process at the Project Assessment Draft Report stage (following which there is a further round of consultation on the results of the investment test).

15 See AER, RIT-T Application Guidelines, p.32, https://www.aer.gov.au/system/files/Final%20RIT-T%20application%20guidelines%20-%2029%20June%202010.pdf.

3.3.3 Proposed pathway for efficient delivery of the Integrated System Plan

Figure 4 presents TransGrid's suggested process for ensuring that priority projects are delivered effectively.

Figure 4: Roles and responsibilities for preparing and implementing the Integrated System Plan



AEMO has noted that the purpose and scope of the Integrated System Plan encompass those which would normally be covered in AEMO's NTNDP. We also understand that the AER has permitted AEMO to defer the release of the 2017 NTNDP and to integrate it into the ISP.[16]

TransGrid would welcome clarification from AEMO and the AER about how existing regulatory frameworks will be used to recognise and implement the Plan, and how these will interact with existing transmission planning processes under the National Electricity Rules. There is a critical need for consistency between the national transmission framework and existing regional and joint planning arrangements. With clarification and consistency, the Integrated System Plan can be effectively implemented by incorporating any priority projects into the existing responsibilities and processes of jurisdictional planners.

TransGrid supports the role and responsibilities of AEMO as the National Transmission Planner. AEMO is well placed to prepare the Integrated System Plan and raise issues or provide advice of a market development nature. The AER provides regulatory oversight when setting a TNSP's revenue allowance and guidance on the application of the RIT-T.

16 See AEMO website, http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Transmission-Network-Development-Plan.

3.3.4 Additional changes to the regulatory framework may be required

The process outlined in section 3.3.3 represents a pathway for existing regulatory processes to deliver the priority projects recommended in the Integrated System Plan, so long as certain information is included in the Plan, and clarifications are made to the RIT-T Application Guideline. It includes expert economic and market analysis, oversight and national planning by AEMO and timely project delivery via existing jurisdictional transmission planning processes.

However, if this approach is not adopted, then an alternative pathway would be required to deliver the Integrated System Plan. This may involve:

- Ministerial direction to deliver the Plan
- Changes (or derogations) to the National Electricity Rules, such as to recognise the standing of the Integrated System Plan in the regulatory framework, or to exempt priority developments identified in the Integrated System Plan from the RIT-T
- The development of an alternative (or modified) investment test for strategic transmission projects, which could consider a broader range of economic benefits outside the electricity market (for example the impact of lower wholesale gas and electricity prices on other sectors)
- Establishing a 'conditional RIT-T' to encourage generators to commit to development in the proposed energy zone.

4 The System Plan for New South Wales

4.1 Optimum renewable energy development in New South Wales

TransGrid has identified the optimum areas in New South Wales for large scale renewable energy development.

TransGrid and Aurecon have collaborated to map and analyse the potential for renewable energy development throughout New South Wales. The analysis considered the quality of renewable energy resources, existing land use, proximity to the existing transmission network and factors that affect the feasibility of generation development (such as terrain).

The analysis has been undertaken to 50m resolution to ensure that the results are robust and suitable to support strategic planning and ultimately investment decisions. A map of the ratings for wind generation is shown in **Figure 5**, and for solar generation in **Figure 6**. In these figures, the most favourable locations for renewable development are shown in green, and the least favourable zones are shown in red.

Figure 5: Wind generation development ratings for New South Wales[17]

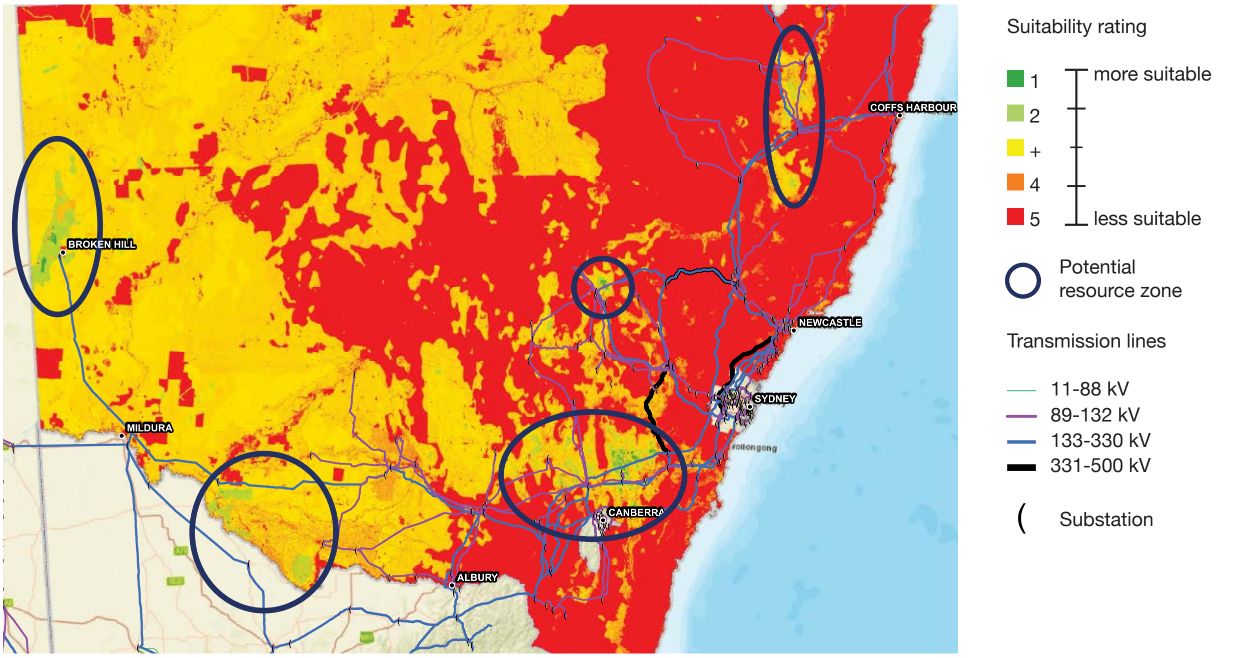
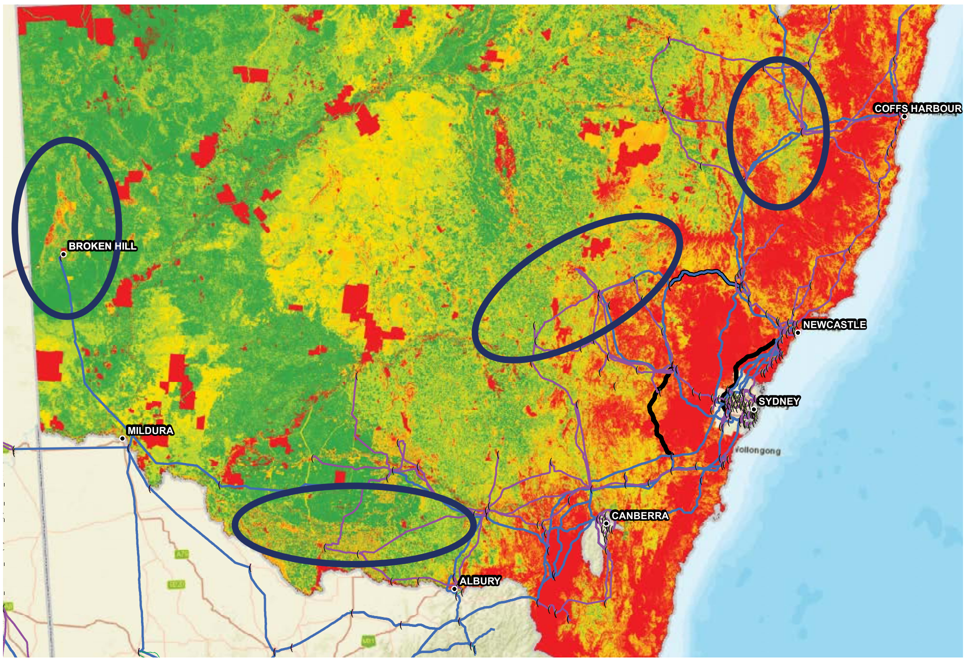


Figure 6: Solar generation development ratings for New South Wales[17]



17 Analysis and mapping prepared by Aurecon.

4.2 Current connection interest

TransGrid has an unprecedented volume of generation connection enquiries with over 30,000 MW of potential solar, wind and hydro projects at various stages of development.

The connection enquiries are situated throughout New South Wales, in locations close to the existing transmission network. A summary of the enquiries by zone is shown in **Figure 7**.

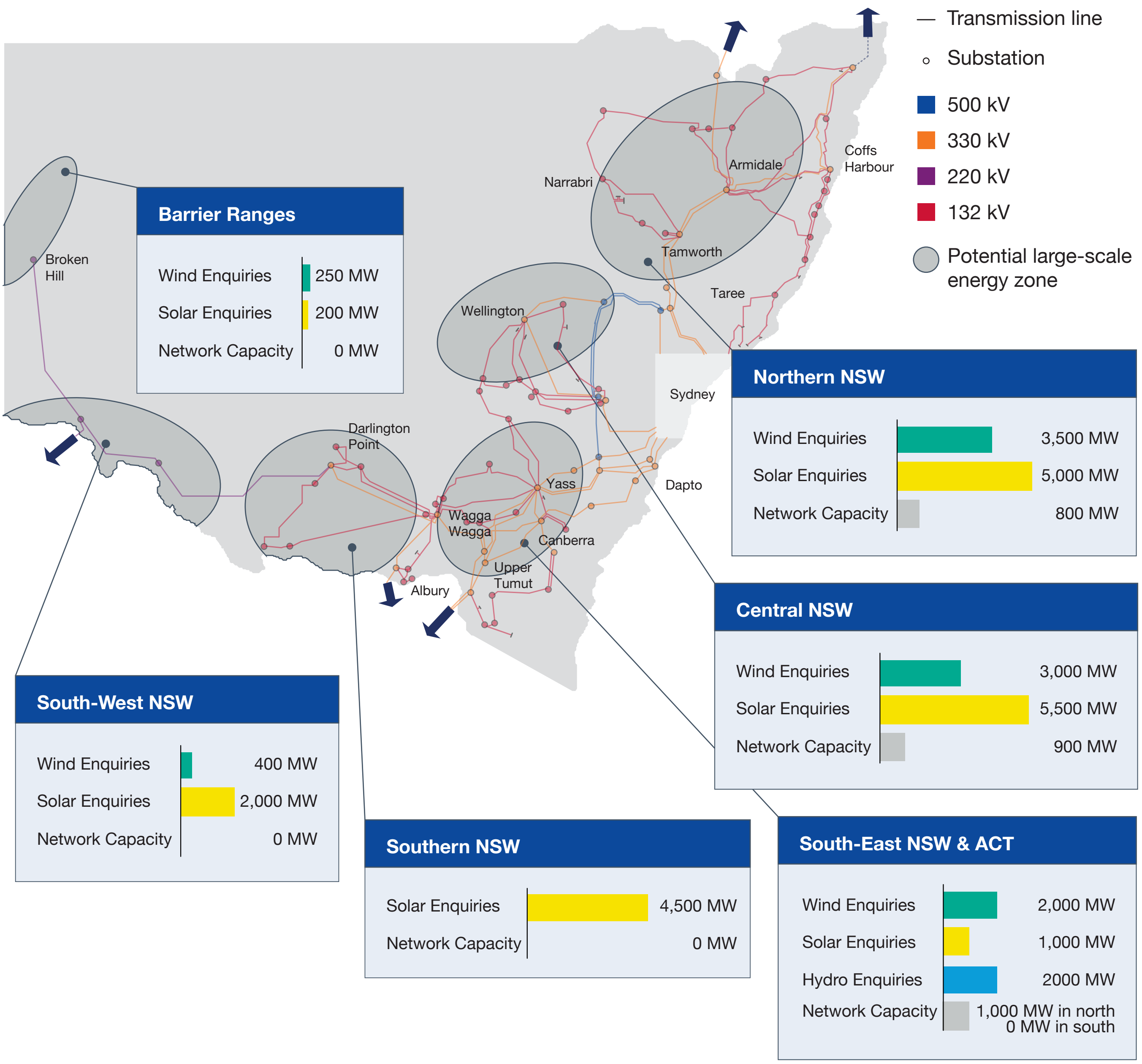
Only a fraction of these projects can be accommodated in the spare capacity of the current network.

The practice of locating new projects close to the existing network:

- represents the lowest connection cost for each individual proponent (assuming available network capacity)
- will lead to network constraints as more projects seek to connect in areas that are already congested
- does not support development of projects in areas with optimum renewable resources that are remote from the existing infrastructure. In many cases, it would represent a lower cost to consumers to extend the transmission network to these zones to achieve lower cost generation.

Where economic, TransGrid recommends energy zones be established in optimum resource areas and transmission networks be augmented to these areas as the lowest cost solution.

Figure 7: Current connection enquiries to TransGrid network



4.3 Potential energy zones in New South Wales

TransGrid has identified and prioritised large scale energy zones in NSW to deliver the least-cost power system.

TransGrid has identified six potential energy zones in New South Wales, as shown in **Figure 7**. **Table 1** presents a summary of how each potential energy zone performs against the key assessment criteria identified in section 3.2.

The energy zones identified by TransGrid span a larger area than those identified by AEMO in the Integrated System Plan consultation paper. Larger zones are more likely to access renewable energy resources across different technology types and incorporate firming capacity, and connecting these zones will not necessarily represent a greater transmission cost.

TransGrid recommends, based on the assessment in **Table 1**, that the potential zones in South-East NSW & ACT, Northern NSW and Southern NSW be progressed as the highest priority zones in New South Wales.

These zones have high quality resources, current enquiries, firming capacity, the lowest indicative transmission cost per MW of new capacity and optionality to integrate with interconnector developments under consideration. TransGrid does not recommend that potential zones in Central NSW and the Barrier Ranges be prioritised for initial development due to a higher risk of asset stranding and high connection costs, respectively.

Local community support for renewables development in potential energy zones will be critical to their ultimate success. Further community engagement will be required to ahead of the declaration of priority energy zones for inclusion in the Integrated System Plan.

Table 1: **NSW energy zone assessment**

Zone	Ultimate high quality resource potential	Current enquiries	Proximity to firming capacity	Proximity to load centres	Indicative transmission cost $/MW additional capacity	Strategic alignment and optionality
South-East NSW & ACT	Wind >5 GW Solar >5 GW Hydro 8 GW	Wind 2 GW Solar 1 GW Hydro 2 GW	Pumped hydro in Snowy Mountains Gas transmission between Yass and Bannaby/Marulan	330 km	$224 k	On pathway between Sydney and Melbourne
Northern NSW	Wind 4 GW Solar >5 GW Hydro 2 GW	Wind 3.5 GW Solar 5 GW	Pumped hydro east of Armidale Potential for gas production at Narrabri	500 km	$285 k	On pathway between Sydney and Brisbane
Southern NSW (and North-West Victoria)	Wind 4 GW[18] Solar >5 GW	Solar 4.5 GW	Not applicable	520 km	$376 k	On pathway Between Sydney, Melbourne and Adelaide
South-West NSW	Wind 5 GW Solar >5 GW	Wind 0.4 GW Solar 2 GW	Not applicable	410 km[19]	$520 k	On pathway Between Sydney, Melbourne and Adelaide
Central NSW	Wind 2 GW Solar >5 GW	Wind 3 GW Solar 5.5 GW	Not applicable	310 km	$285 k	Not located on a pathway between population centres and represents a higher asset stranding risk
Barrier Ranges	Wind >5 GW Solar >5 GW	Wind 0.25 GW Solar 0.2 GW	Not applicable	820 km[19]	$660 k	Potential pathway between NSW and SA and potential future redundant supply to Olympic Dam

Wind Large scale solar Hydro

18 Includes potential resources in North-West Victoria as well as in New South Wales.

19 The nearest major load centre to the potential South-West NSW and Barrier Ranges zones is Melbourne.

4.4 Staging of priority transmission developments in New South Wales

The priority transmission projects that facilitate the least-cost transition to the energy system of the future can be staged to minimise cost, protecting against capital stranding risk and preserving optionality.

TransGrid has considered the potential generation capacity that may eventually be developed in each zone and the staging of transmission developments over different time horizons to align with the ultimate capacity plan. This will minimise the capital at risk for each stage, and preserve optionality to cater for different futures.

TransGrid's proposed staging of New South Wales energy zone development is shown in **Table 2**. The indicative time horizons for each development have been prioritised in order of cost, with the transmission augmentations that add new network capacity to priority energy zones at the lowest cost per megawatt completed first. The proposed staging also considers Australia's current emissions reduction commitments and the optimal timing of new generation development to enter the wholesale market ahead of anticipated generation retirements. Changes to the emissions reduction trajectory will change the timing of transmission development to facilitate new generation development at a faster or slower pace.

The proposed staging maximises the reuse of existing infrastructure by uprating or upgrading existing corridors where possible. This approach will require extended outages of key network elements, reducing the network capacity during the works. These stages will need to be carried out sufficiently ahead of generation developments to manage the reduction in capacity during outages. This has been accommodated in the indicative timings in **Table 2**.

Table 2: NSW energy zone staging

Zone	Stage	Development	Additional firm capacity	Indicative time horizon
South-East NSW & ACT	0	Existing available capacity	1,000 MW	Current
Northern NSW	0	Existing available capacity	800 MW	Current
Northern NSW	1	Uprate Liddell to Tamworth (330kV)	290 MW	0-5 years
South-East NSW & ACT	1	Uprate Yass to Bannaby and Marulan (330kV)	1,000 MW	0-5 years
South-East NSW & ACT	2	Rye Park to Bannaby (500kV)	700 MW	0-5 years
South-East NSW & ACT	3	Upgrade Rye Park to Yass (to 330kV)	500 MW	0-5 years
South-East NSW & ACT	4	Wagga Wagga to Rye Park (500kV)	500 MW	0-5 years
South-West NSW	1	Darlington Point to Wagga Wagga and Robertstown (330kV)	1.000 MW	0-5 years
South-East NSW & ACT	5	Wagga Wagga to Tumut and Bannaby (500kV)	2,000 MW	5-10 years
Southern NSW (and North-West Victoria)	1	Wagga Wagga via Southern NSW and North-West Victoria to Ballarat (330kV) and Melbourne (500kV)	2,000 MW	5-10 years
Northern NSW	2	Uralla via Tamworth to Liddell (330kV)	1,000 MW	5-10 years
South-East NSW & ACT	6	Upgrade Bannaby to Sydney (to 500kV)	500 MW	5-10 years
Northern NSW	3	Sapphire to Uralla (330kV)	1,000 MW	10-15 years
Northern NSW	4	Uralla to Bayswater (500kV)	3,500 MW	15-20 years
South-East NSW & ACT	7	Wagga Wagga to Bannaby (500kV)	3,000 MW	20-25 years

5 Responses to consultation questions

Table 3: Questions on which AEMO seeks feedback

Question	Response
2.1 What are the key factors which can enable generation and transmission development to be more coordinated in future?	TransGrid agrees with the Finkel Review's conclusion that a proactive and strategic approach is required to coordinate the development of electricity and transmission infrastructure as the NEM transitions to a low-emissions future. The current decision-making and regulatory frameworks have been implemented to deliver incremental development of generation and transmission and are unlikely to deliver the transformational change required as thermal generation retires over the next two decades. Under current arrangements, new generation is required to lead network expansion, creating a 'chicken and egg' dilemma for the connection of high quality renewable resources. Strategic development of transmission can result in the connection of better quality renewable generation (operating at higher capacity factors) delivering lower unit costs of energy for consumers. It can also facilitate the development of new generation capacity ahead of anticipated retirements. Establishing large-scale energy zones and extending existing transmission networks to connect them will signal to project developers the locations where renewable projects will be supported, and where network capacity will be developed enabling simpler connections and unconstrained energy dispatch. However, it is essential that priority energy zones and transmission developments are identified in the first Integrated System Plan (and before 2019) to enable their timely development. Refer to sections 2 and 3 for further details.
3.1 Does this analysis capture the full range of potential REZs in eastern Australia?	TransGrid has identified and prioritised six potential energy zones in New South Wales. Refer to sections 4.1, 4.2 and 4.3 for further details.
3.2 What other factors should be considered in determining how to narrow down the range of potential REZs to those which should be prioritised for development?	TransGrid recommends that a two-step process be used to first assess the suitability of potential energy zones and then to combine and prioritise potential energy zones and transmission developments for inclusion in the Integrated System Plan. Each potential energy zone in the NEM should be assessed against the following criteria: ➤ Renewable energy resource quality and diversity to facilitate low-cost generation ➤ Proximity to firming capacity to improve utilisation of transmission ➤ Proximity to load centres to minimise transmission connection distances and losses ➤ Cost of network connection to reuse existing infrastructure where possible and minimise the need for additional investment ➤ Suitability of geography and existing land uses ➤ Level of existing connection enquiries from potential project developers ➤ Level of local community support for energy development in the region. The combination of potential energy zones and developments prioritised in the Integrated System Plan should balance optionality, robustness and strategic alignment of solutions – as well as economic efficiency, system security and emissions reduction. Refer to section 3.2 for further details.

Question	Response
3.3 What are the potential barriers to developing REZs, and how should these be addressed?	The existing market-led development of generation and transmission and current regulatory frameworks represent a barrier to the development of energy zones in the NEM. A strategic approach is needed to identify, prioritise and stage generation and transmission development, and a clear pathway is required to implement the Integrated System Plan. As it is currently applied, the RIT-T will not provide the certainty required to assess strategic transmission developments. TransGrid has proposed a pathway to deliver timely development of the priority projects in the Integrated System Plan: ➤ The Plan should recommend a single pathway for generation and network development, taking into account future uncertainty and results from AEMO's central and bookend scenarios. The Plan should include a long term direction and specify a short term schedule for the development of priority transmission projects across the NEM for the next ten years ➤ The RIT-T Application Guideline should be updated to ensure that the RIT-T is not a barrier to delivering strategic transmission projects ➤ Transmission Network Service Providers (TNSPs) should treat AEMO's single development pathway as the central input to investment tests for Integrated System Plan priority projects. Refer to sections 2 and 3.3 for further details.
4.1 Have the right transmission options been identified for consideration in the ISP?	TransGrid has identified the priority transmission projects for New South Wales which facilitate the least-cost transition of the energy system, and proposed an appropriate staging of their development to minimise cost, protect against asset stranding risk and preserve optionality. This includes consideration of the benefits of transmission between major population centres. For example, the "T" shape in Figure 24 of the consultation paper facilitates interconnection between three regions and will deliver greater benefits than other potential configurations. Refer to section 4.4 for further details.
4.2 How can the coordination of regional transmission planning be improved to implement a strategic long-term outcome?	TransGrid considers that the existing regional and joint planning arrangements work well. However, a coordinated plan is required to identify, prioritise and stage transmission projects and a clear implementation pathway for the Integrated System Plan is required to ensure developments are delivered in a timely manner. TransGrid has proposed a pathway for existing regulatory processes to deliver the priority projects in the Plan, so long as certain information is included in the Plan and clarifications are made to the RIT-T Application Guideline. The Plan can then be effectively implemented by incorporating any priority projects into the existing responsibilities and processes of Jurisdictional Planning Bodies. Refer to sections 2, 3.1 and 3.3 for further details.

Question	Response
4.3 What are the biggest challenges to justifying augmentations which align to an over-arching long-term plan? How can these challenges be met?	The existing regulatory frameworks do not support strategic, long-term transmission developments, and nor have the current rules delivered scale efficient investment. As it is currently applied, the RIT-T is not appropriate for assessing strategic transmission connections because: ➤ Its consideration of strategic benefits valued by consumers is limited ➤ It creates a 'chicken and egg' dilemma ➤ It favours incremental development, which can be more expensive for consumers in the long run ➤ Beneficial projects can be delayed through disputes due to the interests of individual market participants. Refer to sections 2 and 3.3 for further detail.
4.4 Is the existing regulatory framework suitable for implementing the ISP?	The existing RIT-T is not a suitable tool for assessing long-term, strategic transmission connections. A clear implementation pathway is required for priority Integrated System Plan projects to be delivered in a timely manner. Refer to sections 2 and 3.3 for further detail.

NSW Electricity Networks Operations Pty Limited (ACN 609 169 959), as trustee for NSW Electricity Networks Operations Trust (ABN 70 250 995 390). Registered business name is TransGrid (ABN 70 250 995 390).

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