NSW GOVERNMENT

NSW Government Submission on AEMO's Integrated System Plan

March 2018

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Executive Summary

The NSW Government is committed to a secure, affordable and clean energy future for households and businesses and supports an orderly, private-sector led transition to a modern energy system.

The Government appreciates the opportunity to provide input on the Integrated System Plan consultation paper, released by the Australian Energy Market Operator (AEMO) in December 2017. The Government is well-placed to help support AEMO identify the best locations for potential new Energy Zones in NSW, especially considering its unique position as the land use planner for NSW and ability to provide detailed data relating to a diverse range of state priorities.

Through the Finkel Review the NSW Government has supported a nationally consistent approach to climate and energy policy and welcomes the release of the Integrated System Plan to support the future development of efficient and strategic transmission investment across the National Electricity Market (NEM). The development of Energy Zones in NSW could encourage investment in new electricity infrastructure and unlock additional generation capacity to meet the state's evolving energy needs. This will help ensure a secure and reliable energy future in NSW. Developing Energy Zones in NSW can also place downward pressure on wholesale energy prices and support regional development. Energy Zones involve the expansion of transmission infrastructure to open up new parts of the NEM for energy generation, capitalising on economies of scale in infrastructure investment at least cost to NSW consumers, and improving the resilience of the NEM.

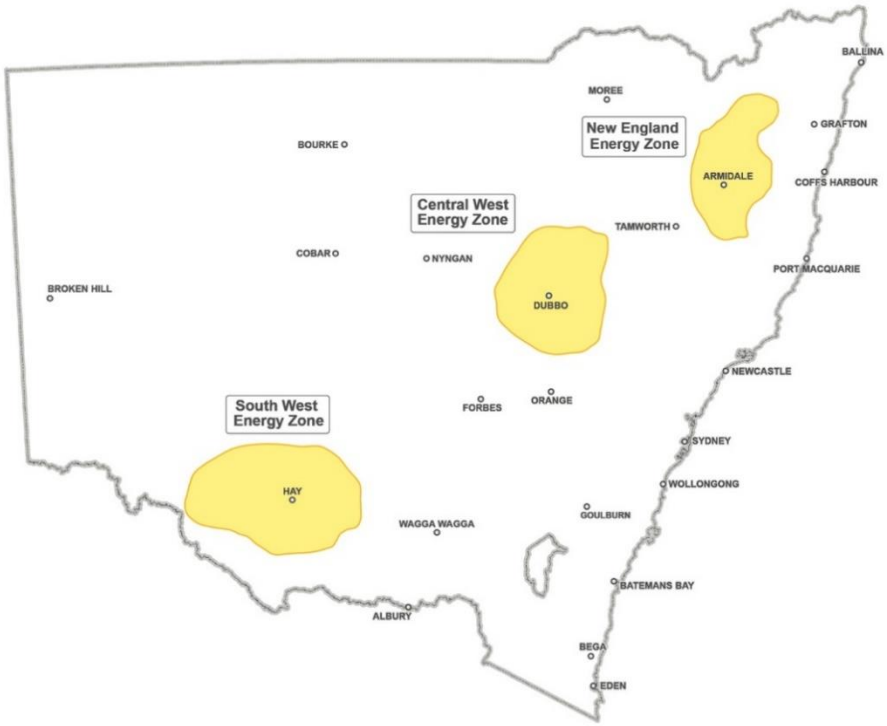
While NSW benefits from good quality energy resources located close to the existing transmission and distribution networks, many of the areas with the strongest resource potential are located remote from the existing network.[1] Transmission extensions to new Energy Zones would help unlock new areas of NSW for energy development, which may be needed to offset the closure of existing traditional energy generators over coming decades. As the state with the largest energy load in the NEM, locating Energy Zones in NSW would also lead to efficiencies by minimising energy lost during transmission between regions, capitalising on NSW's central location.

Importantly, the identification of Energy Zones in NSW would give the private sector greater certainty to make efficient long-term investment decisions, and would support recommendations from both the Independent Review into the Future Security of the National Electricity Market (Finkel Review) and NSW Energy Security Taskforce. The Finkel Review recognised that Energy Zones offer a means of efficiently developing and connecting new large-scale generation capacity, and similar models have been successfully implemented in other jurisdictions around the world.

Independent geospatial analysis overlaying 25 NSW data layers has identified the potential for ten Energy Zones in NSW, including three potential priority Energy Zones in the state's New England, Central-West and South-West regions, as shown in Figure 1. These locations benefit from outstanding energy resources, have reduced environmental and planning constraints, are close to existing transmission and distribution infrastructure and load centres, and align with the Government's regional growth priorities, developed in consultation with regional communities. Combined, the three priority Energy Zones could unlock 77,000 megawatts (MW) of new generation capacity. Complemented by emerging energy technologies, energy efficiency and demand response, this would be more than enough generation to meet future energy needs.

[1] See for example AEMO (2017) 'Integrated System Plan Consultation', p 34; AEMC (2010) 'National Electricity Amendment (Scale Efficient Network Extensions) Rule 2010 – Consultation Paper', p 5.

Figure 1. Potential Priority Energy Zones in NSW



Developing an Integrated System Plan, underpinned by rigorous and comprehensive economic analysis, is an important step in delivering the energy infrastructure needed to transition NSW to a modern energy system. However, further work is also needed at the national level to develop a robust implementation framework that addresses the challenge of coordinating investment in new electricity generation capacity and transmission network infrastructure, in a way that delivers net-benefits to NSW energy consumers and regional communities. There are a range of different approaches that could be used to streamline the Regulatory Investment Test for Transmission (RIT-T) for Energy Zones identified in the Integrated System Plan. These approaches would allow the Integrated System Plan to be leveraged to reduce potential delays and duplication and improve investment certainty.

Submission Overview

1. ***The development of Energy Zones in NSW, where appropriate and cost effective, would support an orderly transition to a modern energy system.***
2. ***The NSW Government has provided detailed data regarding strategic land use planning and regional growth priorities for NSW.***
3. ***Three potential priority NSW Energy Zones have been identified in the state's New England, Central-West and South-West regions.***
4. ***An implementation framework must be developed to operationalise Energy Zones in an efficient and cost-effective way that delivers net-benefits to NSW energy consumers and regional communities.***
5. ***The Integrated System Plan must be underpinned by rigorous and comprehensive economic analysis, ensuring it can be used as a base case for future RIT-T applications.***
6. ***The RIT-T process should be streamlined for applications for the Energy Zones identified in the Integrated System Plan to reduce potential delays and duplication and improve investment certainty.***

Energy Zones would help meet our changing energy needs

1. ***The development of Energy Zones in NSW, where appropriate and cost effective, would support an orderly transition to a modern energy system.***

NSW is currently well-placed in terms of having enough supply to meet the state's energy needs. However, the expected retirement of ageing coal-fired generators in the 2020s and 2030s combined with increasing demand for energy at peak times will put pressure on our future energy system[2] and require the development of replacement generation capacity.

A diverse mix of new generation capacity, complemented by technologies that deliver on-demand supply, demand response and system security services can help to meet our future energy needs. Early planning will help to ensure that this new energy mix is available to prevent any future supply shortfalls. This is especially the case given the extensive lead times for some technologies.[3]

NSW has excellent energy resources by international standards and around 15,000 MW of proposed new energy projects.[4] However, current interest in new generation projects exceeds the existing network capacity in the locations where these projects are proposed, meaning that some projects will become unviable, as shown in Figure 2. According to the NSW transmission network service provider (TNSP), TransGrid, all its new connection enquiries are for wind and solar generation projects, but the best wind and solar resources are generally located in areas with limited transmission capacity.[5] This is because the existing transmission network was primarily designed to connect traditional energy projects such as coal-fired generators and the Snowy Hydro Scheme to major load centres. TransGrid has identified that the existing transmission network outside the Sydney – Wollongong – Newcastle – Hunter Valley area will reach its existing capacity to connect renewable generation by 2020.[6]

Energy Zones would help to unlock the pipeline of new generation projects, capitalising on the state's significant energy resources and signal to the market new high potential areas for renewable energy project development. This would help place downward pressure on wholesale prices by allowing the least-cost generation to be dispatched, setting the market price, rather than being constrained by insufficient transmission capacity, creating a more competitive wholesale market and delivering least-cost energy to NSW consumers. Energy Zones would also help ensure ongoing energy security and reliability in NSW by delivering large-scale generation capacity to replace future withdrawals of existing coal-fired capacity, with improved resource diversity across the NEM.

[2] AEMO projections show that NSW's energy supply is sufficient until 2022-23 under normal circumstances: AEMO (2017) 'Electricity Statement of Opportunities for the National Electricity Market'.

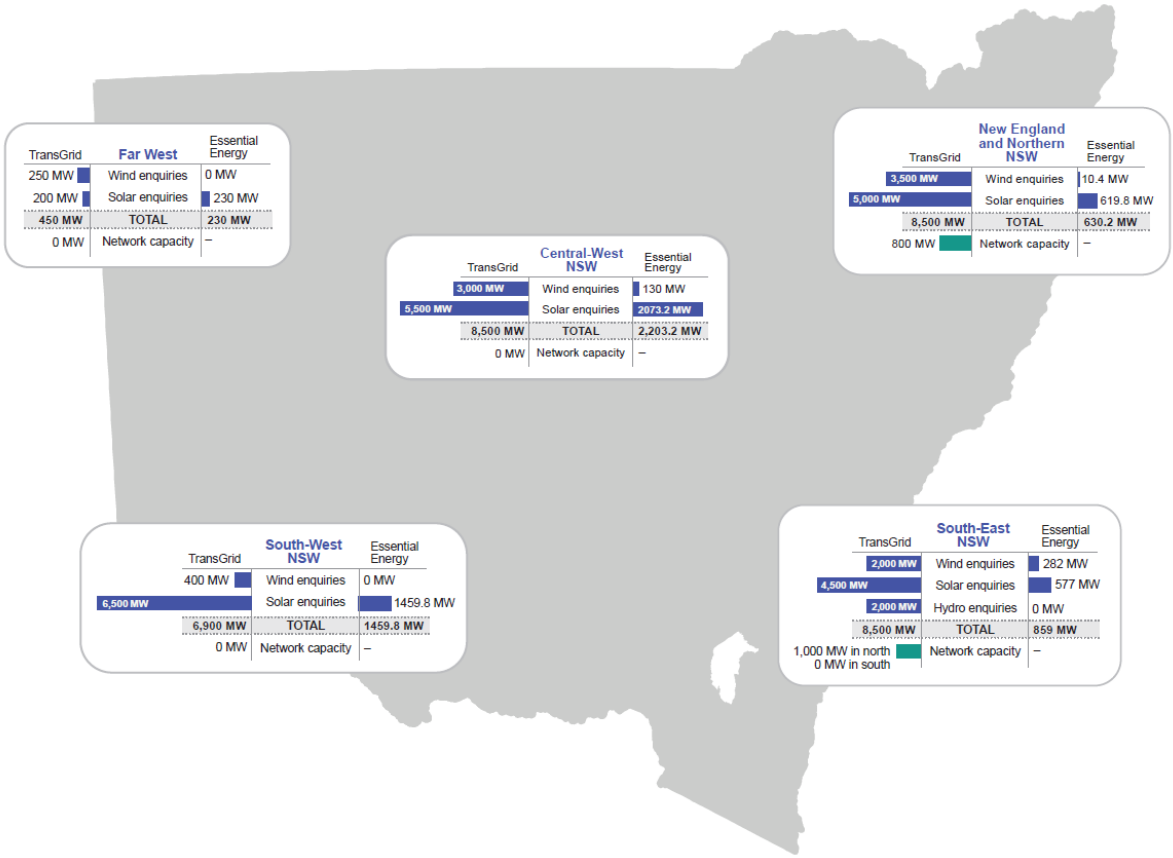
[3] For example, pumped hydro energy storage projects can have a lead time of up to 12 years: Jane Gilmore, (20 August 2017) 'Winning the uphill battle. How pumped hydro could solve the storage problem', Australian Renewable Energy Agency <https://arena.gov.au/blog/pumped-hydro/>.

[4] NSW Department of Planning and Environment (2018) Large-Scale Energy Project Pipeline.

[5] TransGrid (2017) 'Transmission Annual Planning Report 2017', p 14.

[6] Ibid.

Figure 2. Network connection enquiries in regional NSW[7]



NSW is centrally located within the NEM, well-connected to the other states and has the highest energy demand. Locating Energy Zones in NSW would provide opportunities to better match supply and demand across the NEM, minimising transmission losses. Any new interconnections proposed for NSW could be optimised to facilitate the connection of new Energy Zones to increase competition in the wholesale market and make more supply available to meet NSW energy demand.

The Government is acting to prioritise a range of measures to secure our energy future. This includes working through the COAG Energy Council to support the implementation of the Finkel Review. In February 2017, the Minister for Energy and Utilities established a new NSW Energy Security Taskforce to look at how NSW manages energy security and resilience. The Taskforce released their final report in December 2017, with nine recommendations to improve energy security in NSW over the long-term. Many of these recommendations, including the implementation of a demand response program, are already underway. The Taskforce recognised the development of new transmission to connect areas of high renewable resources could improve resilience, reliability and security in the NEM and Recommendation 6 of the Taskforce's Final Report proposed that the Government support the development of a national Integrated System Plan to facilitate the efficient development and connection of renewable Energy Zones across the NEM. The Taskforce also recommended that jurisdictions investigate the potential for land reservation and acquisition as a measure to support the implementation of Energy Zones under the Integrated System Plan.

The development of new Energy Zones in NSW would complement existing Government programs and policies to support an orderly transition to a modern energy system, including the NSW Renewable Energy Action Plan. Released in 2013, the plan includes actions to improve the process of network connection and investigate a more strategic and integrated approach to the development of renewable energy projects. New Energy Zones would also support regional development by aligning with priorities identified in the NSW Regional Plans, in consultation with regional communities.

[7] Figure 2 represents network connection enquiries for major renewable energy projects on the Essential Energy and TransGrid networks, as at February 2018. Aggregated data was not available for Essential Energy network capacity.

It is important to note that Energy Zones offer one part of the solution to secure NSW's energy future and would need to be complemented by a suite of existing COAG and NSW Government policies and programs to support the increased uptake of energy efficiency, distributed energy, demand response and firming capacity. It is also important for AEMO to consider the role that NSW distribution network service providers can play in delivering both NSW Energy Zones and complementary measures to deliver a secure, affordable and a modern energy system.

NSW is an ideal location for new Energy Zones

2. The NSW Government has provided detailed data regarding strategic land use planning and regional growth priorities for NSW.

The Government acknowledges AEMO's central role in developing an Integrated System Plan and identifying locations for Energy Zones across the NEM, from an energy system perspective. However, the NSW Government is well-placed to identify the best locations for NSW Energy Zones from a strategic cross-sector and state-wide perspective, accounting for a broader range of relevant considerations.

The NSW Government has a key role to play in ensuring that the most viable Energy Zones are identified by aligning locations with priorities in areas including land use planning such as regionally important farm land, biodiversity and heritage. Further, alignment of Energy Zones with regional development priorities is likely to be a key factor in the success of Energy Zones. With responsibility for major project planning assessments in NSW, the Government can also ensure that the project design and process for developing Energy Zones reflects the needs of local communities and the environment, in addition to those of the energy system.

Detailed geospatial mapping analysis has been undertaken, building on previous work from AEMO and TransGrid, and drawing together a range of data layers from NSW Government agencies to identify the most strategic locations for NSW Energy Zones. The analysis was carried out at a 50-metre resolution and identified that much of NSW, would be suitable for new energy developments due to its significant energy resources including wind and solar. However, many of these locations are currently constrained by a lack of sufficient transmission capacity.

The analysis overlayed 25 data layers (detailed in Appendix B) including the following key criteria to identify the best locations for potential NSW Energy Zones (methodology in Appendix A):

- **Energy resource and geography –** the level of solar, wind and bioenergy resources and other factors impacting generation capacity in particular locations, including site slope, slope aspect, site elevation and geology.
- **Cost-effectiveness –** proximity to existing transmission infrastructure and load centres, encouraging efficient investment and limiting energy losses.
- **Environmental, heritage and land-use considerations –** potential land-use conflict or impacts on sites of environmental and heritage value, including Biophysical Strategic Agricultural Land.
- **Contribution to a strong and diversified economy** – NSW Government regional development priorities, developed in consultation with regional communities, as well as local and state-wide economic growth goals.
- **Investor and community support –** proximity to existing energy project pipeline where investors have demonstrated interest in particular locations, and proximity to regions with community support for renewable energy projects, as identified through the NSW Regional Plans.

Importantly, the identification of specific regions for potential Energy Zones does not preclude the development of energy generation projects in other parts of the state. It does, however, identify locations suitable for multiple large-scale projects to be developed in close proximity to benefit from the high quality resources and efficiencies generated by cost-effective transmission infrastructure upgrades.

3. Three potential priority NSW Energy Zones have been identified in the state's New England, Central-West and South-West regions.

While ten potential Energy Zones were identified across the state, three potential priority Energy Zones have been identified which offer some of the most cost-effective and strategic opportunities in NSW, in the state's New England, Central-West and South-West regions.

These three zones offer geographic diversity, benefiting from diverse weather patterns that can help smooth the generation profile of the state. Each zone features strong wind and solar resources and is located within an area of strong biomass potential, with two zones located near possible pumped hydro-energy sites, allowing for the co-location of multiple generation technologies. The priority Energy Zones are close to significant load centres and existing transmission capacity, offering efficient investment choices. They feature reduced environmental, land-use and heritage constraints. Each zone also benefits from investor interest, demonstrated through the existing pipeline of projects in the NSW planning system, and community support for renewable energy projects.

Several other options for Energy Zones in NSW were also explored. For example, the mapping analysis identified excellent opportunities in the state's Far-West region, around Broken Hill. However, due to Broken Hill's distance from load centres, the cost to upgrade transmission infrastructure to this region could be prohibitive. Energy losses from transmitting the electricity from Broken Hill to major load centres would also result in inefficiencies. High quality resources were also identified near Cobar and Nyngan. However, these locations are also further from existing transmission and load centres compared to the three potential priority Energy Zones, resulting in less efficient investment options.

In addition, a number of other potential Energy Zones were identified with either strong wind or strong solar resources, but with reduced opportunities to co-locate different generation technologies. These single-resource zones are identified in Figure 3 below.

New England Energy Zone

The New England region is already an emerging growth centre for energy generation projects. Two wind farms and a solar farm are currently under construction near Glen Innes, with further investor interest in the areas surrounding Armidale and Tamworth. This region has some of the highest wind resources in NSW with the potential for 4,000 MW of wind capacity. The solar resource is moderate to strong, which is sufficient to support multiple large-scale projects with approximately 12,000 MW of solar capacity in the region.

The New England region is ideally located near the existing interconnector between NSW and Queensland and would be well-suited to capitalise on any upgrades to the existing interconnector or the development of a proposed new interconnector. This zone is also close to demand centres on the NSW North-Coast, which would reduce energy losses from transmission.

More than 1,500 potential pumped hydro sites were identified in the area surrounding the New England Energy Zone in the Atlas of Pumped Hydro Energy Storage.[8] Pumped hydro energy storage could offer firming services for large-scale projects built as part of the zone. The mapping analysis also identified that this region has some of the highest bioenergy potential in the state.

Community consultation in the New England region for the New England North West Regional Plan 2036[9] found broad support for the promotion of renewable energy production, particularly wind and solar energy.

Central-West Energy Zone

The analysis identified moderate to strong wind resources in the Central West region, north of Dubbo, along with strong solar resources particularly towards the Western part of this zone. The solar and wind capacities of this zone are approximately 15,000 MW and 3,000 MW, respectively. This region is already home to Australia's largest solar farm, the 102 MW Nyngan Solar Plant. A further four solar farms are under construction in the region at Parkes, Manildra, Dubbo and Jemalong, along with the Bodangora Wind Farm. In addition to this, 3,400 MW of wind and solar farms are either approved or seeking approval in the region.[10]

While the location of this zone does not perfectly overlap with projects in the planning pipeline, upgrading transmission infrastructure to open up this area would have the effect of creating connection opportunities for surrounding projects while also enabling new projects to develop and benefit from the high-quality resources in the zone.

[8] 8,600 potential pumped hydro energy storage sites were identified in NSW as a whole: Andrew Blakers, Matthew Stocks, Bin Lu, Kirsten Anderson and Anna Nadolny (2017) 'An atlas of pumped hydro energy storage: The Complete Atlas'.

[9] NSW Department of Planning and Environment (2016) 'New England North West Regional Plan 2036'.

[10] NSW Department of Planning and Environment (2018) Large-Scale Energy Project Pipeline.

The Central-West Energy Zone does not have the advantage of the New England and South-West Energy Zones which are located near to existing and potential interconnectors, however it is located near to existing transmission infrastructure, including the 132kV connection between Dubbo and Nyngan. It is also relatively close to the major load centre of Sydney. The location benefits from reduced heritage, biodiversity or land-use constraints, including few active mining leases.

The Atlas of Pumped Hydro Energy Storage identified approximately 80 possible pumped hydro energy storage sites north and east of Dubbo near Coonabarabran and Bundella that could offer firming services for large-scale wind and solar projects in this location, and a total of 1,151 potential sites between the proposed Energy Zone and the major load centres of Sydney, Newcastle and Wollongong.[11] The Central-West and Orana Regional Plan 2036[12] recognises the potential of renewable energy to diversify the economy across the region and provide local job opportunities.

South-West Energy Zone

The South-West Energy Zone has particularly strong solar resources, with moderate wind resources. The solar and wind capacities of this zone are approximately 40,000 MW and 3,000 MW, respectively. This zone is ideally located to unlock a large pipeline of renewable energy projects currently in the project pipeline between Griffith and Deniliquin, as well as to open up areas further west with even stronger resources. As with the New England and Central-West Energy Zones, this zone is close to existing transmission infrastructure and load centres in both NSW and Victoria. Due to its proximity to the Snowy Hydro Scheme and potential options for new interconnectors between NSW, Victoria and South Australia, the South-West Energy Zone offers clear synergies between generation and transmission infrastructure development. This zone could extend as far east as Wagga Wagga to cover a larger area, however these opportunities would be primarily for solar.

Different mapping exercises, including the mapping undertaken by AEMO, have identified a range of different Energy Zones along the southern border of NSW, each with its own merits. The Government has identified the Energy Zones outlined in Figure 3 as the optimal location for an Energy Zone in South-West NSW due to its high quality solar resources, its proximity to transmission and distribution networks, load centres and the current project pipeline, and the goal of opening up new areas to large-scale renewable energy development which have great potential but are currently difficult to reach due to network capacity constraints. This aligns with the Riverina-Murray Regional Plan 2036,[13] which identifies renewable energy as a high priority growth area and includes a direction to promote the diversification of energy supplies in NSW through renewable energy generation.

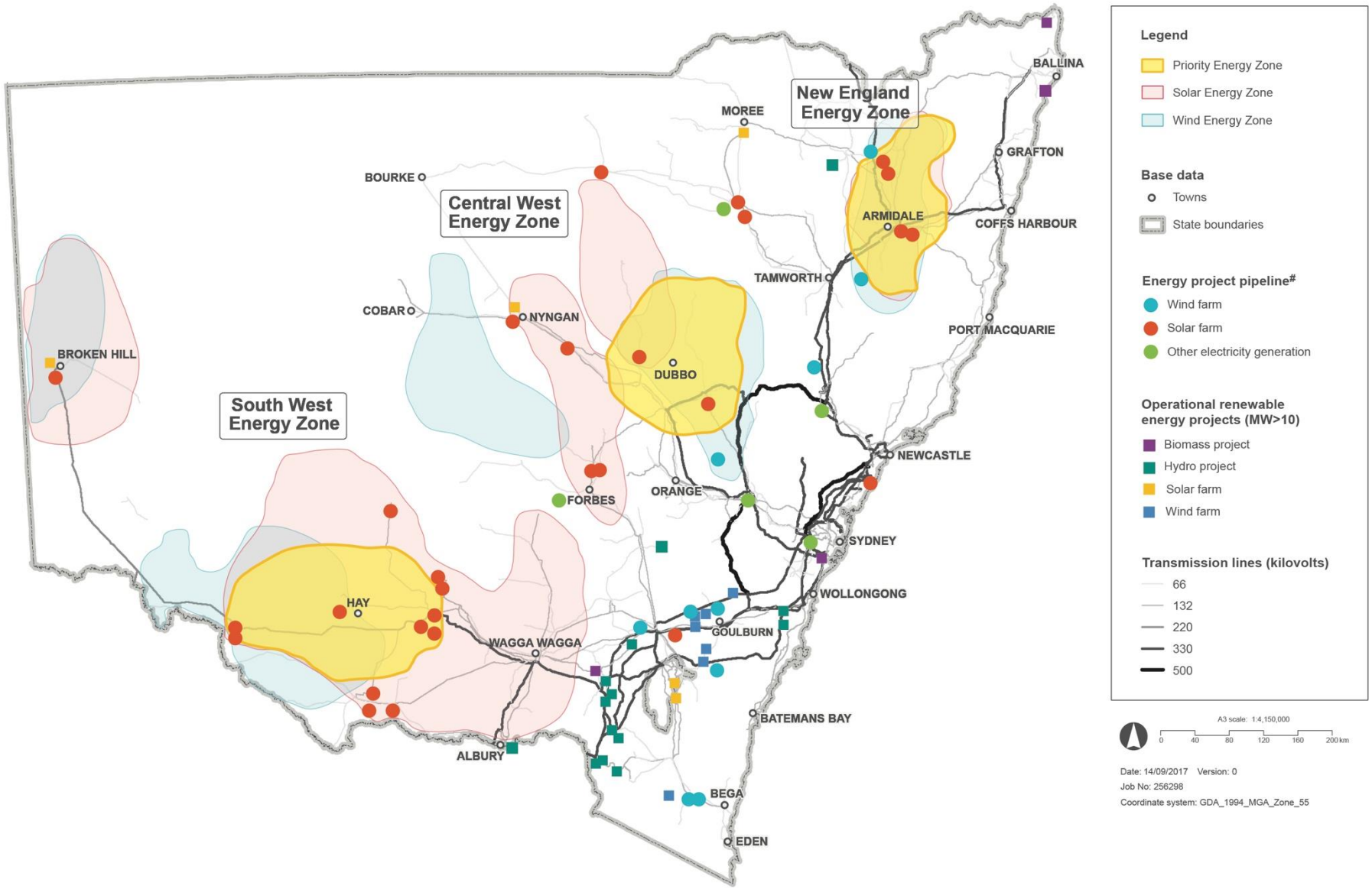
Two large-scale solar farms are currently under construction in the Riverina-Murray region and over 1,200 MW of projects are either approved or seeking approval. The zone is also located in an area of high bioenergy potential and faces reduced constraints relating to biodiversity, heritage, land use, mining tenure and other relevant factors.

[11] Andrew Blakers, Matthew Stocks, Bin Lu, Kirsten Anderson and Anna Nadolny (2017) 'An atlas of pumped hydro energy storage: The Complete Atlas'.

[12] NSW Department of Planning and Environment (2016) 'Central West and Orana Regional Plan 2036'.

[13] NSW Department of Planning and Environment (2016) 'Riverina Murray Regional Plan 2036'.

Figure 3. Potential Energy Zones in NSW



[#] NSW Department of Planning and Environment (2018) Large-Scale Energy Project Pipeline.

Unlocking efficient transmission investment

4. An implementation framework must be developed to operationalise Energy Zones in an efficient and cost-effective way that delivers net-benefits to NSW energy consumers and regional communities.

While the identification of efficient, cost-effective and strategically located Energy Zones is an important step to delivering new generation capacity, this must be complemented by measures to address the lack of coordination between generation and transmission investment. Both the NSW Energy Security Taskforce and Finkel Review recognised this coordination challenge, noting the tensions between the drivers and timeframes for private-sector investment decisions in generation development and processes to develop regulated transmission infrastructure.

The Government is committed to working through the COAG Energy Council and other national processes to facilitate the development of an implementation framework for the Integrated System Plan, to enable efficient and cost-effective Energy Zones to be developed. A recent review of the RIT-T by COAG Energy Council concluded that the RIT-T remains an appropriate method for decision making to ensure efficient investment in infrastructure and to protect consumers from overpaying for electricity but recommended several refinements.[14]

However, current RIT-T arrangements may be insufficient to deliver the specific investment in transmission extensions needed to develop Energy Zones in time to meet future shortfalls in generation supply. This is because the potential for debate over modelling and assumptions used in the RIT-T assessment lengthens lead times for transmission investment, and increases uncertainty over whether the transmission investment required to connect Energy Zones will pass the RIT-T process. This in turn exacerbates the coordination problem by extending the gap in lead times between generation and transmission investment, and limits the ability for generators to commit financially to locating new projects at Energy Zones.

The Government supports the development of an Integrated System Plan to provide a coherent, NEM-wide assessment of the optimal development of generation and transmission, which can be taken as the 'base case' for the assessment of transmission infrastructure to connect Energy Zones. It also has the potential to play an important role as a 'circuit breaker' and to reduce uncertainty and delays associated with individual RIT-T applications, by providing an independent and external set of data assumptions to be used in those applications.

5. The Integrated System Plan must be underpinned by rigorous and comprehensive economic analysis, ensuring it can be used as a base case for future RIT-T applications.

To be effective in this capacity, it is important that AEMO's conclusions in the Integrated System Plan are founded on a rigorous and comprehensive analysis of the NEM-wide and relative economics of Energy Zones. This includes considering how distribution networks and distributed resources could reduce the need for transmission investment. It is also important that the assumptions underpinning the Integrated System Plan are credible and widely accepted by market participants. This would allow the Integrated System Plan to be taken as a 'base case', limiting the scope for contention and debate in future RIT-T processes for new Energy Zones.

The Finkel Review recommended that the reforms to the RIT-T recently proposed by the COAG Energy Council be given time to take effect before further changes are made, with a further review of the RIT-T by mid 2020. However, in the meantime, without changing the RIT-T process, the Australian Energy Regulator's RIT-T Application Guidelines could be amended for RIT-T applications associated with Energy Zones to leverage the Integrated System Plan. This would reduce uncertainty, the potential for duplicating analysis and consequently the scope for disputes and delay.

6. The RIT-T process should be streamlined for applications for the Energy Zones identified in the Integrated System Plan to reduce potential delays and duplication and improve investment certainty.

- The Integrated System Plan could be taken as the 'do nothing' base case for NEM development for the purposes of RIT-T applications
- All NEM market modelling assumptions adopted in the RIT-T application could be consistent with those adopted by AEMO for the Integrated System Plan
- RIT-T applications could be exempted from the requirement to consider non-network options, as the underlying need for the transmission extension will have already been identified by AEMO in the Integrated System Plan.

[14] NSW Chief Scientist & Engineer (2017) 'Final report from the Energy Security Taskforce'.

Appendix A – Methodology for identifying potential NSW Energy Zones

The analysis was undertaken in 6 stages:

1. A range of Government stakeholders from across relevant agencies were consulted to identify key considerations to take into account when identifying potential Energy Zones, and source relevant data. 25 data layers were identified and collected.

2. The data layers were sorted and rated. 13 data layers were selected to be included in the modelling analysis which produced the heatmaps that identify the best locations for wind and solar resources from a technical perspective.

   These data layers were selected on the basis that they either provided technical information about the quality of the wind or solar resource in each location, or they provided information about key constraints that would prevent a wind or solar development from occurring in a particular location.

   Each of these 13 layers was broken down into sublayers based on their core attributes. Each sublayer was then given a rating from 1-5, with 1 being the best possible value and 5 being a 'show stopper' in terms of developing energy projects. For example, wind speed of greater than 7.5 metres per second at a height of 120 metres was rated a 1, while wind speed of less than 6.35 metres per second was rated a 5, meaning it was deemed not suitable for wind energy projects. With respect to land cover, rainfed pasture and open grasses were rated 1, while wetlands were rated 5. With respect to protected areas and biodiversity, all attributes were rated 5, as areas of high biodiversity value and protected areas are considered 'show stoppers' for large-scale energy developments.

3. Each 50-metre cell for each data layer was allocated a rating. Data layers were then combined, with each data layer applied an equal weighting, because each layer is mutually exclusive. For example, if the wind speed is not sufficient for developing a wind project, the other layers become irrelevant. An algorithm was then applied to combine all the ratings for all the data layers for each 50-metre cell and produce heatmaps for wind and solar resources.

4. The model was then run based on the **max/mean approach –** this method takes the mean score for each 50-metre cell when the ratings for all the data layers are combined. However, in a cell where any single layer is rated as 5 the result applied was 5. This is because a 5 represents a show-stopper, so regardless of whether the other data layers had favourable ratings, development of an Energy Zone in that location would not be possible. An example would be where there is strong wind or solar resources in a national park or within old growth forest, both of which are rated 5.

5. 12 additional layers were included as view layers in the model. This enabled qualitative factors to be incorporated that did not go to the technical feasibility of developing energy projects but took into account broader considerations, including economic feasibility, compatibility with other sources of energy such as bioenergy, heritage concerns and community support. The view layers were overlaid onto the heatmaps to allow for more detailed analysis of the benefits and constraints facing each suitable location identified in the heatmaps to inform the final identification of suitable potential Energy Zones in NSW.

6. Potential Energy Zones were identified based on the following criteria: the quality of the energy resource, economic development considerations, economic efficiency, investor and community support and considerations of environmental, heritage and land-use constraints. The zones identified in Figure 3 show the result of this analysis. Each zone balances these criteria to ensure a good balance of strong energy resources, reduced constraints and strong economic benefits both locally and for NSW.

Appendix B – Data layers for identifying potential NSW Energy Zones

No.	Layer	Source
Heatmap analysis layers		
1	Solar PV resource	SolarGIS via the World Bank/IFC Global Solar Atlas
2	Wind resource	DIGS, Geological Survey of NSW
3	Site slope	Geoscience Australia DEM_S_1s
4	Site aspect	Geoscience Australia DEM_S_1s
5	Parcel size	NSW DCDB
6	Land use	Australian Bureau of Agricultural and Resource Economics, Catchment Scale Land Use of Australia 2014
7	Land cover	Geoscience Australia (2010) Dynamic Land Cover Dataset
8	Protected areas	Collaborative Australian Protected Area Database
9	Prohibited areas	Geoscience Australia (GA)
10	Site elevation	Geoscience Australia DEM_S_1s
11	Land use zoning	NSW Department of Planning and Environment
12	Biophysical Strategic Agricultural Land	NSW Department of Planning and Environment
13	Biodiversity	NSW Office of Environment and Heritage
View layers		
14	Soil/Erosion area	NSW Department of Planning and Environment
15	Geology	Geoscience Australia (GA)
16	Easement	NSW Department of Planning and Environment
17	Watercourse corridor	NSW Department of Planning and Environment

No.	Layer	Source
18	Local Government Area	NSW Department of Planning and Environment
19	NSW Electorates	NSW Department of Planning and Environment
20	Bioenergy	DIGS, Geological Survey of NSW
21	Transmission corridors and capacity	NSW Department of Planning and Environment
22	CommonGround mining data - Mining Tenure	NSW Department of Planning and Environment
23	Heritage	NSW Department of Planning and Environment
24	Other planned energy developments	NSW Department of Planning and Environment
25	Land tenure details crown/Private	NSW Department of Planning and Environment