ISP Grid Planning and REZ Development

Submission to AEMO Consultation on

2019 Planning and Forecasting

Walcha Energy

20 March 2019

Executive Summary

It is strongly recommended that a Very Fast transition scenario be added into ISP considerations and risk assessments. ISP planning should demonstrate a capability to respond to the early retirement of an additional major coal fired power station in 2023, following Liddell's retirement in 2022.

It is recommended that the development of the Uralla grid hub together with associated line upratings and reconstructions be incorporated into Group 1 ISP projects as urgently needed strategic reinforcements of the National Grid.

The development of the concentrated renewable energy resources of the Walcha Plateau, south of Armidale, with a high proportion of wind, and the excellent pumped hydro capability on the escarpments, only 170km from Liddell power station is a strategic necessity in the early phase of NEM transformation in NSW.

These recommendations rest on ten important considerations:

- The quality and proximity of the solar and wind resources of the plateau
- The synergy of solar generation and night time wind generation
- High quality PHES sites on the Walcha Plateau escarpments
- Proximity of these RE resources to the existing 330kV grid
- The location of the resources being < 200km from Liddell and Bayswater
- The determination of Walcha Plateau developers to proceed with large scale wind and solar developments
- Compatibility of the proposed developments with existing land uses
- A strong base of community support for the developments
- The environmental compatibility of the developments, and
- The superiority of the Uralla Hub over Armidale East as the major 330kV grid hub for Northern NSW.

It is contended that the route for a second Queensland – NSW 330kV double circuit interconnection should be constructed over the Walcha Plateau to the Uralla Hub and that the route north from Uralla to Queensland be located further west via the Inverell area.

1 NEM Transformation and Transition

Least Cost of Energy Generation

The transformation of NEM Generation is being driven by the lower cost of renewables compared will all other options. The cost of energy from renewables is also decreasing faster than costs of fossil fuel generation. The amount of firming required is variously assessed and will change as the stage of transformation progresses however GenCost 2018[1] indicates that the present LCOE of large scale solar and wind *with firming* is already lower than the costs of fossil fuel generation and that this margin will increase in the period of interest, 2020 – 2030. Figure 1 shows the 2030 projected LCOE comparison.

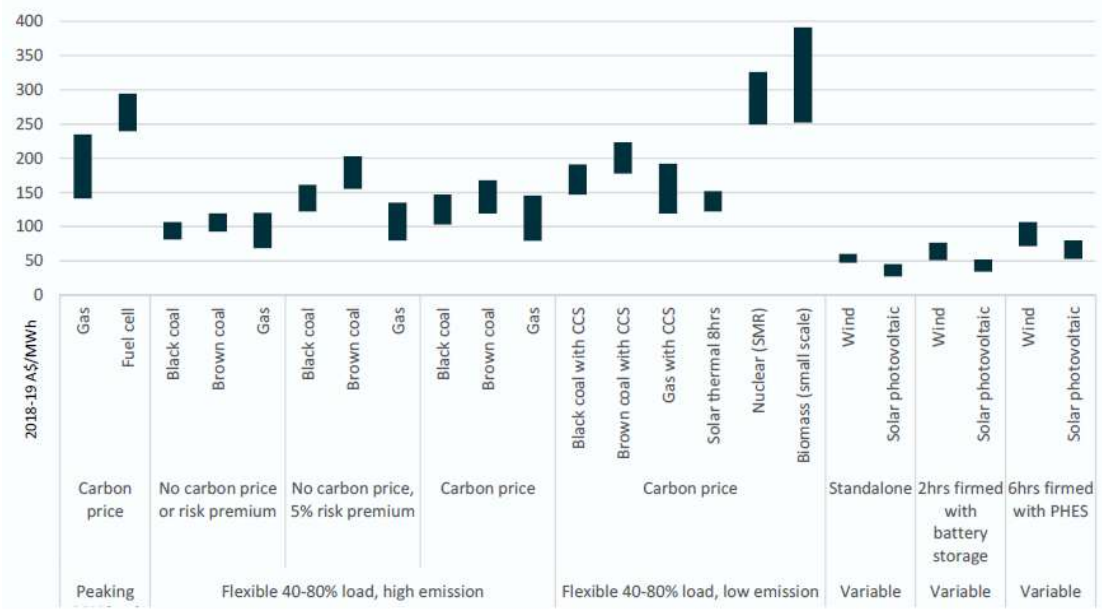

Figure 1 Calculated LCOE comparison by technology (CSIRO GenCost 2018)

Duck Curve Impact on Coal Generators

High residential electricity prices and government solar policy leading to high uptake of residential PV – now over 2 million systems in Australia and growing rapidly. This will progressively drive down daytime demand leading to the "Duck Curve", illustrated in Figure 2, and to low prices in the middle of the day as well as at night. Continual fluctuations, and deep variations of output do not suit base load coal generation plant, and even plant designed for shoulder period operation will be more severely stressed by these operating conditions.

Competitive economic pressures combined with technical limitations and plant reliability issues are likely to lead to the early closure of coal generators. This issue has been addressed by Jotso et al [2] in a detailed paper, *Coal Transitions in Australia*. published by the ANU's Crawford School of Public Policy.

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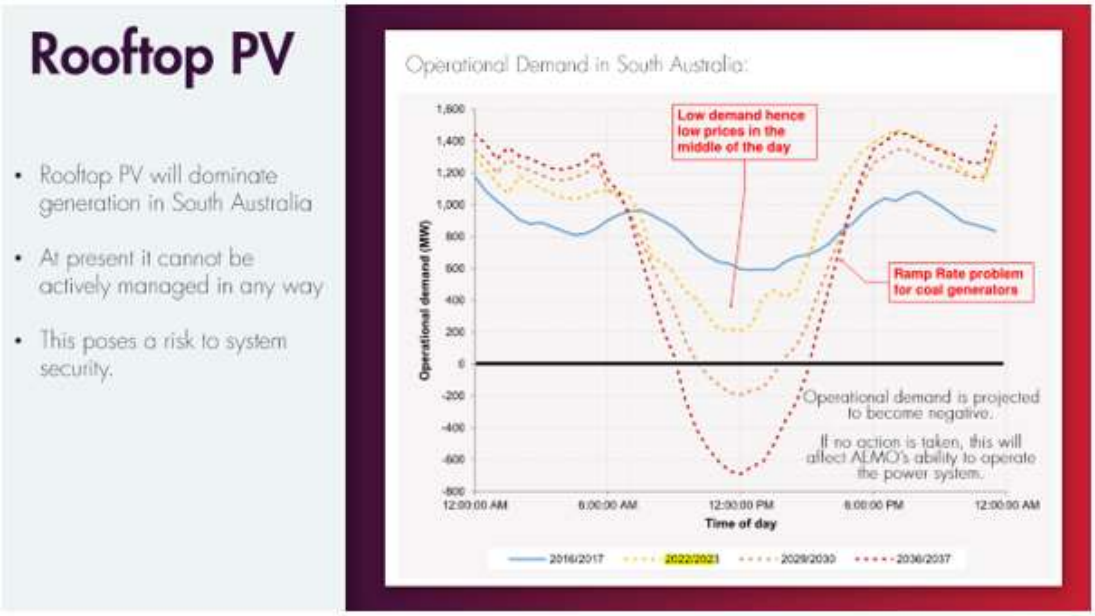
1 Graham PW et al, CSIRO, Energy: *GenCost 2018, Updated projections of electricity generation technology costs*

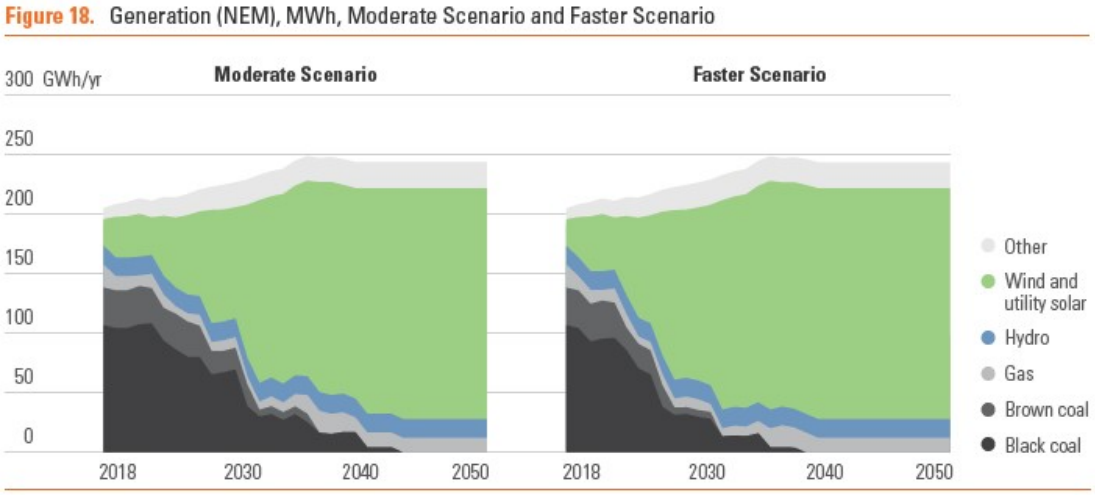
2 Jotzo F, Mazouz S, Wiseman J.(2018). *Coal transition in Australia. Preparing for the looming domestic coal phase-out and falling export demand*. IDDRI 2018.



AEMO Presentation at Asia Pacific Solar Research Conference 4-12-2017 (Example from South Australia)

Figure 2 Impact on demand of increasing residential solar PV

The coal transitions paper highlights the risk of early closures of coal generating plant and demonstrates dramatic impacts illustrated in Figure 3 (Figure 18 of the referenced paper.)



Coal Transitions in Australia, Jotzo et l. 2018

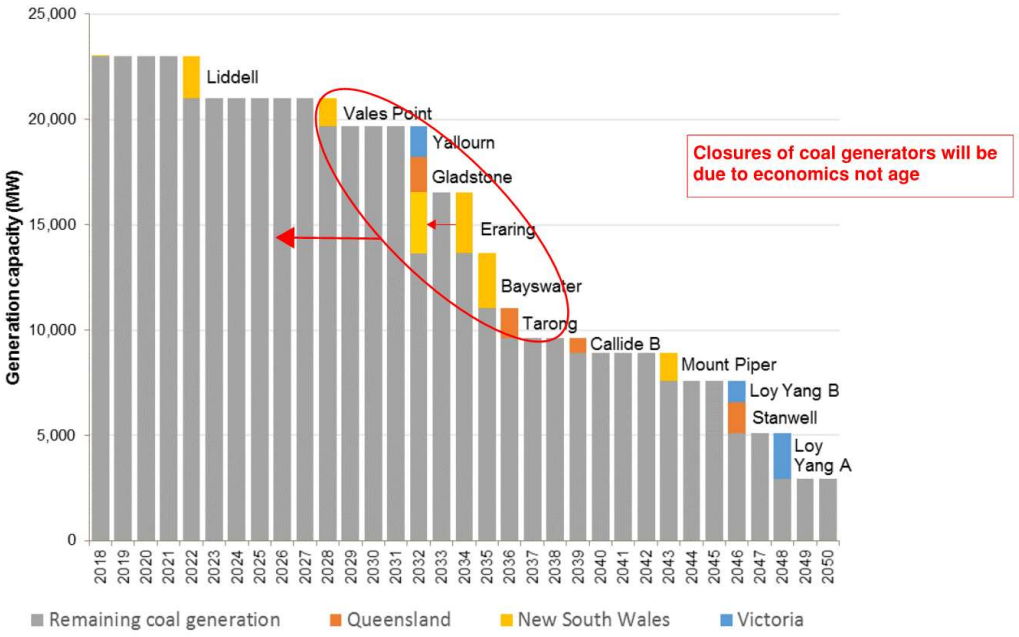
Figure 3 Impact of economic pressure on NEM generation – two scenarios

The moderate scenario is broadly compatible with Australia's 2030 Paris NDC agreement. The implications of a faster scenario should be considered. This has become particularly relevant when considering revised targets and aspirations now being proposed in the political arena. Even the moderate scenario would correspond broadly to the curtailment of economic life of the major coal generators from 50 years to 40 years.

As can be seen in Figure 4, coal plant retirements after 40 years would have a very major impact on the NEM. Although it is likely that grid constraints will slow the transition, the retirement after 40 years of even one circled major coal plants would imply a need to greatly accelerate grid reinforcement and to facilitate the early development of REZ with

predominantly wind power as well as to accelerate the completion of one or more substantial PHES projects. Such measures will contribute significantly to mitigation of the risks associated with early closure of major coal plants.

Figure 4 NEM coal generation fleet operating life to 2050, by 50th year from full operation or announced retirement



Source: Australian Energy Council, 2016. Submission to the Parliamentary enquiry, *Retirement of coal fired power station*, available at https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Coal_fired_power_stations/Submissions.

Figure 4 Coal plant closures assuming 50 year operating life

Figure 4 is extracted from AEMO's ISP consultation paper in December 2017, and assumes a technical life of 50 years for all coal generators which compares to the average 40 year life for recent retirements in Australia. The mark-up in red points to the effect of earlier closures which could see the cliff occur in the 2020s.

It is submitted that the development of the 2019-20 ISP incorporate a "Very Fast" transition scenario and that national grid strengthening that facilitates the mitigation of early power station closure impacts be considered in setting priorities.

It is submitted NEM and ISP planning must consider the risks to supply reliability and market price that would be precipitated by the early closure of Vales Point power station or another similar NSW major power station.

2 Selection and Development of Renewable Energy Zones

It is considered that the identification of renewable energy zones in the 2018 ISP needs further enhancement. This is recognised in the consultation paper (section 4.5) in the discussion of Figure 10 and further feedback is invited. The following comments are made:

- Wind and solar resource are essential factors however some consideration should be given to the *quality* of the resource and the factors that inhibit its full utilisation such as impacts on sensitive environments, population density, land use compatibility and the same considerations with regard to connections and associated grid reinforcement.

- Observed generator connection interest needs to be considered in all areas, however it must be recognised that connection interest may be limited by existing grid capability and remain unexpressed or may have been delayed by the lack of prospective reinforcement until recently.
- Consideration of proximity of nearest transmission line is not an adequate measure of electrical network considerations. Proximity to nearest adequate transmission line may suit most individual generation developments but much more is needed whether major grid augmentation is needed to enable the REZ to be developed. In particular a grid reinforcement or major augmentation can have multiple functions in terms of appropriate and needed National Grid development concurrently with serving connection of a REZ. In such a case only part of the cost should be loaded on the REZ.
- Correlation of local resources with local demand is fine for individual generator developments but in the case of a REZ with a large or very large prospective generation capacity, the critical factor is its proximity to the major load centres and to the main grid serving them.
- The best REZ map seen to date is that included in the TransGrid 2018 APR reproduced below as Figure 5 below, and in NSW TransGrid's submission to the 2018 ISP

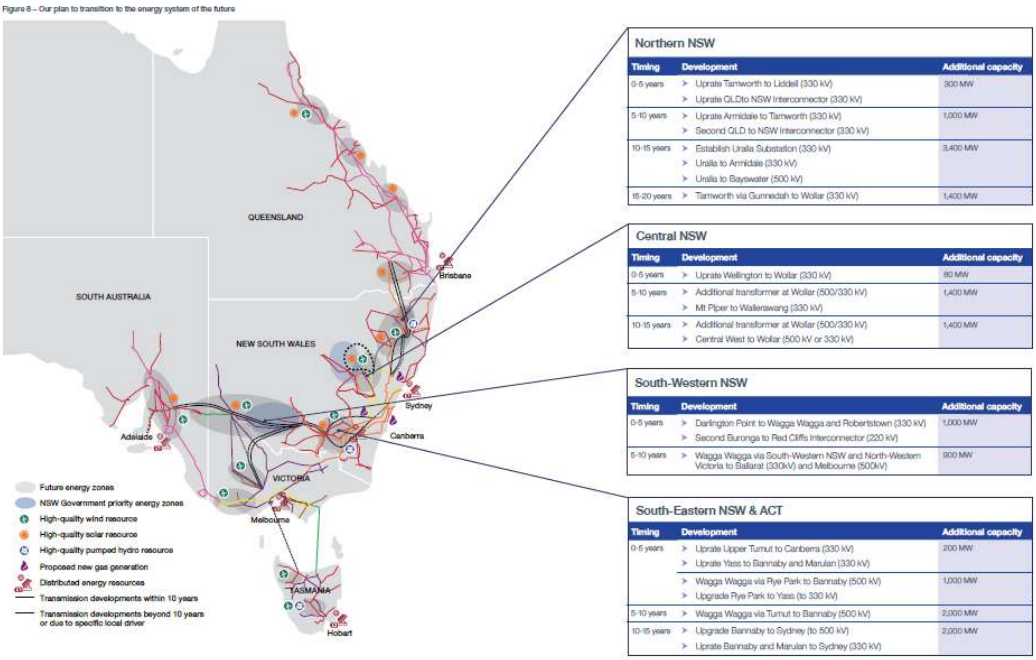


Figure 5 TransGrid REZ map

- The REZ numbered 7 & 9 in Figure 10 of the consultation paper lie generally in the vicinity of the Queensland – NSW Interconnector (QNI), but their size will have to be limited to what the double circuit 330kV line can appropriately carry.
- The ISP proposes to duplicate QNI with a parallel similar double circuit line (QNI 2). TransGrid came under severe criticism for the hastily selected route of QNI due to its sensitive terrain and impacts on threatened species, forested land, small rural communities, and rural residential areas near Armidale. It will not be feasible to get a social licence for new easements in and out of the proposed Armidale East 330kV

Switching Station or for a parallel QNI 2. A second Queensland – NSW interconnection will need to be routed further west.

- The priority of areas with substantial wind energy able to be quickly developed must be taken into account. These areas are scarce, unlike solar zones, and are able to generate through the evening peak load period and supply it without the need for storage. It would very rare for wind generation zones in widely separated latitudes to have concurrent low wind in the evening peak period. Prioritising such wind zones would mitigate risks to supply reliability pending the development of sufficient pumped hydro energy storage
- The synergy of colocated solar and wind resources should be considered in prioritising REZ developments. A wind zone may generate with a 40% capacity factor while tracking solar manages less than 30%. But collocated solar and wind can generate with a significantly higher overall capacity factor. Some zones have significantly more wind at night than during the day and their connections can run at 50% or more capacity factor with only small generation curtailment that can mostly be captured by a modest amount of storage. Zones that connect collocated wind and solar can deliver superior grid utilisation compared with zones that have solely wind or solely solar.
- Noting the ANU/ARENA study that identified thousands of potential pumped hydro storage sites throughout the National Grid, it is important to recognise the synergy of prospective pumped storage with renewable energy in improving grid utilisation and reducing connection capacity requirements, especially when colocated in reasonable proximity to the renewable generation. This follows from the pattern of operation of pumped storage plant, pumping when demand is low and generating when demand is high and when variable renewable generation is low.
- The proposed new interconnector between South Australia and NSW will deliver multiple benefits to the National Grid and the NEM. It will greatly enhance the security of supply in South Australia. It will make available a premium wind and solar resource in South Australia to NSW and Victoria. It will enable solar farms now connecting to the Darlington Point area and 220kV extending to Buronga and thence to NW Victoria and Broken Hill/Silverton to operate with fewer constraints. It will eliminate the heavy constraints of the Darlington Point - Buronga tripping scheme which requires the 220kV connection and generators to be tripped on loss of the Wagga – Darlington Point line.
- The early development of the New England southern REZ area, the Uralla hub and reinforcement between the Uralla hub and the Hunter Valley to rapidly replace Liddell on its retirement in late 2022.

3 Strategies to Improve ISP Planning, Forecasting and Delivery

The following strategies are suggested.

- It is imperative to speed up the approval processes for new transmission. This is not elaborated here as the need is universally recognised.

- Connection enquiries and connection applications should be made public on the AEMO website to enable generation developers to take account of interacting projects and perhaps liaise in respect of grid connections and cost optimisation.
- AEMO, through its ISP processes, identifies necessary national grid augmentation corridors, however it is not appropriate to rely solely on desktop assessments in the selection and nomination of routes. Proposed major grid augmentations in the ISP should primarily be defined by their functional roles, expected capacity requirement, functional terminal points and preliminary timing estimates.
- The feasibility of the route options and the proposed technical and structural form of each line development needs to be tested and refined through contracted scoping studies and investigations. High level public consultation may be needed when the timing falls within a reasonable horizon. Funding for these studies will need to be provided by mechanisms developed by the Energy Security Board. Regulatory reset processes can then be applied to confirm the appropriate triggers for delivery of the project in a timely manner. Project delivery will still require the usual environmental impact assessments and public consultations to obtain development consent.
- The funding mechanism will need to be developed and may, for example, require contributions from the relevant state governments and market participants for intra-regional links and from the federal government which will likely want to focus on inter-regional links.
- Due to the rapidly evolving development of the NEM, ISP requirements and estimated project timings are likely to be revised on an annual basis. In order to be able to deliver new augmentations, it will be appropriate on some routes to acquire easements for a future National Grid link in advance of final approval of the project on a firm delivery schedule.
- To facilitate REZ development and optimise generator connection locations it is recommended that AEMO appoint regional REZ coordinators (similarly to the role of Precinct Coordinators appointed by the NSW Office of Environment and Heritage).
- Some REZ and hub developments involving multiple transmission lines will require seed funding by the respective state government. It is recommended that this be proposed to the Energy Security Board.
- It should be proposed to the Energy Security Board that it recommend to the federal government the inter-regional interconnector projects that require and merit a significant proportion of Federal funding in addition to any state funding deemed to be required. In this recommendation it is assumed that such augmentations may become wholly or partly regulated developments for which TNSP O & M costs would be recoverable.

4 Supplying the Newcastle-Sydney–Wollongong Load

Walcha Energy is investing in northern NSW and has significant site and region-specific knowledge of this region, especially the New England REZ. The following sections focus specifically on supply to the NEM and to the major NSW load centre from within northern NSW.

As noted in earlier sections, the sequence of development of new renewable energy zones needs to be based on sound planning principles, focused on supply to the load centres, must

consider efficient utilisation of the grid, and take into account mitigation of potential and emergent risks in the transformation of the NEM.

The emerging need to strengthen inter-regional grid capacity to provide reliable supply in all Regions and to increase competition in the National Electricity Market is absolute. Reinforcement of the Queensland – NSW transfer capacity is required, however the sequence of development is very important and will influence not only the timing of sections of the work but also ultimately the required augmentation capacity.

It is considered that grid development to enhance grid capacity and reduce losses between Armidale and NSW load centres is very urgently needed and that strengthening the northern NSW grid should begin with Hunter Valley to Armidale and then be extended to Queensland.

Delayed redevelopment and uprating between Tamworth and Armidale, as indicated in the 2018 ISP, will limit the best future utilisation of the existing 330kV grid and lead to premature costly grid developments at higher voltages or with HVDC. New South Wales may become dependent on importing energy from Queensland, but each state should nominally cover its consumption requirements and this need not happen. A requirement for interregional transfer greater than would be delivered by one or two 330kV circuits may be significantly deferred.

Grid reinforcement and RE zones closer to the Hunter Valley, with its strong connections to the NSW load centres and 500kV backbone, should be developed before more remote REZ areas receive major reinforcement. It is clear however that connections north of Armidale should be able to take advantage of both existing 330kV circuits (TLs 8C & 8E) through the establishment of one or two mini hubs.

REZ areas like the Walcha plateau in the part of the New England REZ south of Armidale should be prioritised as it will connect very substantial wind generation as well as solar through the Uralla hub. This development will make a strong contribution to 24 x 7 power by the time Liddell retires.

The Walcha plateau has at least 4,000MW of high quality wind resource as well as solar and excellent pumped hydro sites enabling it to provide 24 x 7 power. Development of all of these resources is needed as soon as possible in view of the impending retirement of Liddell Power Station. Excerpts of the consultation paper resource maps are shown in Figure 6.

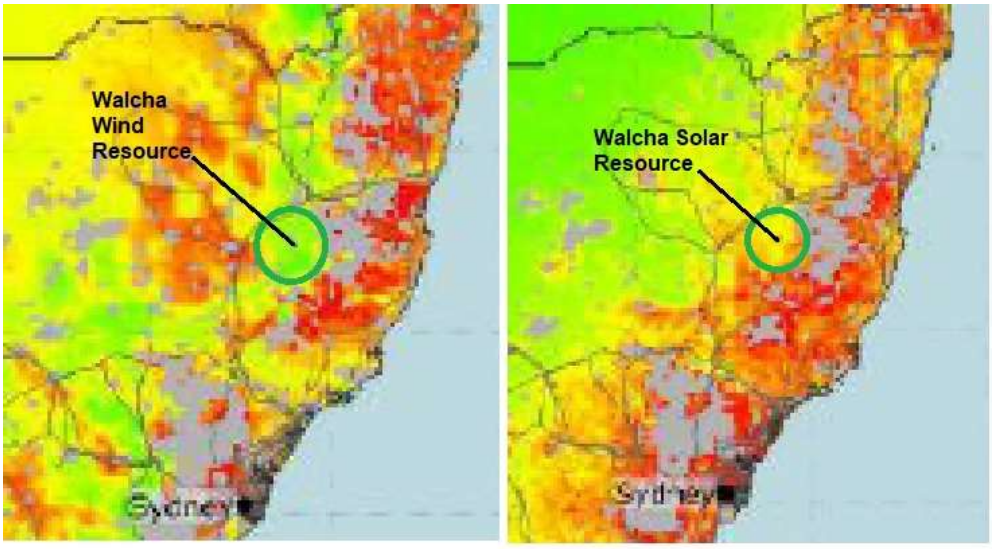


Figure 6 Walcha Plateau Wind and Solar Resources (AEMO consultation paper, section 4.5.2)

The need for early development of the Walcha plateau resources is increased by the need to mitigate the risk of early retirement of additional NSW coal plants challenged by the impact of rooftop solar on the daily load curve and by competitive pressures from renewables.

The Hunter Valley has strong connections to the NSW load centres and 500kV backbone. This strong grid should be extended to Uralla and Armidale as a first priority, and subsequently be extended to Queensland. If grid reinforcement south of Armidale is not completed very rapidly on an accelerated program, the uprating of existing lines, such as those between Tamworth and Armidale, will become impractical due to the impact of outages for reconstruction or uprating. Much bigger grid developments will be required earlier and grid utilisation will fall.

Interconnections between the eastern mainland states should be sized primarily to suit bidirectional flows compensating for the variability of weather systems between Regions. As there is an ample resource available in each state/Region, the resource should be developed to make these states energy self-sufficient overall. The application of this principle to Tasmania and South Australia is a more complex question because of their distinctive resources.

It should be noted that the New England REZ to the north of Armidale is an area with prospectively more scattered, smaller sites located amidst sensitive environmental areas and communities. The Walcha plateau has a very large renewable energy resource in a localised area that is more readily connected to the load centres of NSW and is closer to them.

The 2018 ISP gave priority to additional interconnections between the NEM Regions and, in the case of Northern NSW, provided for the New England REZ development and proposed Uralla Hub to follow. This should be reversed in the 2019-20 ISP with the Uralla hub included in Group 1.

The omission of grid reinforcement between Armidale and Tamworth in the 2018 ISP appears to be an oversight, or may have been based on the assumption that TransGrid would reconstruct TL 86 as part of its forthcoming package of regulated works This was not approved as a regulated development as it was appropriately proposed to be reconstructed with a higher capacity preventing the application of asset replacement provisions. Reconstruction of TL 86 between Tamworth and Armidale (at least as far as Uralla) must be included in the Group 1 projects of the 2019/20 ISP along with the uprating or reconstruction of the other existing lines between Armidale and the Hunter Valley.

N-1 loading of four high capacity 330kV circuits is similar to that of a maximised double circuit 500kV line. Augmenting two existing 330kV circuits in northern NSW with a new 330kV double circuit line will increase the transfer capacity by an amount approximately equal to adding a double circuit 500kV development, however 330kV development is to be preferred as it facilitates new RE generator connections better than development at 500kV or HVDC.

Walcha Energy's submission to the PSCR on *Expanding NSW-Qld Transmission Transfer Capacity* has proposed a "no-regrets" strategy that mitigates the risks by facilitating rapid large scale development of the critically needed renewable energy resources and storage capability of the New England REZ, especially the section to the south of Armidale. The strategy serves as the first stage of duplication of the NSW/QLD grid so that the Regions can back up each other's generation when RE conditions are unfavourable in either Region.

The strategy proposed in the submission merits adoption as the preferred initial stages of Expansion of the NSW/QLD transfer capacity:

- *Uprating and renewal of the existing grid between the Hunter Valley and Armidale, along with reactive plant augmentations to improve the capability of the existing NSW/QLD interconnection, must be the first priorities.*
- *Grid augmentations to double the capacity of the grid between the New England area and the Hunter Valley should be commenced as quickly as possible to enable the rapid development of the New England REZ, for wind and solar generation and for PHES.*
- *The Uralla REZ hub to be established by WalchaEnergy will cross-connect the existing grid and presents the opportunity to create a National Grid hub suitable for the development of the second major NSW/QLD interconnection.*
- *The uprating and renewal of the existing grid combined with the early development of the New England REZ will facilitate thousands of MW of wind and solar renewable energy to be connected, replacing Liddell Power Station, and will concurrently enable the development of high capacity PHES, all within 200km of the Hunter Valley power stations.*

5 Development of the Walcha Plateau REZ

Walcha Energy is developing renewable energy projects near the town of Walcha, approximately 55km south of Armidale on the New England Tableland in northern New South Wales. Walcha Energy proposes to connect the initial stages to the existing, 330kV grid south of Armidale at the Uralla Hub which will be established by Walcha Energy for this purpose.

The Walcha Project will be delivered in stages with the initial stages indicated below targeted to commence in 2019 and be completed in 2023.

Development of the initial stages of the Walcha Energy Project will involve:

- Wind Stage 1 - Winterbourne & Moona – 700MW
- Wind Stage 2 – West of Walcha – 700MW
- Solar Stage 1 Salisbury West – 350MW with 150MWH battery
- Solar Stage 2 Salisbury East – 350MW

Subsequent stages of 2,000MW of wind generation to the south of Walcha and the proposed PHES require major grid augmentation which can form part of the expansion of the Queensland/NSW interregional transfer capacity. It is proposed that duplication of the 330kV grid between the Hunter Valley to Uralla should be on a diverse route from the existing lines and should traverse the length of the Walcha plateau facilitating the connection of the wind resource and of the proposed PHES at Dungowan Dam.

The PHES project at Dungowan is under joint investigation for PHES and water supply under an agreement between Walcha Energy and Tamworth City. The PHES will have a head well in excess of 500m and is envisaged to deliver between 500MW and 1,000MW of generation capability for 4 to 6 hours, while also augmenting Tamworth's water supply by providing additional storage in the upper reservoir.

Several other developers are developing substantial generation projects on the Walcha plateau and the need for four circuits to fully develop the Walcha Plateau REZ is certain.

Walcha Energy is designing its Uralla Hub to be suitable for expansion as the major northern NSW grid hub and is willing to discuss transfer of ownership.

Walcha Energy is prepared to design its 330kV grid connections of wind generation to the Uralla Hub (Wind Stage 1 and Stage 2 above) so as to be rated and compatible with further extension to the Hunter Valley to establish two new high capacity 330kV circuits, to connect its next stages of wind generation and the PHES.

At the Hunter Valley it is suggested that the new circuits terminate, one at Liddell and one at Bayswater where switchbays are available. This would also overcome the limited transfer capacity between Liddell and Bayswater.

6 The Uralla Hub

Walcha Energy has secured a 100 hectare site suitable for development of the Uralla Hub as a local connection or as a REZ and grid hub. As a REZ hub it can connect the generation of of the northern half of the Walcha Plateau to the grid. As a 330kV National Grid hub it could accommodate up to ten 330kV circuits, an SVC, reactive plant and a grid battery if required.

The Uralla hub would be developed as a breaker-and-a-half switchyard overcoming the inadequacy of Armidale Substation's single busbar configuration to serve as a grid hub.

The AEMO ISP proposes duplication of the Queensland – New South Wales Interconnection (QNI) as a parallel duplication of the existing Armidale – Dumaresq – Bulli Creek double circuit line. As Armidale Substation with a single busbar cannot handle the additional connections reliably, it is assumed that an Armidale East breaker-and-a-half switchyard would be developed adjacent to Armidale substation. From an engineering perspective this is fine, but as noted in an earlier section it will not be deliverable in practice.

A route further to the west is the only viable way to duplicate QNI. "QNI 2" needs to be routed via the Inverell area and avoid the sensitive vegetation and threatened species on the Northern Tablelands as well as the impacts on residents and resumptions that would be required to construct parallel to QNI. A route for QNI 2 can be successfully developed if the northern section the route avoids the Armidale area altogether and adopts the proposed Uralla Hub as its staging point as illustrated in Figure 7.

The development of the Uralla Hub is now being initiated by the Walcha Energy Project with a view to connect up to 2,100MW of solar and wind generation in 4 tranches as illustrated in Figure 8. Walcha Energy is prepared to design their work to accommodate incorporation into the larger hub concept illustrated in Figure 9.

The Uralla Hub can be developed as the Grid Hub for northern NSW as outlined in included Reference 1 and Figure 9 below which was included in the project's recent update to TransGrid.

This would include not only turning in TLs 85 and 86 but also reconstructing the Uralla – Armidale sections of TLs 85 and 86 as double circuits, on the existing easements, so as to

bring QNI to the grid hub, bypassing Armidale, while retaining the circuits from Uralla to Armidale. Note that TL 86 is only 10km from TL 85 at the Uralla Hub.

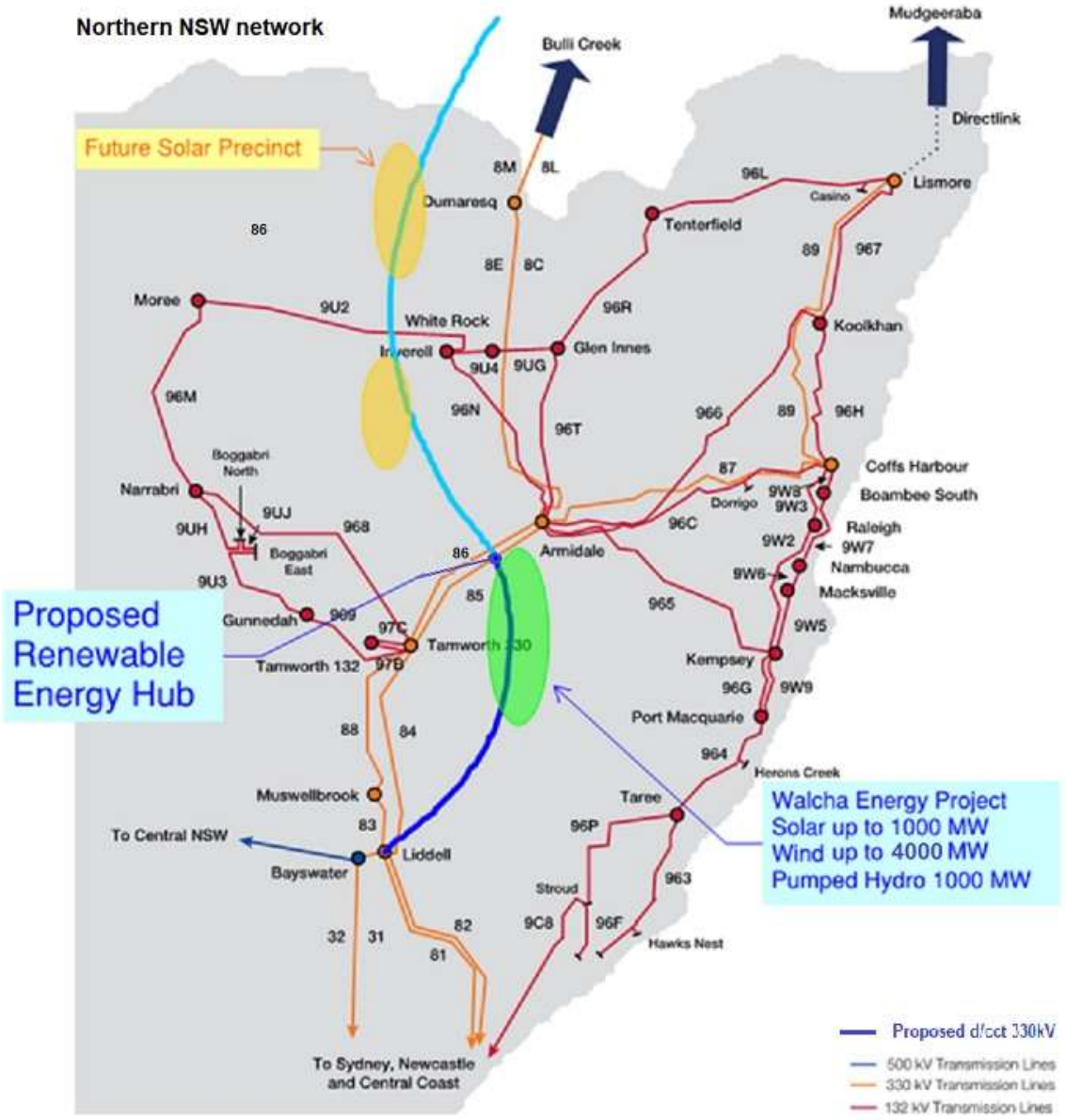


Figure 7 The Uralla Grid and REZ hub as a Staging Point for a second QNI

As mentioned above, construction of a new double circuit 330kV line from Uralla to the Hunter Valley on a diverse route from the existing lines can take advantage of 330kV line sections established to bring 2 x 700MW of wind energy from the Walcha plateau to the hub. These single circuit lines could be rated to match QNI and would be extended for the triple purposes of creating the southern portion of QNI 2 (Hunter Valley to Uralla), connect the excellent wind resource south of Walcha, and connect the 1,000MW PHES development proposed for the southern escarpment of the plateau at Dungowan.

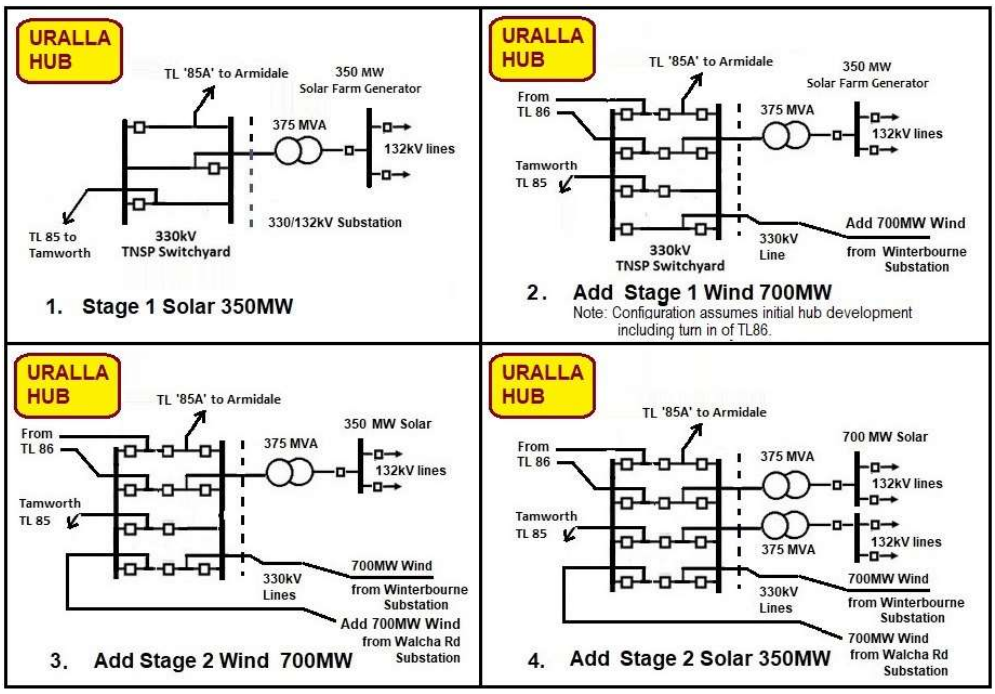


Figure 8 Uralla hub development required for Walcha Energy Project

Uralla can then be connected to Queensland via a diverse route capturing the development of new RE resources and securing the duplication of QNI.

Four 330kV circuits between the Hunter Valley and Queensland, meeting at the Uralla Hub can deliver N-1 secure capacity of equal to that of a double circuit 500kV line, but at a lower cost and facilitating less expensive new generation connections. Reactive compensation would be included in the development. The Uralla Hub would be a suitable location for one of the new SVCs to be placed on a greenfield site rather than disrupting Tamworth as proposed in the 2018 ISP.

This is a no regrets approach as the lines would achieve multiple purposes, being essential for the critically important renewable energy connections while also delivering the backup of inter-regional power flow.

Walcha Energy's submission to the PSCR, and the report by Aurecon attached to it, outlines a step by step plan to implement the hub as both a grid hub and a REZ hub.

The Uralla hub development, including the double circuiting of the lines between Armidale and the hub, is so strategic for the development of the whole national grid north of the Hunter Valley that it is considered to be an essential upgrade in the same way as all Group 1 ISP projects. It is recommended that the Uralla Hub be developed as a regulated development under an accelerated process that would greatly enhance the national grid as well as facilitate the connection of multiple generators in a priority REZ.

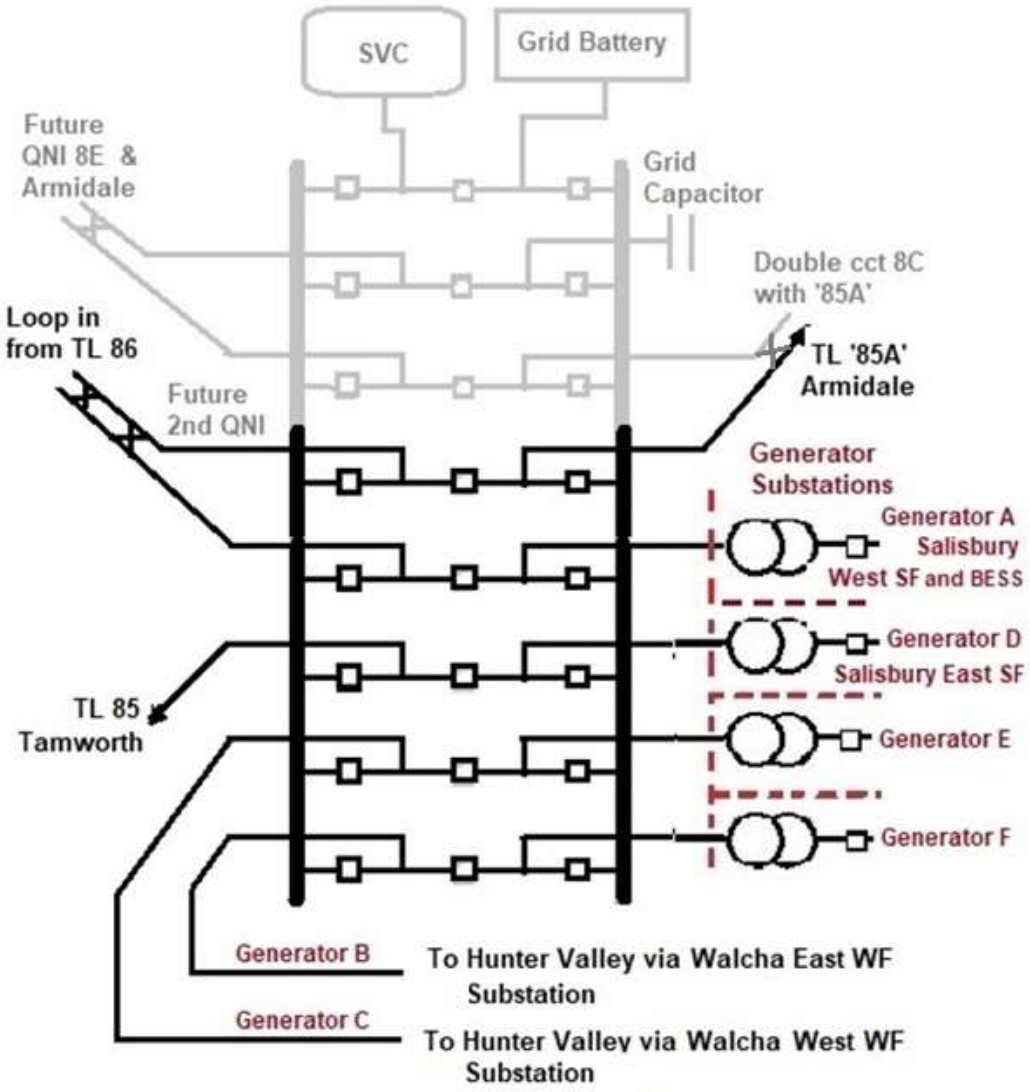


Figure 9 Uralla hub development as grid and REZ hub including selected RIT-T options

7 Summary of Submissions and Recommendations

1. The 2019-20 ISP should include a “Very fast” transition scenario to cover the risks to supply reliability stemming from further coal plant retirements following quickly on the Liddell retirement.

2. ISP planning must consider the risks to supply reliability and market price that would be precipitated by the early closure of Vales Point power station or another similar NSW major power station as result of economic competitive pressures and/or technical considerations.

3. Procedures must be developed quickly to enable more rapid approval of grid augmentations needed to ensure that supply remains reliable for the range of credible transition scenarios facing the NEM.

4. Specific suggestions have been made to facilitate REZ development generally.

5. The wind generation potential of northern and southern NSW should be developed quickly to strengthen 24 x 7 generation pending development of large scale pumped hydro energy storage.

6. The combination of wind, solar and pumped storage development on the Walcha plateau of the New England REZ represents a unique strategic opportunity to mitigate emergent risks to electricity supply within New South Wales.

7. Intra-regional grid development to facilitate the connection of major new generation to the the Newcastle-Sydney-Wollongong load centre must be accelerated.

8. The omission in the 2018 ISP of upgrading the 330kV lines between Tamworth and Armidale must be corrected, included in Group 1 projects, and accelerated.

9. The Uralla hub and double circuit reconstruction of its connections to Armidale should be made a Group 1 project. It is highly desirable that this strategic development proceed ahead of impending new generator connections to the 330kV lines south of Armidale.

10. The Uralla hub is presently planned to proceed as a private development funded by Generators, however the strategic nature of the development requires that it be incorporated into National Grid development.

8 References

Attachments included in this submission

1. Submission to NSW Government: ***The Uralla Renewable Energy Hub,*** MirusWind June 2018

2. Submission: ***NSW Transmission Infrastructure Strategy 2018 – Proposed Approach***, MirusWind/Energy Estate 26-9-18

3. ***WalchaEnergy - Developing the Uralla grid and renewable energy hub,*** Aurecon, December 2018

4. ***WalchaEnergy Submission to PSCR Expanding NSW -Qld Transmission Transfer Capacity***

5. ***Hybrid Wind & Solar Curtailment - Sample co-location study results,*** Aurecon 2017

Other references

6. ACCC. (2018). '***Restoring electricity affordability & Australia's competitive advantage'***. Australian Competition and Consumer Commission [online] Available at: https://www.accc.gov.au/publications/restoring-electricity-affordability-australias-competitive-advantage [Accessed 27 Nov. 2018].

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