Draft 2020 Integrated System Plan

Submission to AEMO Consultation

Walcha Energy

20 February 2020

Executive Summary

The inclusion of the Fast Change Scenario and of the Step Change scenario in ISP planning and forecasting consideration is welcomed. It is noted however that neither of these scenarios correspond to the faster coal transition scenario modelled by the Crawford School of Public Policy, ANU. From a risk management viewpoint, the ISP should seek to demonstrate a capability to respond quickly to the early retirement of several additional major coal fired power stations, closely following the Liddell retirement in 2022-23, driven by economic factors.

The ISP needs to focus on the early development of resources closer to load centres and give more weight to power system resilience in grid development. Strategies to deliver accelerated grid augmentations need to be developed to provide flexibility in commitment schedules. This will require careful definition of appropriate new nodes, selection of routes and possibly optioning or acquiring easements. New mechanisms will need to be developed to achieve these necessary measures.

Early development of the large scale renewable energy resources of the Walcha Plateau, south of Armidale, with more than 4,000MW of high quality wind resources is a strategic necessity in the present phase of NEM transformation in NSW. The Walcha Plateau escarpments also provide excellent PHES development opportunities at a most strategic location in the NEM. Near term grid development should provide for appropriate connection REZs that include such well located, top quality PHES development opportunities.

Group 1 projects to date address only the low hanging fruit that can be delivered by the addition of reactive plant and selected line upratings. It is recommended that the ISP scope be expanded to correct functional weaknesses in switching arrangements at critical nodes that lead to constraints under forced and scheduled outages. There is an urgent to strengthen grid capacity at weak links.

For northern New South Wales it is submitted that the development of the Uralla grid hub, together with associated line upratings and reconstructions between Tamworth and Armidale, set out in this submission, be undertaken urgently to continue the grid strengthening of the Group 1 projects on existing routes.

Further reinforcement of the 330kV grid is needed between Armidale and the NSW load centres to improve MLFs for Generators north of Armidale, to remove the constraints on development of the New England REZ, to reduce impacts of development on other generators, and to optimise the QNI 2 development. It is proposed that the project to construct a new high capacity 330kV double circuit line from the Uralla Hub to the Hunter Valley be elevated from Group 3 to a Group 2 project. A route via Walcha Plateau wind resources, and close to the excellent PHES resources on the escarpments, should be adopted.

These works belong in highest priority category needed to enable NSW to rapidly develop appropriate energy resources and large scale storage needed to manage the early retirement of further coal fired power stations on the heels of the Liddell retirement.

With the proposed additional Group 1 projects between Tamworth and Armidale these developments will overcome functional weaknesses of the 330kV grid in northern NSW. They will create a resilient northern NSW 330kV grid. They will support all the generation of the New England REZ and they will back up future 500kV and/or DC interconnection with Queensland.

The above recommendations rest on:

- The quality and proximity of the wind and solar 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 resilience of the proposed grid development concept
- The location of the resources < 200km from Liddell and Bayswater
- The compatibility of the proposed developments with existing land uses
- A strong base of community support for the developments, and
- The environmental compatibility of the developments.

ISP commitment to the early development of the Uralla Hub will ensure the early development of the wind and PHES potential of the Walcha Plateau. It will also facilitate optimization of the capacity and timing of the proposed QNI Medium and QNI Larger interconnection proposals.

1 Introduction

Walcha Energy welcomes the introduction into the draft 2020 ISP of the fast change and step change scenarios.

There is a clear risk that economic factors and technical limitations will force the early closure of major fossil fuel stations. The technical suitability of the existing fleet of large scale fossil fuel generators has already been challenged by solar roofs and the impact of the increasing duck curve on daytime demand.

It is of critical importance that ISP 2020 refocus its priorities to facilitate REZ developments that can secure electric energy availability for major load centres.

Grid congestion, solar roof competition, and falling loss factors have impacted severely on the profitability of large scale solar farms, even where allowance has been made for reasonable amounts of battery storage. Many investors have pressed the pause button on large scale solar development.

The time is right for AEMO to refocus on wind energy development, especially in view of the high capacity factors achieved by recent larger wind generator developments and predicted for the next generation of large scale wind farms. Given the lead times applying to PHES developments the benefits of 24 x 7 wind generation are compelling at the present stage of renewable energy (RE) development.

The 2018 ISP focused on the need for interconnections to balance supply from variable RE generation between the Regions. However long transmission lines have high capital costs and significant maintenance costs. This is exacerbated by the need for N-1 resilience and, particularly in forested areas, an increasing risk of double circuit outages being reclassified as N-1. On the Great Dividing Range and forested slopes and gorges of the east coast states, the current summer has shown how transmission is particularly vulnerable to bushfires, exacerbating the resilience issues. Given the evolving nature of the grid over time the risks associated with major grid outages are extremely problematic to quantify, yet there is a clear need to develop an appropriate systematic mechanism by which to attribute proper value to grid resilience in designing grid developments.

Long lines have significant electrical losses. Marginal Loss Factors (MLFs) applied to the sale of energy by Generators cannot be accurately predicted in the absence of an overall transition plan for NEM generation. The emergence of new technologies and distributed energy systems, add to the difficulty of predicting the timing of retirements of large generators over the life of new generation investments. These uncertainties impact on the remuneration paid to Generators and represent a strong case for focussing new REZ development on locations with good accessibility to the load centres they will supply and prioritising grid augmentations that will reduce losses and improve resilience.

This submission makes the case for prioritising REZ developments with major 24 x 7 wind energy resources of appropriate scale and reasonably close to major load centres.

The east coast of Australia benefits from a number of REZs with superior night time wind. These include the New England REZ. Superior night time wind results in a highly productive synergy of co-located and co-transmitted wind energy and solar energy. The utilisation of grid developments to connect such REZs to the load centres is substantially improved, addressing a concern identified in the COGATI process. The availability of high quality PHES sites close to a REZ, can deliver further major improvements to grid utilisation and add more value to the associated grid investments.

Each of the above factors applies to the development of the New England REZ, and especially to the development of the portion of the REZ to the south of Armidale which has huge wind resources and most strategic, high quality PHES opportunities. The development of the 330kV grid to provide four high capacity circuits between Armidale and the Hunter Valley will not only facilitate development of the excellent wind and solar resources of the Walcha Plateau, but will address the functional deficiencies of the northern NSW 330kV grid, will improve MLFs throughout the northern tablelands, and will serve to facilitate the optimisation of the later stages of augmentation of the Queensland – NSW interconnection.

2 NEM Transformation and Transition

Least Cost of Energy Generation

The transformation of NEM Generation is being driven by the lower cost of renewables compared with 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] indicated 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. The draft of GenCost 2019-20[2] confirms the trend.

Figure 1 shows the projected LCOE comparison for 2030.

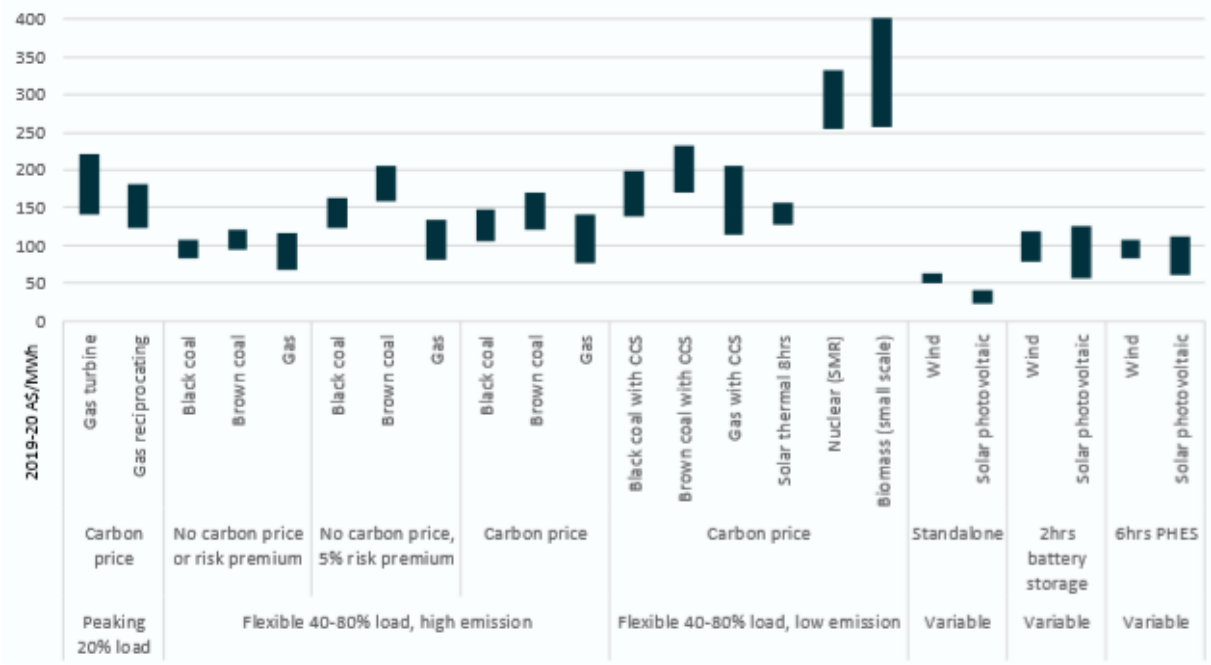

Figure 1 Calculated LCOE by technology and category for 2030 (CSIRO GenCost 2019-20)

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 [3] in a detailed paper, *Coal Transitions in Australia*. published by the ANU's Crawford School of Public Policy.

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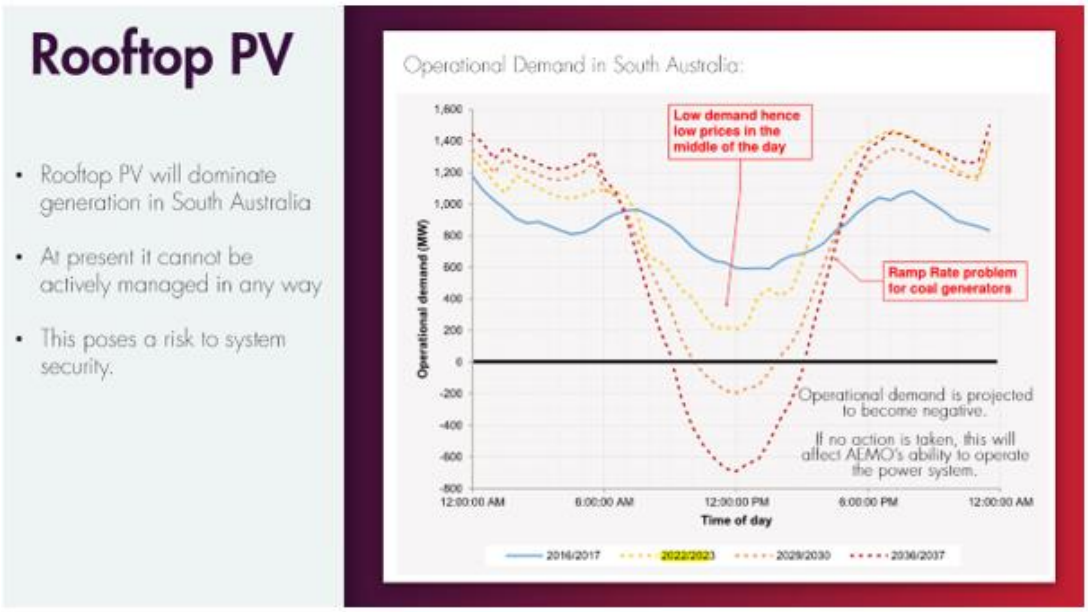
[1] Graham PW et al: *GenCost 2018,* CSIRO, Australia. (GenCost is a joint initiative of CSIRO and AEMO.)

[2] Graham PW et al: *GenCost 2019-20, Preliminary results for stakeholder review,* CSIRO, Australia.(Fig 4-2)

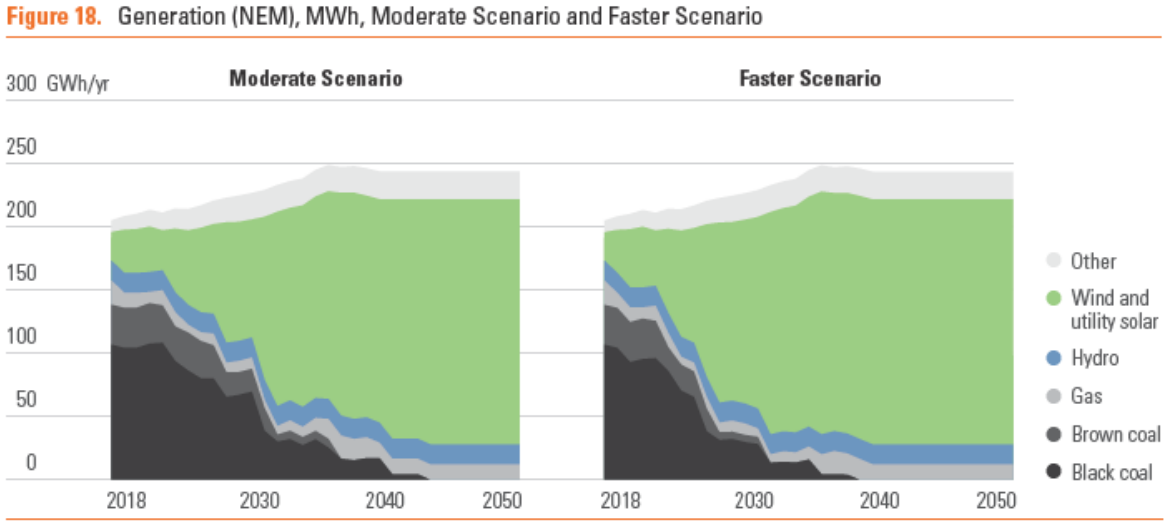
[3] Jotzo F, Mazouz S, Wiseman J.(2018). *Coal transition in Australia: an overview of issues, ANU.*



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

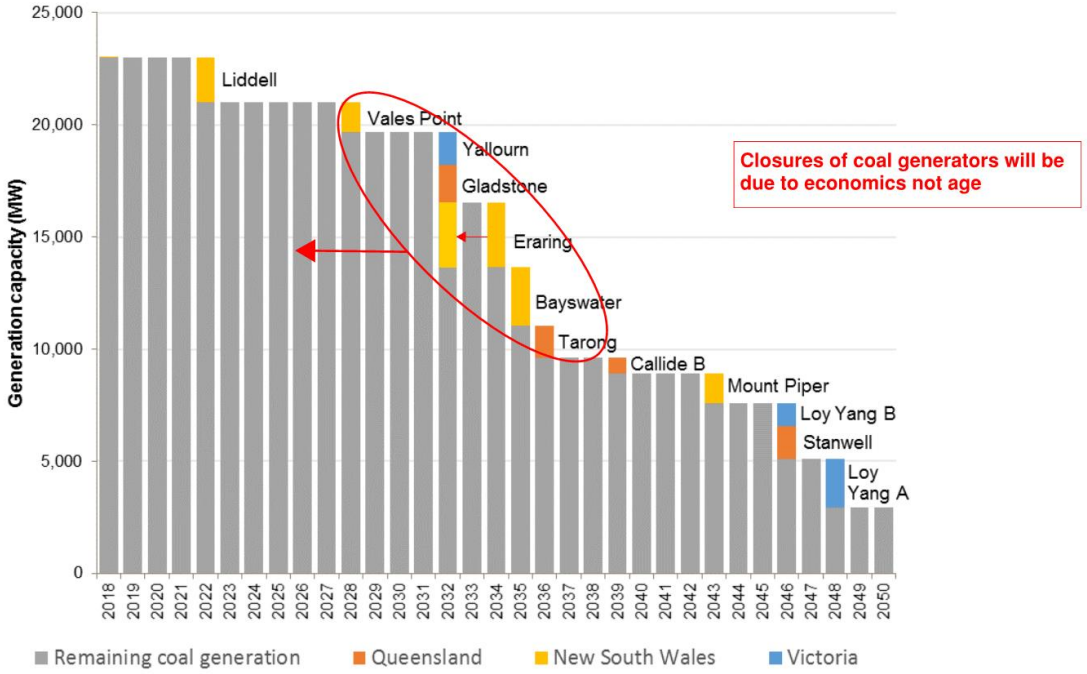
Figure 3 Impact of economic pressure on NEM generation – two scenarios

The moderate scenario is broadly compatible with Australia's 2030 Paris NDC agreement. The implications of a faster scenario should be considered. 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 of the 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. In a submission to the AEMO Planning and Forecasting consultation, Walcha Energy submitted as follows:

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.

3 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

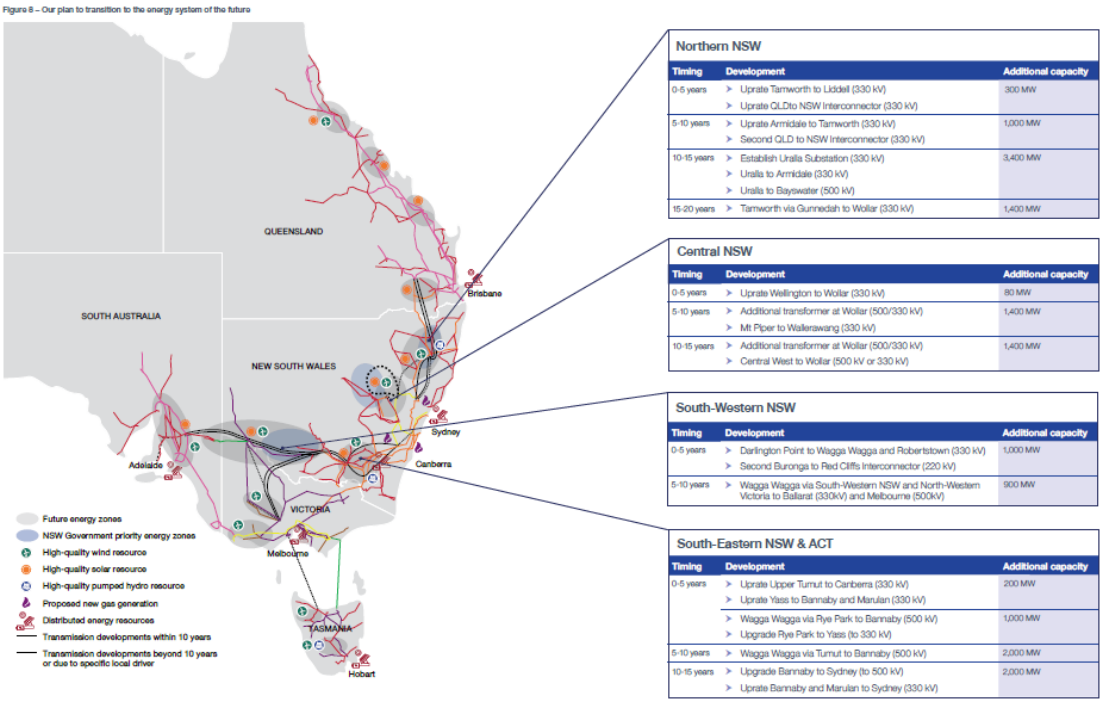


Figure 5 TransGrid REZ map

- The North West NSW REZ numbered N1 in Figure 15 of the draft 2020 ISP lies along the Group 2 Near Term and Group 3 Future QNI 2 Interconnector projects shown in Figure 1 *Development paths for the NEM in the Draft 2020 ISP*. It is submitted that within NSW this concept is premature in Group 2 and should be replaced by the development between Armidale and the Hunter Valley proposed in this submission.
- This submission endorses the change in the draft 2020 ISP that routes QNI 2 further west in the northern NSW section, away from the sensitive lands traversed by QNI.
- The QNI 2 project in NSW north of Armidale and Inverell should not be included in Group 2 as the early development of this section will inappropriately attract solar development remote from the NSW load centres where the energy will be needed and will add to a surfeit of solar generation emerging in southern Queensland.
- The NSW Government's proposed Central West development and the Walcha Plateau development in the New England REZ should precede QNI Medium and QNI Large. The former should capture wind resources of the Liverpool Range area as well as solar resources from the Wellington-Dubbo area and northwards to Gunnedah. The Walcha Plateau development will capture huge wind resources and PHES opportunities more appropriate to the present stage of NEM transition.
- 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 can 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 will mitigate risks to supply reliability pending the development of sufficient pumped hydro energy storage
- The synergy of co-located solar and wind resources should be considered in prioritising REZ developments. A wind zone may generate with a 50% capacity factor while tracking solar manages less than 30%. Co-located solar and wind can connect more generation than the grid line rating. The New England REZ can connect 150% of the grid entry rating with only small generation curtailment, much of which can be captured by a modest amount of storage. Zones that connect co-located wind and solar can deliver superior grid utilisation compared with zones that have solely wind or solely solar.
- It is important to recognise the synergy of prospective pumped hydro energy storage (PHES) with renewable energy in further improving grid utilisation and reducing connection capacity requirements, especially when co-located in proximity to the renewable generation as would apply to PHES on the steep Walcha Plateau escarpments with 500m to 700m head. This follows from the pattern of operation of pumped storage plant, pumping when demand is low and generating when demand is high and solar generation is low.
- The early development of the New England southern REZ area, the Uralla Grid and REZ Hub and reinforcement between Armidale, the Uralla hub and the Hunter Valley should be the priority development in NSW and grid development plans should facilitate this rather than prematurely open up new RE near Queensland that is very remote form Newcastle and Sydney.

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 acknowledged. Reinforcement of the Queensland – NSW transfer capacity will be 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.

Grid development to enhance grid capacity and reduce losses between Armidale and NSW load centres is very urgently needed. Strengthening the northern NSW grid should begin with Hunter Valley to Armidale and then be extended to Queensland subsequently, although processes to identify the most appropriate route and secure an easement should be initiated to enable construction to proceed quickly when it is really needed.

Delayed redevelopment and uprating between Tamworth and Armidale, as indicated in the 2018 ISP and the present 2020 ISP draft, 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. It is preferable that each state should normally cover its consumption requirements. This can be achieved. 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.

The Walcha plateau has at least 4,000MW of high quality wind resource as well as solar and excellent pumped hydro sites. Development of these resources is needed as soon as possible. Excerpts of AEMO resource maps are shown in Figure 6.

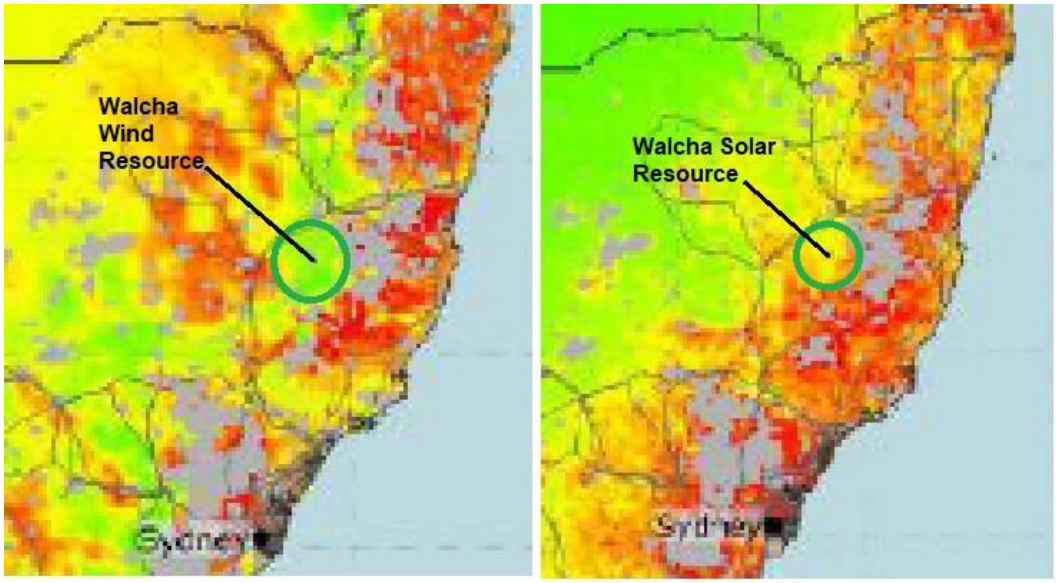


Figure 6 Walcha Plateau Wind and Solar Resources (AEMO Planning & Forecasting consultation paper, section 4.5.2)

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 this 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 330kV grid circuits 85 & 86. It presents the opportunity to create a National Grid hub suitable switching QNI and for the development of the QNI 2 when required as indicated in Figure 7.*

- *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 also enable the development of high capacity PHES, all within 200km of the Hunter Valley power stations.*

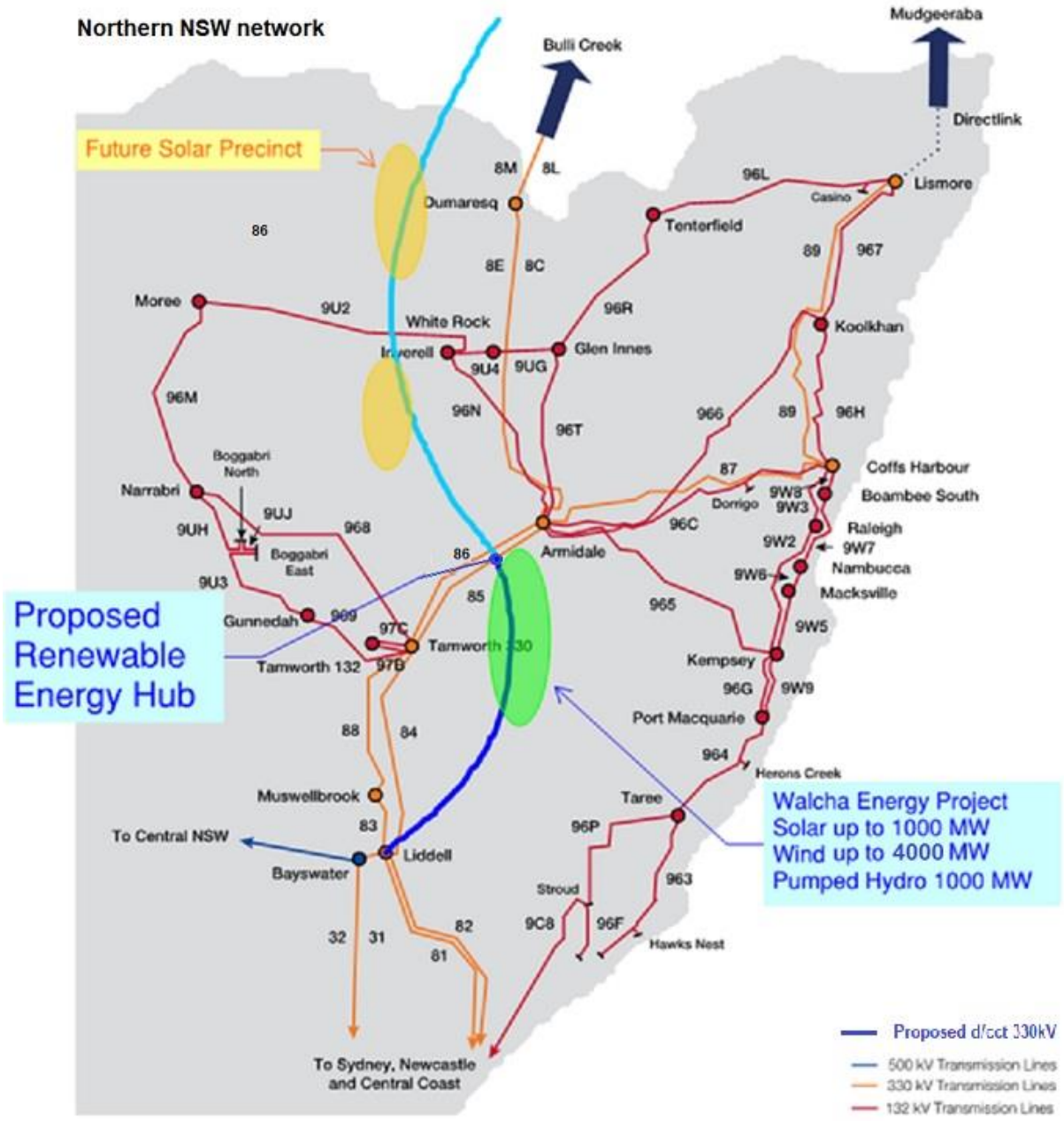


Figure 7 The Uralla Grid and REZ hub as a Staging Point for a second QNI

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 Wind Farm – 700MW. This project has been acquired by Vestas.
- Wind Stage 2 – Ruby Hills Wind Farm (West of Walcha) – 700MW
- Solar Stage 1 Salisbury West Solar Farm – 350MW with 150MWh battery
- Solar Stage 2 Salisbury East Solar Farm - 350MW

Subsequent stages of at least 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, the proposed PHES at Dungowan Dam and offering a connection to the proposed Hills of Gold Wind Farm.

A joint pre-feasibility investigation for PHES and augmented water supply at Dungowan Dam has been carried out by Arup under an agreement between Walcha Energy and Tamworth City. The PHES will have a head well in excess of 500m and have energy storage to deliver 500MW of generation for 6 hours.

Several other developers are developing substantial generation and storage projects on or near 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 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.

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. To fulfil this role QNI should be extended to the Uralla Hub. This can readily be achieved by reconstructing the portions of transmission lines 85 and 86 between Armidale and Uralla as double circuit lines on the existing easement (plus a connection to bring 86 line to the hub).

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.

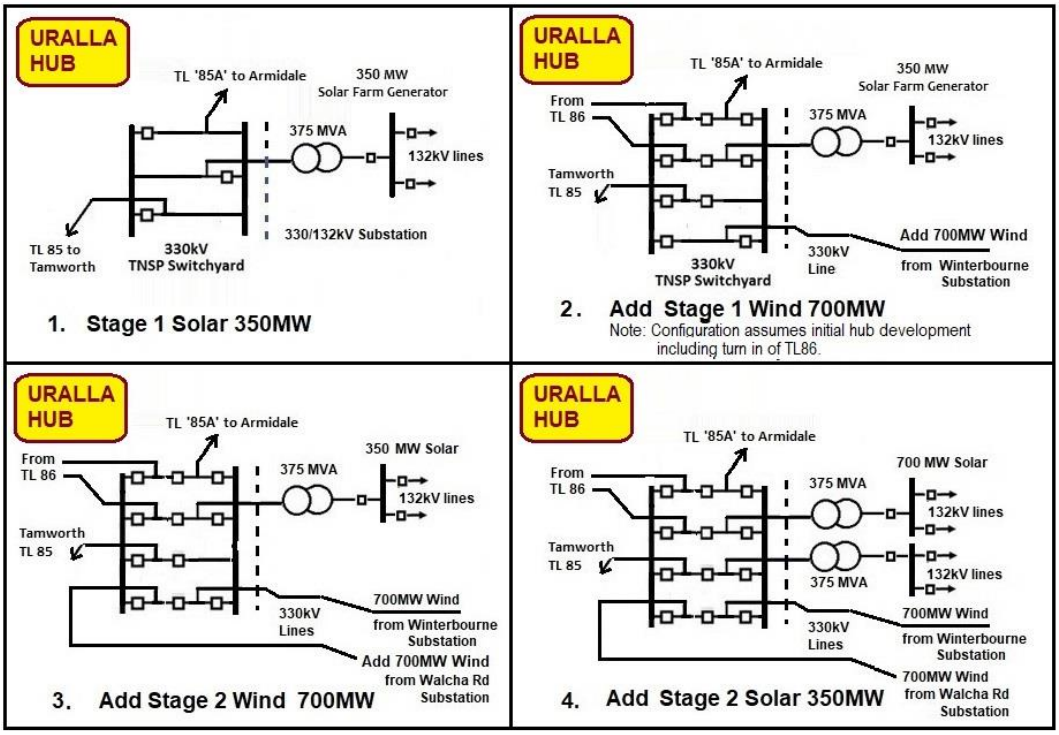


Figure 8 Uralla hub development required for Walcha Energy Project

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 Reference 1 and outlined in Attachment 1 and Figure 9 below which was included in the project's 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.

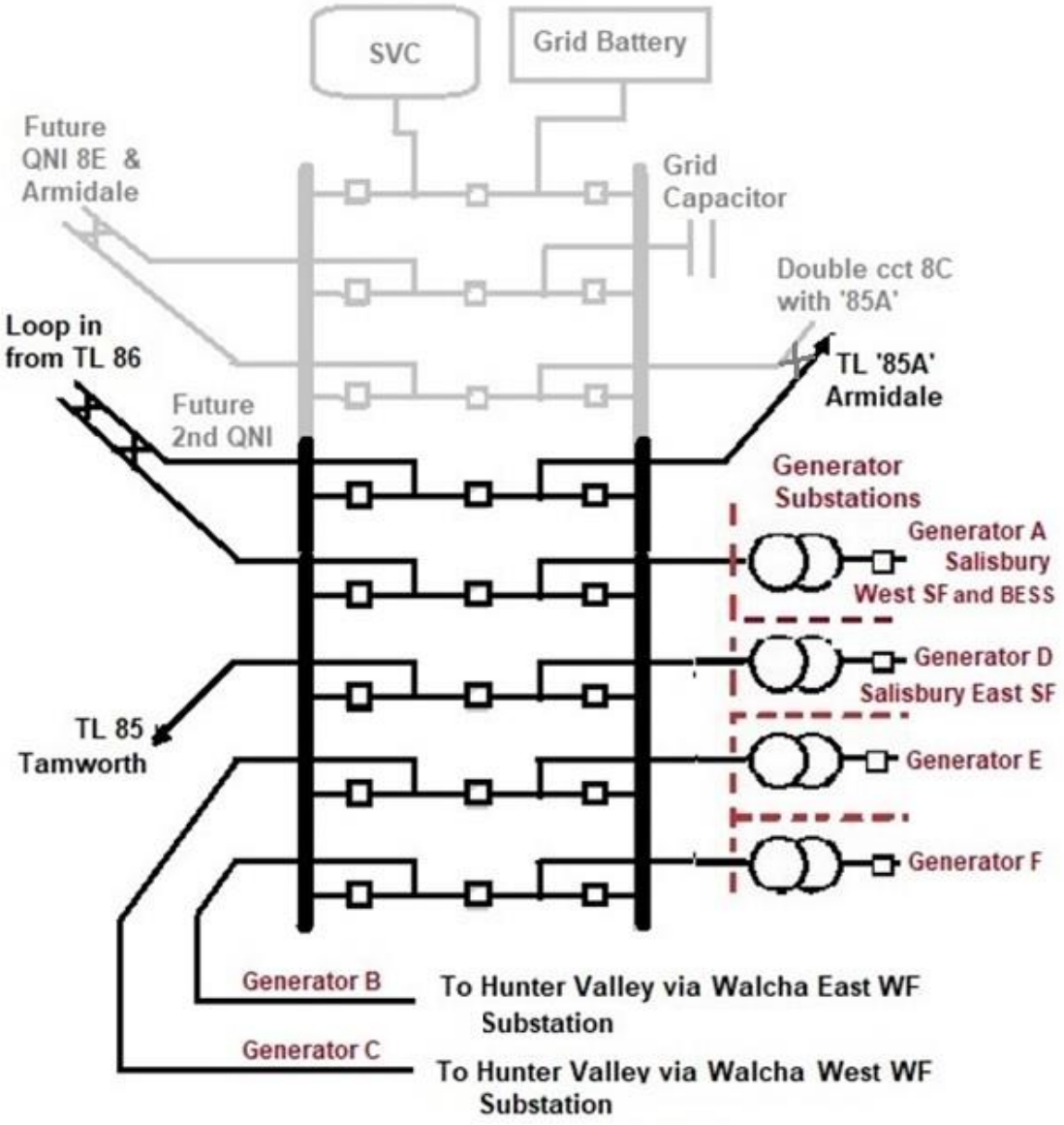


Figure 9 Uralla hub development as grid and REZ hub including selected RIT-T options

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.

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.

7 Summary of Submissions and Recommendations

1. The 2019-20 ISP inclusion of a "Very fast" transition scenario is endorsed. This is important 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. 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.

5. 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.

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

7. The New England REZ will deliver more than 6,000MW of renewable energy to New South Wales. Together with the Central West development of 3,000 MW the adequacy of electric energy supply from within NSW to NSW load centres can be secured for the period to 2030.

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. Like the other Group 1 projects it requires no new transmission line routes. It is highly desirable that this strategic development proceed ahead of impending new generator connections to the 330kV lines south of Armidale. The importance is such that government funding and a construction derogation should be considered.

10. The Uralla hub is presently planned to be funded by Generators as a REZ hub, however the timely commitment of major funds by private developers is contingent on commitments such as promotion of the grid hub as an ISP Group 1 project or a government funding commitment to ensure early development of the grid hub.

11. The strategic nature of the development requires that the Uralla hub be incorporated into National Grid development. Promoting the basic grid hub development to Group 1 with a funding commitment by government for the initial stage will ensure the rapid development of this strategic project and maximise the development of the REZ resources.

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