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To: Ms Audrey Zibelman
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AEMO ISP Team

21 February 2020

By email: isp@aemo.com.au

SUBMISSION ON DRAFT INTEGRATED SYSTEM PLAN

Introduction

1. This personal submission calls upon AEMO to take strong leadership in developing the Integrated System Plan. Professional transmission planners have a critical role in developing the National Grid of the future.

2. The industry is all too conscious that Rules formulated to contain grid costs and optimise market-driven incremental development have proved incapable of addressing the present technology driven transformation of the power system. New technologies have completely changed the economics of power generation. New generation can be developed faster than the grid required to connect it. Investment has run ahead and serious grid congestion has already emerged. Grid augmentation is urgent.

3. Following the Finkel Report charting a path to the future, AEMO has identified renewable energy zones (REZ) throughout the NEM regions. The ISP envisages a 500kV and 330kV overlay to the existing grid. Modified and new mechanisms are needed to accelerate and deliver the flexible but resilient grid that now must be designed and implemented.

4. Grid development will drive new large scale renewable energy investment, while aged fossil fuel plants struggle to match the changing daily load curve as rooftop and large scale solar farms generate with the sun's daytime availability. Interconnected wind generation has a critical role at this time, and regional energy storage needs to be developed to enhance grid utilisation and reduce interconnection requirements.

5. The 2020 ISP must identify short and medium term strategic priorities pertinent to the circumstances of each Region. There is a need to prioritise the grid augmentations that facilitate strategic development of the most suitable REZs and their connections to the major state loads. In Northern NSW and Queensland it is submitted that wind resources and facilitating development of the best regional PHES sites are key priorities that should drive grid development and interconnection development strategy.

Development Paths

Figure 1 of the Draft 2020 ISP is reproduced here and comments follow.

Figure 1 The development paths for the NEM in the Draft 2020 ISP[17]

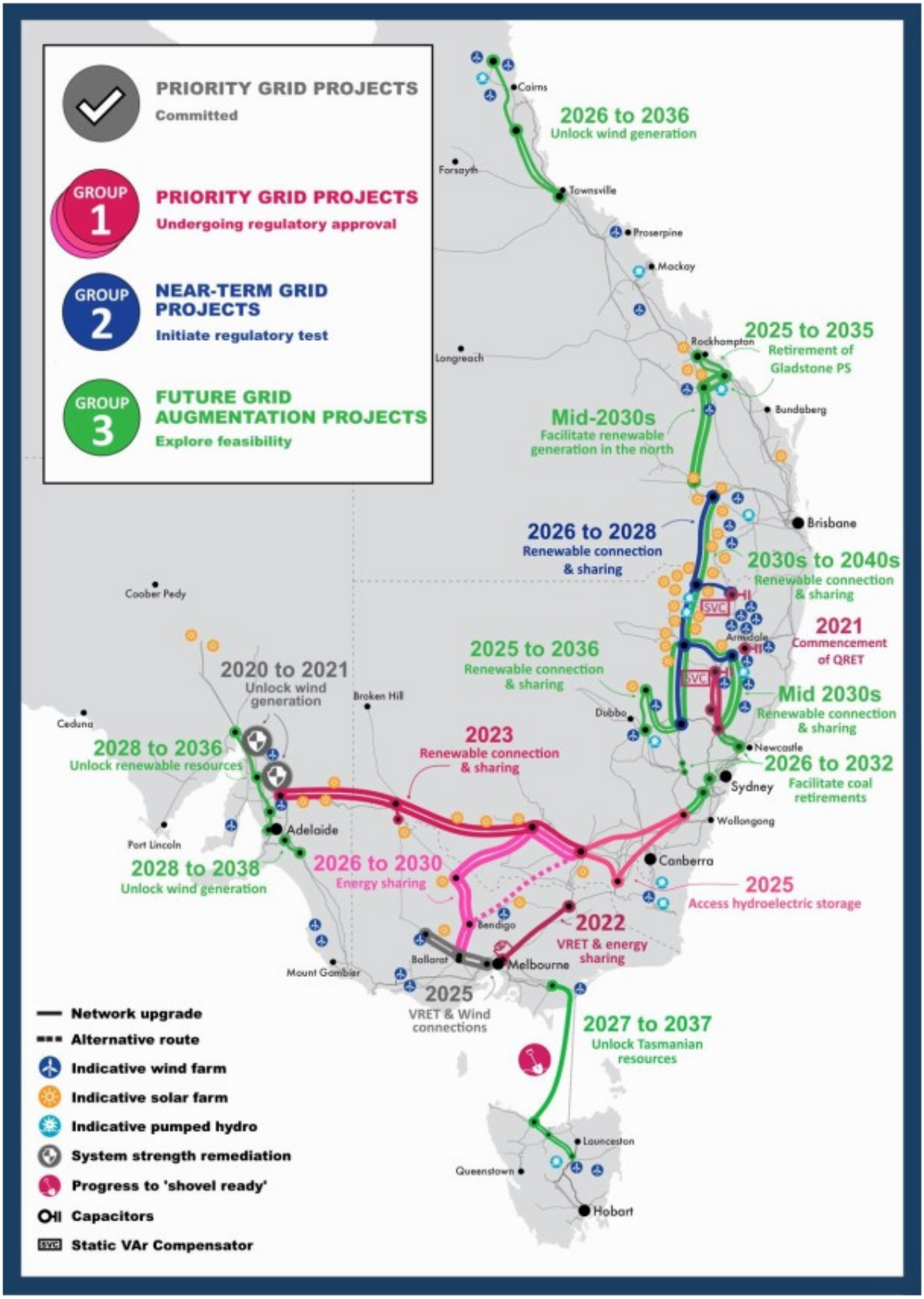


Figure 1 Development paths of the Draft 2020 ISP

500kV Development

6. Completion of the NSW 500kV Ring

The draft ISP development paths envisage 500kV interconnections, Victoria - NSW and Queensland-NSW. However they do not address the heart of the 500kV system that would be created. The central 500kV ring between Bayswater and Bannaby in NSW remains incomplete, jeopardising the resilience of the envisaged 500kV grid and putting future supply to Sydney at risk. Load flow studies under a wide range of generation conditions must demonstrate the capability of the grid to deliver to the Sydney load from sources variably to the south, west or north.

The existng NSW 500kV lines traverse many stretches of forested lands vulnerable to bushfire outages. The ring needs to be completed as indicated by the solid **red** lines in Figure 2 if grid augmentations to the north and south are to deliver to the NSW load centres.

As the sources of generation are dynamically changing, the 500kV ring has become critical infrastructure for supply to Sydney, Newcastle and Wollongong and to hold together the whole NSW grid. This is essential national infrastructure.

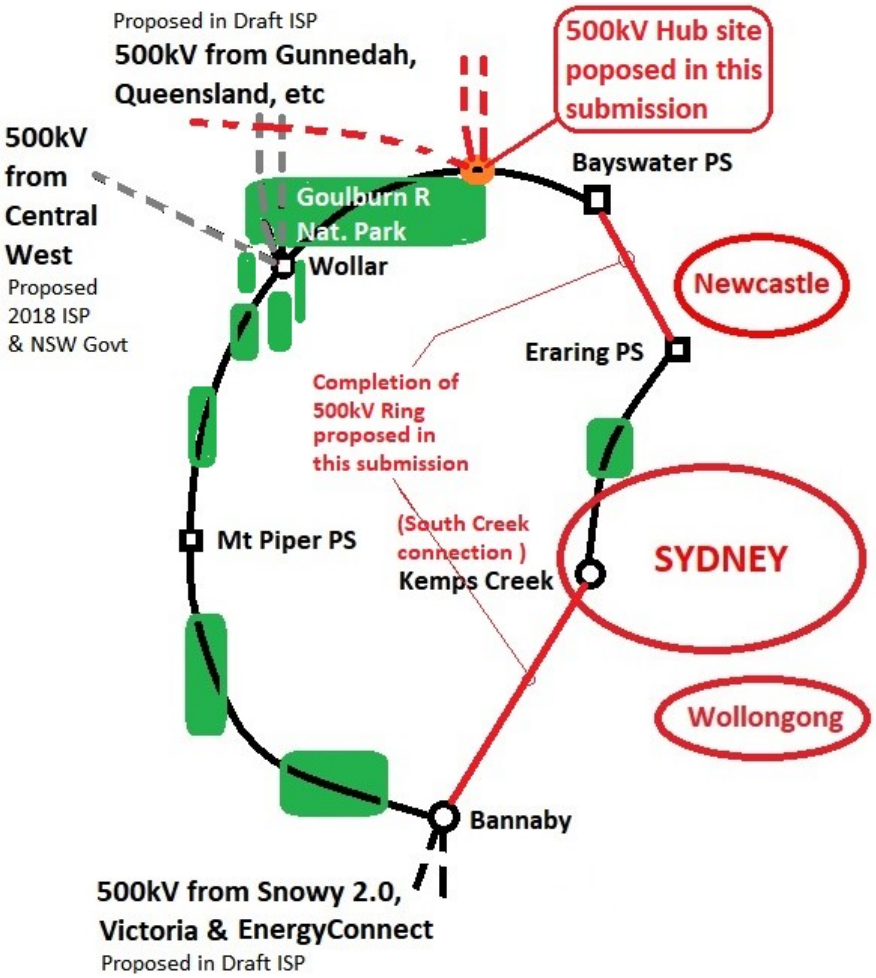


Figure 2 Proposed completion of NSW 500kV ring

7. The 500kV hub location

Wollar is not a suitable location for the proposed 500kV hub envisaged by the draft ISP. Wollar is surrounded by unique terrain of major significance, extremely sensitive National Parks and Nature Reserves, and filling the gaps between them to the northwest, the large Wilpinjong and Ulan coal mines as can be seen in Figure 3. It would be difficult to connect just one additional line to Wollar for the NSW Central West development, let alone four more circuits from the north as envisaged by the draft ISP.

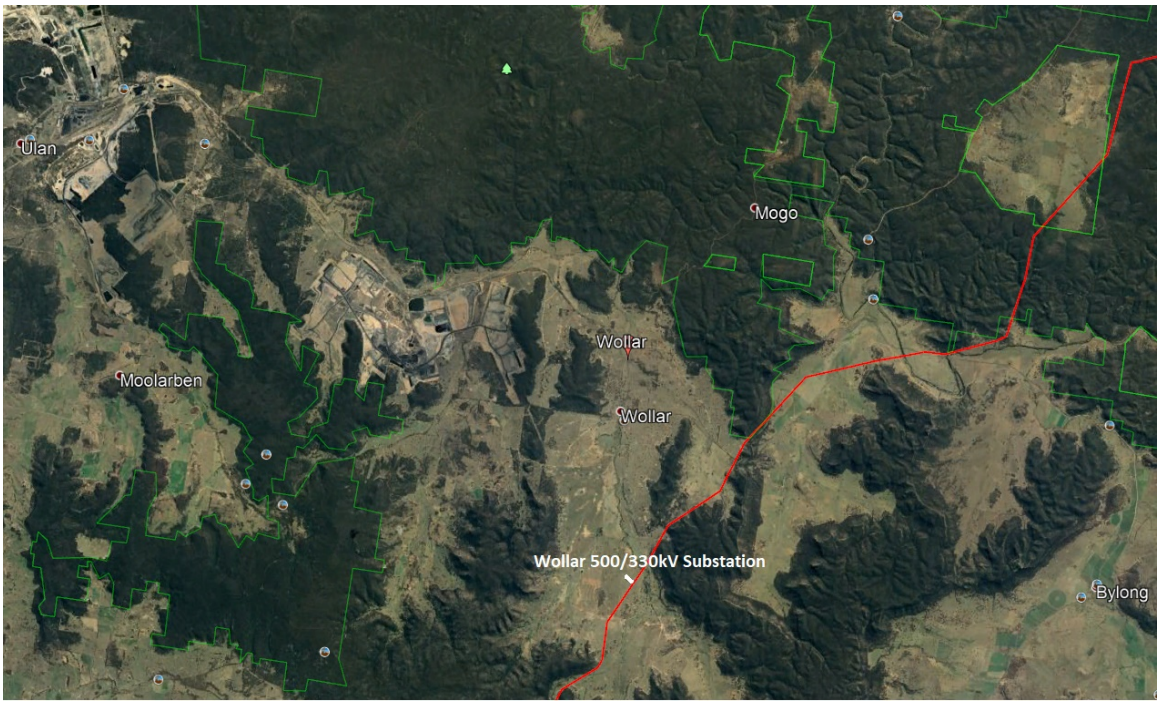


Figure 3 Wollar 500kV Substation and surrounds

A direct 500kV QNI2 route from the north or a line from Gunnedah or Uralla would have to traverse the Goulburn River NP and/or adjacent Nature Reserves to get to Wollar. This could not gain a social licence and would be an unacceptable bushfire risk route.

The southern terminal for 500kV circuits from the north should be located on the section of the Bayswater – Mt Piper 500kV line that lies to the north of Goulburn River National Park, that is a new site south of Merriwa. (Several siting options on the Bayswater – Wollar 500kV line route can be considered.)

A Merriwa terminal would be an ideal connection point for the NSW transmission infrastructure project to connect the NSW Central West REZ. The route would parallel the Liverpool Range facilitating connection of its wind resources and those of the Coolah area. Adding these wind resources to Central West solar will result in high utilisation of a 500kV connection.

The Liverpool Range can be crossed by a 500kV line from Queensland via the proposed Uralla Hub, or as a separate development via Gunnedah. The Merriwa site is very suitable as a connection point for all options from Queensland including a terminal point for a future DC link.

Group 1 projects strengthening the existing QNI

The draft 2020 ISP characterises Group 1 projects as follows.

Stage 1 Group 1 projects to Upgrade existing QNI

Priority grid projects undergoing regulatory approval These investments are highly likely to provide strong benefits in all, or nearly all, scenarios. They require near-term investment to maximise those benefits, and the potential regret costs from overinvestment are very low.

8. The scope of these projects, now designated QNI Minor, has been selected such that they are low hanging fuit, easily approved and funded under the accelerated RIT-T process. They will certainly achieve useful improvements to the capability of the existing QNI. However QNI Minor does not sufficiently address the transmission planning functioonality required in northern NSW or the generator connection issues already evident on the existing Queensland to Hunter Valley 330kV grid.

9. Why were lines 85 and 86 omitted from the 330kV line upratings in the 2018 ISP and why has this not been corrected in the draft 2020 ISP?

   TransGrid started reporting the need to rebuild the wood pole 330kV TL 86, due to its deteriorated condition, some years ago. Presumably it was expected that this would be included in TransGrid's current 5 year works program, but the Regulator rejected it because TransGrid sensibly proposed increasing the rating of the line, which has a small conductor (twin Lime ACSR) ideally suited to the original wood pole design. The additional cost of the uprating was very small but the Regulator considered the project, proposed as a replacement due to the line's condition, required separate justification as a new project due to the uprating. Why has this justification not been made and recognised in the draft 2020 ISP? The work is necessary and now urgently required.

   330kV transmission lines 83, 84 and 88 between Liddell and Tamworth are to be uprated as part of QNI Minor. Why not Tamworth Armidale TL 85 also? This work should be in the same package as the uprating of the other 330kV steel tower lines included in QNI Minor. Lines 85 and 86 are also part of the existing QNI that needs to be uprated south from Armidale to the Hunter Valley.

   The need is clear now for a second tranche of QNI Minor ("Group 1A") or an accelerated early phase of Group 2 projects to bring to completion the strengthening of QNI.

10. A fully functional QNI

    To make the existing QNI fully functional there is a need for a northern NSW 330kV grid hub, configured as breaker–and-a-half, to mitigate the consequences of N-1 dispatch when outages affect Tamworth or Armidale Substation. The Dumaresq -Armidale circuits 8C and 8E should be terminated in such a northern NSW hub. With the ISP requirements for new circuits and easements, the existing Tamworth and Armidale localities

are not suitable for such a hub. So the proposed northern NSW grid hub south of Uralla should be a "Group 1A" project rather than being delayed to Group 3.

It might well have been more suitable for some of the reactive plant augmentations slated for QNI Minor to be located in the new greenfield hub than in congested brownfield sites.

It is doubtless too late in the process to make such changes as part of QNI Minor, but they illustrate how the current grid augmentation rules constrain grid development planning.

11. AEMO needs to develop an optimal resilient ISP unconstrained by the pressures of incrementalism inherent in the old RIT-T process which was suited to a power system developing by minor extensions and replacements, unlike the present power system in transformation.

Group 2 and Group 3 projects

12. Group 2 and Group 3 projects in the draft 2020 ISP have evolved from the 2018 versions with some distinct improvements but more changes are needed.

    The 2018 ISP focussed on interconnectors. Project Energy Connect is clearly appropriate, and Marinus link is a plausible option to backup Basslink and develop additional opportunities. However the wisdom of prioritising Group 2 interconnection with Queensland ahead of REZ development in northern NSW must be questioned.

13. What should drive the ISP?

    It is the view of this submission that grid augmentations supporting strategic REZ development cannot be relegated to Group 3. They are needed now. Development of strategic prioritised REZs should be driving the ISP grid development plan for NSW, and the same applies for Queensland.

14. Within NSW, and assuming Project Energy Connect and associated southern NSW grid development, this submission proposes that **maximising the utility of the existing QNI and the development of the New England and Central West REZs should be given priority, particularly because of their substantial high quality wind resources**. Grid development that connects the resources of these REZ is a no regrets approach. It can be achieved more quickly than long interconnections and reduces the severe risks that would be triggered by early retirement of major fossil fuel plant.

15. Prioritising QLD - NSW interconnection over NSW REZ development (as in the draft ISP) will attract generation developments remote from the Sydney load centre, with high losses, and inefficient grid utilisation. It will

lead to a more expensive overall ultimate development, and very likely to the deferral of at least some of the best-located NSW renewable resources, ones that include large scale wind.

16. Due to the lead times involved in developing regional PHES in northern NSW and mass distributed energy storage, development of high quality wind resources within 200km of the existing strong central grid needs to be prioritised in the present stage of energy and NEM transformation.

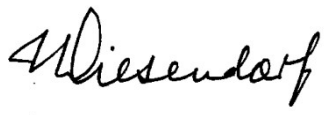
17. The NSW Government has chosen the Central West REZ for its special development project rather than the New England REZ. Although the New England REZ can be developed more quickly, its development interfaces with the RIT-T processes already under way in respect of strengthening the Queensland – NSW interconnection. It is observed however that if the 500kV hub on the Bayswater – Wollar – Mt Piper line is relocated as proposed above, some synergies are likely to eventuate.

18. This submission contends that the draft ISP substantially underestimates the scale of the renewable resources that would be developed though prioritising the grid works connecting the New England zone robustly by four circuits from Armidale to the Hunter Valley. This development can be combined with route investigations and selective site and easement acquisitions to suit appropriately-timed rapid development of future Queensland – NSW interconnection(s) when the need is triggered.

19. Early development of a mini-hub at Sapphire / White Rock with connection to both circuits 8C and 8E is recommended in addition to the early development of the proposed Uralla Grid and REZ hub.

20. The new double circuit 330kV line from the Uralla hub to the Hunter Valley, proposed in the draft ISP as a Group 3 project, should be scheduled for early development in the 2020 ISP. The route should facilitate connection of large scale pumped hydro storage on the escarpments of the Walcha Plateau as well as connection of major wind generation south of Walcha.

For consideration



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