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AEMO and
TransGrid

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Victoria to NSW Interconnector Upgrade - RIT-T Project Specification Consultation Report

Snowy Hydro Limited welcomes the opportunity to comment on this vital interconnector upgrade. Snowy Hydro is a producer, supplier, trader and retailer of energy in the National Electricity Market ('NEM') and a leading provider of risk management financial hedge contracts.

Executive Summary

Upgrading the existing 330 kV network between Snowy and Sydney will not address the identified need to alleviate current and projected limitations on power transfer capacity from Victoria to New South Wales. These options will result in illusionary benefits but real and materially significant transmission outage costs. In summary:

- Upgrading Line 01 alone will not provide material energy reliability benefits or cost savings for NSW consumers because there is limited headroom with the next binding constraint, on Lines 4 & 5 (Yass to Marulan) and similarly with constraints on 330 kV Lines 8 & 16. In addition Line 39 can also bind quickly after or even before Lines 4 & 5, again limiting any material benefit of the proposed Group 1 upgrades alone.
- There will be significant market disruption during Line 01 upgrades and this will be further compounded if other 330 kV lines between Canberra and Sydney are also taken out of service for upgrades:
    - The outage cost represents the cost to the market from losing access to cheaper generation sources which are replaced with more expensive generation. Conservative estimates put the the outage cost in the vicinity of $30 million. This outage cost would be significantly more for outages required to upgrade other 330kV lines between Snowy and Sydney.
- Upgrading an existing line (or lines) may actually reduce system resilience and reliability. In a risk assessment, a capacity upgrade for an existing line actually increases consequences relative to the base case because there will be more power flowing over the existing network section and therefore more consequential loss following an outage; and
- There is "brown-field" risk as the existing 330 kV lines in southern NSW are the oldest 330 kV lines in Australia (all 50 to 55 years old) and it would be expected there will be limited original design information, unanticipated component degradation, and unexpected site findings during an upgrade program, and increased failure rates associated with these lines as they move further into their second 50 years of operation.

There is a strong need to bring forward and advance the Snowy to Bannaby 500 kV line (Option 2a/3a) instead of upgrading 330 kV lines between Snowy and Sydney. The Snowy to Bannaby 500 kV line provides immediate benefit in terms of addressing the need, in particular by providing up to 1000 MW of existing generation capacity that can access and supply into the NSW region.

Secondly, the recently released Project Assessment Conclusions Report for the South Australia Energy Transformation suggests a high likelihood that Project EnergyConnect will be commissioned

in 2022. That being the case, and given existing congestion and transmission cut-set constraints in southern New South Wales, a failure to commission BannabyLink by 2022 will result in the interconnecter becoming, for a time, a stranded asset. This would be both inefficient and needlessly compromise system security.

Snowy Hydro also advocates upgrading Murray to Dederang with new route diverse lines in conjunction with the Dederang to South Morang path upgrade (Option 3b) to achieve a significant increment in VIC import capability and this is a credible option for increased interconnection between Vic and NSW if linked to Option 2a/3a and the future Snowy to Wagga to Bannaby line sections. This development should be brought forward to align with the commissioning of Snowy 2.0 in 2024. This would increase the overall system resilience and provide insurance against the risk of earlier exit of coal fired generation in Victoria.

DETAILED SUBMISSION

Identified Need

The consultation document highlights that the power system is undergoing a transformational change, with increases in renewable generation, changing consumption patterns, and the pending retirement of thermal generation across the NEM. We agree that these changes collectively will require flexible and dispatchable generation and/or additional interconnector capacity to enable more efficient sharing of generation resources between states.

AEMO's 2018 Integrated System Plan (ISP) recommended developments to increase Victorian transfer capability to New South Wales as a means to capture positive net market benefits through increase interconnection thereby facilitating more efficient sharing of generation between states to meet the identified need. Stronger interconnection will also help improve system reliability and make the power system more resilient to a uncertain future.

Snowy Hydro is proposing to build and operate the Snowy 2.0 pumped hydro-electric storage facility ('Snowy 2.0'). Snowy 2.0 will increase the pumped hydro-electric capacity within the existing Snowy Scheme by 2,000MW and 350,000 MWh by linking the existing Tantangara and Talbingo reservoirs with tunnels feeding a new underground power station. When combined with appropriate augmentation of the transmission networks, Snowy 2.0 will underpin the transition to a low emissions future by both physically and financially firming and de-risking existing and new variable and intermittent renewable generation coming online across the NEM.

Credible Options to Address the Identified Need

Three primary options are considered in the Project Specification Consultation Report (PSCR). Option 1 represents a near-term and modest cost option as recommended by the ISP. Option 2 and Option 3 represent larger options, which are also capable of meeting the identified need. Snowy Hydro will show that options 2a/3a and 3b meet the identified need and significantly increase the reliability and resilience of the power system.

Drawbacks of Option 1 and Option 2 and Option 3

Upgrading the existing 330 kV network will not effectively address the identified need and has major drawbacks as follows:

- There will be significant market disruption during Line 01 upgrades:
    - The outage cost represents the cost to the market from losing access to cheaper generation sources which are replaced with more expensive generation. Using AEMO's estimate of outage cost for Option B4 in the Western Victoria Renewable Integration - Project Assessment Draft Report, the outage cost is estimated to be in the vicinity of $30 million.
- Upgrading Line 01 alone will not provide material energy reliability benefits or cost savings for NSW consumers because there is limited headroom with the next binding constraint, on Lines 4 & 5 (Yass to Marulan) which will ultimately limit the benefit of a simple Line 01 upgrade.
- Similarly, constraints on 330 kV Lines 8 & 16, and Line 39 can also bind quickly after or even before Lines 4 & 5, again limiting any material benefit of the proposed Group 1 upgrades alone.

- Upgrading of the entire existing 330 kV network in Southern NSW to technical conductor limits will be required in order to provide any material increase in NSW energy security. The resources required and outages necessary for such an upgrade program will result in massive market disruption compared to the upgrade of just Line 01, particularly given the time-frames available for the Group 1 project to complete (eg by end 2022).
- Any material upgrade of the southern NSW 330 kV network (6 years and possibly more is estimated in the PSCR) will over-run into ISP Group 2 timeframes before any significant benefit is realised.
- The southern NSW sections of the Victoria to New South Wales Interconnector (VNI) Group 1 project will ultimately be made redundant by the increasingly necessary Group 2 projects and, as noted, the commencement of the Group 2 projects will occur even before the VNI Group 1 projects are completed.
- Even if the entire existing 330 kV network in Southern NSW was upgraded to its technical limit (noting that the existing system is almost entirely constructed with the lighter "Bison" conductors which are no longer used), the rapid and increasing rate of renewables uptake in renewable energy zones will quickly consume any available headroom on the southern NSW to Sydney 330 kV system, creating further binding on the Group 1 upgrades, and ultimately requiring the Group 2 upgrade in any case.
- Further, upgrading an existing line (or lines) will reduce system resilience and reliability. In a risk assessment a capacity upgrade for an existing line actually increases consequences relative to the base case because there will be more power flowing over the existing network section and therefore more consequential loss following an outage; and
- There is significant "brown-field" risk associated with upgrading the existing 330 kV lines in southern NSW. These are the oldest 330 kV lines in Australia (all 50 to 55 years old) and it would be expected there will be limited original design information, unanticipated component degradation, and unexpected site findings during an upgrade program, and subsequently increased failure rates associated with these lines as they move further into their second 50 years of operation.

When undertaking the RIT-T cost-benefit analysis it is important that the disbenefits of Options 1, 2 and 3 are fully captured in the assessment.

Merits of Option 2a/3a

Advancing the Group 2 Snowy to Bannaby 500 kV line (Option 2a/3a) is more advantageous than upgrading 330 kV lines between Snowy and Sydney because:

- The Snowy to Bannaby 500 kV line provides significantly more benefit in terms of addressing the need, in particular by:
    - Immediately providing up to 1000 MW benefit into the NSW region. That is, there is already existing 1000 MW of Vic generation capability (including Murray power station) which is unable to access the NSW region due to system constraints;
    - Providing the first step in the ISP Group 2 round of Projects in a timely manner, and
    - Off-loading the existing 330 kV network allowing more access for generators seeking connection to the southern NSW 330 kV network in the Yass/Canberra to Bannaby Renewable Energy Zone.

- Advancing Snowy to Bannaby 500 kV line integrates better with the future power system configuration including the NSW Government's Transmission Infrastructure Strategy, with subsequent increments and ultimately an additional 2800 MW with the construction of the Snowy 2.0 project and the Snowy to Wagga to Bannaby line sections. This would be integrated as it connects to the SW-NSW renewable energy zones, the Snowy 2.0 Pump Hydro Energy Storage (PHES), and the proposed Project EnergyConnect (Riverlink) interconnection; and
- The 500 kV option also increases southern NSW system resilience and reliability and therefore increases NSW supply reliability.

Further to this, the 500 kV line option can be constructed without requiring significant market outages, is a greenfield project that does not carry risks associated with strengthening and modifying old towers, and can be completed in a time that (if acted on now) could meet the closure date for Liddell Power Station.

When undertaking the RIT-T cost-benefit analysis it is important that the benefits of Options 2a/3a are fully captured in the assessment.

Serious consideration should also be given to building this option as a 500kV double circuit line to cater for future expansions of generation in southern NSW.

Merits of Option 3b

Snowy Hydro considers that a sufficiently route diverse Victoria northeast corridor reinforcement comprising new line(s) Murray to Dederang to South Morang (or to another metropolitan Melbourne 500 kV terminal station) should be included as credible options. Option 3b covers the South Morang-Dederang 330kV section. We advocate Option 3b be expanded to include a new single circuit Murray to Dederang 330kV lines.

Snowy Hydro considers that upgrading Murray to Dederang with new route diverse lines in conjunction with the Dederang to South Morang path upgrade would achieve a significant increment in VIC import capability and is a credible option for increased interconnection between Vic and NSW if linked to Option 2a/3a and the future Snowy to Wagga to Bannaby line sections.

There are a number of reasons why a route diverse northeast corridor path from Murray to Dederang to South Morang is a credible and efficient option:

- Known Upgrade - upgrade of the northeast corridor path (Murray to Dederang and Dederang to South Morang) has been included in the AEMO Victoria Annual Planning Report (VAPR) for over ten years;
- Lower Cost - The northeast corridor is the shortest geographical route between NSW and the VIC 500 kV backbone;
- Preferred Electrical Path - The series compensated Dederang to South Morang lines reduce the effective "electrical" distance between Melbourne and Murray switching station to approximately 230 km, meaning power flows from NSW to VIC will always favour this path rather than flow via the alternate (longer) western options (unless they are significantly overbuilt to sufficiently reduce impedance);
- Less Complex - Alternately for the western options power flow control devices may be required to "force" power to flow via these longer route options. However using

the northeast corridor avoids this requirement as it is already the shortest electrical route between NSW and VIC;

- Integrates with other RIT-T's - the northeast corridor upgrade option coordinates with the AEMO Western VIC Renewables RIT-T, the ElectraNet SA Energy Transformation RIT-T and REZ proposals;
- Scaleable - The northeast corridor upgrade could be constructed at 500 kV allowing for future expansion and eventual 500 kV interconnection between NSW and VIC via the eastern corridor;
- Flexible at Southern end - If entry of additional lines into the South Morang Terminal Station is constrained it would be possible to divert to one of the other 500 kV north-metro substations eg Sydenham.

System Resilience

Earlier than expected coal plant retirement would significantly increase the net market benefits of Options 2a/3a and Option 3b. Importantly, system resilience is greatly enhanced by bringing forward the timing of these options to allow for uncertainties associated with the exit of coal plant due to a multitude of macro factors.

Conclusion

The NEM is experiencing unprecedented and transformational changes as we reach an an inflexion point that will shape the future of the NEM, being a once-in-a-generation opportunity to secure an orderly transition to truly interconnected, reliable, and lower emission intensive NEM.

Bringing forward new 500 kV lines from Snowy to Bannaby and new route diverse 330 kV or 500 kV lines from NSW to Vic need to be accelerated ahead of the timeframes outlined in the ISP to secure reliability in NSW and Vic following the closure of Liddell in 2022, and to help the Victorian market reliably incorporate increased renewable generation. These transmission upgrades to the shared network will also support other new projects, in particular the new renewable energy zones in NSW and Victoria.

Snowy 2.0 with these transmission upgrades is the key energy development for the future NEM as the key enabler of an orderly and secure transition to a low emissions economy. The delivery of these transmission augmentations will deliver significant value for the NEM as a whole and ultimately consumers, because it will enable a reliable transition at lowest cost.

Snowy Hydro appreciates the opportunity to respond to the PSCR. Any enquiries should be addressed to me by e-mail to kevin.ly@snowyhydro.com.au.

Yours sincerely,

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