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Australian Energy Market Operator  
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## **2022 Draft ISP Consultation**

Snowy Hydro Limited welcomes the opportunity to comment on the Australian Energy Market Operator (AEMO) 2022 Draft Integrated System Plan (ISP) Consultation.

### **Executive summary**

Snowy Hydro welcomes and supports AEMO's ISP as a critical blueprint to underpin the transformation of the power system. While each ISP has set out the planning for the NEM to best adapt to the growing shift to zero carbon sources of generation, the latest ISP2022 draft has gone backwards in recognising the urgency of reform. As detailed in this document, Snowy Hydro is concerned the ISP2022 draft contains a number of deficiencies in modelling inputs and assumptions which must be rectified before the final ISP2022 is released.

There is, now, no question of the need for transmission upgrades: the only question is one of timing.

Each successive ISP since its first release in 2018 has shown that previous forecasts of renewables growth have been met or, usually, exceeded. A prudent policy setting would recognise this trend and adjust transmission planning accordingly. The current ISP2022 draft has not taken this approach which is dangerous because, while perfect timing is impossible, the risks of 'getting it wrong' are asymmetrical.

Transmission augmentation which takes place later than required not only leads to higher prices and slower decarbonisation, but also blackouts and dangerous system instability. A better approach would be to acknowledge the inevitability of network augmentation, setting a clear, timely pathway for new transmission projects. For a budgeted cost, this would exploit upside in renewables growth and greatly improve system resilience against the danger of exogenous events, which have been a growing risk in the NEM in recent years.

Specifically, it is impossible to reconcile AEMO's forecasts of an increasingly rapid structural shift toward renewables with its recommendations to delay key transmission links, in particular VNI West and HumeLink. Compared to earlier versions of the ISP, AEMO assumes a more aggressive coal retirement, yet states that transmission links are now needed later than previously identified. It also prioritises Marinus Link over VNI West, seemingly valuing

Tasmanian wind resources (which, in fact, offer little diversity value) over the larger renewables investment in Victoria and access to Snowy 2.0, the single best asset for shoring up system security in the NEM. This is dangerous for consumers and industry.

The ISP2022 draft seeks to delay transmission upgrades until the last moment while retaining the flexibility to bring forward or yet further delay projects as needed. That may appear to be sensible policy but it is unworkable in practice and, as well as the risk asymmetry already mentioned, ignores real-world investment considerations. Transmission projects are big lumpy investments with long lead times. Procurement and planning arrangements must begin years in advance. Similar constraints apply to investments in generation and storage which would exploit the new transmission capacity. The ISP2022 draft has not acknowledged the 'regret costs' associated with this uncertainty, in particular the use of 'decision rules'. Investors crave policy certainty which is not reflected in the ISP2022 draft.

In summary:

- **The balance of energy supply and demand does not add up.** The ISP2022 draft quotes 140GW of VRE by 2050, delivering 70% of renewable capacity. However, total NEM demand is only 330TWh in this scenario, of which 90TWh is supplied by Distributed Energy Resources ("DER"). 140GW of VRE would produce in excess of 400TWh per annum, applied to 240TWh of net load. The ISP2022 draft notes "some curtailment of VRE is expected"; according to these data, that curtailment rate would be in the order of 41%.
  - This outcome, by itself, invalidates this ISP2022 draft. Wind and solar is not economic at 41% curtailment; *this quantity of VRE would never be built in the first place.*
- **NEM dispatchable capacity declines until 2034.** This modelling output shows that the analysis in ISP2022 draft has erroneously focused on energy rather than capacity. It makes the additional error of assuming perfectly controllable DER Storage, but this is trivial compared to the fact that the tails of the probability distributions of net demand are clearly not even considered. Net NEM *peak* load is becoming more volatile and unpredictable by the year; a system that has less, and much older, dispatchable capacity in 2034 than it does in 2021 cannot be expected to underpin a reliable or cost-effective source of supply for the NEM's customers.
- **The NEM storage assumptions are invalid.** ISP2022 states that:

*" Today, ~30% of detached homes in the NEM have rooftop PV, their ~15 GW capacity meeting their owners' energy needs and exporting surplus back into the grid. By 2032, over half of the homes in the NEM will do so, rising to 65% with 69 GW capacity by 2050, with most systems complemented by battery energy storage. Their 90 TWh of electricity will then meet nearly one fifth of the NEM's total underlying demand."*

Issue 1 with this statement is that, while solar may well meet customer's *average energy* needs, it will not meet their *peak capacity* needs once the sun has set (i.e. the focus is again on energy rather than capacity). Issue 2 is that the ISP appears to simply assume that home energy storage will be economic, or even possible for "most systems".

The 620GWh of storage assumed by 2050 presumably includes Snowy 2.0's 350GWh; therefore the NEM's storage needs are assumed to be fulfilled by an additional 270GWh of storage, spread over 43GW of generation. This represents an average of 6.3 hours of storage (excluding Snowy 2.0) across the NEM. The probability that this will be enough to last even a single week of low wind or solar output, by 2050, is zero.

- **ISP2022 is inconsistent with ISP2018 and ISP2020 and its proposed transmission capacity would be grossly inadequate.** ISP2018 made the following observations with respect to VNI West:

*"VNI West, a new high voltage alternating current (HVAC) interconnector between Victoria and New South Wales, should be progressed for completion as soon as practicable, which is by 2027-28. Early works for this project should commence as soon as possible for completion in late 2024. This project is currently AEMO's preferred option to maintain system security and reliability in Victoria. It provides a prudent pathway to access sufficient dispatchable capacity to deliver into Victoria and, therefore, avoids the risk associated with earlier than planned exit of a major generator. It will also bring forward additional resilience benefits (for example, in case of an extended BassLink outage, a prolonged wind drought or another extended generator or transmission outage), address the increasingly pressing need to manage minimum demand in Victoria, open up new REZs, and provide Victorian consumers access to Snowy 2.0.*

*VNI West improves the resilience of the power system to withstand high impact low probability (HILP) events such as prolonged generation or transmission outages or extreme weather events once Yallourn closes. The multiple system shocks of the 2019-20 summer are instructive. The VNI West project would deliver a material uplift in the resilience of the national grid, as well as mitigate co-incident shocks such as a Basslink outage, coal plant failure, peak demand period, protracted wind drought or impaired PV production due to fire and smoke haze. Without VNI West, more Reliability and Emergency Reserve Trader (RERT) may need to be procured (assuming it is available) or more dispatchable capacity may be required to deliver on community expectations that electricity supply will remain reliable during a "1 in 10 year" summer."*

Snowy Hydro agrees wholeheartedly with this analysis, which is conspicuous by its absence in ISP2022. Also absent is any analysis of the correlations of supply by region, and how this affects the need for storage and transmission. This is discussed in greater detail below.

- **Decision rules creating uncertainty between ISP's**

A key reason for the inconsistencies between ISPs is attributed to the decision rules. The ISP should be providing a level of certainty and not adding further decision rules to HumeLink and VNI West.

AEMO's approach for these two projects (ie. 'staged with decision rules') creates open-ended opportunities for transmission planners to drastically alter the timing of project delivery. This uncertainty significantly dilutes the value of the ISP as a planning instrument and its utility to energy market investors. For HumeLink, AEMO's ISP 2024 could change, yet again, the date for the project under the decision rules, 2 years out from its supposed completion.

Numerous renewable market participants are investing billions to firm the grid and cannot risk connection to the grid on decision rules that could change the HumeLink and VNI West completion dates in the 2024 AEMO ISP. Given that the ISP has accepted the essential nature of HumeLink and VNI West, this investment should not be vulnerable to decision rules that can seemingly change at any time at the whim of the regulator.

### **Snowy Hydro's detailed position and response**

Snowy Hydro has made numerous submissions to AEMO on the ongoing ISP process. However, glacial progress has been made on transmission development in the last three years and the current development trajectory.

This is unfortunate, since the position in which the NEM now finds itself is untenable.

The crux of the problem is that the ISP's timing for the individual links is still based on a RIT-T that key market participants (AEMO, ESB and renewable investors etc) agreed was outdated and not fit for purpose three years ago. We should not be surprised that the ISP therefore provides the wrong answer to the wrong question.

The ISP's starting premise remains that the RIT-T's deeply flawed "net benefit" test is the arbiter of what links are built, and in which order they are built. The proof that this results in perverse outcomes can be seen in a single fact: the Marinus Link is now proposed to be built before VNI West. This is apparently based on the fact that the ISP authors believe a) Tas wind will "*provide greater resource diversity to mainland wind farms*" and b) that relatively high Tasmanian wind capacity factors will make Tas wind preferable to mainland-based wind. This is however highly unlikely, for two main reasons:

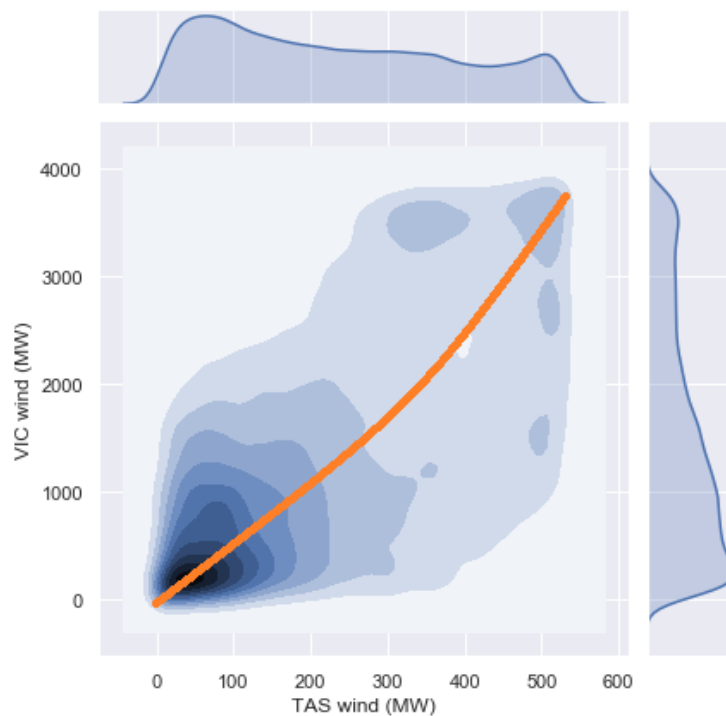
- The wind capacity and energy is on the "wrong" side of the interconnect to the mainland, introducing additional transmission access risk to serve mainland NEM customers, and, more importantly,
- The value of the Tas wind resource, when it is operating at high capacity factors, will be extremely low. This is because Tas and Vic wind generation are positively correlated, which will incur either a storage cost (to store the wind energy in Tas) or result in curtailment, as explained below.

The summary graph below demonstrates (using the latest available ISP2020 data set), that TAS wind generation has a high correlation (0.55) with VIC wind generation, mostly because they are geographically close to one another so are more closely affected by synoptic scale weather systems (high and low pressure systems). These variations are generally on the scale of multiple days. If VIC wind generation is high it is very likely that TAS wind generation is also high, and vice versa. The graph below is a probability density plot (heatmap) of TAS wind generation vs VIC wind generation. The probability density plot of TAS wind is at the top, VIC wind at the right.

This incorrect "*resource diversity*" assumption by itself invalidates the current ISP's preference for Marinus over VNI West. However, the complete picture is even more problematic:

- VNI West ensures access by Victorian consumers to Snowy 2.0 capacity and energy, and access by Victorian VRE to Snowy 2.0's storage. VNI West is critical to the development of the most prospective wind sites in Victoria and to safeguard Victoria's reliability.
- Marinus provides access, via deep-sea cables, to a correlated wind resource and a relatively small quantity of storage provided by Hydro Tasmania's proposed Battery of the Nation ("BoN").

The latest information regarding the BoN economics that is available to Snowy Hydro indicates that BoN is only marginally economic, at best, if Snowy 2.0 is built. Given that Snowy 2.0 is under construction, what is the probability that BoN and Marinus will even exist? Deferring VNI West for four years (compared to ISP2018 and ISP2020) in the hope that a marginally economic and geographically remote undersea cable and remote storage will save the day is playing Russian roulette with NEM reliability and efficiency.



Below we outline Snowy Hydro's position in relation to the major flaws in the current ISP2022 draft, and then provide a pathway to resolve these shortcomings.

### 1. The ISP process is a dis-incentive to invest in wind and solar

- The optimal configuration of transmission development has been apparent for some time. Option 3C plus VNI West (plus Project EnergyConnect) provide what is unambiguously the optimal path forward. ProjectEnergyConnect will be stranded until VNI West and HumeLink are built, because it terminates in Wagga, and will be useless if it cannot connect to Melbourne and Sydney (which it cannot do without VNI West/HumeLink).

Confirmation of this development path would unlock billions of dollars of investment in the wind and solar farms that would deliver Australia's ambitious renewable energy targets. Failure to confirm this development path will fail to unlock billions of dollars of investment in the wind and solar farms. VNI West would complete a circuit through Sydney, Melbourne and Adelaide (via Project EnergyConnect) that would give certainty to investors (for renewables and dispatchable plant and storage plants) in three NEM States.

- While the terminally flawed RIT-T is accorded the position of determinant of transmission builds, equity participants in the NEM remain wary of committing their funds. Having been once bitten by the stalled "rhombus of regret" in western Victoria, these participants are twice shy about building wind or solar infrastructure that will not, according to the latest ISP2022 draft, have a route to market until 2031 (i.e. VNI West).

It does not help Australia's case that these participants (many of whom already deliver renewable energy to Snowy via long-term offtakes negotiated across 2019-21) look on in dismay at the fate of VNI West's role in transmitting their energy to the load centres and to Snowy 2.0. These investors are informed participants in the NEM. They are typically global energy investors who cross-invest in generation and storage, and therefore know that Snowy 2.0 is a key piece to ensuring generation backup and storage for Victoria. The treatment to which Snowy 2.0 has been subjected provides them no comfort that their own investments would be treated equitably or transparently.

## 2. Issues with the ISP modelling

- The methodology by which the ISP purports to seek to optimise reliability and consumer prices is flawed, in particular its treatment of the intermittency of renewables and the need for storage amounts. Exhibit A is the following fact:

The ISP2020 data set clearly shows that the average daily *minimum* wind generation in Vic and Tas **coincides**, at around 7pm.

This also happens to coincide with the evening decline in solar generation to zero. This in turn coincides with the one or two hours of evening peak demand that result in the highest and most volatile NEM spot prices during all seasons, but particularly during hot weather.

**Does the ISP modelling examine the supply / demand balance at evening peak times? Or is the modelling blinded by the higher capacity factors of wind in Tasmania (which are largely irrelevant because the peak output cannot be stored, because Victoria has correlated peak wind output?)**

**Given these factors, how can Marinus possibly have a greater net benefit than VNI West?**

- The available ISP scenario analysis does not include meaningful coincident stress events and fails to inform on the effects of correlated outages of coal plants. During hot

weather, coal plants are derated with virtually 100% correlation. The limits on the temperature of discharge water from black coal plants have been historically problematic, as are correlated temperature trips of coal boilers. The risk of correlated heat-related coal plant forced outages cannot be discounted on the basis of two relatively mild summers in 2021 and 2022 (if this is the basis for the exclusion of such analysis). In addition, transformer and transmission trips are also correlated with hot weather and therefore with coal unit derating and outages. The above discussion is just one example of the type of analysis that should be front and centre in an ISP, but is in fact absent.

- The need for storage seems to have been assumed away. Previous ISPs acknowledged the need for numerous large-scale, deep storage facilities across the NEM. The need for Snowy 2.0 was specifically mentioned as being one of several pump/storage installations of equivalent size that the NEM would require to minimise prices and improve reliability. How does the RIT-T modelling reflect the fact that Snowy 2.0's benefits will be lost to Victoria until 2031? How is the lost system efficiency and reliability costed? Why has the role of utility-scale storage and dispatchable capacity been effectively ignored or, possibly worse, assumed to be provided by NEM consumers in distributed solar / battery systems? How crucial to the whole ISP2022 is the assumption that these systems will be economically viable "for most households"?
- It is difficult to accept that the model used to test ISP scenarios can inform at a level of accuracy that would allow calibration of transmission build times by plus or minus a single year. This reported outcome casts severe doubt on the ISP modelling. The NEM is susceptible to droughts (water, wind and solar) and climatic volatility, as are all electricity markets. The lessons from Texas and Europe are in plain sight and simply cannot be ignored.

The pathway to resolution must recognise that the RIT-T is the NEM's servant, not our master. Elements of the test are logical and robust, but the changing shape of the NEM, particularly with respect to intermittency and the need for deep storage, make this test in our view, in its current form, obsolete.

The following steps are recommended:

### **1. Adopt Option 3C immediately**

- Option 3C is unambiguously the best path forward for HumeLink. It should be adopted immediately; planning and construction should henceforth focus just on this option.

Snowy Hydro has previously provided alternative funding and construction options via a special purpose vehicle; we would be happy to re-submit this work and discuss its implementation.

### **2. Bring forward VNI West**

- As discussed above, the preference of Marinus over VNI West is itself proof that the version of the RIT-T used in the current ISP is fatally flawed.

- To unlock billions of dollars of investment in the wind and solar farms that would deliver Australia's ambitious renewable energy targets, and to maximise the utility of Snowy 2.0's enormous storage (and of other storage assets that will be commissioned in Victoria), VNI West must be commissioned as soon as possible. The attempt to calibrate the commissioning date to a particular year, based on the ISP modelling, places an entirely unwarranted level of faith in this modelling.

## **About Snowy Hydro**

Snowy Hydro Limited 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. We are an integrated energy company with more than 5,500 megawatts (MW) of generating capacity. We are one of Australia's largest renewable generators, the third largest generator by capacity and the fourth largest retailer in the NEM through our award-winning retail energy companies - Red Energy and Lumo Energy.

Snowy Hydro appreciates the opportunity to respond to AEMO's 2022 Draft ISP Consultation and any questions about this submission should be addressed to [panos.priftakis@snowyhydro.com.au](mailto:panos.priftakis@snowyhydro.com.au).

Yours sincerely,



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