AEMO Draft 2022 ISP

Star of the South submission

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Contents

1 Star of the South

Star of the South is Australia's first offshore wind project, proposed off the south coast of Gippsland in Victoria. We are a private company comprised of Australian founders and Copenhagen Infrastructure Partners (**CIP**), who are a global leader in offshore wind.

Offshore wind is one of the fastest-growing renewable energy technologies globally, helping to transition energy systems to a consistent and reliable form of renewable power while creating jobs and economic investment in regional coastal towns around the world. The recently passed *Offshore Electricity Infrastructure Act 2021* will come into operation during 2022. In an Australian first, this will provide a pathway for offshore wind projects to obtain relevant licences to build and operate infrastructure in Commonwealth waters.

We have made significant progress on our project since receiving a Commonwealth Government licence to test the conditions out at sea in 2019 – we are actively monitoring wind and wave conditions, and have commenced formal planning and environmental assessment processes. To support ongoing development, the project recently received funding from the Victorian Government through the Energy Innovation Fund. This funding will allow the project to begin pre-construction development activities throughout 2022.

Offshore wind in Gippsland is anticipated to provide essential diversification to the Victorian electricity grid. With access to a strong connection point in the Latrobe Valley, a world class wind resource off the Gippsland coast and proximity to retiring generators, offshore wind can provide substantial amounts of electricity to the National Electricity Market (**NEM**) where it is most needed. We believe offshore wind is an essential technology to enable a smoother transition to a carbon neutral future, and that many benefits of offshore wind have not yet been adequately captured.

We wish to acknowledge the Australian Energy Market Operator (**AEMO**) for its extensive work to date on the Draft 2022 Integrated System Plan (**ISP**) and we welcome the opportunity to make a submission into the consultation process.

2 Is social licence the greatest challenge?

The Executive Summary of the Draft ISP neatly summarises what many consider is the greatest challenge to the transition of the electricity system in Australia:

> **Securing social licence for VRE, storage and transmission.** This Draft ISP shows how the NEM can optimise consumer benefits while supporting government policies for emissions reduction and Australia's new net zero target. However, the land needed for major VRE, storage and transmission projects to realise these goals is unprecedented. Early community engagement will be needed to ensure investments have an appropriate social licence. The new REZ Design Report framework is a start, but proactive engagement and integrated land-use planning is also needed at a jurisdictional level. In some cases, this may lead to alternative developments that reduce the need for new transmission, including batteries, gas-fired generation and offshore wind developments that connect to the existing network easements.

Section 7.2 of the Draft ISP expands on this:

> The new REZ Design Report framework is a start, but proactive engagement and integrated land-use planning is also needed at a jurisdictional level. The sector continues to underestimate the time and money that community consultation requires, with the rules placing it 'at the back end' rather than the front of the process.

2.1 Our experience in Gippsland

We recognise the ongoing transformation of the energy system is complex and have invested time and resources in understanding the impacts and opportunities renewable energy developments represent for local communities.

While onshore renewables, storage and transmission have a significant role to play in decarbonising the grid and Australia's economy, there is a limit to what is practical and acceptable to build from a community and social perspective. Early and genuine engagement is essential, but will not always resolve the concerns of local communities and resolve opposition to project development.

We have been working with Traditional Owners and local Gippsland communities to build relationships and trust, identify potential issues and opportunities and help shape the development of Star of the South for the past six years. This includes more than 5,000 stakeholder interactions, 600 meetings, formal consultation periods, establishing a local regional office and team and convening a Community Advisory Group with diverse representation across the region.

Our experience working with local communities and stakeholders in Gippsland has highlighted the importance of social licence for new energy projects. Listening, understanding concerns and genuinely considering community perspectives has been a critical factor in our success and progress to date.

There has been a history of projects focusing solely on cost as a driver of key decisions, with social and environmental issues being (or perceived to be) secondary or disregarded. In the Gippsland region where we operate, this legacy has resulted in distrust and cynicism in communities affected by past decisions.

During early development of our transmission design, our community and land teams worked alongside the engineering, environment and commercial teams. We met with landholders, community members and key stakeholders to listen and understand their concerns and ideas so that these could be considered in a multi-criteria assessment covering technical, commercial, land, environment and community considerations. Extensive consultation was required to identify and resolve potential issues and explain the decision-making process and rationale.

We identified a strong desire for our transmission route to avoid productive agricultural land and environmentally sensitive areas, to minimise disruption for landholders and to be underground – to protect the region's highly valued rural and coastal landscapes. Significant and ongoing community concern about above ground transmission infrastructure highlight to us that any project that includes such infrastructure runs the risk of a hostile community from inception.

Taking a triple-bottom line approach to our transmission route and technology decision has resulted in a well-accepted outcome that:

- delivers on the project objectives and criteria
- addresses key community and environmental considerations
- reduces risks to time, unplanned costs, approvals and reputation.

Our experience in this regard is highly relevant, considering the challenges that will be faced by the unprecedented level of onshore VRE and transmission that is currently suggested by the Draft ISP, and whether the outcomes anticipated are realistic relative to the cost and timing assumptions accounted for in the modelling.

2.2 Transmission infrastructure

The section above discusses our real-world experience of community consultation for a substantive project involving some 70-80km of onshore transmission infrastructure. But this is entirely dwarfed by the enormity of the task suggested by the Draft Optimal Development Path (**ODP**) that would require some 10,000km of new transmission infrastructure.

And it is not just our real-world experience that can be used as a point of reference. For example, the Western Victoria Transmission Network Project (**WVTNP**) has experienced opposition from communities and some local councils. It was initially forecast in the RIT-T process to cost c.$370m for a new 190km line and related augmentations.[1] Under the guidelines developed by the Australian Energy Regulator (**AER**), AEMO only considers specific issues for the RIT-T process, including network parameters, cost parameters and time parameters. But the RIT-T guidelines exclude matters related to social and environmental impacts – as these are assessed in the planning and approvals processes. However, by the nature of the process this means the RIT-T process will deliver the least cost outcome – but one that does not necessarily have a clear path to building the required social licence or achieving the necessary approvals to proceed (either in the form approved, or at all).

We are not seeking to comment on the specifics of the WVTNP, other than to note there are significant hurdles still to be overcome, as summarised in the advocacy by Moorabool Shire Council.[2] Ultimately, to secure support and approvals, a project like WVTNP may need to ameliorate the environmental and community effects of the project at some cost, which is an early signal of the challenges to come for the 10,000km of new transmission infrastructure anticipated under the ODP.

The HumeLink project in NSW is also an example where costs increased dramatically from initial estimates in 2019 to the final solution in 2021, from c.$1.35bn[3] to c.$3.3bn.[4] There are a variety of reasons for this. What it demonstrates is that large transmission projects are complex, and to build social licence and obtain approvals may result in very significant changes in capital costs.

Project EnergyConnect, linking NSW and SA, is another example where costs increased dramatically from initial estimates in 2019 to the final solution in 2021. The capital cost estimate was $1.53bn in the earlier stages of the RIT-T process,[5] but after further work including environmental and other

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[1] AEMO: Western Victoria Renewable Integration, Project Assessment Conclusions Report, July 2019

[2] https://www.moorabool.vic.gov.au/About-Council/Large-Projects-Impacting-Moorabool/Western-Victoria-Transmission-Network-Project

[3] TransGrid, Reinforcing the New South Wales Southern Shared Network to increase transfer capacity to the state's demand centres: Project Specification Consultation Report, June 2019

[4] TransGrid, Reinforcing the NSW Southern Shared Network to increase transfer capacity to demand centres (HumeLink): Project Assessment Conclusions Report, July 2021

[5] ElectraNet, SA Energy Transformation RIT-T, Project Assessment Conclusions Report, February 2019

investigation necessary to obtain its social licence, the capital cost approved by the AER in mid-2021 was $2.28bn.[6]

The Central West Orana REZ transmission project has encountered strong opposition along a section of the proposed route that crosses prime farmland on the Merriwa Cassilis Plateau.[7] There are many others that could be cited.

This is expected to be the case for many other proposed transmission projects that require new corridors to be established in areas where the community has not previously expected such significant infrastructure. We note that the latest GenCost report includes estimates, some of which have very high levels of uncertainty of cost (+-50%) – but even those may increase if meeting social licence requires significant changes to route, technology or even deliverability.

In addition to social challenges, the acceptability of mass transmission development from an environmental perspective is also important to consider. Government regulators and communities are increasingly prioritising the importance of habitat and biodiversity. The construction of thousands of kilometres of transmission would have cumulative environmental impacts that must be considered from an early stage and avoided where possible to achieve timely approvals. This can result in costly design or technology changes and/or the purchase of expensive and increasingly hard-to-find vegetation offsets.

We have discussed above the significant challenges that will be faced for transmission infrastructure obtaining the social licence required to get approvals and proceed within the timeframes used in the Draft ISP. We believe these challenges are not properly reflected in the timeframes, nor are they reflected realistically in the cost assumptions that are the basis for the Draft ISP. The Draft ODP appears to be a case based on an overriding notion that social licence issues will not pose any challenges that upset the assumptions used in the modelling. This is discussed further in Section 0 below.

2.3 Renewable energy generation

Section 2.2 focussed on the challenges for transmission infrastructure. There is at least an equal challenge for the onshore renewable energy generation assumed by the Draft ISP.

Over the last 15 years or so, renewable developers have built some 15GW of VRE and developers have all but exhausted the better sites and transmission capacity. Incrementally, every new site has lower capacity, greater community challenges or greater transmission augmentation needs – or all three. The Draft ISP should contemplate the very real risk that LCOE will rise for each new generation development, not decrease, despite continued (but slower) decreases in cost via technological advances.

[6] Australian Energy Regulator, Final Decisions, TransGrid & ElectraNet – Project EnergyConnect Contingent Project, May 2021

[7] https://www.theland.com.au/story/7411631/proposed-rez-electricity-network-route-option-sparks-fury/

There appears to be increasing community concern in regional and rural areas as to the continued build-out and cumulative impact of co-located VRE, with visual and other environmental effects, for the generation of energy required in areas well beyond those communities. The replacement of each thermal generator from the Latrobe Valley will require in the order of 10-20 VRE projects depending on size, capacity factor, marginal loss factors etc.[8] So while there is diversity of risk, there are still 10-20 separate sets of approvals that need to be obtained for that replacement, along with a greater length and geographical spread of new transmission than would be required for new energy sources which are larger and can be located in areas with existing strong grid access. The Draft ISP should contemplate that not all of these processes will go to plan.

To triple the VRE capacity by 2030 as suggested by the Draft ISP – that is, to build an additional 30GW in the next decade – is a formidable task. We believe these challenges are not properly reflected in the timeframes, nor are they reflected realistically in the cost assumptions, that are the basis for the Draft ISP. As with transmission, the Draft ODP seems to be a case based on an overriding notion that social licence issues will not pose any challenges that upset the assumptions used in the modelling. This is discussed further in Section 0 below.

2.4 Reflecting the social licence risk in the Draft ISP

Our experience, and those of others discussed above, in relation to obtaining the necessary social licence to operate suggests strongly that this challenge **should not just be acknowledged** by the Draft ISP as a risk – it **should be modelled**.

The limits to social licence can apply both to the rate of development and to the cumulative scale of development. Constraints of either kind pose a risk to the achievement of net zero emissions by 2050, because the target applies to the volume of emissions saved as well as the time over which those savings are realised.

Although there is significant uncertainty as to the limits of social licence, it is clear that constraints are correlated with such factors as:

- the value of land for competing non-energy purposes (particularly farming and tourism)
- its cultural and environmental significance, including to Traditional Owners
- the size of properties (i.e. smaller lots increase transaction costs and social licence risk)
- the density of population
- the existence of existing infrastructure (e.g. transmission lines and easements) which will lessen the visual and economic impact of new lines
- the timing and method of landowner and community engagement (i.e. early and open engagement lowers risk)

[8] For example, the 10 TWh average annual output of Yallourn would require 10 additional 300 MW wind farms with an average capacity factor of 40%.

- the scale and design of landowner and community compensation and benefit-sharing.

It is crucial that the ISP assess and evaluate the impact of social licence risks on both the rate and scale of renewable energy and transmission development. Those assessments would require both quantitative and qualitative approaches.

For example, sensitivities should be developed such as these:

- what if these challenges resulted in 25% or 50% of the transmission projects being delayed by 5 or 10 years – or abandoned completely?
- What if 25% or 50% of the proposed onshore VRE projects – especially those in areas with substantial operating projects already – could not proceed due to community opposition or cumulative environmental impacts?
- What if transmission costs increase by 25% or 50% or 100% to reflect the additional hurdles that obtaining a social licence to operate will entail in developed regions – in particular the risk that some lines will need to be placed underground to avoid environmental or social issues (as part of the onshore component of Marinus Link is)?
- What if generation LCOE increases by 15% or 30% to reflect social licence concerns or the additional costs of developing in particularly remote areas?

We recommend that AEMO consider these sensitivities in its modelling so that the alternatives can be demonstrated. Will these scenarios impact the estimated timing of coal retirements? Or will alternatives, including the significant offshore wind projects proposed by Star of the South and numerous others, fill the gaps to enable a smoother and more accepted outcome, while maintaining energy reliability, security and price outcomes?

2.5 The contribution of offshore wind

There is clearly the need for a large amount of additional onshore VRE supported by significant transmission infrastructure upgrades and new lines. We believe there is also a strong contribution that offshore wind can make to the energy transition, which the Draft ISP downplays.

Uncertainties about the limits on the rate and scale of onshore renewables can be reduced by better analysis and modelling (as suggested above), but there will remain a wide range of plausible long-run shares of onshore renewables and offshore wind at this early stage of the net zero transition.

Should social licence constraints on onshore renewables (and associated new transmission) bind early (which is more likely in Victoria than any other state due to its high population density and agricultural output), then substantial reliance on offshore wind will be needed. Even though lower reliance on offshore wind is plausible under less binding onshore constraints, it will be prudent to build the offshore wind industry early to a minimum viable build rate so that all realistic shares of onshore wind in 2050 remain achievable.

This analysis will need to model supply chain capacity as well as social licence constraints, to identify the earliest start date and minimum build rate of offshore wind. It will also need to consider Australia's hydrogen export ambitions, which will compete with Victorian demand for cheaper interstate production of hydrogen.

3 Regional considerations

3.1 Avoiding stranded assets

In Section 2.2 we discussed the uncertainty in costs and deliverability of 10,000km of new transmission lines that the ODP in the Draft ISP contemplates.

These uncertainties in cost, which in our view are not fully reflected in the AEMO analysis, are not shared by projects that have a lesser dependence on new transmission corridors, like offshore wind that can take advantage of significant existing transmission infrastructure linked to the current coal generators in the Latrobe Valley in Victoria and the Hunter Valley in NSW.

The Draft ISP contemplates clearly that the coal generators will retire – and earlier than many have previously envisaged. The significant investment in building and maintaining the transmission lines from the coal centres to the capital cities in each State will continue to be paid for by electricity consumers for long as the transmission lines remain part of the regulated asset base of the transmission network service providers.

To obtain best value from these assets – and avoid consumers continuing to pay for stranded assets – means there is a logical case to use as much of this capacity as possible from new generation, including both onshore and offshore wind.

The case for offshore wind in Gippsland resonates with local communities and workers. They understand that the continued use of existing transmission lines from the Latrobe Valley to Melbourne after the coal generators retire makes practical and economic sense. There is strong support to build on the strengths of regional communities and continue their tradition of generating power – to help them prosper economically but also to make good use of assets and infrastructure already in place.

3.2 Regional employment

While we recognise that jobs and investment are not a factor in AEMO's modelling, we believe that regional employment factors for the location of new generation assets should be given much greater consideration, and this can link directly to the sensitivities suggested above in Section 0.

In our experience, regional development is a key positive that can provide balance to perceived negative aspects of a project and alleviate community concerns. Regional jobs in the electricity sector are currently clustered around existing infrastructure, in particular coal generators (and in the case of offshore wind, similarities with offshore oil and gas). Projects near existing electricity generation provide benefits for the local communities and supply chains which will provide for a smoother transition from existing jobs and supply in fossil fuel generation to renewables. In short, the contribution of an asset to the regional community helps to build social licence and address the potential social and economic impacts presented by the closure of coal generators

We believe weighting should be given to projects in regions near existing energy jobs to provide local communities with stable, high quality ongoing employment and this should be reflected in the modelling methodology. **We recommend this be incorporated by AEMO by putting a higher weighting of a project's likelihood to proceed – that is, a lower risk of social licence issues causing a project to be delayed or abandoned – where the project is located near existing coal, oil or gas infrastructure.**

4 Diversification benefits

4.1 System benefits

The Draft ISP discusses generally the geographic diversity required to provide reliability of supply as dispatchable thermal generators are retired. Whilst the detailed modelling seeks to ensure reliability of supply via various mechanisms, it is unclear that the diversification benefits of different technologies such as offshore wind – and the effects this has on reliability – have been adequately taken into account. For example, based on the modelling undertaken by Jacobs,[9] a number of benefits can be demonstrated by the early adoption of offshore wind as a generation diversification strategy, including:

- Offshore wind off the coast of Gippsland would maintain current system power flow diversity by replacing almost like for like the level of generation lost by the exit of Yallourn (e.g. based on a 2.2 GW installed capacity project, Star of the South would produce on average c.8.6 TWh of generation per annum, compared to c.10.1 TWh per annum from Yallourn). In 2019, a good wind year, Star of the South would have produced c.9.5 TWh compared to the actual output of Yallourn of 9.8 TWh).
- Offshore wind resources, with relatively high capacity factors and more even generation patterns, are likely to provide a greater contribution to supply during extreme demand periods (which form the basis for reliability stress testing), reducing the need for firming standby plant like gas or additional storage (see further on this below).
- The offshore wind profile off Gippsland generally has low correlation with the wind profile elsewhere in Victoria (particularly the significant installed capacity in Western Victoria which is indicated to be expanded significantly in the Draft ISP). This improves the firmness of supply from renewable energy, which would be reflected in reduced price volatility in prices, and therefore lower premiums applied in PPAs which ultimately flow through to consumer prices.
- The offshore wind profile is geared to evening periods in summer months, meaning it can make a significant contribution to meeting peak demand (and from a renewable source, reducing reliance on high-priced standby plant). For example, our modelling shows that if Star of the South had been available during the load shedding event in January 2019, it would have been able to generate at c.92% of capacity and would likely have avoided the loss of load (and likely a significant downward effect on prices[10]).

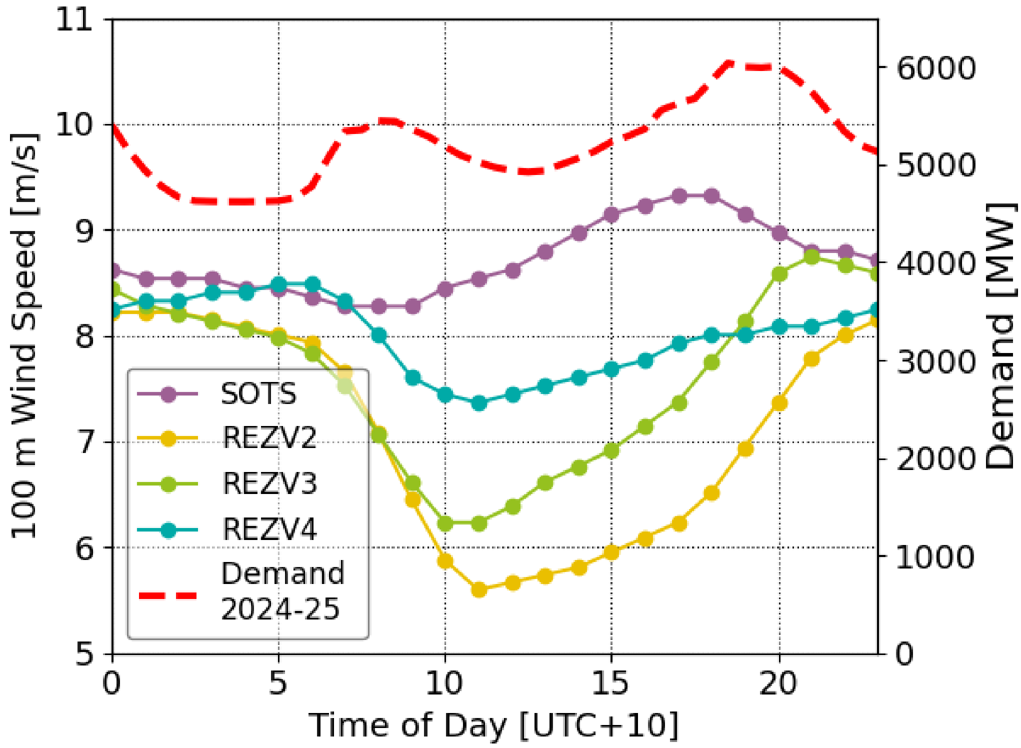
When analysing the diversification benefits of offshore wind, more granular data provides more accurate results, avoiding the averaging effects of combining data – our modelling has used half hourly trading intervals rather than daily or weekly profiles.

[9] The modelling is confidential to Star of the South, but we would be happy to discuss with AEMO the basis on which confidential access could be provided.

[10] See further Section 6 for brief discussion on pricing impacts

Adding wind farm generation in the same geographical areas as existing generation obviously results in a high correlation between those assets. Adding geographical diversity can have a significant impact on overall VRE firmness, as illustrated by the following averaged wind data over each of the relevant Victorian REZ, plus Star of the South (labelled SOTS in Figure 1 below) representing offshore wind off the coast of Gippsland:[11] We also found that the daily generation profile of offshore wind (using Star of the South as an example) is better matched to demand than onshore renewables, as both demand and offshore generation peak in the afternoon.

Figure 1: Average wind profile vs demand



The different generation profiles driven by these different wind resource profiles – when also added to solar profiles – will result in a much lower need for storage if offshore wind is added to the diverse mix of VRE in Victoria and the NEM more generally.

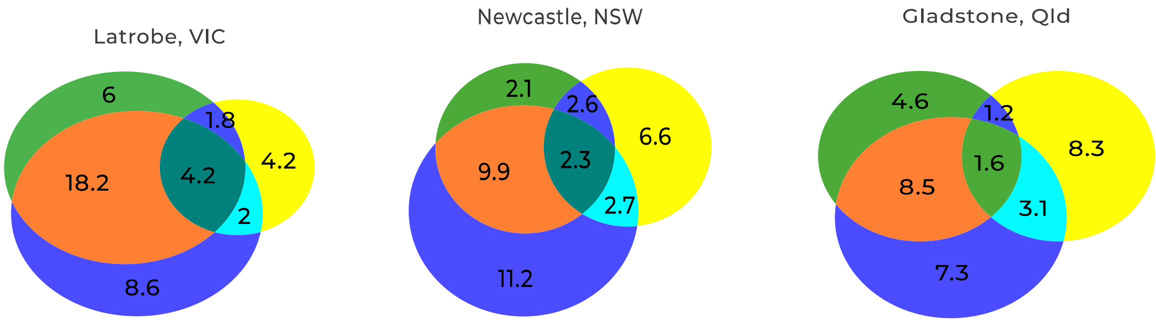
The BlueEconomy CRC illustrated this point in their recent report, showing the diversity benefits of offshore wind complementing onshore wind and solar VRE.

> Potential offshore wind sites in Victoria (left), NSW (middle) and Queensland (right), the percentage of year during which offshore wind (blue), onshore wind (green) and solar PV (yellow) generation is operating at high capacity (>50%), and others operate at low (<25%) capacity. Where circles do not overlap this indicates the percentage of the year when one energy source is at high capacity while

[11] Diurnal wind profiles derived from the Global Wind Atlas (high res. climate data downscaled from ERA5; 2008-2017).

the others are at low capacity. For example, in Newcastle, NSW, offshore wind is operating at high capacity, with onshore wind and solar PV both operating at low capacity, for 11.2% of the year. [12]

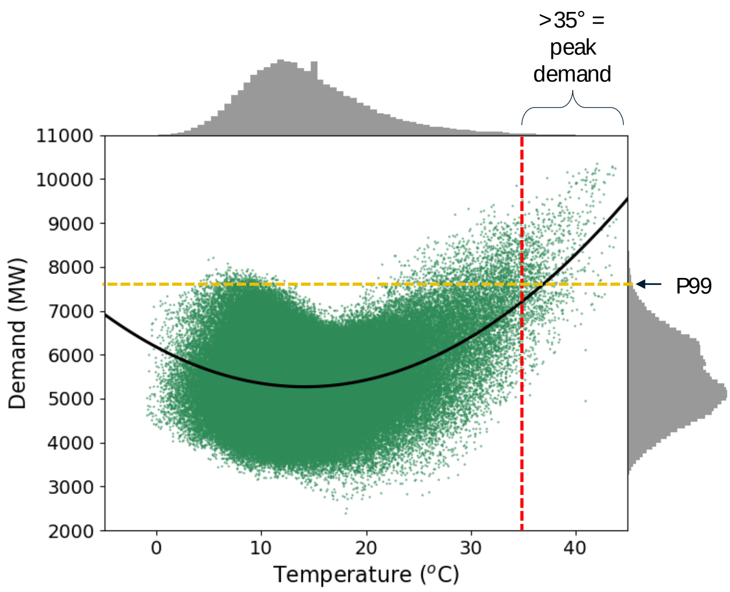
Figure 2: Generation diversity



4.2 Peak demand and reliability

In terms of reliability of the system, it is the peak demand periods that drive decisions, including in the Draft ISP, given the requirements of the Retailer Reliability obligation. Peak demand in Victoria is very highly correlated with high temperatures, as illustrated below:[13]

Figure 3: Correlation between temperatures and peak demand



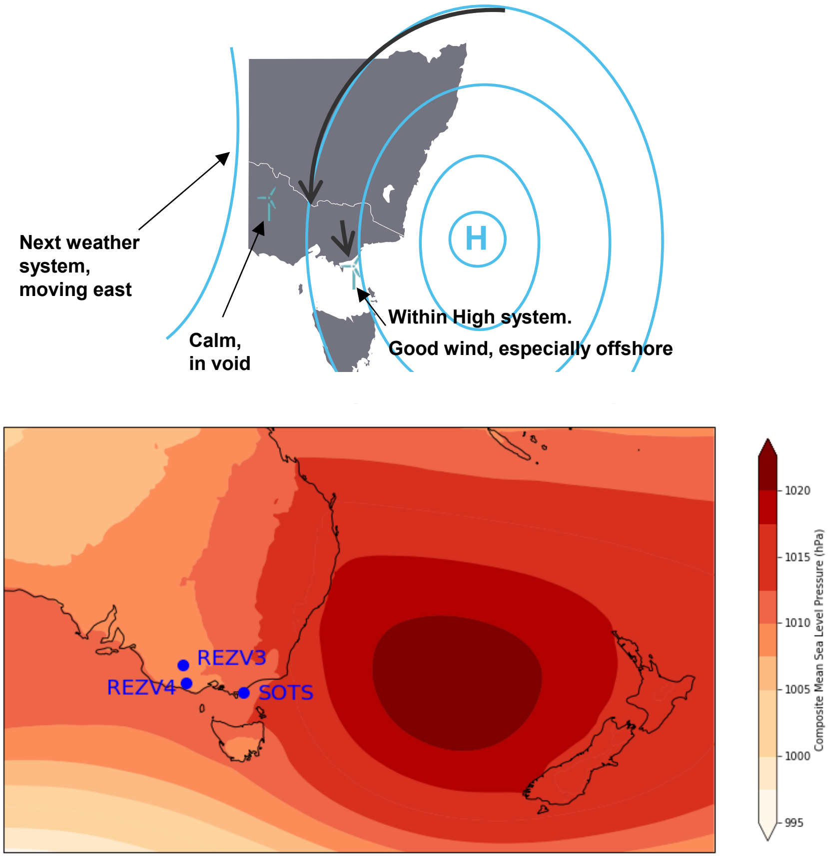
[12] Blue Economy Cooperative Research Centre, Offshore Wind Energy in Australia – Final Project Report, July 2021

[13] Based on 21 years of Victorian electricity demand from AEMO MMS Data Model; and 2 m Melbourne temperatures from ERA5 reanalysis dataset (hourly averages; 2000-2021).

This correlation between high temperatures and peak demand is not a surprise. However, what we have also discovered is a very strong correlation between these high temperatures/peak demand and strong wind patterns in the Tasman Sea off the coast of Gippsland. Star of the South worked with the Bureau of Meteorology to identify the underlying weather systems causing this high generation potential during likely peak demand periods. Peak demand is generally caused by high air conditioner use during heatwaves. The Bureau found that the Tasman Sea high pressure systems associated with Melbourne heatwaves consistently caused high offshore wind speeds at the Star of the South site. This is explained by high pressure systems which cause strong northerly winds passing over inland Victoria and then over Melbourne, but which also cause weak wind patterns in Western Victoria.

Star of the South analysed 100 Victorian peak demand half-hours over the past 9 years, amounting to 20 events (average 2.5 hours per event). Every single one of these events involved a high-pressure system in the Tasman sea, east of Victoria, resulting in very strong wind resource (and therefore high generation output from offshore wind if it was installed). This is illustrated below, schematically and with an illustration of the synoptic flow from the Bureau of Meteorology[14]

Figures 4 and 5: Cause and effect

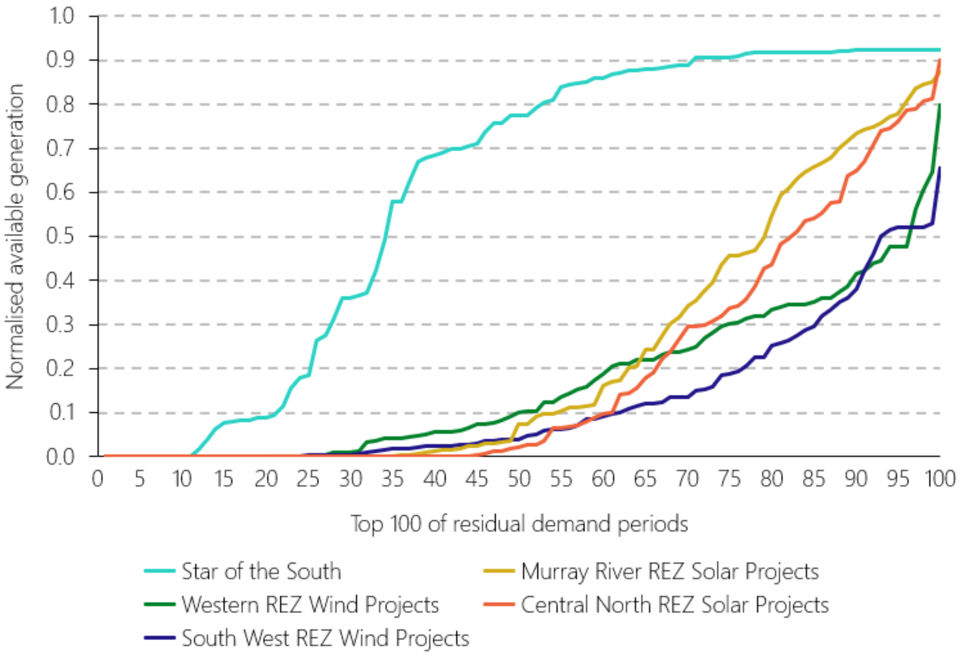


[14] Chart prepared by the Bureau of Meteorology for Star of the South shows composite 1600 AEDT mean sea level pressure fields for the 384 days of data (January 1990 – February 2019) when Melbourne experienced temperatures ≥ 35 ℃

Offshore wind provides a naturally occurring hedge against peak demand. This is easily observable by AEMO using historical data for Bald Hills windfarm, which is highly correlated to the wind profile of Gippsland offshore wind.

Analysis performed by Ernst & Young for Star of the South shows the available generation resource for Star of the South would provide a high level of generation resource during Victorian peak demand periods compared with onshore wind and solar PV. The chart below shows the difference between the offshore wind project's generation profile and that of a representative pipeline wind and solar projects in western and northern Victoria during a projection of the top 100 residual peak demand periods to be met by large-scale electricity generation in the data analysed for 2036-2037.[15]

Figure 6: Contribution to residual peak demand



The reliability of the system during peak demand periods can drive decisions on what assets are required to be built in the Draft ISP, especially as the current security of supply – the coal generators – are retired. The discussion above demonstrates that there are significant benefits in terms of reliability driven by the adoption of offshore wind in step with the retirement of coal generators.

[15] EY's analysis was completed in May 2020, based on historical data available from AEMO and the Australian Bureau of Meteorology, AEMO's demand projections and a set of existing and committed onshore wind and solar projects agreed with Star of the South. Generation availability was analysed from a meteorological perspective only; it does not consider unavailability due to technical reasons such as electricity transmission network constraints. Results could vary under a different set of assumptions.

5 Economics of offshore wind

Section 3.2 of the Draft ISP summarises the approach that AEMO has taken in relation to modelling offshore wind:

> Offshore wind has great potential due to resource quality, possible lower social licence hurdles, and proximity to strong transmission, but the economics are not yet proven. It is therefore not currently projected to play a large role in the future energy mix at current forecasts of future costs, unless land use considerations limit onshore development. Further cost reductions could see offshore wind feature more prominently in future ISPs.

Section 2.3 of the Draft 2022 Forecasting Assumptions Update adds the following:

> Offshore wind is the technology that exhibits the biggest difference in starting capital cost, and cost reduction across the horizon, compared to the 2020-21 GenCost projections adopted in the 2021 IASR. This is largely due to observed cost reductions in projects being delivered globally. Compared to many of the other technologies, however, there remains more uncertainty on the costs of projects delivered in Australia given the lack of any completed projects. Furthermore, the maturity of other supporting assumptions is not as advanced. This includes for example, considerations of site availability in locations suitable for fixed offshore wind (depths below 60 metres).
>
> Further refinement of offshore wind assumptions will be progressed over the next year; considering this uncertainty, AEMO considers that it is premature to wholly apply this updated assumption to the 2022 ISP despite the improvement in cost trajectory for this technology. Instead, AEMO will introduce an additional ISP sensitivity to understand if the draft optimal development path would be materially different if offshore wind costs were to reduce significantly. Similarly, the next GenCost process will consider the inclusion of cost projections for floating offshore wind.

We agree that cost reductions have been observed across offshore wind projects globally. Equally, there is a level of uncertainty in the costs for Australian projects given the particular environmental, labour and social considerations that apply here. There is also the opportunity to develop a local industry to support offshore wind that may not result in the lowest cost, but instead provide the greatest overall value to the local communities and Australia more generally.

The cost considerations are neatly summarised by the Blue Economy CRC:[16]

> Current proposed electricity generation cost assumptions (GenCost) for the ISP assign current capital costs of offshore wind projects ~3 times greater than that of onshore wind, reducing to approximately 2.7 times for 2050 commissioning (Graham et al., 2021). This is in contrast to the global weighted mean capital cost projections reported by IRENA, where offshore wind capital costs are projected to be approximately 2.3 times onshore wind in 2050 (IRENA, 2019), and substantially greater than that projected in the UK, where offshore wind is a mature sector, costs are better understood, and offshore wind construction costs are projected to be approximately 1.2 times that of onshore wind by the mid-2030's (BEIS, 2020).

We support the inclusion of a sensitivity to understand the effects of inputting these lower costs for offshore wind (particularly fixed platforms, where the project experience is deeper and level of uncertainty lower). This will be particularly relevant when combined with the sensitivities we

[16] Blue Economy Cooperative Research Centre, Offshore Wind Energy in Australia – Final Project Report, July 2021

suggest above in relation to social licence challenges adversely affecting the timing and cost assumptions, or indeed the deliverability, of the scale of onshore VRE and transmission assets assumed by the 2022 ISP.

The transmission costs need to be factored in for offshore wind as they have been in AEMO's modelling – but as previously outlined, this should reflect (at least via sensitivity analysis) the effects of increased costs to cater for community concern, in particular via any undergrounding of transmission lines at additional cost to overhead lines. However, the onshore transmission requirements for offshore wind are generally much shorter than for more remote REZ, and importantly in many cases can utilise the significant existing transmission infrastructure from coal generation regions. The first offshore wind projects, which could be commissioned in 2028-2030, fit well with the timing of expected retirement of coal assets, utilising the same transmission infrastructure.

6 Pricing impacts

The Draft ISP does not expressly seek to model power prices, but rather focuses on the most efficient delivery of new capacity, which in theory should deliver the lowest impact to power prices.

Star of the South has commissioned modelling from Jacobs to assess the impact that the diversity of wind generation brought about by an offshore wind farm has on price outcomes in Victoria. Given the observed strong relationship between good offshore wind resource and very hot weather, there is a strong contribution from offshore wind during high price periods (as discussed above in Section 4.2). If included in the system, offshore wind displaces high price gas generation, and so should be expected to reduce the absolute prices during those periods.

More importantly, the combined contribution from offshore and onshore wind with a more diversified generation pattern would act to reduce price volatility and put downward pressure on prices in Victoria across all time periods in a year. The modelling demonstrated across multiple potential scenarios that Star of the South, with its diversity of offshore wind generation, created annual price reductions ranging between $0/MWh to $10/MWh in Victoria and $0/MWh to $7/MWh in other regions.[17]

This is seen for two reasons:

- First, the differing hourly generation profile of Star of the South sees relatively more generation during the day and evening hours (compared with incremental onshore VRE that would otherwise have been built). This results in lower prices in these periods, especially in the early evening period in the summer and early autumn months.
- Second, generation during the late autumn and early winter months is proportionally higher for Star of the South than the onshore VRE that would otherwise be built. Without Star of the South, the late autumn and early winter months sees renewable generation falling off as insolation levels are low and there are less windy days, at a time when demand is picking up due to the winter heating load. With more coal plants retiring, gas plants are dispatched more often, setting the price during these periods. The higher levels of generation for Star of the South during these months (compared to onshore VRE) lead to less gas being dispatched, lower prices and better carbon outcomes. It is this second effect which has the greatest impact on reducing annual prices.

We would be happy to discuss this in further detail with AEMO to ensure these potential benefits are not being overlooked in the methodology applied in the Draft ISP.

[17] The modelling is confidential to Star of the South, but we would be happy to discuss with AEMO the basis on which confidential access could be provided.

7 Concluding remarks

While onshore renewables, storage and transmission have a significant role to play in decarbonising the grid and Australia's economy, there is a limit to what is practical and acceptable to build from a community and environmental perspective.

We have discussed the significant challenges that will be faced for both transmission infrastructure and some VRE projects obtaining the social licence required to get approvals and proceed within the timeframes used in the Draft ISP. We believe these challenges are not properly reflected in the timeframes, nor are they reflected realistically in the cost assumptions, that are the basis for the Draft ISP.

Our experience, and recent experience on other projects, in relation to obtaining the necessary social licence to operate suggests strongly that these challenges should not just be acknowledged by the Draft ISP as a risk – they should be modelled.

And that modelling should reflect the greater likelihood of success of projects in regions near existing energy jobs – that is, a lower risk of social licence issues causing a project to be delayed or abandoned, where the project is located near existing coal, oil or gas infrastructure.

There is clearly the need for a large amount of additional onshore VRE supported by significant transmission infrastructure upgrades and new lines. We believe there is also a strong contribution that offshore wind can make to the energy transition, which the Draft ISP downplays.

The contribution of offshore wind should also be assessed from the perspective of the diversity of supply it provides, the corresponding decrease in volatility of renewable energy supply and therefore a reduction in overall power prices.

We have also discussed the benefits in terms of reliability of supply in peak demand periods, driven by the correlation between peak demand in hot weather and a strong offshore wind resource.

We would welcome the opportunity to discuss these issues in further detail with AEMO if that would be useful in AEMO's finalisation of the 2022 ISP.