NEM Offshore Wind Benefits Study

Star of the South Wind Farm Pty Ltd as trustee for the Star of the South Trust Australia Pty Ltd
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Project name: NEM Offshore Wind Benefits Study

Jacobs Group (Australia) Pty Ltd

Floor 13, 452 Flinders Street
Melbourne, VIC 3000
PO Box 312, Flinders Lane
Melbourne, VIC 8009
Australia

T +61 3 8668 3000
F +61 3 8668 3001
www.jacobs.com

Summary Findings

The National Electricity Market (NEM) is expected to undergo unprecedented change over the next 30 years. The key drivers of this are the NEM's incumbent generation infrastructure reaching the end of its technical life, Australia's goal to achieve net-zero emissions by 2050 and the ensuing government policy, targets and infrastructure investment required to deliver the country's energy transition. This will be earmarked by three coinciding pressures:

1. Energy supply mix transformation, driven by coal retirements and new entrant renewable build.
2. Rising demand growth, led by electrification, electric vehicles, hydrogen production, and data centres.
3. Increasing system constraints, such as transmission availability, generation curtailment, land access and social licence, and seasonal reliability.

Recently, the NEM has relied on geographically distributed onshore wind and solar, supported by thermal generation and inter-regional transmission to meet reliability and cost objectives. However, maintaining system strength, reliability, and cost is becoming difficult as a larger share of the NEM's coal fleet retires and is replaced by variable renewable generation. Marginal onshore renewable projects required to replace coal are located further from load, in regions with weaker transmission capacity and growing social and planning constraints.

Offshore wind (OFW) has emerged as a potential solution. Despite a higher generation capital cost, offshore wind has higher capacity factors, stronger correlation with winter and evening peak demand, complementary profiles with onshore wind and solar, and may reduce system constraints from transmission, social licence, and planning.

Star of the South Wind Farm Pty Ltd as trustee for the Star of the South Trust Australia Pty Ltd (henceforth, SOTS Trust Australia) has engaged Jacobs Group (Australia) Pty Ltd (henceforth, Jacobs) to conduct a market study evaluating the potential benefits of offshore wind in the Gippsland offshore wind declared area, to the National Electricity Market (NEM) using Jacobs' simulation model of the NEM wholesale market.

The modelling underlying this report was undertaken in December 2025 and is reliant on market knowledge available at that time.

Two scenarios were modelled in this study to assess the comparative benefits from offshore wind to the NEM:

- A No Offshore Wind (NOFW) scenario, in which offshore wind does not form part of the generation mix.
- An Offshore Wind (OFW7) scenario, in which 7 GW of offshore wind is developed in Bass Strait, off Gippsland by 2040.

The comparison between the NOFW and OFW7 scenarios is structured to isolate the effect of offshore wind, with all other assumptions held constant across the two scenarios. The general market assumptions are the Jacobs Base Case assumptions and referred to as such throughout this report. The purpose of this analysis is to understand the value of offshore wind at a system level, comparing total system costs, prices, transmission, and reliability.

The Jacobs Base Case reflects our assessment of likely market trends, including:

- Decarbonisation pathways aligned with Australia's goals for net-zero emissions by 2050 and limiting global temperature change to below 2°C above pre-industrial levels.
- Demand forecasts based on the Australian Energy Market Operator's (AEMO) Central (Step Change) scenario, with growth underpinned by strong electrification and electric vehicle uptake, hydrogen production, and data centre expansion.

- Coal retirements based on modelled economic viability under a net-zero by 2050 framework.
- Policy continuity of current Commonwealth and State renewable targets, including the expanded Capacity Investment Scheme (CIS). A shadow carbon price to electricity generation is applied from the early 2030s, reflecting assumed Safeguard Mechanism reforms.
- Transmission development broadly aligned with the 2024 ISP, with realistic delays applied to major projects such as EnergyConnect, HumeLink, and Marinus Link.
- Technology costs based on CSIRO GenCost 2024-25, including elevated costs in the short-term due to inflation and rapid deployment.
- Thermal fuel costs are aligned to AEMO's central (Step Change) scenario.
- Capacity expansion includes all committed and actionable renewable capacity projects at the time of modelling, with the development of all onshore Renewable Energy Zones (REZs) broadly aligned with the 2024 ISP.

Total System Cost

While the levelised cost of energy (LCOE[1]) is a widely used metric for comparing the standalone cost of different technologies, the total system cost provides a more comprehensive and decision-relevant assessment by capturing all costs required to reliably supply electricity.

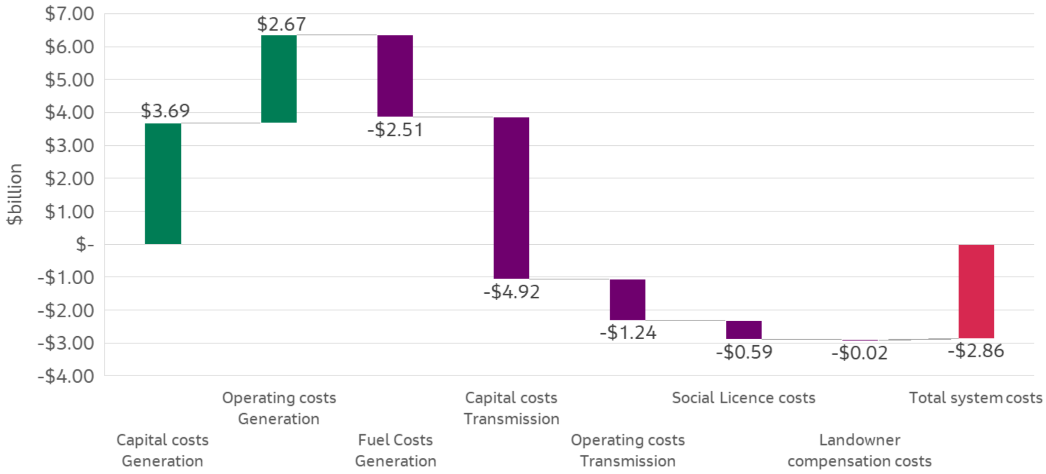
A system cost framework includes:

- Generation (including storage) capital and operating costs.
- Transmission investment.
- Fuel costs.
- Firming and backup capacity.
- Land access and social licence costs.
- Diversification, reliability, and unserved energy impacts.

The system cost framework shows which combination of technologies deliver the lowest total cost electricity system while meeting reliability and decarbonisation targets. The Offshore Wind scenario is found to have lower total system costs, compared to the No Offshore Wind scenario (Figure ES 1).

[1] The LCOE expresses the average cost per megawatt-hour of electricity produced by a single asset over its lifetime, incorporating capital costs, operating costs, and expected energy output.

Figure ES 1: NPV[2] of relative system costs, OFW7 minus NOFW ($Dec 2024, billions)



Between 2026–2060, the total NEM system costs (net present value) are approximately $2.9 billion lower in the Offshore Wind scenario. Despite higher generation capital and operating costs in the Offshore Wind scenario ($3.7 billion and $2.7 billion higher, respectively), which are reflective of the capital-intensive nature of offshore wind, costs are more than offset through transmission capital and operating costs ($4.9 billion and $1.2 billion lower, respectively), fuel costs ($2.5 billion lower), and social licence and landowner compensation costs ($0.6 billion lower combined).

Although offshore wind is not the cheapest option from a standalone capital cost perspective, offshore wind reduces overall system costs, through reduced transmission investment, lower fuel expenditure (less gas peaking generation), and avoided social licence costs.

Transmission and Land Use Benefits

Reduced transmission investment is the largest contributor to system cost savings under the Offshore Wind scenario.

In the absence of offshore wind, the NEM must rely on an additional 8.3 GW of onshore wind capacity by 2040, primarily built in increasingly constrained Renewable Energy Zones (REZs) in Victoria, New South Wales (NSW), and Queensland. Accommodating this capacity requires new transmission infrastructure including REZ augmentations.

By contrast, offshore wind in Gippsland connects close to major load centres, reducing the need to transport energy over long distances. The study finds that offshore wind enables:

- A reduction of $4.9 billion in transmission capital costs.
- A further reduction of $1.2 billion in transmission operating costs.
- The avoidance of 7.7 GW of REZ transmission capacity augmentations, estimated to be approximately 930[3] km of new transmission lines.

In addition, offshore wind reduces exposure to land access and social licence constraints. As high-quality onshore renewable projects become saturated and REZs are built to their capacity limits, new projects face increasingly higher costs from difficulties in obtaining land, more complicated planning approval arrangements,

[2] Net Present Value between 2026 to 2060, with a 7.4% discount rate.

[3] Conservative estimates are as low as ~400 km, and as high as ~2000 km.

or extended engagement with community and traditional landowners. Offshore wind in Gippsland avoids $0.6 billion in social licence costs which would have otherwise been incurred from new onshore projects that would be required in addition to the current build out.

In both scenarios, Queensland and South Australia have similar net imports (remains as net exporters to other regions). In the offshore wind scenario, Victoria also remains steady as a net exporter to other regions, however in the no offshore wind scenario, there is an increased reliance on imports from other regions, becoming a net importer from the mid-2030s. Increased imports to Victoria in this scenario are largely from NSW and Tasmania, relying on greater utilisation of Marinus Link and VNI West.

Fuel Cost and Firming Benefits

In the absence of offshore wind, the NEM must rely on an additional 3.4 TWh of gas generation by 2040, primarily during the peak winter periods which is not always met by onshore renewable generation. By contrast, offshore wind can reduce gas-fired generation volumes due to higher capacity factors than onshore wind, and stronger generation during winter and evening periods when demand is high. The study finds that offshore wind enables:

- $2.5 billion of fuel cost savings from reduced hydrogen and peaking gas usage.
- Reduced reliance on fuel-intensive assets with low utilisation but high capital recovery requirements.

The gas generation costs accounted for in this study only encompass fuel costs (in addition to capital expenditure for new build, and operation and maintenance costs). Costs associated with maintaining adequate gas supply (including importing gas) and/or storage (particularly in Victoria) are not included in the scope of this forecast.

Wholesale Price and Consumer Impacts

Wholesale electricity prices are lower with offshore wind, compared to the scenario with no offshore wind, with an average annual wholesale savings of $1.6 billion and as much as $5.2 billion annual savings by 2040.

In the long-term[4], Jacobs assumes mean reversion, where wholesale electricity prices will converge to the long-run marginal cost of the next additional generation capacity required. In the case of the No Offshore Wind scenario, offshore wind is not available as part of the generation mix so the future capacity buildout is dependent on further onshore capacity options. The saturation of high-quality, cheaper onshore renewable projects means the next available onshore option becomes increasingly expensive due to lower renewable resource, higher land access costs, and social licence constraints. Wholesale electricity prices are projected to increase until it reaches the level necessary to support the buildout of the next available generation capacity. Under the constrained availability of additional onshore renewable capacity, existing gas generators must ramp up supply, particularly in peak winter periods which set prices at much higher levels. This escalates from the late 2030s as new gas power plants are needed once coal exits the system with new onshore renewable options limited or cannot sufficiently meet all peak demand. A higher increase in wholesale prices therefore occurs from 2039 onwards in the No Offshore Wind scenario.

The study finds that offshore wind creates an average annual wholesale savings of $1.6 billion, from:

- A $5/MWh reduction in wholesale price on average across the NEM, between 2033–2040.
- An annual reduction in wholesale price in 2040 by:

[4] Mean reversion is not applicable to the period before the early-2030s because the CIS and state renewable targets underwrite a greater level of renewable capacity than what the market would have otherwise built without government subsidies (hence, lowering wholesale electricity prices below the cost of new entrant generation).

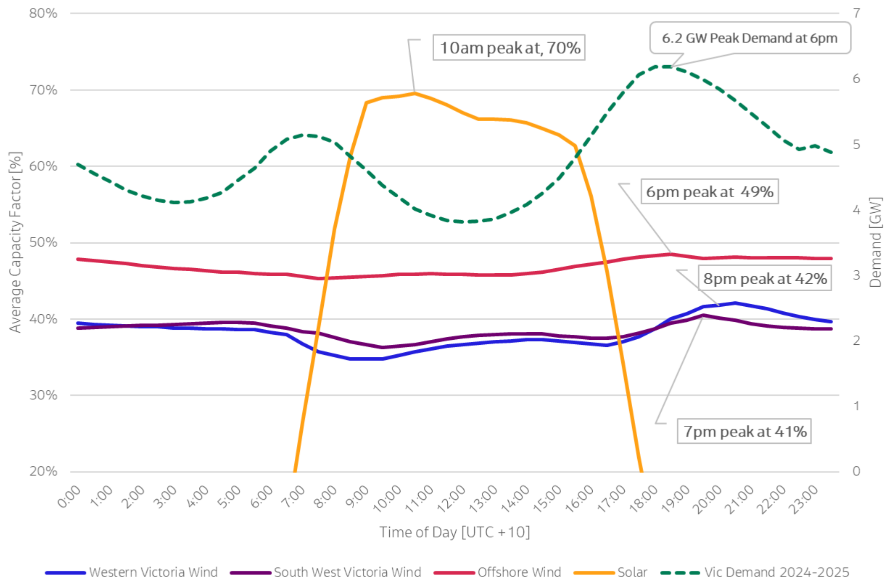
- $15/MWh on average across the NEM.
- $26/MWh in Victoria.

- An annual electricity bill[5] savings (by 2040) of:
    - $84 per annum for a typical east-coast Australian household.
    - $151 per annum for a typical Victorian household.

Reliability and System Resilience

Offshore wind provides reliability benefits by being able to generate during periods of low onshore renewable generation coinciding with high demand (Figure ES 2).

Figure ES 2: Diurnal profiles



Monte Carlo snapshot analysis for 2040 shows that offshore wind:

- Avoids 0.37 GWh of unserved energy (USE) in 2040 compared to a No Offshore Wind scenario.
- Leads to no observed USE across 130 Monte Carlo samples.
- Provides a reliability benefit[6] of $75 million between 2026–2060.

Offshore wind improves system resilience during onshore renewable droughts and reduces reliance on last-resort peaking plants.

[5] Assumes changes to the wholesale electricity cost component only; 5 MWh annual household electricity consumption assumed.

[6] Using a 7.4% discount rate.