THE CENTRE FOR INDEPENDENT STUDIES

(Limited by Guarantee) A.B.N. 15 001 495 012
Level 1, 131 Macquarie St, Sydney NSW 2000
**Phone:** 61 2 9438 4377 **Email:** cis@cis.org.au

cis.org.au

15 September 2025

Barry Sterland
Commissioner
Productivity Commission
Level 8, Two Melbourne Quarter
697 Collins Street
Docklands Vic 3008
Submitted via https://engage.pc.gov.au/surveys/secure_form/survey/make-your-submission

**RE: Submission to Productivity Commission's *Investing in cheaper, cleaner energy and the net zero transformation* Interim Report**

Dear Mr Sterland,

The Centre for Independent Studies (CIS) welcomes the opportunity to respond to the Productivity Commission's *Investing in cheaper, cleaner energy and the net zero transformation* Interim Report.

The CIS is a leading independent public policy think tank in Australia. It has been a strong advocate for free markets and limited government for more than 40 years. The CIS is independent and non-partisan in both its funding and research, does no commissioned research nor takes any government money to support its public policy work.

The Productivity Commission's statement that careful emissions reduction policy design will enable gains in productivity and living standards is unfounded.

Likewise, the statement that faster approvals of energy infrastructure will "make energy cheaper than otherwise — supporting productivity growth" is also unfounded with respect to wind and solar farms and transmission lines built to support renewables. The recommendations to reform environmental laws, set up a strike team, establish a Coordinator-General and amend the *Environment Protection and Biodiversity Conservation Act 1999* will not reduce electricity costs or improve productivity, as higher penetrations of renewables increase electricity costs. The need to build more systems (e.g., storage, transmission, gas peakers) to deliver the same amount of electricity necessarily results in higher costs and lower productivity at higher grid penetrations of renewables.

Lowering the Safeguard Mechanism will simply increase the regulatory burden and costs placed on industries, many of which are already struggling to stay open due to high electricity prices. It will not increase productivity.

We support the proposed phaseout of the exemption of electric vehicles from the Fringe Benefits Tax, vehicle stamp duty and registration discounts. However, we do not support a new emissions-reduction incentive to cover heavy vehicles, as this will only add to transport costs and worsen productivity.

We support improved transparency of emissions-reduction policies by consistently including estimates of government policy cost-effectiveness in impact analyses. However, expanding emissions-reduction incentives to new sectors such as agriculture and household gas will only worsen productivity by reducing efficiency and driving up costs.

Resilience to future changes in climate will only be made more difficult by increasing energy costs. Investments in climate resilience will be wasted if consumers cannot afford to run air conditioners on hot days and heating on cold days, and rebuilding after natural disasters will be much more expensive if products such as bricks are no longer able to be made onshore due to high electricity prices shutting down industry.

Yours sincerely,

Aidan Morrison
Director of Energy Program
Centre for Independent Studies
Email: amorrison@cis.org.au

# Nuclear Energy

The Productivity Commission should advocate for lifting outdated and unnecessary bans on nuclear energy. On page 10, the interim report lists a core principle as:

> Ensure that policies do not preference some emissions-reduction options or technologies over others. Emitters should get the same benefit from reducing emissions regardless of how they do it. If policies favour some lower-carbon options over others, emitters may pursue these because they attract a large reward, not because they are the cheapest way to reduce emissions.

Current bans on nuclear energy at the federal and state levels, alongside subsidies for renewables such as the Capacity Investment Scheme, represent a clear preference for certain technologies over others. The Productivity Commission's statement above is a caution that technology-specific subsidies distort choices. Indeed, the Commission notes that the Renewable Energy Target is "a major driver of investment in renewable energy" and that the Capacity Investment Scheme "will likely need to provide more revenue than they would have received absent the policy … [and] is likely to deliver a net subsidy to generators."[1]

These are strong acknowledgements that much of the investments in wind and solar projects has been policy-driven by subsidies, not because they are the least-cost way of reducing emissions. The Productivity Commission should explicitly call for technology-neutrality in practice, which means lifting the legislative bans on nuclear energy.

# Capacity Market

As part of Draft recommendation 1.1, the interim report recommends "introducing enduring, broad-based market settings in the electricity sector" that will "embed investment incentives to ensure reliability and system security are maintained". A market that rewards generators for dispatchable capacity that can be switched on when needed would achieve this. Reliability and system security will become increasingly difficult to maintain as generators without dispatchable capacity, i.e. wind and solar, are forced into the market by government subsidies. The current energy-only market is not sufficient to ensure reliability and system security are maintained over the long term, as acknowledged in the recent Nelson Review.[2] The recent Iberian Peninsula blackout is a good example of the dangers associated with overreliance on asynchronous generation.[3] [4]

The Productivity Commission recommends on page 31 of the interim report that all significant new emissions reduction policies are accompanied by a published cost-effectiveness estimate that clearly identifies costs, benefits and emissions reductions arising from each policy. However, the Commission explicitly mentions "reliability benefits" in the context of electricity and does not mention "reliability costs". This does not reflect reality. Reducing emissions in the grid through shifting from fossil fuels to weather-dependent renewables will necessarily increase reliability costs through the need for backup generators with poor utilisation and/or synchronous condensers. Wind and solar cannot provide reliability benefits.

## Renewables Investment

Private investment in wind and solar projects has been almost non-existent in recent years. On page 12 of the interim report, the Productivity Commission asserts: “Even absent a post-2030 policy, some emissions reduction would likely occur through market forces. Wind and solar generators have lower levelised costs than any other fuel source”. This is incorrect. Further emissions reduction through increasing the share of renewable energy in the grid will not happen through market forces, and wind and solar generators are not the lowest cost generation technology.

Analysis conducted for the NEM Review, supported by the Department of Climate Change, Energy, the Environment and Water, shows that all wind and solar projects built in the NEM between 2010 and 2023 have had significant government support (Figure 1).[5] The only projects to be built with minimal support over this period were gas and hydro projects.[6]

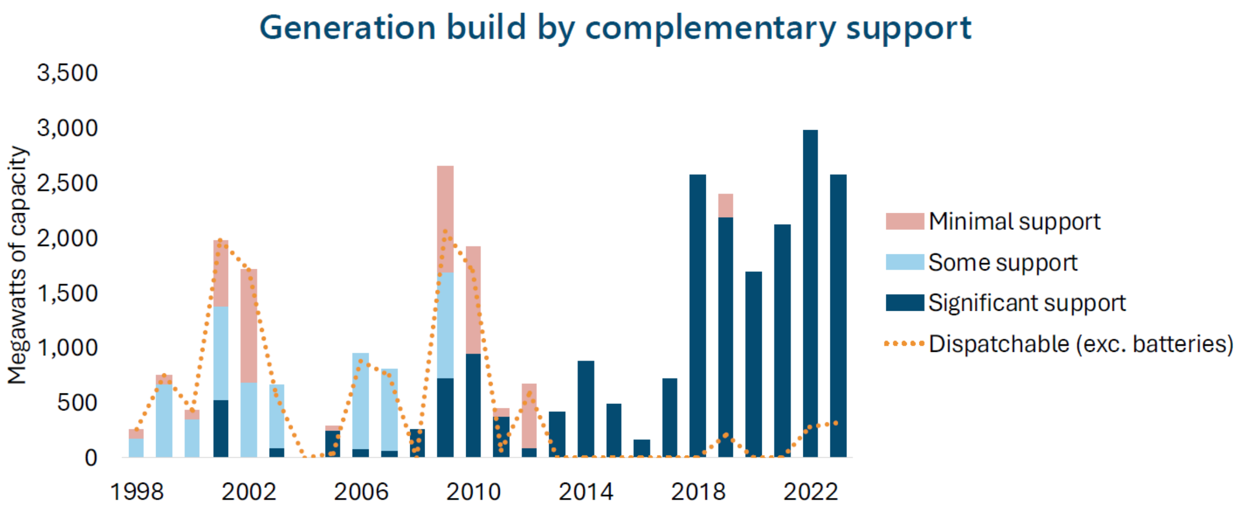


**Figure 1. NEM generation build of coal, gas, solar, wind and hydro shows increasing proportion of projects with significant government support over time as dispatchable generation build declines.**

There is no reason to believe the market will build material amounts of new wind and solar generation without government support in future. Wind and solar capture prices have continued to decline in recent years as their penetration has increased (Figure 2). The market is sending signals to investors that there is too much wind and solar in the grid and it is not a worthwhile investment. As saturation increases during periods of high wind and solar output, wind and solar capture prices will only be further suppressed.

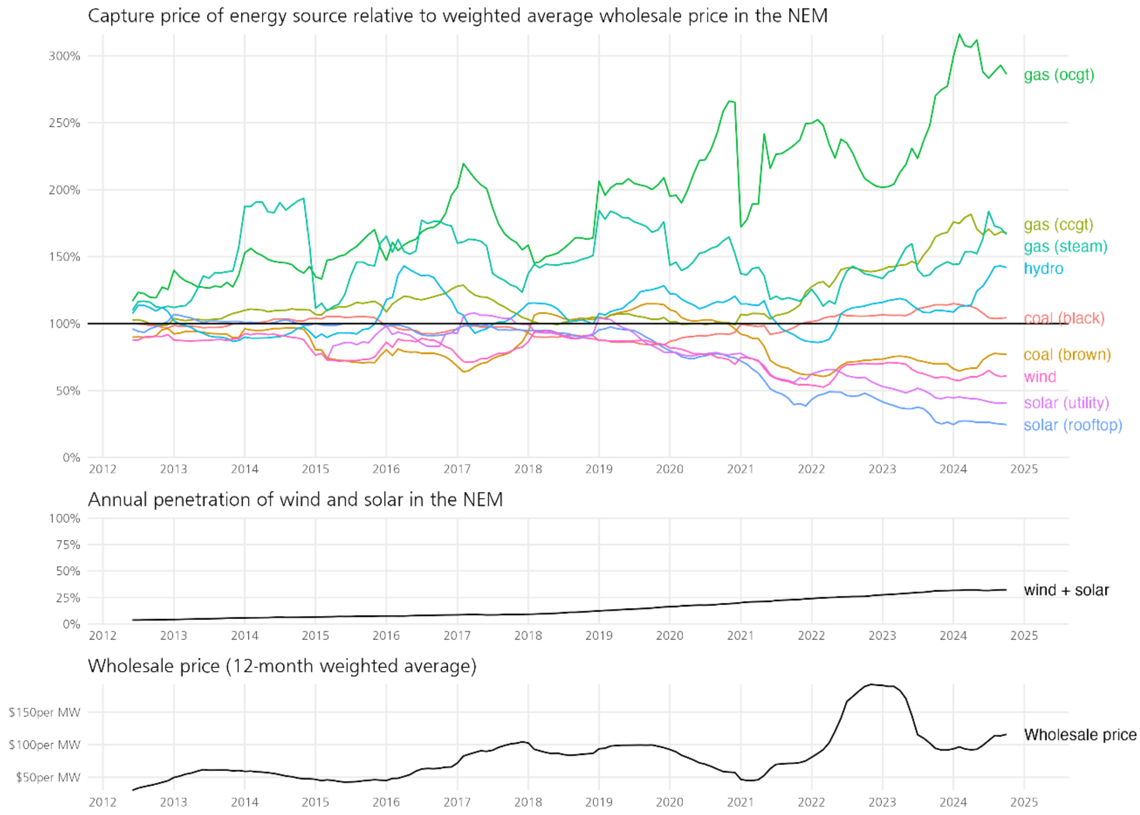


**Figure 2. Capture price of energy source relative to volume-weighted wholesale price in the NEM. Data sourced from OpenElectricity.**

Wind and solar do not have the lowest levelised cost of any fuel source. The Productivity Commission has cited the 2024-25 Draft GenCost report as evidence for this claim. However, the final 2024-25 GenCost report shows that new-build black coal is cheaper than integrated renewables, at $111/MWh.[7] Firmed wind and solar at 60, 70, 80 and 90% penetration ranges in cost from $116 to $125/MWh at the lower bound.[8] Black coal also has a lower midpoint ($145/MWh) than 90% wind and solar ($151/MWh) in 2024, which represents the planned level of renewables penetration for Australia's future grid. CSIRO's data makes clear that coal, not renewables, is the lowest cost generation technology.

# Renewable Fuels

Renewable fuels occupy an important part of the Net Zero plan, since there are many sectors of our economy that are hard to electrify, such as long-distance freight (trains, trucking and shipping), as well as aviation. Despite current challenges, there is much technological optimism around the future feasibility of these fuels.

On page 24 of the interim report, the Productivity Commission states: "Technologies like electric trucks, hydrogen trucks and renewable diesel are relatively expensive and are not ready for widespread use. The Australian Government expects that a broader uptake of these technologies will only be possible from the 2030s; and, in the case of electric and hydrogen trucks, a 'mass market adoption' will only be viable in the 2040s."

The 'renewable fuel' category contains two major fuel types: biofuel and green hydrogen.

Biofuel is petrol, diesel and jet fuel made from organic (non-fossil) feedstock. The intention with these fuels is to allow the continued operation of traditional fossil-fuel combustion engines, with reduced or zero emissions. However, cost and scalability remain the key concerns for biofuel development. As relatively new technology, estimates for sustainable aviation fuel (SAF) have historically indicated significantly higher prices than conventionally sourced jet fuel.[9] There are two components to the overall cost and scalability:

1. Process cost — determined by technology, which will improve with maturity; and chemistry, which is a fixed and unavoidable amount of energy required to transform the material;
2. Feedstock cost — determined by its intrinsic value and availability. The economics of the process is aided by the fact that much of the feedstock for these processes is waste or otherwise low or negative-value product.

Feedstock scale is the issue. There is a limited volume of waste available. An analysis of the volume required to achieve a non-trivial scale of production is concerning. Take canola as an example, used to synthesise biodiesel. Australia produced 2.14 million tonnes of canola in 2019, which is enough to produce 5.5 million barrels of biodiesel — just 1.5% of Australia's fuel demand. If all of Australia's current cropping agricultural land (31 million hectares) was diverted to canola production, this would still only produce 36% of our liquid fuel demand.[10]

It is clearly not feasible to divert productive agricultural land toward fuel feedstock. The EU initially introduced legislation to require a biofuel mix of 5.75% in transport fuel, but had to amend its legislation after observing that it had indirectly caused significant global deforestation and displacement of food crops, particularly palm oil in Indonesia and Malaysia, and soy in South America.[11]

The other main type of renewable fuel is green hydrogen.

Green hydrogen is electrolysed from water with renewable electricity, and stored as a gas or liquid for use in fuel cells or as chemical products. However, green hydrogen's high production costs and operational challenges threaten these ambitions. The fundamental issue lies in the energy-intensive nature of electrolysis. Producing 1 kg of green hydrogen requires 53 kWh of energy[12] — equivalent to powering a typical home for 3 days. This energy demand, coupled with high capital costs for electrolysers, makes green hydrogen expensive.

CIS sensitivity analyses indicate that even with optimistic assumptions around future costs of technology or electricity, green hydrogen costs realistically exceed $10/kg, far above the $2/kg market price of grey hydrogen. This gap necessitates subsidies of approximately $8/kg to compete, a scale that becomes astronomical when applied to national or export ambitions.

The challenges extend beyond production. Applications like long-haul transport and steelmaking require storage and transportation, which are hindered by hydrogen's high compression or liquefaction costs (12-36% of energy content). Fuel cell applications for transport must grapple with a round-trip energy efficiency below 30%,[13] and hydrogen's volatility and embrittlement of metals increase safety and maintenance costs. These factors further erode the economic case for hydrogen in hard-to-electrify sectors.

The economics and scale issues associated with renewable fuel production rule out the inclusion of renewable diesel and hydrogen in any serious plan for the future.

# Faster approvals will not increase productivity

Transitioning to a system dominated by wind and solar, with additional transmission, storage, synchronous condensers and poorly utilised gas ‘peaking’ plants required, cannot deliver cheaper energy for consumers or support productivity growth. Faster approvals of ‘clean energy projects’ will therefore not lower electricity prices, even if small reductions in project costs are achieved, as these projects themselves increase the total costs of the electricity system for the same output.

On page 37, the interim report states: “Faster approvals will reduce emissions, reduce costs for developers, attract investment and help give consumers access to cheaper and cleaner energy than a slow approvals system would offer. These benefits will all support productivity growth.” Low electricity costs are key to a productive economy because electricity is an input to almost every product and service. Building ‘clean energy’ projects which add to total system costs for Australia’s electricity system will necessarily increase prices for consumers, making the economy less productive.

The interim report states on page 51: “Reducing project costs for proponents will tend to produce electricity prices lower than would otherwise be the case.” No mention is made of the fact that such projects collectively increase electricity prices compared to Australia’s historically coal-dominated system. Speeding up approvals for priority ‘clean energy’ projects by establishing a strike team and Coordinator-General will therefore not increase productivity. Regardless of how quickly these projects are built, they will drive up prices – the question is merely by how much.

The Productivity Commission’s lack of modelling of future electricity prices represents a serious omission given the importance of cheap electricity to productivity. The rest of this section provides clear evidence that electricity prices will only continue to rise as the attempt to transition Australia’s electricity system to renewables continues.

Currently, wholesale costs are around $90/MWh in Victoria and $122/MWh in NSW,[14] which Energy Minister Chris Bowen implied were already unaffordable as of April 2024, saying “We have never denied that electricity prices are higher than we would like. That’s why we’ve delivered three rounds of energy bill relief”.[15]

The 2024-25 CSIRO GenCost report shows that a 90% renewables grid, which Australia is currently attempting to build, will deliver substantially *higher* electricity prices than currently faced by consumers. GenCost data indicates the costs for integrated renewables at 90% penetration range from a lower bound of $125/MWh to an upper bound of $176/MWh.[16] These are already higher than current wholesale prices in NSW and Victoria.

Additionally, the lower bound of integrated renewables costs is not a credible representation of real-world costs. It represents the upper bound of CSIRO’s assumed capacity factors, being 32% for solar and 48% for wind,[17] which are not realistic average capacity factors for new projects. The upper bound of the renewables cost estimates is more realistic as an average, though CSIRO assumes the lower bound of capacity factors to be only 10% below the current average,[18] at 19% for solar and 29% for wind, which is likely to still be too optimistic for a grid with 90% renewables.

As more high-quality wind and solar sites are taken, new solar and wind farms must be built on sites with increasingly poor-quality resources. This means the average capacity factors for solar and wind across the NEM would be much lower at 90% renewables penetration than at current levels.

The inevitability of declining resource quality with increasing renewables penetration is highlighted by a wind project recently seeking approval in NSW, the Hills of Gold Wind Farm.[19] The Independent Expert Advisory Panel for Energy Transition report revealed:

- The proponent volunteered a benchmark capacity factor for wind in NSW of 32.1%, which is lower than the average of AEMO ISP workbook values of 33.3%.
- The proponent volunteered a marginal loss factor (transmission losses) of 0.92 for their own project, but argued that the average for NSW wind farms is 0.89, according to Aurora Energy Research.
- The Panel considers that Hills of Gold wind resource is "probably slightly better than average" and that "Many of the 'easiest' i.e. most favourable sites in NSW have already been developed. Hence the pipeline of remaining sites all have less than ideal conditions in one or more respects."

CSIRO does not include marginal loss factors in the GenCost report. Including transmission losses of around 10% in the benchmark capacity factor results in delivered energy from wind farms being only around 29% of maximum output. This confirms that the average capacity factor of wind farms in NSW is currently ~29%. Since the most favourable sites have already been taken, remaining sites will deliver a lower average capacity factor for future projects comprising a 90% renewables grid. A similar phenomenon also occurs for solar projects, as the most ideal sites are taken, with only less ideal, more expensive sites left for new projects.

In addition to optimistic capacity factors, CSIRO also underestimates renewables integration costs. Battery expert Alex Wonhas has indicated Australia may need more than double the amount of battery storage previously thought, which CSIRO appears to have ignored.[20] CSIRO has also ignored the recent increases in transmission costs, including VNI West's costs doubling.[21] CSIRO also appears to have greatly underestimated the number of synchronous condensers and other firming infrastructure required by a 90% renewables grid; though quantifying this is difficult, given CSIRO is refusing to release the underlying modelling. All these additional costs mean CSIRO's cost estimates are likely to be greatly underestimated, even at the upper bound.

Therefore, CSIRO's upper bound for integrated renewables of $176/MWh should be taken as a lower bound for future electricity prices in a 90% renewables grid. Electricity prices cannot fall below this at 90% renewables penetration. This means consumers will face prices substantially higher than the currently unaffordable electricity prices in future. Worsening affordability for consumers, particularly heavy industry, will make the economy decreasingly productive in coming decades.

The Productivity Commission should not merely model the effect on power prices of bringing more capacity online faster, if this is compared only to a baseline of the same capacity being brought on later. Such a comparison is largely meaningless for consumers and the economy. The Commission should instead produce modelling of future electricity prices comparing the proposed future grid dominated by weather-dependent renewables compared to a 'business-as-usual' baseline that maintains the current proportion of generation sources. This may involve modelling refurbishment of existing thermal generators and/or construction of new thermal generators. Another scenario that should be modelled is the inclusion of nuclear power in the generation mix.

## Total Cost of the Energy Transition

The Productivity Commission has not presented modelling or analysis indicating the total cost of the energy transition and its impact on productivity. The figures cited are misleading in that they give the impression capital costs are much lower than they will be in reality.

The interim report states on page 51: “AEMO (2024, p. 13) estimated that the upfront capital cost of all the required utility-scale generation, storage, firming and transmission infrastructure to 2050 has a present value of $142 billion (2024 dollars).” This is incorrect. AEMO’s present value capital cost figures in the 2024 ISP exclude billions of dollars in costs arising from projects that were considered ‘committed’ or ‘anticipated’, which includes the pumped hydro projects Snowy 2.0, Borumba, and Kidston, as well as the transmission projects Project EnergyConnect, Western Renewables Link, Central West Orana REZ Network Infrastructure Project and CopperString.[22]

Consumer energy resources such as rooftop solar and home batteries, as well as the distribution network upgrades necessary to support them, are also excluded from AEMO’s total capital cost figures.[23] The amount of rooftop solar and home batteries alone needed by AEMO’s plan represents around $360 billion in extra capital costs,[24] with distribution network upgrade costs likely to add between $47 to $2,252 dollars per customer every year.[25] These substantial costs highlight why it is crucial that the Productivity Commission consider the total costs of the proposed transition to renewables and its effect on productivity.

## 82% Target will not be reached

The Productivity Commission references the 82% renewables by 2030 federal government target but does not consider whether it is achievable. The interim report states on page 7 that “Clean energy will underpin a decarbonised economy. Australia has a target for 82% of electricity to come from renewable sources by 2030.” However, there is now little doubt that Australia will miss this target by a substantial margin.

This has been suggested by the Grattan Institute,[26] Energetics,[27] Nexa Advisory,[28] Rystad,[29] and more recently Professor Ross Garnaut[30] and UBS.[31] Clean Energy Council data of financially committed generation projects indicate that the rate of new renewables projects being committed to has failed to increase in the past few years, with annual new committed capacity now lower than in 2018.[32]

A major barrier is workforce capacity. A UTS report commissioned by AEMO found that delivering the 2024 ISP’s Optimal Development Path would require tripling the number of electrical engineers by 2029, alongside a total electricity sector workforce estimated at 200,000–400,000 by 2030.[33] The report warned that the rapid increase in requirements for workers brings a high risk of skill shortages that could impact on the delivery of the Optimal Development Path and create risks of delays, higher project costs, and increased cost of capital.[34]

## Climate Adaptation

Supplying consumers with cheap electricity is a crucial part of climate adaptation. As the interim reports notes on page 55: "Without adaptation, heatwaves will lead to lower quality of life, poorer health outcomes and reduced labour productivity (DHAC 2023, p. 84; Treasury 2023, pp. 96–98), particularly as working from home arrangements place individuals in their homes during the hottest parts of the day." If consumers are able to afford adequate air conditioning in their homes during heatwaves, this will greatly reduce the negative health and productivity impacts of high temperatures. Affordable electricity is critical for ensuring widespread access to air conditioning and the current attempts to transition to a grid dominated by renewables will only impede access for vulnerable consumers, worsening the effects of heatwaves.

Similarly, rebuilding after natural disasters will be made much cheaper by retaining brickmaking and other critical industries onshore, which may only happen if electricity prices do not continue to rise.

## Emissions Reduction

The interim report states on page 10: "Reducing emissions from greenhouse gases is an important national priority. It will bring benefits in the form of less damage from climate change." No evidence has been given for this claim. Australia represents only around 1% of global emissions.[35] This means Australia reducing its emissions will have such a small effect on global emissions that, according to the IPCC's findings, Australia achieving net zero will have no measurable impact on the climate.[36]

Therefore, there is no need to amend the *Environment Protection and Biodiversity Conservation Act 1999* to consider the energy transition in approval decisions. The EPBC Act should remain focused on a project's direct impact to the environment, rather than indirect impacts through emissions reduction that are so small as to be undetectable and therefore immaterial to preserving Australia's biodiversity and natural environment. Considerations relevant to the electricity system are already covered in the 'economic and social matters' that the minister must consider under the Act.

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[1] Productivity Commission. 2025. *Investing in cheaper, cleaner energy and the net zero transformation*: *Interim report*. p. 12.

[2] Nelson, Tim, Paula Conboy, Ava Hancock & Phil Hirschhorn. 2025. *National Electricity Market wholesale market settings review: Draft report*. p. 42.

[3] Crownhart, Casey. 2025. 'Did solar power cause Spain's blackout?' MIT Technology Review. https://www.technologyreview.com/2025/05/08/1116166/spain-blackout-grid/.

[4] Porter, Kathryn. 2025. 'Voltage, inertia and the Iberian blackout part 2: faulty PV inverter crashed the grid'. *Watt Logic*. https://watt-logic.com/2025/07/16/voltage-inertia-and-the-iberian-blackout-part-2-a-faulty-solar-inverter-crashed-the-spanish-grid12088/.

[5] Nelson, Tim, Paula Conboy, Ava Hancock & Phil Hirschhorn. 2025. 'NEM Review: Findings and directions'. NEM review analysis, drawing on AEMO Generation Information, Bloomberg New Energy Finance, and the work and expertise of a range of experts.

[6] The gas plants built with minimal government support shown in the chart from 2010 onwards are as follows: Darling Downs (630 MW) & Condamine (140 MW) in 2010, Mortlake (566 MW) in 2012 and Barker Inlet (210 MW) in 2019. The hydro plants built with minimal government support shown in the chart from

2010 onwards are as follows: Jounama Dam (14.4 MW) in 2010, Jindabyne Dam (1.1 MW) in 2011 and Tumut 3 Power Station Upgrade (150-300 MW) in 2010-2011. Note: Snowy Hydro is government-owned but the hydro projects listed did not receive subsidies – they were built on a commercial basis.

[7] Hilton, Zoe. 2025. 'Why is CSIRO hiding the inconvenient truth about renewables cost blowout?' Daily Telegraph.

https://www.cis.org.au/commentary/opinion/why-is-csiro-hiding-the-inconvenient-truth-about-renewables-cost-blowout/.

[8] Graham, Paul, Jenny Hayward and James Foster. 2025. 'GenCost 2024-25: Final report'.

https://www.csiro.au/en/research/technology-space/energy/electricity-transition/gencost.

[9] Journal of Cleaner Production. 2024. 'Sustainable aviation fuel technologies, costs, emissions, policies, and markets: A critical review'. https://www.sciencedirect.com/science/article/abs/pii/S095965262400920X.

[10] Assumptions: 2.14 million tonnes of canola in 2019. Source: ABS. 2022. 'Canola, experimental regional estimates using new data sources and methods'. https://www.abs.gov.au/statistics/industry/agriculture/canola-experimental-regional-estimates-using-new-data-sources-and-methods/2019-20-financial-year.

40% oil yield per tonne of canola. Source: Farm Energy. 2019. 'Rapeseed and Canola for Biodiesel Production'. https://farm-energy.extension.org/rapeseed-and-canola-for-biodiesel-production/.

90% transesterification yield. Source: Mohamad, M., N. Ngadi, S.L. Wong, M. Jusoh & N.Y. Yahya. 2017.

'Prediction of biodiesel yield during transesterification process using response surface methodology'.

*Fuel*. 190. pp 104-112. https://www.sciencedirect.com/science/article/abs/pii/S0016236116310936.

Specific gravity of biodiesel: 0.88. A simple calculation of the above figures gives 5.495 MMbbl biodiesel, which is 1.51% of 365 MMbbl annual fuel demand.
1.66 tonnes/ha canola yield. Source: Agriculture Victoria. 2025. 'Growing canola in Victoria'. https://agriculture.vic.gov.au/crops-and-horticulture/grains-pulses-and-cereals/growing-grains-pulses-and-cereals/growing-canola-in-victoria.

Total cropping hectares in Australia: 31 million ha. Source: ABS. 2018. 'Land Management and Farming in Australia'. https://www.abs.gov.au/statistics/industry/agriculture/land-management-and-farming-australia/2016-17.

[11] The Guardian. 2011. 'European biofuels target condemned by leading US scientists'. https://www.theguardian.com/environment/2011/oct/07/european-biofuels-target-us-scientists.

[12] Blain, L. 2022. 'Record-breaking hydrogen electrolyzer claims 95% efficiency'. New Atlas. https://newatlas.com/energy/hysata-efficient-hydrogen-electrolysis/.

[13] Headly, A.J. 'Hydrogen Energy Storage'. Sandia National Laboratories. p 13. https://www.sandia.gov/app/uploads/sites/163/2022/03/ESHB_Ch11_Hydrogen_Headley.pdf.

This source cites round-trip efficiency of 40%: "Fuel cell efficiency of 40-55%". In reality, it is less. 53 kWh spent in electrolysis means 190,000 kJ is the energy input, each kg contains 120,000 kJ of energy, of which 10% is lost in storage, and roughly 50% is lost in the fuel cell. This equates to 28% final useful energy.

[14] IEEFA. 2024. 'Nuclear in Australia would increase household power bills'. p 10. https://ieefa.org/sites/default/files/2024-09/Nuclear%20in%20Australia%20would%20increase%20household%20power%20bills_Sep24.pdf.

[15] Energy Minister Debate on 10th April 2025 at the National Press Club.

[16] CSIRO. 2025. *GenCost 2024-25*. p. 96.

[17] Ibid. p. 94.

[18] Ibid. p. 71.

[19] Independent Expert Advisory Panel for Energy Transition. 2024. 'Hills of Gold Wind Farm Proposal Advice on energy production cost impacts under turbine configuration scenarios'. https://www.ipcn.nsw.gov.au/sites/default/files/pac/projects/2023/12/hills-of-gold-wind-farm/additional-case-material-available-for-public-submission/attachment-d--ieapet-advice.pdf.

[20] Parkinson, Giles. 2025. 'Australia may need twice as many big batteries to make up for lost wind'. *RenewEconomy*. https://reneweconomy.com.au/australia-may-need-twice-as-many-big-batteries-to-make-up-for-lost-wind/.

[21] Verley, Angus. 2025. 'VNI West transmission network costs double as Victorian farmer protests'. https://www.abc.net.au/news/2025-08-01/transmission-line-vni-west-cost-blow-out-victoria-farmers-fight/105599880

[22] AEMO. 2024. '2024 Integrated System Plan'. p 13-14, 68. https://www.aemo.com.au/-/media/files/major-publications/isp/2024/2024-integrated-system-plan-isp.pdf.

[23] Ibid, p 13.

[24] Hilton, Zoe, Aidan Morrison & Michael Wu. 2024. 'The six fundamental flaws underpinning the energy transition'. p 6. https://www.cis.org.au/publication/the-six-fundamental-flaws-underpinning-the-energy-transition/.

[25] Hilton, Zoe, Michael Wu, Aidan Morrison. 2025. 'Rooftop Solar: Paradise Lost'. p 15. https://www.cis.org.au/publication/rooftop-solar-paradise-lost/.

[26] Richard Yan, "Now comes the hard part of the great energy transition", Grattan Institute, 2024. https://grattan.edu.au/news/now-comes-the-hard-part-of-the-energy-transition/.

[27] Energetics, "Why Australia is not on track to achieve a 43% emissions reduction by 2030", 2024. https://www.energetics.com.au/insights/thought-leadership/why-australia-is-not-on-track-to-achieve-a-43-emissions-reduction-by-2030.

[28] Daniel Mercer, "Australia will fall well short of 82 per cent renewable energy by 2030, analysts predict, as problems mount", *ABC*, August 2023. https://www.abc.net.au/news/2023-08-06/australia-likely-to-fall-short-of-82pc-renewable-energy-target/102689392.

[29] Cropp, Ryan. 2025. 'Renewables rollout running seven years late, PM told'. *Australian Financial Review*. https://www.afr.com/policy/energy-and-climate/renewables-rollout-running-seven-years-late-pm-told-20250829-p5mqu8.

[30] Paul Kelly, "Labor's energy target all miss and wind as turbine construction slumps", *The Australian*, July 2025. https://www.theaustralian.com.au/nation/politics/turbine-construction-slump-labors-energy-target-all-miss-and-wind/news-story/96909d29b83b5aa80287b46c6cff6c0c.

[31] Rolfe, John. 2025. 'Analysts reveal shock forecast for Australia's biggest power station Eraring'. *Daily Telegraph*. https://www.dailytelegraph.com.au/news/national/analysts-reveal-shock-forecast-for-australias-biggest-power-station-eraring/news-story/9c5cfd6768d6c7caa58bee3ad4e7d903.

[32] Clean Energy Council. 2025. 'Quarterly investment report: Large-scale renewable generation and storage'. p 11. https://cleanenergycouncil.org.au/getmedia/8f050d63-3955-483a-8934-8fd8b0cfd4f7/cec_renewable-projects-quarterly-report_q1-2025.pdf; Clean Energy Council. 2022. 'Renewable Projects Quarterly Report'. p 4. https://cleanenergycouncil.org.au/cec/media/background/resources/cec-renewable-projects-quarterly-report-q4-2022.pdf.

[33] Jay Rutovitz, Elianor Gerrard, Helen Lara, and Chris Briggs, "The Australian Electricity Workforce for the 2024 Integrated System Plan: Projections to 2050", RACE for 2030. https://racefor2030.com.au/project/australian-electricity-workforce-for-the-2024-integrated-system-plan/.

[34] Ibid., p. 3.

[35] CSIRO. 2024. 'What are the sources of carbon dioxide in the atmosphere?' https://www.csiro.au/en/research/environmental-impacts/climate-change/climate-change-qa/sources-of-co2.

[36] The IPCC has found that warming has a near-linear relationship to cumulative $CO_2$ emissions, with every 1000 $GtCO_2$ likely causing about 0.45°C of global warming. Over the past century, the IPCC found it is likely that natural drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C, with the best estimate for the average global temperature change being an increase of 1.07°C. Australia's ~1% share of global emissions has therefore equated to only around 0.01°C or less of global warming over the past century — an order of magnitude smaller than the IPCC's own estimate of background climate noise. Therefore, the IPCC's findings imply that Australia's emissions, by themselves, cannot produce a measurable change in the global climate signal. Source: IPCC. 2021. 'Climate Change 2021: The Physical Science Basis Summary for Policymakers'. p 5, 28. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.