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2025-2026 GenCost Consultation Submission

Submission to CSIRO, 2 February 2026

The Centre for Applied Energy Economics and Policy Research (CAEEPR) is a collaborative partnership between Griffith Business School and energy sector participants in Australia's National Electricity Market.

CAEEPR aims to maximise the energy sector's potential to achieve emission reductions and contribute to inclusive, sustainable, and prosperous businesses and communities while building capacity in electricity economics. CAEEPR uses a national electricity market model to develop and analyse different scenarios to assess different policy positions for generator dispatch and transmission efficiency.

CAEEPR's sub aims/objectives that are most relevant to this submission:

- Supporting the transition to more sustainable and less carbon-intensive power generation and transmission system and address the accompanying policy, economic, technical and political challenges within the industry.
- Provide thought leadership and industry engagement strategies that our members can design and deliver best practice energy services with reduced emissions.
- Create and uphold advanced Electricity Market models for analysing wholesale spot and future markets, power system reliability, integration of dispatchable and intermittent resources, and network capacity adequacy.

This submission has been prepared by Andrew Fletcher who is an Industry Adjunct Research Fellow at CAEEPR. The views expressed in this submission are entirely the author's and are not reflective of CAEEPR.

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Introduction

I welcome the opportunity to provide feedback to CSIRO and AEMO on the CSIRO GenCost 2025-26 Consultation Draft and the GHD 2025 Energy Technology Cost and Parameter Report respectively, with both reports released in December 2025. As these reports are intrinsically linked and the submission contains content that is relevant to both, the submission should be considered for both CSIRO's GenCost Consultation and AEMO's Draft 2026 Forecasting Assumptions Update Consultation.

This submission provides targeted recommendations to CSIRO and GHD regarding their respective reports. Recommendations are aimed at improving accuracy, transparency and alignment with real-world development costs, technology performance, and global benchmarks.

Contents

1. GHD 2025 Energy Technology Cost and Technical Parameter Review

1.1 Temporary workers accommodation cost

1.1.1 Onshore wind

Recommendation: Specify whether temporary workers accommodation is included in onshore wind build cost estimate

Temporary workers accommodation cost should be included in onshore wind capex. This this cost item was included in onshore wind costs for the first time in Aurecon's 2024 report (Aurecon, 2025), following consultation with industry. Aurecon included $75m in installation cost based on the estimated sizing of accommodation for a peak capacity of 500 workers over a three-year period (Aurecon, 2025).

1.1.2 Utility scale solar PV

Recommendation: Include temporary workers accommodation in installation cost estimates for utility scale solar PV

Temporary workers accommodation cost was not included in previous Aurecon reports and GHD's report makes no mention of it. In recent years various State Government policies have been introduced relating to requirements for generation and storage projects to provide housing and accommodation during development and operation, for instance:

- In 2024 the NSW Government released reforms supporting the delivery of construction worker accommodation within renewable energy zones (NSW Government, 2026).
- In 2025 the Queensland Government's introduced a requirement for proponents to enter into a Community Benefit Agreement with the relevant Council, that covers matter including housing and accommodation (Queensland Government, 2025).

There are number of examples of temporary workers accommodation being part of solar farm developments including:

- Central West Orana REZ (NSW) – Large number of work camps proposed from multiple proponents totalling more than 2,000 beds for solar farms alone (URBIS, 2025).
- Bulli Creek (QLD) – purpose-built solar construction camp to accommodate up to 800 workers (Clean Energy Council, 2025).

While GHD could also consider including temporary workers accommodation cost for utility scale BESS and OCGT, employment factors are higher for utility scale solar PV (RACE for 2030, 2024) and thus workers accommodation cost are more material.

1.2 Land and development costs

1.2.1 Utility scale solar PV

Recommendation: Include development costs for utility scale solar PV in addition to property and environmental offset costs

GHDs cost estimation methodology was originally developed for PHES (GHD, 2025B) and estimates land and environmental offset costs based on a $/ha assumption. GHD estimates land and development cost for utility scale solar PV in the same manner and doesn't appear to include the cost of development activities such as planning and approvals, environmental and other studies and community consultation.

1.2.2 Onshore wind and utility scale BESS

Recommendation: Apply methodology for estimating land and environmental offset cost for utility scale solar PV to onshore wind and utility scale BESS

GHD's data driven methodology for estimating land and environmental offsets cost for utility scale solar PV is a welcomed improvement. To ensure consistency across technologies, a similar approach for onshore wind and utility scale BESS, technologies with relatively high land requirements, is recommended:

- Onshore wind: GHD assumes land cost of 0.5% of EPC ($15/kW) and development cost of 2% of EPC ($62/kW). Although landholder hosting payments may be lower than solar PV land acquisition cost, GHD's methodology could be useful for estimating environmental offset cost and validating the $15/kW estimate.
- Utility scale BESS: While land cost per MW may be less material it should vary with BESS duration.

1.2.3 Electrolysers

Recommendation: Provide rationale and evidence for materially reducing land and development cost for electrolysers

GHD have reduced land and development cost from 8-10% of capex (Aurecon, 2025) to 5% of capex, while also martially reducing total capex estimates. Per Figure 1 GHD assume electrolysers land and development cost per MW are materially lower than utility scale solar PV, despite the higher degree of complexity and customisation to site required for electrolyser projects (Ramboll, 2023) and likely higher land costs at industrial hub locations such as ports.

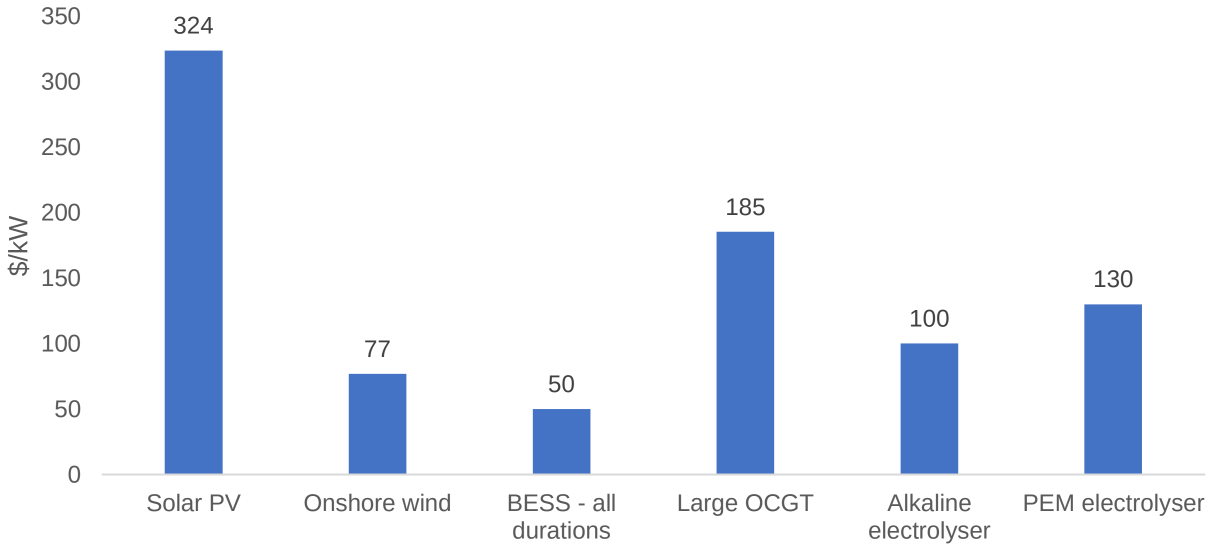

Figure 1: Land and Development cost for key technologies selected in AEMO ISP modelling | Source: (GHD, 2025A)

Figure 2 shows that GHD's land and development cost estimates are materially lower than the 'other' category for electrolyser projects cost estimates based on detailed studies.

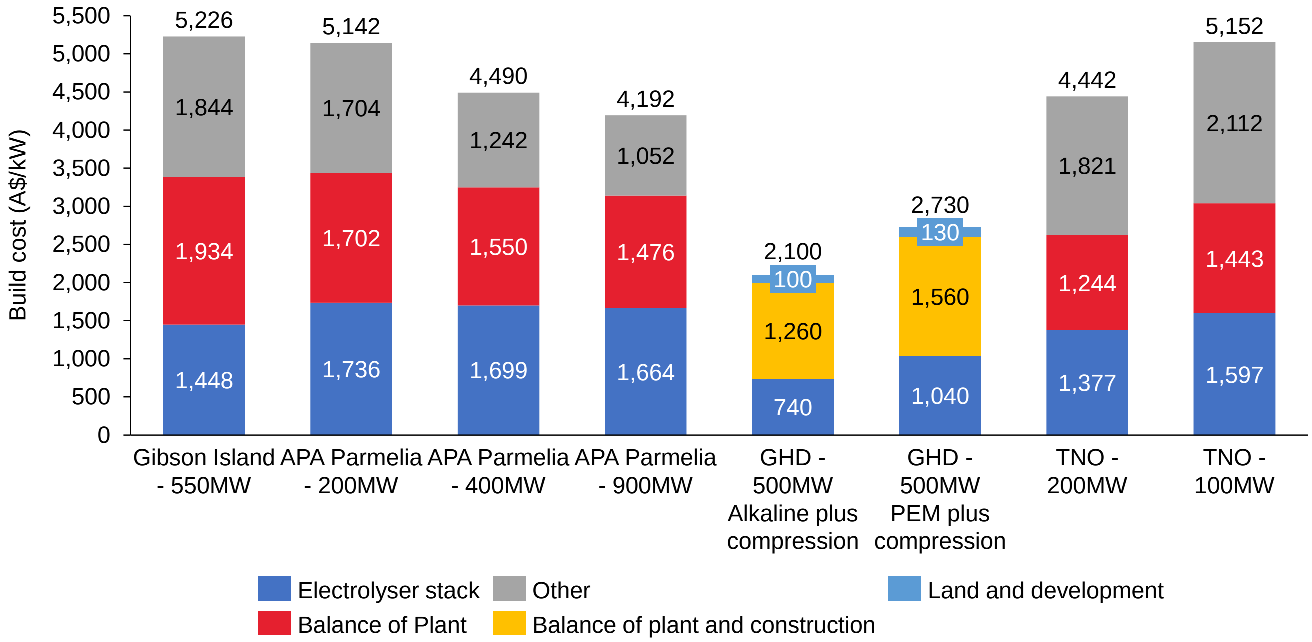

Figure 2: 2024 Electrolyser project capex estimates breakdown for detailed studies and GHD estimates, excluding connection cost and hydrogen storage (A$/kW)

Source: (CSIRO, 2025) (Stanwell Corporation Limited, 2022) (Fortescue, 2024) (APA Group, 2024) (Aurecon, 2025) (Fortescue, 2024) (TNO, 2024)

Notes:

- All figures are real A$ 2024
- AUD/USD exchange rate: 2024 – 0.65, 2023 - 0.663, 2022 - 0.689, 2021 – 0.752. USDE/EUR exchange rate: 2024 - 0.93
- Electrolyser technology not specified in TNO estimates. APA Parmelia is Alkaline, Fortescue Gibson Island PEM.
- APA Parmelia Green Hydrogen Project Feasibility Study (APA Group, 2024) is dated October 2024, however it provides Class 4 estimates which are in $ real (2022), which have been inflated by CPI to June 2025. Hydrogen storage costs is assumed to be $2,000kg/$H_2$ for APA Parmelia, based on analysis of (Australian Pipelines and Gas Association - GPA Engineering, 2021).
- Fortescue Gibson Island build cost is based on Class 3 estimates and an assumed 8% contingency for project is allocated across consistently across all project components. Insufficient detail was provided on hydrogen storage volumes in the Gibson Island feasibility study summary to estimate its contribution to project capex.
- Where transmission connection cost has not been itemised an estimate is deducted based on a cost of $110.5/kw consistent with the value for CQ in the 2025 IASR (AEMO, 2024)

1.3 Onshore wind hypothetical project

Recommendation: Base cost estimate on a hypothetical project with specific power similar to wind projects being developed in the NEM, such as the previously assumed Vestas V162-6.2MW turbine or a Vestas V172-7.2MW turbine.

Multiple industry sources have provided feedback to the author that they haven't seen evidence supporting a reduction in onshore wind farm capex. GHD has changed the hypothetical project turbine selection from a Vestas V162-6.2MW to a Vestas V162-7.2MW. GHD's turbine selection results in hypothetical project capacity increasing 16% vs the previous Aurecon report, while build cost has decreased by 10% on a real basis, resulting in a 5% real decrease per MW. However, GHD's turbine selection results in a specific power which is inconsistent with typical NEM wind projects under development and recently reaching financial close, with this over-powering a key driver of reduced build costs per MW. For example, a lower specific power turbine such as a Vestas V172-7.2MW, has a 13% larger rotor swept area than the Vestas V162-7.2MW, resulting in higher loads on components such as towers and foundation, increasing material requirements and capex, beyond just larger turbine blades.

GHD's hypothetical turbine selection is likely to be inconsistent with AEMO's onshore wind capacity factors from the 2025 IASR. Based on typical NEM wind resources GHD's hypothetical turbine selection is unlikely to be optimal for levelized cost of energy, with over-powering resulting in lower capacity factors.

Figure 3 shows that GHD's turbine selection results in specific power of 349W/m², far higher than the 301 W/m² from Aurecon's 2024-2025 report (Vestas V162-6.2MW) and previous reports.

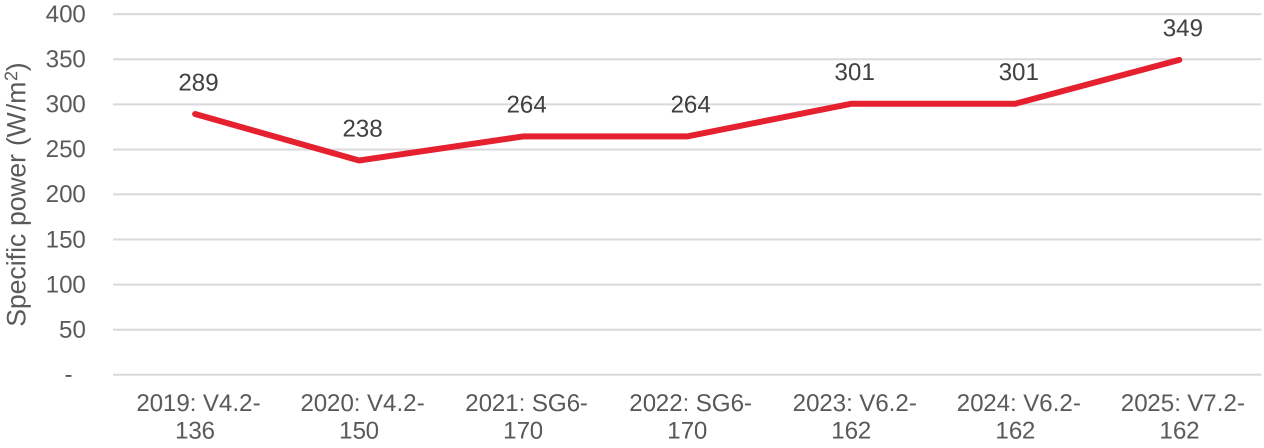

Figure 3: Hypothetical wind farm specific power | Source: (GHD, 2025A), various Aurecon reports

Figure 4 shows that GHD's hypothetical project has materially higher specific power than wind farms that have recently reached financial close in Australia. Higher specific power turbines are typically suited to higher wind speed sites, with the wind farms in Figure 4 located in regions with relatively high wind speeds for Australia, including Western Australia.

	Palmer	Carmody's Hill	Waddi	Delburn	Nullagine	2025-26 Hypothetical
Proponent	Tilt Renewables	Aula Energy	Tilt Renewables	SEC	Fortescue	GHD
State	SA	SA	WA	VIC	WA	
Wind farm capacity (MW)	288	256	108	205	132	720
Wind turbine OEM	Vestas	GE	Vestas	Vestas	Envision	Vestas
Turbine capacity (MW)	7.2	6.1	6.2	6.2	7.8	7.2
Diameter (m)	172	158	162	162	182	162
Rotor swept area (m²)	23,235	19,607	20,612	20,612	26,016	20,612
Specific power (W/m²)	310	311	301	301	300	349

Figure 4: Specific power of actual wind farms reaching financial close recently vs GHD 2025-26 Hypothetical Project | Source: (GHD, 2025A), (Renew Economy, 2026) (Energy Source & Distribution, 2026) (Vestas, 2025) (Delburn Wind Farm, 2026) (PV Magazine, 2025)

Based on market intelligence from a CAEEPR member who is active in wind farm development, Figure 5 shows that GHD's hypothetical turbine has materially higher specific power than wind turbines primarily offered by turbine OEMs to Australian developers.

Additional feedback from this CAEEPR member is that for a typical NEM wind resource a Vestas V162-7.2MW is unrealistic, with a Vestas V162-6.2MW and Vestas V172-7.2MW, likely preferable Vestas options. Vestas' 7.2MW capable EnVentus nacelle is offered with 162m and 172m rotor diameters and is a completely different nacelle design than the original Vestas V-162-6.2MW (see images from (Vestas, 2026)). To withstand the 172m rotor diameter loads it is assumed that the 7.2MW rated nacelle has higher weight and cost, which may also have implications for tower and foundations loading and capital cost. Given this higher cost and typical NEM wind speeds, a developer is more likely to pair the 7.2MW nacelle with a 172m rotor diameter, noting that as previously discussed this higher rotor swept area will likely result in increased capex.

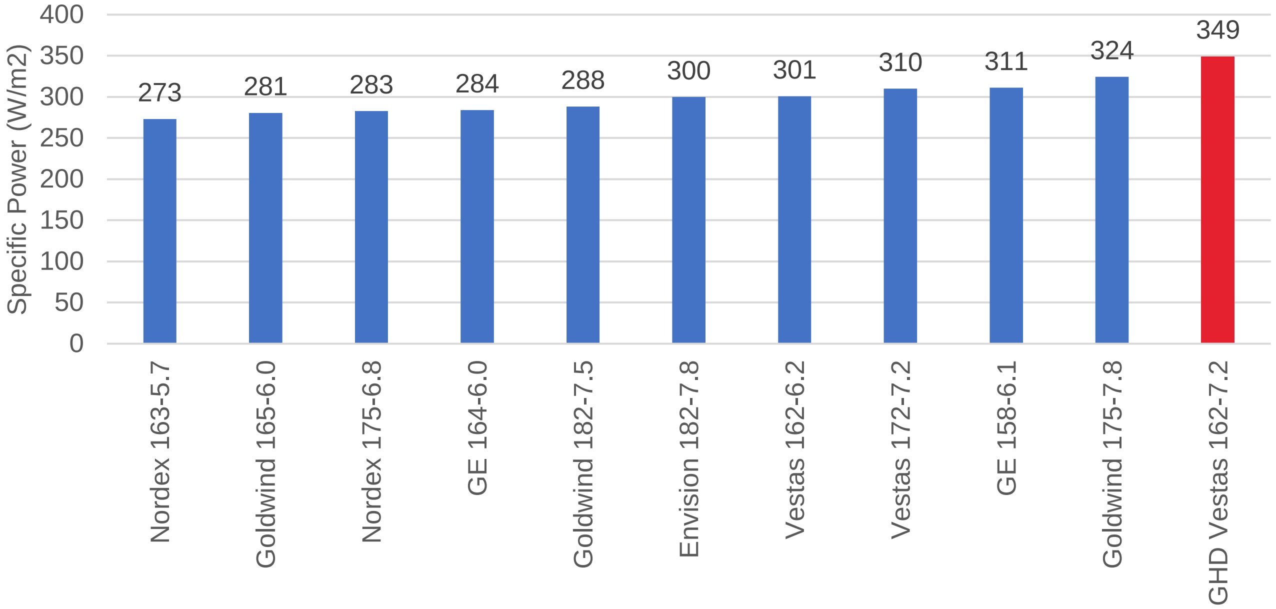

Figure 5: Specific power of wind turbines primarily offered by turbine OEMs to Australian developers vs GHD 2025-26 Hypothetical Project

Source: CAEEPR member

GHD commentary also states that, *"simple productivity gains from larger machines and higher towers continue to open up otherwise marginal sites"*, which doesn't reflect industry experience that balance of plant and turbine installation costs have increased as turbines have scaled, as shown in Figure 6. This trend was discussed with CSIRO, Aurecon and industry experts as part of the 2024-25 GenCost consultation process.

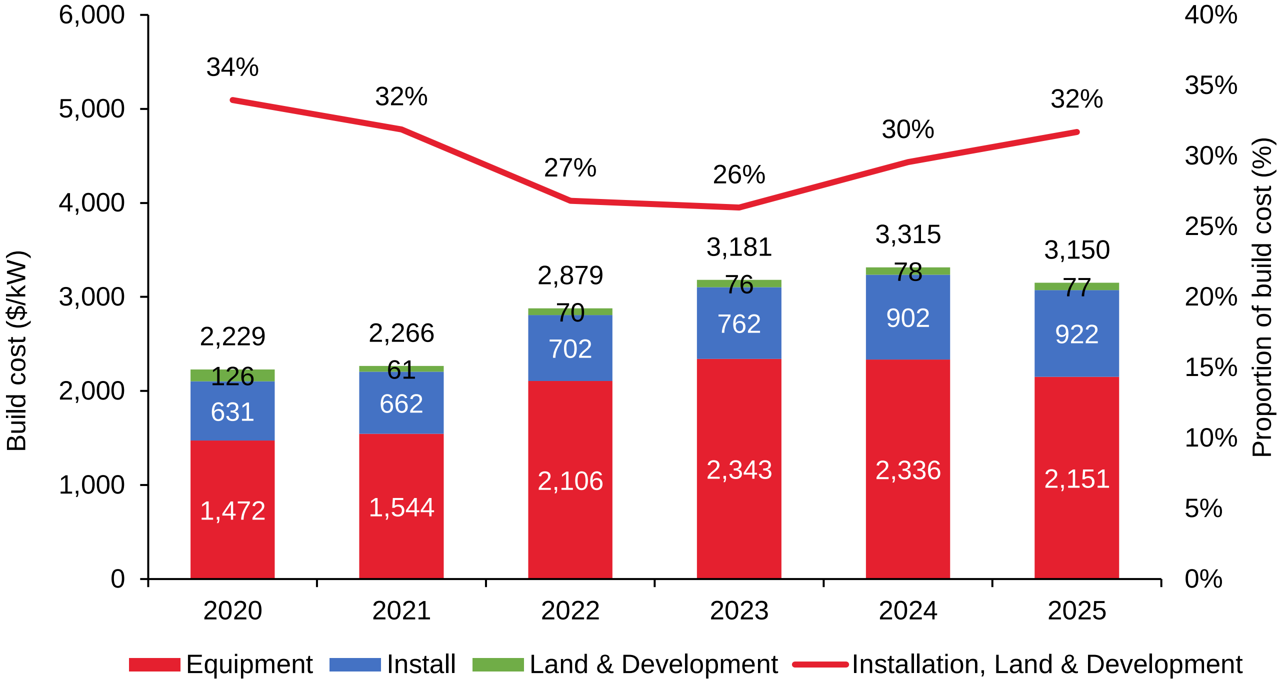

Figure 6: Onshore Wind build cost by cost category and proportion of build cost related to Installation, Land & Development

Source: (GHD, 2025A), previous Aurecon reports

1.4 Utility scale BESS technical parameters

1.4.1 Degradation

Recommendation: Vary degradation by battery duration consistent with the previous Aurecon report and 2025 IASR (AEMO, 2025B).

GHD has provided one figure for degradation of 1.6% pa. GHD is encouraged to revert to varying battery degradation by duration, a change which was made as a result of the 2025 IASR consultation process, which is consistent with lower C rates driving less instantaneous heat production and thus degradation. This relationship is confirmed in recent commentary by Quinbrook regarding the 8 hr BESS projects it is developing in partnership with global leading battery manufacturer CATL (Renew Economy, 2025).

1.4.2 Technical and economic lives

Recommendation: Increase economic and technical lives for 8hr BESS to 25 years.

Increasing lives from 20 to 25 years is consistent with discussion in GHD's report and commentary by Quinbrook regarding lower C rates for 8hr BESS leading to longer warranted lives (Renew Economy, 2025). A 25 year life for an 8hr BESS is consistent with feedback from a CAEEPR member developing 8hr BESS projects and with the operational life of the recently announced Tesla Megapack 3 (PV Magazine, 2025)

1.5 Residential battery storage technical parameters

Recommendation: Change degradation and round-trip efficiency assumptions to be consistent with AEMO

AEMOs assumptions are informed from data from multiple battery manufacturers (AEMO, 2025A) and in relation to roundtrip efficiency also reflect that many residential batteries are expected to be DC coupled with rooftop solar PV.

- Round trip efficiency: 85% GHD, 90% AEMO
- Battery degradation: 1.6% pa GHD, 1.8% AEMO for 2.5hr duration

1.6 Electrolysers

1.6.1 Change in capital cost estimate project boundary

Recommendation: Provide more detailed breakdown of cost estimate to allow like for like comparison with previous Aurecon report and explanation of what has driven cost reduction

GHD's widening of the project boundary for its electrolyser cost estimate to include item such as hydrogen compression and buffer hydrogen storage is welcomed. GHD has reduced electrolysers capex estimates by 24% for alkaline and 6% for PEM, however once the greater scope is included the cost reduction is larger, but can't be determined from the report. For instance for hydrogen buffer storage the report states that high pressure steel vessels are assumed with "2,700 kg H_2 each" of hydrogen storage. It is not clear if this figure represents the storage for each 10MW unit/module or the entire 500MW project and the cost of this hydrogen storage is not provided. Hydrogen storage is modelled separately by researchers and in AEMO commissioned modelling (ACIL ALLEN, 2025), which highlight the value of this information to stakeholders.

1.6.2 Level of capital cost estimates

Recommendation: Increase build cost estimates to be consistent with detailed studies on actual projects and international benchmark data

The author's 2024-2025 GenCost consultation submission (Fletcher, 2025B) highlighted the significant gap between Aurecon and IEA's electrolyser cost estimates and those based on detailed studies relating to actual projects. This submission updates this research and analysis.

Figure 7 shows that while IEA has increased its electrolyser capex estimates ex China by 20% to be more consistent with actual projects, GHD has reduced electrolysers capex estimates by 24% for alkaline and 6% for PEM, while increasing the boundary of the capex estimate. This has resulted in GHD's alkaline estimates being around half that of IEA and BNEF and an even lower percentage of cost estimates based on detailed studies of actual projects. Given no major Australian hydrogen projects have reached financial close in recent years, GHD is encouraged to justify these substantial discounts.

Because of GHD's lower current cost estimates, CSIRO's 2050 Net Zero Emissions scenario[1] (AEMO Accelerated Transition) electrolyser capex projections are around half that of IEA and BNEF.

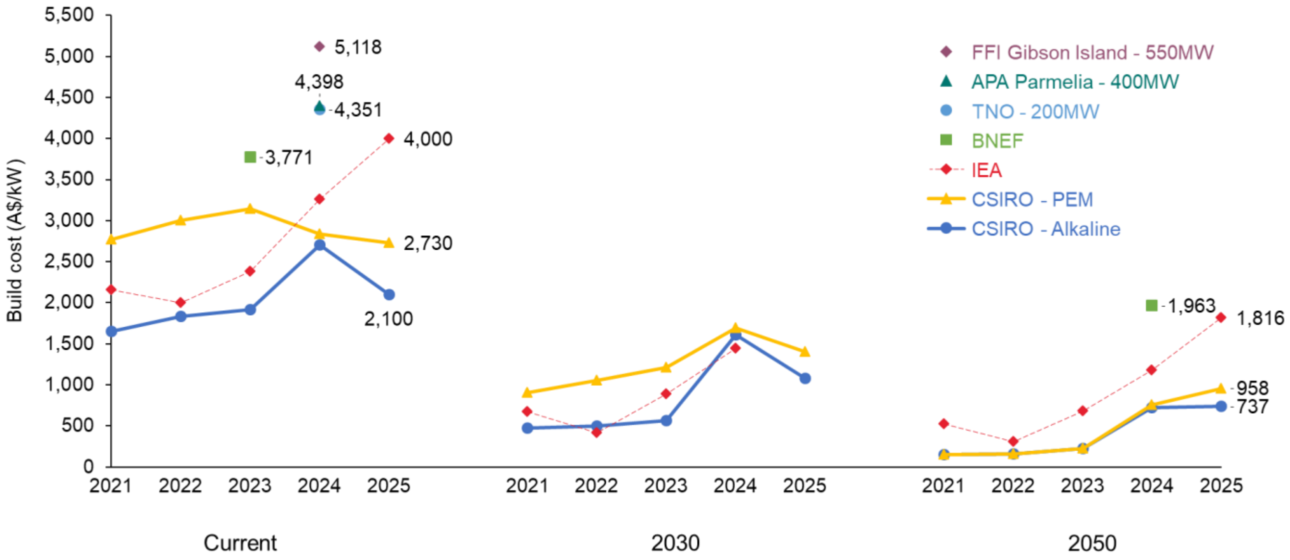

Figure 7: Accelerated Transition electrolyser projections for CSIRO (NZE by 2050) and IEA (Net Zero Emissions) compared to BNEF and project capex estimates based on detailed studies

Source: (CSIRO, 2025) (CSIRO, 2024A) (CSIRO, 2024B) (CSIRO, 2023) (CSIRO, 2022) (International Energy Agency, 2025A) (International Energy Agency, 2024A) (International Energy Agency, 2023A) (International Energy Agency, 2022A) (International Energy Agency, 2021A) (Department of Energy - United States of America, 2024) (Tengler, 2024) (TNO, 2024) (APA Group, 2024) (Fortescue, 2024)

Notes:

- Current figures are nominal $, while projections are real $2024
- AUD/USD exchange rate: 2024 – 0.65, 2023 - 0.663, 2022 - 0.689, 2021 – 0.752, 2020 -0.6863 USDE/EUR exchange rate: 2024 - 0.93
- 2025 WEO estimates are based on a 2024 date and thus 2024 exchange rate is applied

1.6.3 Capital cost estimate breakdown

Recommendation: Estimate capital cost breakdowns on reputable, contemporary data sources

GHD includes data on the breakdown of electrolyser capex based on 2020 IRENA analysis that suggests that cell stacks represent 55% of investment cost (assumed to be $1,200kW) for a 100MW electrolyser project. IRENA's electrolyser cost estimates and projections don't align with actual projects or international benchmarks (Siekkinen, 2024; Ramboll, 2023; Barnard, 2025; Fletcher, 2025B).

Figure 8 shows that based on reputable contemporary data sources, the electrolyser stack represents 13%-38% of build cost.

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[1] The Announced Pledges scenario, which maps to CSIRO's NZE post 2050 and AEMO's Step Change scenario, was not included in the IEA 2025 World Energy Outlook (International Energy Agency, 2025A)

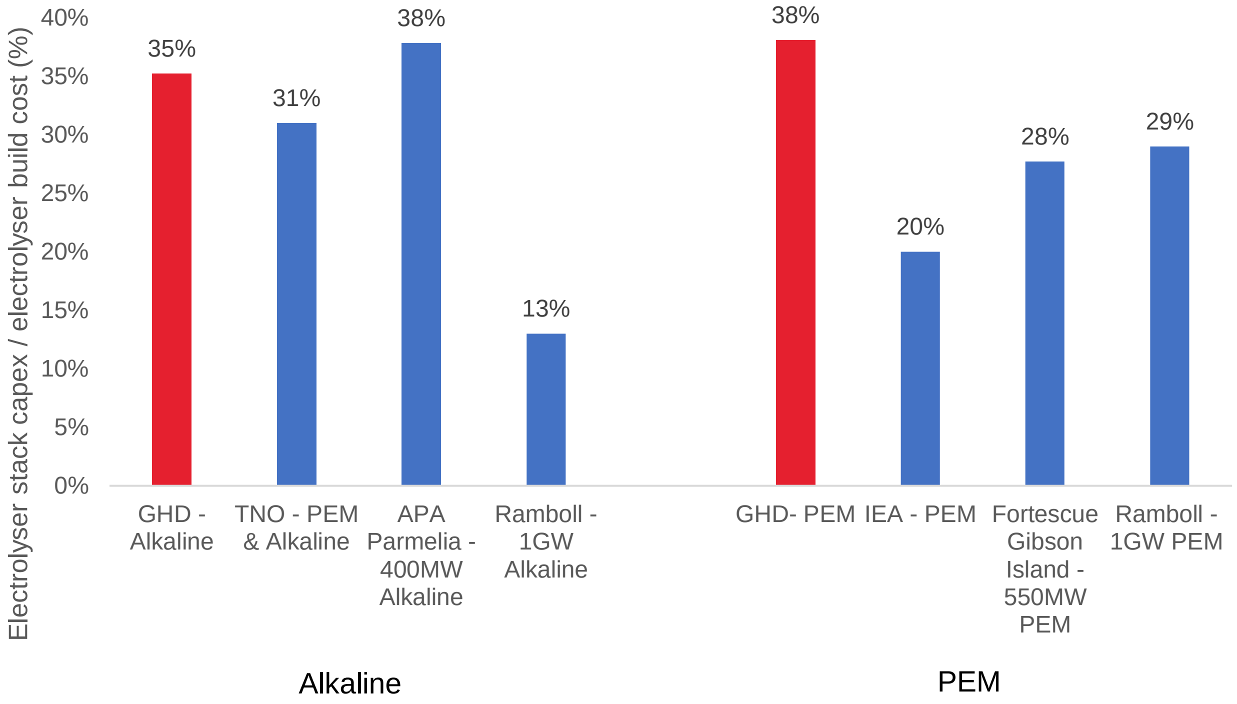

Figure 8: Electrolyser stack as a proportion of electrolyser build cost for detailed studies, plus IEA and GHD

Source: (GHD, 2025A) (TNO, 2024) (APA Group, 2024) (Ramboll, 2023) (International Energy Agency, 2024B) (Fortescue, 2024)

1.6.4 Overview section

Recommendation: Reflect stalled development of hydrogen industry

Compared to the Recent Trends section the Overview section of GHD’s report lacks balance. GHD is encouraged to balance investment data from hydrogen industry peak body, the Hydrogen Council, with independent research that shows that announced hydrogen projects have failed to materialise. Research from the Potsdam Institute for Climate Impact Research (Odenweller & Ueckerdt, The green hydrogen ambition and implementation gap, 2025) found that in 2023, only 7% of announced electrolysis capacity was realised on time. Figure 9 updates this research and found that only 4% of announced electrolyser capacity was realised on time, 0.5GW instead of the 12.5GW announced just one year earlier (Odenweller, Update: What's the state of the green hydrogen market ramp-up?, 2026).

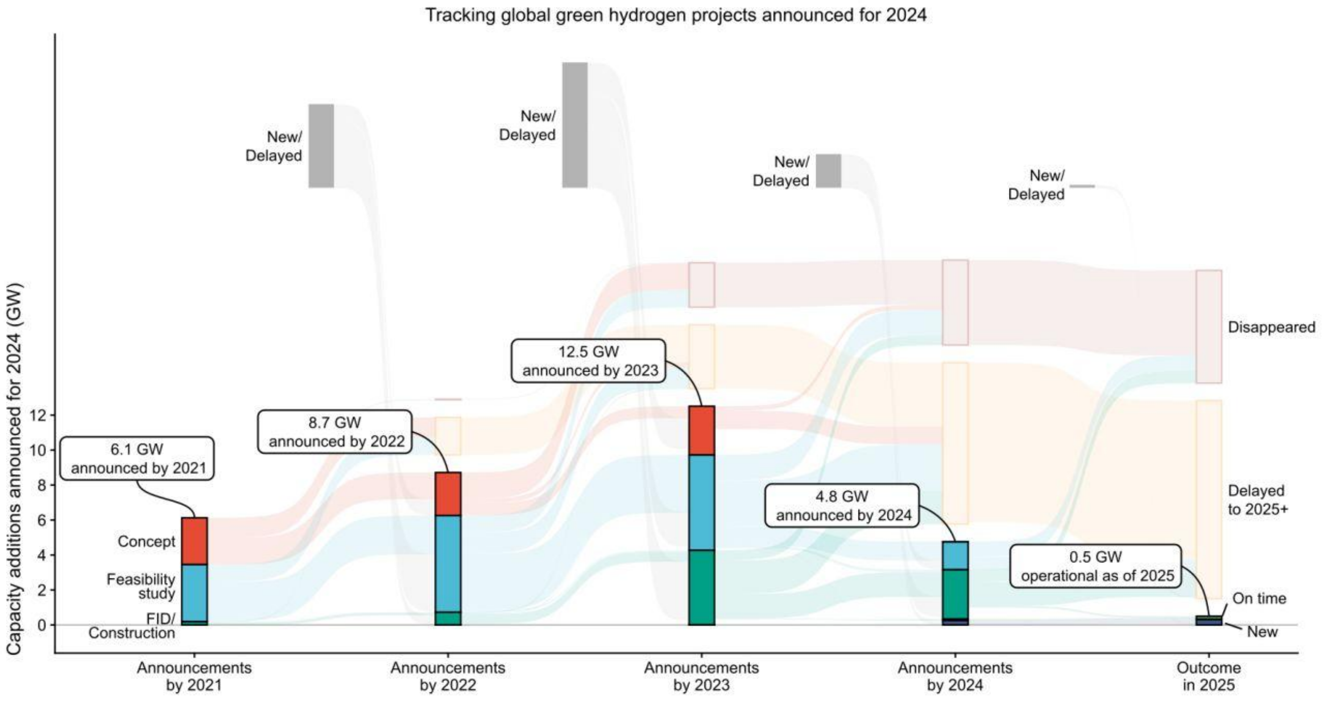

Figure 9: Tracking global green hydrogen projects announced by 2024

Source: (Odenweller, Update: What's the state of the green hydrogen market ramp-up?, 2026)

2. CSIRO GenCost

2.1 Utility scale solar PV

2.1.1 Balance of system learning rates

Recommendation: Lower balance of system learning rate for Global NZE Post 2050

Appendix Table C1 includes Large Scale BOP assumptions for Current Policies and Global NZE by 2050 scenarios of 17.5%, while for Global NZE Post 2050 (the middle scenario) 20% for LR 1 is assumed and 10% for LR2 and LR3. CSIRO have confirmed that this is an error and Current Policies was intended to have the lower value.

Based on trends in Australian build costs over recent years CSIRO is encouraged to reduce local learning rates for the Global NZE Post 2050 scenario. While a substantial research base regarding solar PV module learning rates supports CSIRO's global learning rate assumptions, there is a distinct lack of research regarding utility scale solar PV balance of system learning rates.

Figure 10, implies that learning may have been negative for utility scale solar PV Installation, with Land and Development cost increasing as a proportion of build cost from 34% for 2020 to 55% for 2025[2], a 9% pa real increase from $575/kW or $887/kW. While it is acknowledged that Installation cost is based on a simplistic percentage of EPC assumption, that has been sticky, and Land and Development cost have increased from 2024 to 2025 because of a methodology change, the upward trend aligns with:

- Deterioration in site quality, as best sites developed first. Site geography impacts both land and environmental offset costs, as well as installation costs.

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[2] All years in Figure 10 assume a 200MW AC hypothetical project

- Environmental and planning regulation and community consultation requirements have increased development timeframes and costs.
- Increasing social licence commitments, including local content requirements. For instance the Capacity Investment Scheme is a, *“merit-based application and assessment process, including a strong weighting on community and First Nations engagement and social licence commitments, deliverability and benefit to system reliability.”* (Department of Climate Change, Energy, the Environment and Water, 2025)
- Construction escalation, which while exceeding CPI for the period (Oxford Economics Australia, 2025A) and included in CSIRO projections, is insufficient to explain the 9% real compound annual growth in Installation, Land and Development from 2020 to 2025.

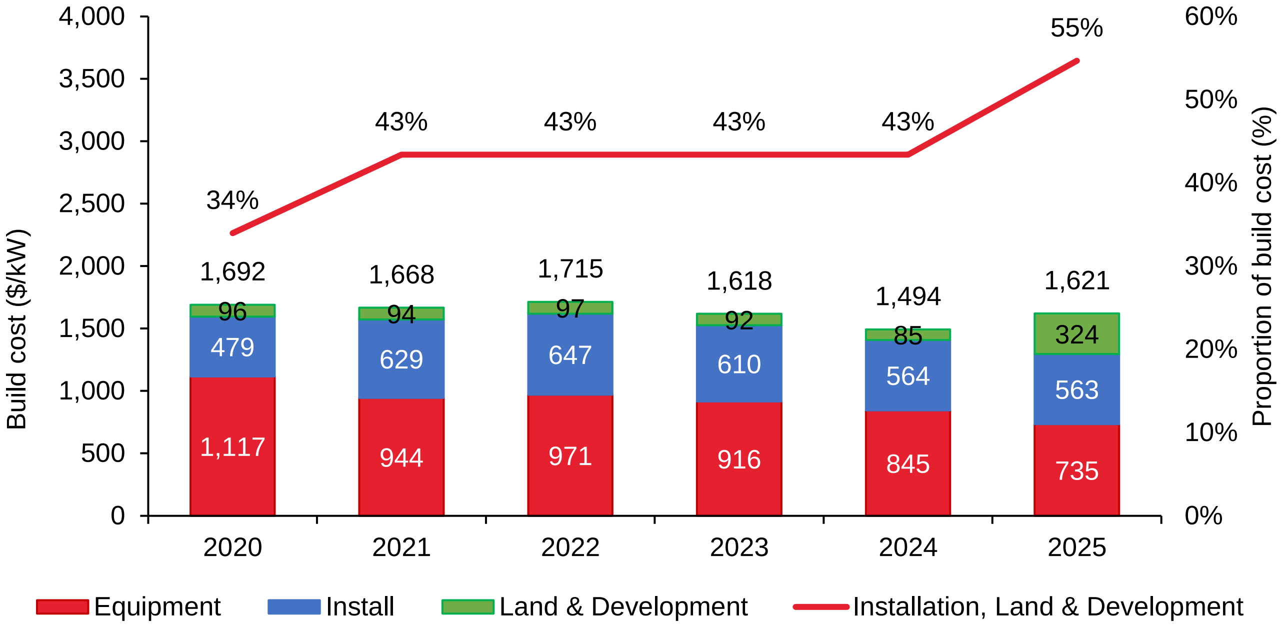

Figure 10: Utility Scale Solar PV build cost by cost category and proportion of build cost related to Installation, Land & Development

Source: (GHD, 2025A), previous Aurecon reports

2.2 Onshore wind

CSIRO is encouraged to reduce the level of cost reversion to 2035 for onshore wind consistent with recommendations and analysis in the author’s 2024-25 GenCost Consultation submission (Fletcher, 2025B). Section 2.2.1 and 2.2.2 builds on the previous submission, providing updated analysis.

2.2.1 Installation, land and development cost

Recommendation: Reduce level of cost reversion for installation, land and development cost

Assuming cost reversion conflicts with broader issues that are impacting infrastructure and major construction sectors, which aren’t electricity industry specific, including that:

- Material real reduction in labour, commodity, materials and international shipping are not projected in the medium term by leading economists such as Oxford Economics Australia (Oxford Economics Australia, 2025B).
- Material reversion in these cost is inconsistent with installation cost escalation projections by (Oxford Economics Australia, 2025A) and AEMO’s transmission cost escalation projections (GHD, 2025C).

- In the longer-term decarbonisation is expected to result in significant increases in material cost, such as steel and international shipping cost (Fletcher, 2025A), which represent a relatively high proportion of build cost for onshore wind.

Local cost represents a larger proportion than the 30% of EPC for installation assumed by GHD (GHD, 2025A), as GHD's classification is consistent with a turbine supply and install agreement, which includes turbine transport and installation in equipment cost. Local cost may also be higher than GHD assumes, with the previous Aurecon report finding that installation including workers accommodation can represent 25%-40% of EPC cost (Aurecon, 2025).

Figure 11 shows Oxford Economics Australia's breakdown of installation cost, excluding work camps, into inputs. Many of these costs are also relevant for electricity transmission, where GHD is assuming high levels of real escalation (GHD, 2025C). Oxford Economics Australia's Electricity Related Labour and Material Escalation Projections, commissioned by Marinus Link (Oxford Economics Australia, 2025B), provide detailed projections for many of these inputs, with significant real reductions not projected. There also isn't a clear rationale for a reversion in work camp costs, which represented 4% of Aurecon's 2024-25 build cost estimate (Aurecon, 2025).

	Design	Labour	Concrete	Steel	Cable	Plant	Freight	Logistics	Roads
	10%	30%	10%	5%	10%	10%	10%	5%	10%

Figure 11: Onshore wind input weightings for installation escalation projections | Source: (Oxford Economics Australia, 2025A)

The authors' 2025 Draft 2025 IASR Consultation submission outlines that Oxford Economics Australia's installation cost escalation factor projections don't incorporate increased cost of steel, concrete and freight due to decarbonisation (Fletcher, 2025A)

2.2.2 Equipment

Recommendation: Reduce level of cost reversion for equipment

Steel and shipping are major cost components for onshore wind turbine equipment, with steel used in turbines and towers representing 6% of build cost and shipping 8% of build cost (Frontier Economics, 2025). Consistent with analysis in 2.2.1, CSIRO are encouraged to reduce the level of cost reversion for equipment.

Of particular note is that as summarised in (Fletcher, 2025A) decarbonising shipping will likely result in at least a doubling of costs (Gray, O'Shea, Smyth, Lens, & Murphy, 2024).

2.3 Electrolysers

2.3.1 Build Cost Projections

Recommendation: Benchmark projections to IEA

Given that CSIRO's electrolyser cost projections are around half that of IEA (see Figure 7), which also appears to use a global learning model, it is encouraged to explain and justify what is driving this difference with this international benchmark in the GenCost report. IEA and CSIRO both use World Energy Outlook global electrolyser uptake assumptions and IEA's assumed learning rates (Table 1) and CSIRO's assumed learning rates (Table 2) are similar, which suggest that differences in current capex estimates are likely the key driver of the gap in projections.

IEA Global Hydrogen Review	Electrolyser stack	Other	Balance of plant	EPC and installation cost
2021	15%			
2022	18%	7-13%		
2023	18%	5-12%		
2024	18%		2-10%	8%
2025	13%		2-5%	8%

Table 1: IEA Global Hydrogen Review learning rates by electrolyser component | Source: (International Energy Agency, 2025B) (International Energy Agency, 2024B) (International Energy Agency, 2023B)

(International Energy Agency, 2022B) (International Energy Agency, 2021B)

Source	Slower Growth (Current policies)	Step Change (Global NZE post 2050)	Accelerated Transition (Global NZE by 2050)
Global Learning Rate 1	10%	10%	18%
Global Learning Rate 2	5%	5%	18%
Global Learning Rate 3	5%	5%	9%
Local Learning Rate 1-3	8%	8%	8%

Table 2: CSIRO GenCost 2025-26 Consultation Draft Electrolyser learning rates | Source: (CSIRO, 2025)

3. References

ACIL ALLEN. (2025). *Gas, liquid fuel, coal and renewable gas projections - Final Report.* Retrieved from https://aemo.com.au/-/media/files/major-publications/isp/2025/acil-allen-2024-fuel-price-forecast-report.pdf?la=en

AEMO. (2024). *Draft 2025 stage 1 inputs and assumptions workbook - excel.* Retrieved from https://aemo.com.au/-/media/files/major-publications/isp/2025/draft-2025-stage-1-inputs-and-assumptions-workbook.xlsx?la=en

AEMO. (2025A). *2025 Distributed PV and Batteries/VPP Forecast Report.* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2025/draft-2026-fau/aemo-2025-distributed-pv-and-batteries-vpp-forecast-report.pdf?rev=a01e30d93cf94d3aaa668c7ee75358a6&sc_lang=en

AEMO. (2025B). *2025 Inputs, Assumptions and Scenarios Report.* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/2025-inputs-assumptions-and-scenarios-report.pdf?rev=63268acd3f044adb9f5f3a32b6880c27&sc_lang=en

APA Group. (2024). *Parmelia Green Hydrogen Project - Feasibility Study Summary Report.* Retrieved from https://arena.gov.au/assets/2024/11/APA-Group-Parmelia-Green-Hydrogen-Project-Feasibility-Study-Summary-Report.pdf

Aurecon. (2025). *2024 Energy Technology Cost and Technical Paramter Review Report.* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/aurecon-2024-energy-technology-cost-technical-parameter-review-report.pdf?rev=5526946b9e3e4db680b7bcc82ecce94b&sc_lang=en

Australian Pipelines and Gas Association - GPA Engineering. (2021). *Pipelines vs Powerlines – A Technoeconomic Analysis in the Australian Context.*

Barnard, M. (2025, February 24). *Hydrogen Electrolysis Cost Projections from Major Organizations Low by 60% to 300%.* Retrieved from CleanTechnica: https://cleantechnica.com/2025/02/24/hydrogen-electrolysis-cost-projections-from-major-organizations-low-by-60-to-300/

Clean Energy Council. (2025). *Examples of innovative worker accommodation.* Retrieved from https://cleanenergycouncil.org.au/getmedia/d702188f-06e1-4f98-b5c6-6176afb43157/innovative-worker-accommodation-case-studies-from-2025-best-practice-charter-reports.pdf

CSIRO. (2022). *GenCost 2020-21: Final Report.* Retrieved from https://doi.org/10.25919/8rpx-0666

CSIRO. (2023). *GenCost 2021-22: Final Report.* Retrieved from http://hdl.handle.net/102.100.100/487557?index=1

CSIRO. (2024A). *GenCost 2024-25 Consultation Draft.* Retrieved from https://www.csiro.au/en/research/technology-space/energy/GenCost

CSIRO. (2024B). *GenCost 2023-24: Final Report.* Retrieved from https://doi.org/10.25919/bvtn-0n42

CSIRO. (2025). *GenCost 2025-26 Consultation Draft.* Retrieved from https://www.csiro.au/-/media/Energy/GenCost-2025-26-Draft/GenCost2025-26ConsultDraft_20251216-FINAL.pdf

Delburn Wind Farm. (2026). *The Project*. Retrieved from https://delburnwindfarm.au/the-project/

Department of Climate Change, Energy, the Environment and Water. (2025). *Capacity Investment Scheme.* Retrieved from https://www.dcceew.gov.au/energy/renewable/capacity-investment-scheme#:~:text=The%20CIS%20aims%20to%20create,supply%20chains%20and%20Australian%20manufacturers.

Department of Energy - United States of America. (2024). *DOE Hydrogen Program Record - Clean Hydrogen Production Cost Scenarios with PEM Electrolyzer Technology.* Retrieved from https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/24005-clean-hydrogen-production-cost-pem-electrolyzer.pdf?sfvrsn=8cb10889_1

Energy Source & Distribution. (2026, January 8). *GE Vernova to supply turbines for Carmody's Hill Wind Farm*. Retrieved from https://esdnews.com.au/ge-vernova-to-supply-turbines-for-carmodys-hill-wind-farm/

Fletcher. (2025B). *2024-2025 GenCost Consultation Submission.* Retrieved from https://www.griffith.edu.au/__data/assets/pdf_file/0027/2090736/Andrew-Fletcher-GenCost-2024-25-Consultation-submission.pdf

Fletcher, A. (2025A). *Draft 2025 IASR Stage 2 Consultation Submission.* Retrieved from https://www.aemo.com.au/-/media/files/major-publications/isp/2025/stage-2-submissions/andrew-fletcher.pdf?rev=3f841b8db377489e9043e1f49b810982&sc_lang=en

Fortescue. (2024). *Gibson Island Green Hydrogen and Ammonia Project - Public FEED Summary Report.* Retrieved from https://arena.gov.au/assets/2024/10/Fortescue-Future-Industries_Gibson-Island-Renewable-Ammonia-Project-FEED-Study_Public-FEED-Summary-Report.pdf

Frontier Economics. (2025). *Power Generation Technology Capex Forecast.* Retrieved from Confidential report provided by CAEEPR member. CAEEPR member available for discussion with CSIRO if requested.

GHD. (2025A). *2025 Energy Technology Cost and Technical Parameter Review - Draft Report (Rev C).* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2025/draft-2026-fau/ghd-2025-energy-technology-cost-and-technical-parameter-report.pdf?rev=4951107dc12e4fddb32c8a96ba47bcc5&sc_lang=en

GHD. (2025B). *Pumped Hydro Energy Storage Parameter Review.* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-iasr-scenarios/final-docs/ghd-2025-pumped-hydro-energy-storage-cost-parameter-review.pdf?rev=23aa606f804b44c9a60efb1cd078468b&sc_lang=en

GHD. (2025C). *ISP Transmission Cost Database Tool: 2025 Update.* Retrieved from https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2025/2025-electricity-network-options-report/final/ghd-2025-transmission-cost-database-update-report.pdf?rev=004c9c0d02d64ef39ba5445110121f4d&sc_lang=en

Gray, N., O'Shea, R., Smyth, B., Lens, P. N., & Murphy, J. D. (2024). An assessment of decarbonisation pathways for intercontinental deep-sea shipping using power-to-X fuels. *Applied Energy, 376*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0306261924015460#:~:text=They%20conclude%20that%20for%20immediate,being%20the%20most%20promising%20alternative.

International Energy Agency. (2021A). World Energy Outlook 2021. Retrieved from https://iea.blob.core.windows.net/assets/4ed140c1-c3f3-4fd9-acae-789a4e14a23c/WorldEnergyOutlook2021.pdf

International Energy Agency. (2021B). *Global Hydrogen Review 2021.* Retrieved from https://iea.blob.core.windows.net/assets/5bd46d7b-906a-4429-abda-e9c507a62341/GlobalHydrogenReview2021.pdf

International Energy Agency. (2022A). *World Energy Outlook 2022.* Retrieved from https://www.iea.org/reports/world-energy-outlook-2022

International Energy Agency. (2022B). *Global Hydrogen Review 2022.* Retrieved from https://iea.blob.core.windows.net/assets/c5bc75b1-9e4d-460d-9056-6e8e626a11c4/GlobalHydrogenReview2022.pdf

International Energy Agency. (2023A). *World Energy Outlook 2023.* Retrieved from https://iea.blob.core.windows.net/assets/86ede39e-4436-42d7-ba2a-edf61467e070/WorldEnergyOutlook2023.pdf

International Energy Agency. (2023B). *Global Hydrogen Reveiw 2023.* Retrieved from https://iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf

International Energy Agency. (2024A). *World Energy Outlook 2024.* Retrieved from https://iea.blob.core.windows.net/assets/60db7f34-da7f-41d7-8232-c0b718463fd0/WorldEnergyOutlook2024.pdf

International Energy Agency. (2024B). *Global Hydrogen Review 2024.* Retrieved from https://iea.blob.core.windows.net/assets/89c1e382-dc59-46ca-aa47-9f7d41531ab5/GlobalHydrogenReview2024.pdf

International Energy Agency. (2025A). *World Energy Outlook 2025.* Retrieved from https://iea.blob.core.windows.net/assets/dfe5daf4-dbc1-4533-abeb-fafb1faee0f9/WorldEnergyOutlook2025.pdf

International Energy Agency. (2025B). *Global Hydrogen Review.* Retrieved from https://iea.blob.core.windows.net/assets/a6c466dd-b6f0-44bd-a60a-6940eccfb1c3/GlobalHydrogenReview2025.pdf

NSW Government. (2026). *Construction workers accommodation*. Retrieved from www.planning.nsw.gov.au: https://www.planning.nsw.gov.au/policy-and-legislation/housing/regional-housing/regional-housing-taskforce/construction-workers-accommodation

Odenweller, A. (2026, January 15). *Update: What's the state of the green hydrogen market ramp-up?* Retrieved from LinkedIn: https://www.linkedin.com/posts/adrianodenweller_update-whats-the-state-of-the-green-activity-7417205029314650112-lH24/

Odenweller, A., & Ueckerdt, F. (2025). The green hydrogen ambition and implementation gap. *nature energy*. Retrieved from https://www.nature.com/articles/s41560-024-01684-7

Oxford Economics Australia. (2025A). *2025 IASR Planning and Installation Cost Escalation Factors.* Retrieved from https://www.aemo.com.au/-/media/files/major-publications/isp/2025/stage-2/2025-iasr-planning-and-installation-cost-escalation-factors.pdf?rev=4e6c3e6264324a9dabfc07ce2c995b55&sc_lang=en

Oxford Economics Australia. (2025B). *Electricity-Related Labour & Materials Escalation Costs: Forecasts to FY32.* Retrieved from https://www.aer.gov.au/system/files/2025-08/MLPL-B-010%20Attachment%208%20-%20Electricity-Related%20Labour%20and%20Materials%20Escalation%20Costs%20%28Oxford%20Economics%20Australia%29%20-%20July%202025.pdf

PV Magazine. (2025, September 29). *Envision and Fortescue join forces to set new benchmark for renewable energy infrastructure in Australia*. Retrieved from https://www.pv-magazine-australia.com/press-releases/envision-and-fortescue-join-forces-to-set-new-benchmark-for-renewable-energy-infrastructure-in-australia/

PV Magazine. (2025, September 9). *Tesla unveils new generation of utility-scale batteries: Megapack 3 and Megablock*. Retrieved from https://www.ess-news.com/2025/09/09/tesla-unveils-new-generation-of-utility-scale-batteries-megapack-3-and-megablock/

Queensland Government. (2025). *Community Benefit Agreements - Guidance for Local Governments and Proponents.* Retrieved from https://www.planning.qld.gov.au/__data/assets/pdf_file/0017/102275/community-benefit-agreements-guidance.pdf

RACE for 2030. (2024). *The Australian Electricity Workforce for the 2024 Integrated System Plan: Projections to 2050.* Retrieved from https://www.aemo.com.au/-/media/files/major-publications/isp/2024/electricity-sector-workforce-projections/nem-2024-workforce_final.pdf

Ramboll. (2023). *What will it take to reduce CAPEX in green hydrogen production?* Retrieved from https://www.ramboll.com/net-zero-explorers/what-will-it-take-to-reduce-capex-in-green-hydrogen-production

Renew Economcy. (2026, January 12). *Australia's most powerful turbines unveiled as fourth wind farm reaches financial close in Xmas flurry*. Retrieved from https://reneweconomy.com.au/australias-most-powerful-turbines-unveiled-as-fourth-wind-farm-reaches-financial-close-in-xmas-flurry/#:~:text=The%20288%20megawatt%20(MW)%20Palmer,by%20the%20end%20of%202027.

Renew Economy. (2025, October 14). *Australia's biggest battery project is about to get a lot bigger, and will be first to 1 GW and 5 GWh*. Retrieved from https://reneweconomy.com.au/australias-biggest-battery-project-is-about-to-get-a-lot-bigger-and-will-be-first-to-1-gw-and-5-gwh/

Siekkinen, V. (2024). *The difference between hydrogen visions and the reality: Investment values.* Retrieved from LinkedIn: https://www.linkedin.com/pulse/difference-between-hydrogen-visions-reality-values-visa-siekkinen-dnpjf/

Stanwell Corporation Limited. (2022). *Central Queensland Hydrogen - Project Feasibility Study Report.* Retrieved from https://arena.gov.au/assets/2022/12/central-queensland-hydrogen-project-feasibility-study.pdf

Tengler, M. (2024, Sep). *Electrolysis System Cost Forecast 2050- Higher for Longer*. Retrieved from LinkedIn: https://www.linkedin.com/posts/mtengler_electrolysis-system-cost-forecast-2050-higher-activity-7240358570565804034-J7e2/?utm_source=share&utm_medium=member_desktop

TNO. (2024). *Evaluation of the levelised cost of hydrogen based on proposed electrolyser projects in the Netherlands. Renewable Hydrogen Cost Element Evaluation Tool (RHyCEET).* Retrieved from https://app.1848.nl/document/tkapi/504159

URBIS. (2025). *Central West Orana Regional Major Infrastructure Study.* Retrieved from https://www.planning.nsw.gov.au/sites/default/files/2025-12/central-west-orana-regional-major-infrastructure-study-population-workforce-housing-and-accommodation.pdf

Vestas. (2025, December 17). *Vestas secures 108 MW order in Australia with Tilt Renewables*. Retrieved from https://www.vestas.com/en/media/company-news/2025/vestas-secures-108-mw-order-in-australia-with-tilt-rene-c4283771

Vestas. (2026, January 27). *EnVebtus Platform*. Retrieved from https://www.vestas.com/en/energy-solutions/onshore-wind-turbines/enventus-platform