Critique of the GenCost 2023-24 Draft Report Methodology and Assumptions

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Introduction

The GenCost report by CSIRO provides important projections of electricity generation and storage costs that inform energy policy and investment decisions in Australia. However, a review of the methodology suggests the report contains limitations in how real-world complexities are modelled. Assumptions favouring some low carbon technologies over others also raise concerns over embedding partial perspectives into influential long-term cost forecasts. This critique summarises identified flaws in the modelling approach and areas of apparent bias against nuclear power. While no projection is perfect, understanding structural limitations and subjective assumptions is key to judiciously interpreting results.

Concerns over Modeling Methodology

The GenCost report relies on a modelling methodology that may not fully capture the complex real-world dynamics involved in transforming energy systems. Several structural limitations were identified that restrict how well uncertainties, constraints, risks and nonlinear changes can be evaluated:

- The levelised cost of electricity (LCOE) calculations used to compare technologies appear to underestimate integration costs for variable renewables. Storage requirements are based only on meeting peak demand, not prolonged periods of low renewable output. More long-duration storage may be needed in practice to manage intermittency, but is not modelled. System inertia and stability impacts of increasing inverter-based generation are also excluded.

- Scenario assumptions on highly uncertain factors like future climate policy, electrification rates, technology learning, and resource constraints are modelled narrowly as smooth incremental changes. Disruptive step-changes and bifurcation points are overlooked.
- The model structure favours incremental capacity expansions suited to mature systems rather than the radical transitions with new assets rapidly displacing old infrastructure that could occur in some decarbonisation pathways.
- The model lacks granular geographical data needed to represent regional cost variations, grid upgrade needs, reliability differences across locations, environmental constraints, public acceptance barriers, supply risks, and resilience to extreme climate events.
- The modelling cannot evaluate risks that could substantially impact costs, such as fuel supply crunches, constraints on raw material availability, project delays from permitting and land acquisition issues, stranded asset costs for retiring plants, rebound effects driving higher electrification demand, or decommissioning obligations.
- No sensitivity analysis across wide uncertainty ranges for key assumptions like technology learning rates or resource constraints is presented. Ensemble modelling exploring divergent futures could improve robustness.

The heavy reliance on assumptions conducive to incremental forecasts makes the methodology best suited for marginal changes rather than exploring radical low carbon transitions. It likely underestimates real-world complexities, path dependencies, hurdles, unintended consequences, and disruptive changes that could emerge.

Bias Against Nuclear Power

Several aspects of the tools, metrics, scenarios, and assumptions used in the GenCost report appear to systematically disadvantage nuclear power:

- The levelised cost of electricity (LCOE) metric favours variable renewables like wind and solar by excluding integration costs, transmission investments, and reliability attributes. Nuclear services like inertia and load following are not valued or compensated .
- Scenarios with very high electrification and renewable penetration make assumptions tilted against thermal generation like nuclear, such as forced plant retirements. Such scenarios embed preferences for particular outcomes.
- Resource and land use constraints are underestimated for some renewables like bioenergy and rooftop solar but overestimated for nuclear. Regional grid and connection costs are excluded for renewables.
- Fuel supply risks are emphasised for uranium but downplayed for natural gas. Lifecycle emissions and environmental impacts are scrutinised more for nuclear than wind, solar or batteries.
- Public acceptance and regulatory risks appear higher for nuclear although transmission, battery storage, and renewable projects also face opposition. Safety issues are highlighted without equivalent analysis of battery storage risks.

Potential cost differences

Based on the identified methodology concerns and potential biases, here is how correcting for these could impact the relative costs projected for renewables versus nuclear power in the GenCost report:

- Properly accounting for integration and transmission costs could reasonably increase levelised costs for solar PV and wind power by 25-50%, given they comprise up to 34-41% of costs at high renewable penetration levels (p.60).
- More realistic long-duration seasonal storage needs could add 10-30% to costs of high renewable systems, based on likely undersizing of modelled storage requirements.
- Factoring in supply chain constraints, connection barriers and climate impact resilience for renewables could add 15-25% to costs, based on historic examples of cost overruns.
- Increasing learning rate assumptions for SMRs to levels applied for emerging renewables could accelerate cost declines, reducing SMR costs by 25-40% over the 2040-2050 period.
- Applying appropriate financing costs could advantage capital-intensive nuclear by 15-25% over renewables.
- Valuing nuclear's load following capability could improve economics by 5-10%. Factoring in lower public acceptance risks could provide a further 5-10% advantage.

In total, reasonably addressing the identified methodology limitations and bias against nuclear could potentially reduce the levelised cost differential for nuclear relative to renewables by 50-70%. This would make nuclear power more competitive in scenarios where it is currently projected to be much more costly.

However, firm quantifications require detailed modelling. The precise impacts depend on the corrections made. But the potential impacts are substantial enough to warrant re-evaluating assumptions and expanding scenario analysis to better account for uncertainties and risks across all low carbon options. This critique aims to highlight areas for improvement, not definitively quantify the impacts.

Conclusion

In conclusion, while the GenCost report provides a useful reference, the modelling methodology contains limitations in capturing real-world complexities, uncertainties, and transitional disruptions. Assumptions across scenarios, tools, and metrics reveal systematic biases likely unfavourable to fair assessment of nuclear power. Understanding these structural limitations and biases is essential when interpreting the cost projections and conclusions presented. More balanced comparative assessment of the pros, cons and uncertainties across all low carbon technology alternatives is needed.