

**Nuclear energy for Australia?
Not Plan A and probably not Plan B**

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Overview

Australia can make the historic transition to a low-emissions electricity system without the lights going out and without power bills skyrocketing.

But getting to 100 per cent renewable energy over the next two decades would be expensive unless there were major technological advances to backup renewable supply during rare, weather-related renewable energy droughts. That's one reason it's sensible for Australia to continue its current strategy of *net* zero emissions in the National Electricity Market (NEM) by the 2040s, not absolute zero emissions or 100 per cent renewable energy.

Gas generation with negative-emissions offsets will be the lowest-cost 'bridging' technology backup until a zero-emissions alternative, such as hydrogen-fired generation, pumped hydro storage, or carbon capture and storage, becomes an economically competitive alternative.

It is theoretically possible that nuclear energy, in the form of small modular reactors, could play this role in the 2040s or beyond. For now, however, this technology is far from commercial reality, its promised benefits are as yet unrealised, and its costs are unknown with any level of confidence, particularly in this backup role.

There should be three parts to Australia's net-zero electricity system plan.

First, maintain the primary focus on increasing investment in solar and wind generation, firmed with storage and gas while closing the coal plants. The Integrated System Plan (ISP) supports this as the lowest-cost pathway to net zero. Even without the current prohibitions, current nuclear technologies are too expensive and would take too long to deploy to be useful here.

Second, fully develop the role of gas as a backup technology, while supporting research and development on the alternatives that are very costly today.

And third, stay close to technical and economic developments in nuclear technology.

Australia should position itself to be a fast adopter of nuclear if and when it becomes economical. Preparatory work on legislation and regulations could begin ahead of that time if justified by emerging circumstances.

1 Introduction

This submission is by Tony Wood and Alison Reeve of Grattan Institute, an independent think tank focused on Australian domestic public policy. Grattan aims to improve policy by engaging with decision-makers and the broader community.

The House Select Committee on Nuclear Energy is inquiring into and will report on the consideration of nuclear power generation, including deployment of small modular reactors, in Australia.¹

Grattan has advocated for energy market reforms for well over a decade. This submission draws on our previous reports and other published material.

1.1 Background

Australia's known uranium resources are the world's largest – almost one-third of the total. Those resources have been mined since 1954 and all of the production is exported.²

Nuclear power generation is banned in Australia. The Australian Radiation Protection and Nuclear Safety Act 1998 and the Environment Protection and Biodiversity Conservation Act 1999 both prohibit nuclear power. Similar prohibitions exist under the laws of every state and territory.³

Recent interest in nuclear power and the initiation of this inquiry have been largely triggered by a proposal from the federal Coalition for nuclear power to be part of its policy platform for the next federal election.

1. Federal Select Committee on Nuclear Energy calls for submissions (2024).

2. World-nuclear-assoc

3. HerbertSmithFreehills (2024).

1.2 There is no realistic case for nuclear in Australia today

In a 2012 report, Grattan assessed a range of technologies capable of contributing to Australia's low-emissions power sector against five criteria.⁴ The assessment of nuclear power was:

- Scalability: Nuclear power could meet a large proportion of Australia's electricity needs.
- Current and outlook costs: New-build costs are uncertain, with limited experience in the past 25 years. Developing designs may be cheaper, safer, and more efficient, but are at research and development stage and commercially unproven.
- Extent of commercial development: There has been no deployment in Australia. There has been widespread deployment overseas in the past, but limited recent deployment in Western Europe and North America. Deployment is continuing in several other countries.
- Prospect for private sector involvement: The absolute size of investment needed is a major barrier. Financial and regulatory risks make private sector involvement unlikely in Australia without strong public sector support.
- Implementation: Our best estimate then was that it would take 15-to-20 years from initiating serious engagement on nuclear in Australia to commissioning a large-scale plant.

Grattan's headline conclusion in 2012 was that uncertainty about the probable cost of nuclear power in Australia would continue until there was a weight of practical experience in deploying current reactor

4. Wood and Edis (2012).

designs in countries with similar economic and regulatory conditions. But, unlike some other countries such as the UK, Australia could afford to wait for this to happen, because Australia has multiple options to ensure its overall energy security. Given this, Australia should wait to see the economics of new nuclear deployment in other countries before considering any commitment to build nuclear power plants here.

Since the publication of that report in 2012, little has happened to change our views. The cost of nuclear has not improved over that time, and large-scale nuclear construction timelines continue to blow out.

The Chair of the Australian Energy Regulator has suggested it would take 8-to-10 years to establish the necessary regulator framework.⁵ And successive Australian governments continue to make the same mistakes in failing to secure social licence for nuclear waste, which does not bode well for securing similar social licences for nuclear power.⁶

Since, 2012, the cost of solar and wind generation has fallen dramatically and renewables' share of power generation has increased from about 10 per cent to about 40 per cent. The pace of deployment has recently slowed, mostly due to challenges in building the transmission network capacity in areas where there is insufficient capacity to connect more distributed generation. These challenges have been caused by escalating costs, slow regulatory approvals, and failure to secure local social licence for this new infrastructure.

On the nuclear front, a relatively recent development is the concept of small modular reactors (SMRs). SMRs are advanced nuclear reactors that have a power capacity of up to 300 MW(e) per unit, which is about one-third of the generating capacity of traditional nuclear power reactors.⁷ Their promise is lower cost and simpler deployment

than traditional large reactors through manufacturing repeatability and passive safety design. Although more than 80 designs are in development, their economic competitiveness is still to be proven in practice. Recent work by the Academy of Technological Sciences and Engineering suggests a mature market for SMRs is unlikely before the mid-to-late 2040s. This means they are no quicker an option for Australia than is large-scale nuclear.⁸

Concerns that a high-renewables system is pushing up prices and threatening reliability are being used to build a case for small nuclear reactors in Australia. However, as we show in the remainder of this submission, this case is not an easy Plan B.

5. Clare Savage (2024).

6. Lowe (2023).

7. International Energy Agency (2023).

8. ATSE (2024).

2 Nuclear is no easy choice as Plan B

Federal and state governments are struggling to deliver on renewable electricity and price reduction targets. State governments are introducing contractual arrangements that seek to provide confidence that coal plants will not close too soon. The system is becoming more dependent on gas as the backup to a high-renewables generation mix. The fact that Australia's Plan A has such challenges is to be expected, given the scale and pace of the energy transition. Those challenges are not a reason for turning from the transition.

The current ISP includes 15 gigawatts of gas generation, mainly as backup to renewables.⁹ The greenhouse gases from such a fleet in that mode would be less than 5 million tonnes of CO₂ per annum – about 1 per cent of Australia's total current emissions. However, the logistics and financing model for such a system have yet to be developed.

Based on current techno-economics, alternatives such as hydrogen or deep storage are even more challenging. In that context, nuclear may be appealing – but only if its unique barriers can be overcome.

2.1 Common market reforms

Major reforms to Australia's energy markets are necessary to deliver a plan for net zero.¹⁰ A critical requirement of such reforms is to ensure resource adequacy, regardless of the technologies considered. Priority issues include:

2.1.1 Manage coal exits

The NEM is currently in the era of coal closure. This era started with the closure of the South Australian Northern plant in 2016 and the

Victorian Hazelwood plant in 2017. The era will continue until coal no longer plays a material part in energy supply.

State governments are already using direct contract mechanisms with coal generators to provide insurance against early or delayed closures that could create major risks of blackouts and price spikes, or uncertainty for renewables investors. These mechanisms should maintain momentum on emissions reductions and avoid shifting excessive risks from operators to governments and consumers, while being clear and transparent to the market.

2.1.2 Deal with gas

The role of gas must change from being a source of heat and feedstock to being the backup described in this submission.

That means coordinating plans for getting off gas that recognise the different uses of gas across the country. It also means extending the ISP to identify the locations and supply chains that would be necessary to operate gas as a backup.

2.1.3 Plan for post-coal energy market reform

In 2017, the Finkel Review¹¹ recommended that Australia's energy ministers strike a new Australian Energy Market Agreement that commits all parties to take a nationally consistent approach to energy policy. This recommendation was not adopted at that time. In planning for the post-coal era, implementing such an agreement would be an ideal role for the National Energy Transformation Partnership struck by the federal, state, and territory ministers in 2022.

9. AEMO (2024).

10. Wood et al (2024).

11. Finkel et al (2017).

The process of developing a new agreement should be led by governments, because it goes to matters of policy (and politics). The rumoured NEM review should form the basis of a fundamental review of the operation of the NEM, the National Gas Market, and retail laws. The states are integral to the design process, because they will be integral to the success of the new NEM.

If the review is to develop an enduring framework for a national energy market, it must avoid the pitfalls that previous attempts encountered. The review must be approached as a co-design exercise between consumers, industry, and politicians, drawing on the deep expertise of the market bodies. It has to acknowledge and accommodate political and physical realities as well as technocratic theory. It cannot be held hostage by ministers insisting that various technologies must be in or out.

The design work should begin with a cross-jurisdictional review to identify the respective roles for markets, consumers, and governments; and to decide what rights and responsibilities each of these groups should have. Without this, it will be difficult to go beyond making small tweaks to existing frameworks – and the stresses and strains that they labour under will continue.

Once ministers have made the high-level calls on roles and responsibilities, the technical detail of designing rules and operating procedures that reflect these can then be passed to the market bodies to develop.

2.1.4 Have an exit strategy from direct government intervention

The immediate risks in the transition have led to multiple government interventions in the market, including the Capacity Investment Scheme, gas price caps, and state-owned energy companies. These arrangements should have sunset clauses that align with coal closures

and the post-coal market structure, so that Australia returns to having an energy market that underwrites investment in new generation.

2.1.5 Link with climate policy

The single biggest challenge facing energy markets is decarbonisation. And yet, with a couple of honourable exceptions, governments are consistently shy about stating explicitly what this means and by when it should happen.

The ISP is clear that the current least-cost forward pathway for the electricity sector includes a small but important role for gas power generation. But filling this role economically requires mid-merit gas power to be retired, and peaking gas plants to be built, to backup wind and solar. A key piece of information for prospective investors in plants with this role is the extent to which the investors will have to pay for the their plants' emissions in the future.

Governments could remove this uncertainty by making a definitive statement that, post-2030, gas power generation will face a carbon price. The form of the price, and the amount, could be agreed through a NEM review. Alternatively, the federal government could use the Safeguard Mechanism to do it.

2.2 Specific challenges for nuclear

Any credible policy framework for an Australian nuclear option must consider three key issues:

- There are no commercially available small modular reactors, meaning there are no credible estimates of their cost beyond CSIRO's best guess,¹² nor credible estimates of the timeline for their availability. Better information may emerge if the suite

12. Graham et al (2024, p. xi).

of registered designs move forward to pilot and demonstration projects.¹³ Australian governments should follow developments closely, but allow other countries with more experience of nuclear to take the early-stage risks.

- The unfilled niche in the energy market is for a back-up technology that can provide electricity during any renewables droughts. Currently gas is envisaged as the solution. This is not a role well-suited to large-scale nuclear plants, and there are questions as to whether even small modular reactors can operate with the necessary degree of flexibility in a backup role.
- At present, nuclear power is illegal nationally and in every state and territory. It would be a very difficult political challenge to overturn all of these prohibitions without bipartisan agreement and broad community endorsement.

13. Statista (2024).

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