NEWSLETTER No.3

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Rethink needed by Grattan Institute, Climate Council & CSIRO

Frontier Economics Report 2, Dec 2024 has modelled AMEOs Integrated System Plan (ISP) that found renewable plus nuclear is cheaper than an all renewables model. We examine what it means for the Grattan Institute, the Climate Council and CSIRO.

Frontier Economics Findings:

Pricing of the National Electricity Network (NEM) AEMO base cases are significantly more expensive than an alternative with 38% nuclear energy and 54% renewables. Refer to Tables 9 and 10 of Frontier Economics, Report No.2, Dec 2024.

Table 9 – Generation, network and total system costs – sum real $ billion (2025-2051)

Scenario		Generating Cost ($billions)	Transmission Cost ($billions)	Total Cost ($billions)
Step Change	AEMO base case	$528	$66	$594
	Nuclear alternative	$402	$44	$446
Progressive	AEMO base case	$405	$32	$437
	Nuclear alternative	$317	$14	$331

Table 10 – Generation, network and total system costs – NPV $ billion (2025-2051)

Scenario		Generating Cost ($billions)	Transmission Cost ($billions)	Total Cost ($billions)
Step Change	AEMO base case	$190	$35	$225
	Nuclear alternative	$142	$21	$163
Progressive	AEMO base case	$148	$17	$166
	Nuclear alternative	$116	$8	$124

The Frontier Economics report can be found at: https://www.frontier-economics.com.au/wp-content/uploads/2024/12/Report-2-Nuclear-power-analysis-Final-STC.pdf

Several critical factors were overlooked in CSIRO in GenCost 2024:

- The capacity factor for nuclear, namely how much of the time it runs at full capacity was under-estimated at 55 to 89% where the global average in 2023 was 81.5% and in USA it was 93.1% - significantly higher than assumed.
- A renewables grid is far bigger than a grid with nuclear electricity connected into it, particularly where transmission lines already exist.
- Renewables + firming took a single point in time firming requirement, rather than consider how firming works within the AEMO ISP model.

1. Grattan Institute Tony Wood Alison Reeves - 9 Dec 2024

https://grattan.edu.au/news/nuclear-energy-for-australia/

Even without the current prohibitions, current nuclear technologies are too expensive and would take too long to deploy to be useful here.

The Frontier Economics Report No.2 shows current nuclear technologies can be used, with existing nuclear reactors combined with renewables. This is significantly cheaper than renewables with batteries, pumped hydro and gas turbines.

By using proven reactor designs, we can replace coal and meet Australia's 2050 net-zero targets. Frontier Economics Report No.2 takes account of a sequential transfer of energy, from coal-to-nuclear (C2N) that accounts for coal operator capacities.

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

Gas backup technology isn't imperative for providing emergency backup electricity, if coal power stations are kept running to provide baseload electricity, and are then replaced by nuclear power stations.

Gas backup should be planned carefully to meet the requirements of the NEM based on 54% renewables and 38% nuclear, rather than 100% renewables. Ideally by 2050, sufficient nuclear energy should be provided to avoid the need for gas turbines. Since relying on gas undermines our net-zero by 2050 obligations.

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

Australia hasn't done well in anticipating technical and economic developments in nuclear energy. Cost savings are achieved through using proven technologies such as Kepco APR-1400s rather than unproven small modular reactors (SMRs) and first of a kind reactor (FOAKs).

The situation will improve if federal and state nuclear energy bans are lifted, with a reasonable expectation that nuclear energy projects could go ahead. The government can further de-risk nuclear, by having a fleet of the same reactors, with consistent training and redundancies throughout.

In the long term, beyond 2040, would be a more appropriate time to consider SMRs and other emerging technologies in our energy mix, once they have a proven track record, and can be deployed at a reasonable cost.

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.

Frontier Economics Report No.2 has shown that renewables plus nuclear energy is between 25% and 44% cheaper than a 100% renewables pathway.

As a result of this, we should commence work on legislative and regulatory changes in adopting nuclear energy. This should ideally be undertaken with bipartisan support and with an undertaking by bureaucrats and academics, not to be obstructive in developing a far more efficient and progressive energy pathway for Australia.

2. Climate Council - 10 May 2024

https://www.climatecouncil.org.au/nuclear-power-stations-are-not-appropriate-for-australia-and-probably-never-will-be/

Nuclear reactors risk our energy security – by failing to replace retiring coal

In coal-to-nuclear (C2N) projects, nuclear power stations replace coal power stations according to a predetermined sequence. This accounts for coal plant maintenance and nuclear power plant construction and commissioning. As a result, there isn't an energy security risk as the coal power station is kept operating until the nuclear power station is switched on. Even after switching over, the coal power station can remain as a backup for as long as needed.

Going nuclear means Aussies pay more, for less

Frontier Economics Report No.2 Dec 2024 Tables 9 and 10, show that renewables plus nuclear provides a cost saving of between 25% and 44% compared to renewables only. As a result, Aussies will pay less, if nuclear is introduced into the energy mix.

Nuclear reactor projects often face big cost and timeline blowouts

Cost and time blowouts occur for: first-of-a-kind (FOAK) projects that have not been proven, projects that are affected by regulatory changes, and where there are financial and supply issues for new projects.

Australia will need to purchase nuclear plant from one of the top manufacturers in the world, following a detailed assessment. It will be an nth-of-a-kind (NOAK) reactor, that has a proven track record of successful operation. By purchasing in this way, Australia minimizes the risk of any cost increases and project delays.

Nuclear reactors pose significant community, environmental and health risks

There are around 440 nuclear reactors operating globally, with spent fuel managed safely and securely. We have experience in safe fuel management at the ANSTO OPAL reactor at Lucas Heights, on the outskirts of Sydney. The OPAL reactor makes medical and industrial isotopes and has been operating without incident since 2006.

Spent fuel is not stacked in yellow drums with radiation signs stamped on. The material in these drums is low level waste materials, clothing, packaging etc that has been irradiated during medical, industrial, agricultural and research works. Low level waste contains short half-life material, that doesn't pose long term health risks. It only requires short to medium term storage; hence it is often stored in the yellow drums.

Nuclear reactors would require massive amounts of water in increasingly drought-prone regions

Both coal and nuclear power stations heat water to create pressurized steam, that in turn drives steam turbines in a closed loop. The steam is then condensed back to water using an external water source, cooling tower. So C2N projects involve a like-for-like replacement of water source and steam cycle components.

There isn't any requirement for massive amounts of additional water, or an increase in drought risk, that was suggested. In fact, water usage can be reduced at C2N sites by using dry cooling towers to condense steam to water in a closed loop, and when coal mining operations cease.

Climate change threatens our kids' safety, and we need to be cutting climate pollution now

Climate pollution poses a global challenge. The World Health Organization (WHO) estimates that 7 million people die each year because of air pollution, that is largely due to burning fossil fuel.

Unfortunately, intermittent renewables, wind, water and solar aren't sufficient, to run a large energy grid anywhere in the world. Australia's current plan is to have a massive oversupply of renewables that last between 10 and 30 years, batteries that are the largest in the world, that last for around 10 years, and gas turbines, to operate when the batteries run low.

To make all these renewables and batteries requires fossil fuels; to rebuild every 10 to 30 years requires more fossil fuel and as a result this pathway creates a repeating cycle of excessive energy use, waste and climate pollution. It is reduced significantly by introducing nuclear power to avoid overbuilding low yield wind and solar farms and replacing batteries.

3. CSIRO News Article - The Question of Nuclear In Australia's Energy Sector - 9 Dec 2024

https://www.csiro.au/en/news/all/articles/2024/december/nuclear-explainer

Nuclear power does not currently provide the most cost competitive solution for low emission electricity in Australia.

The Frontier Economics Report No.2 Dec 2024 shows the CSIRO GenCost24 Report is seriously flawed. Please refer to this report for a detailed explanation of where the wrong assumptions and comparisons have been made, and why renewables with nuclear is between 25% and 44% cheaper, than a renewables with storage and peaking gas solution for the NEM.

Long development lead times mean nuclear won't be able to make a significant contribution to achieving net zero emissions by 2050.

Frontier Economics modelling incorporates closure dates for coal power stations and bringing nuclear power plants online to meet our net-zero 2050 obligations and maintain a stable energy grid, with 65% baseload power.

Lead times have been overstated by CSIRO based on introducing new and untested technologies such as SMRs, whereas Frontier Economics have based the energy transition on using proven, operational reactors from other countries, with established supply lines.

While nuclear technologies have a long operational life, this factor provides no unique cost advantage over shorter-lived technologies.

The cost advantage of nuclear (60 to 80 years) over shorter lived technologies, batteries (10 years), solar panels (10 to 20 years), and wind turbines (20 to 30 years), is nuclear keeps running, providing low cost energy when shorter-lived technologies need to be replaced. This provides long term financial benefits, plus it reduces waste, landfill, and abandoned infrastructure.

Nuclear projects require a long-term investment horizon and have substantial upfront costs and delay risks. This doesn't suit investors, looking at reliable returns over a 10 to 20 year period. However, if we move to 54% renewables there will still be plenty of opportunities for investors. Coupled with this, the government can provide investment opportunities on nuclear projects, where it under-rights the risk, and provides a guaranteed return to investors. Models such as the Regulated Asset Base (RAB) funding model, recently developed for nuclear projects in the UK, could be considered in Australia.