Is nuclear the answer to Australia's climate crisis?

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In Australia's race to net zero emissions, nuclear power has surged back into the news. Opposition leader Peter Dutton argues nuclear is "the only feasible and proven technology" for cutting emissions. Energy Minister

Chris Bowen insists Mr. Dutton is promoting "the most expensive form of energy".

Is nuclear a pragmatic and wise choice blocked by ideologues? Or is Mr. Bowen right that promoting nuclear power is about as sensible as chasing "unicorns"?

For someone who has not kept up with developments in nuclear energy, its prospects may seem to hinge on safety. Yet by any hard-nosed accounting, the risks from modern nuclear plants are orders of magnitude lower than those of fossil fuels.

Deep failures in design and operational incompetence caused the Chernobyl disaster. Nobody died at Three Mile Island or from Fukushima. Meanwhile, a Harvard-led study found more than one in six deaths globally—around 9 million a year—are attributable to polluted air from fossil combustion.

Two more mundane factors help to explain why nuclear power has halved as a share of global electricity production since the 1990s. They are time and money.

The might of Wright's law

There are four arguments against investment in nuclear power: Olkiluoto 3, Flamanville 3, Hinkley Point C, and Vogtle. These are the four major latest-generation plants completed or near completion in Finland, the United States, the United Kingdom and France respectively.

Cost overruns at these recent plants average over 300%, with more increases to come. The cost of Vogtle, for example, soared from US$14 billion to $34 billion (A$22-53 billion), Flamanville from €3.3 billion to €19 billion (A$5-31 billion), and Hinkley Point C from £16 billion to as

much as £70 billion (A$30-132 billion), including subsidies. Completion of Vogtle has been delayed by seven years, Olkiluoto by 14 years, and Flamanville by at least 12 years.

A fifth case is Virgil C, also in the US, for which US$9 billion (A$14 billion) was spent before cost overruns led the project to be abandoned. All three firms building these five plants—Westinghouse, EDF, and AREVA—went bankrupt or were nationalized. Consumers, companies and taxpayers will bear the costs for decades.

By contrast, average cost overruns for wind and solar are around zero, the lowest of all energy infrastructure.

Wright's law states the more a technology is produced, the more its costs decline. Wind and especially solar power and lithium-ion batteries have all experienced astonishing cost declines over the last two decades.

For nuclear power, though, Wright's law has been inverted. The more capacity installed, the more costs have increased. Why? This 2020 MIT study found that safety improvements accounted for around 30% of nuclear cost increases, but the lion's share was due to persistent flaws in management, design, and supply chains.

In Australia, such costs and delays would ensure that we miss our emissions reduction targets. They would also mean spiraling electricity costs, as the grid waited for generation capacity that did not come. For fossil fuel firms and their political friends, this is the real attraction of nuclear—another decade or two of sales at inflated prices.

Comparing the cost of nuclear and renewables

Nevertheless, nuclear advocates tell us we have no choice: wind and solar power are intermittent power sources, and the cost of making them

reliable is too high.

But let's compare the cost of reliably delivering a megawatt hour of electricity to the grid from nuclear versus wind and solar. According to both the CSIRO and respected energy market analyst Lazard Ltd, nuclear power has a cost of A$220 to $350 per megawatt hour produced.

Without subsidies or state finance, the four plants cited above generally hit or exceed the high end of this range. By contrast, Australia is already building wind and solar plants at under $45 and $35 per megawatt hour respectively. That's a tenth of the cost of nuclear.

The CSIRO has modeled the cost of renewable energy that is firmed—meaning made reliable, mainly via batteries and other storage technologies. It found the necessary transmission lines and storage would add only $25 to $34 per megawatt hour.

In short, a reliable megawatt hour from renewables costs around a fifth of one from a nuclear plant. We could build a renewables grid large enough to meet demand twice over, and still pay less than half the cost of nuclear.

The future of nuclear: small modular reactors?

Proponents of nuclear power pin their hopes on small modular reactors (SMRs), which replace huge gigawatt-scale units with small units that offer the possibility of being produced at scale. This might allow nuclear to finally harness Wright's law.

Yet commercial SMRs are years from deployment. The US firm NuScale, scheduled to build two plants in Idaho by 2030, has not yet broken ground, and on-paper costs have already ballooned to around A$189 per megawatt hour.

And SMRs are decades away from broad deployment. If early examples work well, in the 2030s there will be a round of early SMRs in the US and European countries that have existing nuclear skills and supply chains. If that goes well, we may see a serious rollout from the 2040s onwards.

In these same decades, solar, wind, and storage will still be descending the Wright's law cost curve. Last year the Morrison government was spruiking the goal of getting solar below $15 per megawatt hour by 2030. SMRs must achieve improbable cost reductions to compete.

Finally, SMRs may be necessary and competitive in countries with poor renewable energy resources. But Australia has the richest combined solar and wind resources in the world.

Should we lift the ban?

Given these realities, should Australia lift its ban on nuclear power? A repeal would have no practical effect on what happens in electricity markets, but it might have political effects.

A future leader might seek short-term advantage by offering enormous subsidies for nuclear plants. The true costs would arrive years after such a leader had left office. That would be tragic for Australia. With our unmatched solar and wind resources, we have the chance to deliver among the cheapest electricity in the developed world.

Mr. Dutton may be right that the ban on nuclear is unnecessary. But in terms of getting to net zero as quickly and cheaply as possible, Mr. Bowen has the relevant argument. To echo one assessment from the UK, nuclear for Australia would be "economically insane".

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