# UQ nuclear power report debunks Labor’s naysaying

In its election campaign the Labor Party made hay of the then Liberal government’s failure to address the spiralling costs of energy, especially gas. But predictably, since it won government Labor has proved itself every bit as hamstrung by ideology, cowardice, and pandering to vested interests as its predecessors. One immediate result is that despite official forecasts from Treasury, the Reserve Bank of Australia, and indeed Treasurer Jim Chalmers in his 25 October federal Budget speech, that energy prices will continue to skyrocket by over 50 per cent in the coming year, Labor has already reneged on its campaign promise to impose price controls and domestic reservation quotas “if necessary” to ensure energy security for Australian businesses and households (p. 3). And regarding longer-term solutions, both Prime Minister Anthony Albanese and Energy Minister Chris Bowen continue to reject nuclear fission—the cleanest, safest and most efficient means of generating energy currently available to mankind—on spurious economic and environmental grounds, in favour of socalled renewable energy sources that have already proven incapable of supporting the “transition” to “net-zero” greenhouse gas emissions by 2050 (or at all) without completely wrecking what is left of Australia’s economy.


As it happens, however, all Albanese’s and Bowen’s arguments were already debunked before they made them, by a June 2021 University of Queensland (UQ) report which shows that state-of-the-art Small Modular Reactor (SMR) complexes are ideally suited to replace not only all of Australia’s current fleet of coal-fired power stations, but its wind turbines and solar panels too—and can do so far more cheaply and efficiently than any other current or prospective technology.

Titled *What would be required for nuclear energy plants to be operating in Australia from the 2030s*, the UQ report was authored by a team of researchers led by Prof. Stephen Wilson, a specialist in energy management from the university’s School of Mechanical and Mining Engineering. Whilst the report “is not intended to be an advocacy document”, they state at the outset, “The authors ... have generally come to the view that Australia should embrace nuclear energy. But not all of the authors have always held that view. Our personal views as to why Australia would be better off with nuclear energy than without it span a range of reasons, from climate change to minimising land footprints, to grid strength, energy security and reliability, and long-run cost.”

## Cheapest over all

Speaking to the Investor Group on Climate Change Investment and Finance Summit in June, Bowen declared nuclear the slowest and most expensive form of power generator. “Its adoption in Australia would push up power prices and crowd out cheaper and cleaner technologies”, Bowen claimed. “Firmed renewables are quicker to build and cheaper to operate. Those who say otherwise are either dangerously ignorant or simply seeking to perpetuate the climate wars.” None of this is true, and the dangerous ignorance is Bowen’s.

The only “renewable” energy source to which Bowen’s statement applies (indeed the only one worthy of the name at all) is hydroelectricity, which this government is not considering—and which most of Australia lacks the terrain and rainfall to support in any case. Otherwise, whilst wind turbines and solar panels incur the lowest up-front cost to install, it is universally acknowledged that the costs and timeframe of the accompanying “firming”—i.e. building the battery or pumped hydro storage to smooth out their intermittent output lest they completely destabilise the grid—will be several times that of the generators themselves; and acquiring enough lithium for the requisite quantity of batteries (presuming sufficient reserves even exist) would entail establishing entire new energy-intensive mining, processing and manufacturing industries from scratch. Moreover, the UQ report shows that the short lifespan of wind and solar generators means their low upfront cost is very much a false economy. “The end-of-life for existing Australian power plants is already in view”, it notes. “Not only coal-fired plants, but *all gas plants, wind turbines and all solar PV [photovoltaic] panels on rooftops and in large farms* will have reached the end of their service life by 2050.” (Emphasis added.) In contrast, nuclear reactors have a projected service life of 60-80 years. Further adding to the expense of “renewables” is that they must be built mostly on new (“greenfield”) sites in remote areas, necessitating expensive new transmission infrastructure to connect them to the grid.

SMR complexes, on the other hand, with their small footprint and greater inherent safety compared to large conventional nuclear plants (of which more below), could take advantage of existing infrastructure. “The potential to re-use old coal plant sites for new SMR plants is one opportunity to make use of what we [already] have”, the report says, noting further that around Australia “there are industrial sites, with transmission connections and other tangible infrastructure, close to communities with a skilled workforce interested in jobs where family members may today be employed at ageing

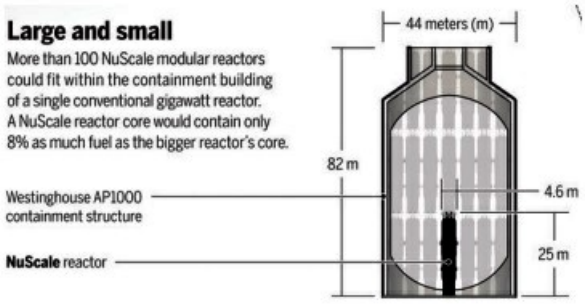
coal plants." As the authors put it, "Any low- or no-carbon [sic] future requires larger capital allocation … so the need for financing on a very large scale is not unique to nuclear." Estimates of the total investment needed to replace plants decommissioned by 2050—which, remember, includes *all* current wind and solar installations—are "in the order of $150 billion, varying from $75 to $350 billion, regardless of the configuration of the generation-transmission-storage system", the report states. But contrary to Bowen's assertion, "A welldelivered SMR fleet of 20 GW [gigawatts] … would leverage existing physical capital such as sites and network assets, securing the system *at the lower end of the range of total system costs*" (emphasis added).

## Build them anywhere

The report outlines various advantages of SMR complexes that cannot be matched by other zero-emissions technologies, which make them ideally suited to Australia's needs. Of the several SMR variants currently or soon to be available, the report's authors selected that produced by American company NuScale as the mature design—it is approved by both the International Atomic Energy Agency (IAEA) and US regulators—most suitable for Australia for both technical and, presumably, political reasons.[1]

As the report notes, nuclear is the only emissions-free power source capable of replacing large coal-fired plants on a one-to-one basis—both in terms of generating capacity as such, and in "the full range of system services needed for secure operation of a synchronous grid", which above all else demands a constant supply of firming (sometimes called "baseload") power. Large conventional reactors "have very large containment structures and are surrounded by large emergency planning zones" (EPZs), however, making them unsuitable to replace existing coal- and gas-fired plants close to population centres. (An EPZ is the area likely to be immediately affected in the event of a meltdown, for which emergency evacuation and other contingency plans must be in place.) A 1 GW Westinghouse AP1000 pressurised water reactor, for example, is housed in a containment building 82 metres high by 46 m wide; requires large amounts of water for cooling via commensurately enormous cooling towers; and in the USA, where several such reactors are in use, typically has an EPZ radius of 16 km (10 miles). NuScale SMRs are also pressurised water reactors (meaning they use superheated steam to turn a generator turbine), but that is where the similarity ends: each module is a cylinder measuring 25 x 4.6 m, which contain 8 per cent of an AP1000's fuel and of which more than 100 would fit inside their larger cousin's containment building. And because each module's containment "is integrated with the reactor vessel, the [EPZ] need not extend beyond the site boundary", the report states. That boundary, it adds, need only enclose a mere 16 hectares (ha), or roughly 40 acres; for comparison, it notes, the Australian Parliament House complex in Canberra occupies 35 ha. But even were Australia to adopt the US standard of a 1 km2 (i.e. 100 ha) EPZ for SMRs, it would still be smaller than UQ's 114 ha St. Lucia campus in Brisbane.

FIGURE 14 SMRs compared with large reactors




Furthermore, whilst each of the 12-module NuScale plants the authors envision for Australia would, if wet-cooled, use some 2,800 litres of water per megawatt hour (MWh), "Aircooling the steam cycle *reduces this to zero*" (emphasis added). Thus there is no obstacle to NuScale plants being installed in Australia's arid interior—though as the report acknowledges, other SMR designs such as "Generation IV" molten saltor gas-cooled reactors may ultimately prove more suitable. Unlike coal or gas plants which need to be located near a fuel source (or pipeline, in the latter case), nuclear reactors run for years if not decades between maintenance and refuelling intervals, on comparatively miniscule amounts of fuel easily transportable by road. And because of their modularity, SMRs are scalable to the needs of the communities they serve, including through the addition of more reactors to any given complex as population and local industries grow. Additionally, the ability to bring individual modules on- or offline on demand, combined with the use of steam turbine bypass technology, gives them the capability to ramp their output up and down rapidly in the manner of a "peaking" gas turbine, to smooth out the fluctuations caused by intermittent wind and solar generators already in the system. And unlike any "renewable" source, SMRs produce "process heat" which, whilst insufficient at around 300 °C for heat-intensive industries such as metal smelting (that, too, is a job for Gen IV plants), would be well suited to such tasks as the desalination of water (whether seawater, or saline ground and surface water inland) to improve water security; providing central heating to towns in their vicinity ("district heating") during cold weather; and lower-temperature industrial applications such as the synthesis of liquid fuels and fertilisers. Excess electrical output, the report notes, could also be deployed for the electrolysis of hydrogen—presuming, that is, that the technology to make use of it ever becomes viable.

As for the perennial objections regarding so-called nuclear waste, the report notes simply that "the 'used fuel' removed from a reactor … still contains approximately 96 per cent of the original fuel that can be recovered to produce new fuel", and/or simply re-used in fast neutron reactors; and that

Australia has both the world-class waste treatment technology—developed by the Australian Nuclear Science and Technology Organisation (ANSTO), which operates the Lucas Heights research reactor in Sydney—and near-perfect geological conditions for long-term storage of high-level nuclear waste if desired.

## Government financing required—but so what?

Ultimately the report concludes that the only obstacles to an Australian nuclear power industry are political. Despite federal and state laws (in NSW, Victoria and Queensland) prohibiting the peaceful use of nuclear power, which must be repealed before the construction (but not the planning) of SMR complexes can begin, Australia is a co-founder and board member of the IAEA, and through ANSTO "is recognised internationally as a leader in nuclear research, medical isotope production, advanced materials science and technology for radioactive waste management." Our universities have the requisite training programs already in place for the few nuclear-specific engineering and technical roles required, while as noted above, other jobs at nuclear plants could be filled by coal plant workers with minimal re-training, and in many cases none at all.

Aside from the aforementioned legal barriers, the main obstacle is finance, which the report's authors state bluntly is "impossible" without government backing, given the unhinged condition of today's deregulated financial and energy markets. "Private capital will be vital for financing nuclear energy plants", they argue, "but there are some roles only government can play. *This should not be viewed as a special nuclear energy exception*, because it is already the general rule. … [D]irect or indirect government intervention now influences all generation investments and divestments." (Emphasis added.) Quite so; but private capital, whilst welcome on the right terms, is not in fact "vital" at all. As the report itself acknowledges, "Governments may underwrite, lend to, or invest directly in new power generation" as they see fit. Moreover, there already exists a dedicated government lender, the Clean Energy Finance Corporation, for that purpose.

All that is really wanting, therefore, is a bit of leadership. "Champions may emerge from among members of parliament at national or state level … [and] in local government, support from which will be very valuable", the report suggests. But just as importantly, "Citizens can provide leadership by engaging actively with the conversation"—both individually, and "collectively as part of civil society through membership in organisations … and participating in public discussion fora". Obviously the Citizens Party agrees.

**Footnotes:**

1. More advanced designs are or soon will be available from Russia and China, but acquiring them is unfortunately impracticable for the time being thanks to the prevailing McCarthyite political climate in Australia.

*By Richard Bardon, Australian Alert Service, 26 October 2022*