Senate's inquiry into the 'Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022

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1. Introduction

My name is Alan Lawrenson, a private citizen, aged 77, who is enjoying retirement in Sydney. My retirement has seen me author a best-selling series of three books on Prostate Cancer. I am current considering authoring a new book tentatively titled ***"A Layman's Guide to a Nuclear Power Future for Australia".***
I spent the last ten years of my working life to 2006, as CEO of a peak industry body, called Science Industry Australia Inc. I was responsible for driving the Federal Government/Industry partnership: *The Science Industry Action Agenda.* Previously, I had some exposure to the South African nuclear research community, selling a range of nucleonic test equipment.

2. Net Zero Emissions in Australia by 2050

The Federal Government have legislated a 43% reduction in CO_2 emissions by 2030. This followed the previous Government legislating for Net Zero Emissions by 2050. It was always considered that this latter figure would require new technology that has not yet been invented or confirmed as being viable, to achieve this almost universally accepted target. Green hydrogen technology is one such new technology, that still has to confirm its technical and commercial viability.

The Labor Government have decreed that the 2030 reduction target will be achieved by rapid expansion of the solar panel and wind turbine fleet with some battery storage, whilst diminishing the use of gas-generated power and letting coal-fired power to slip into history.

I comment further on these power generation sources as follows:

Solar Voltaic Panels

The uptake of solar in Australia is world leading. This uptake has been driven to a significant extent by Governmental subsidies, including over-generous electricity buy-back of excess power generated. The increasing availability over the past few years of moderately priced in-home battery storage of power generated in sunshine hours, for

used at nights has also accelerated uptake. The increased popularity of EV's has also aided battery home electricity storage uptake.

Of course, home use of electricity is relatively small, compared to industrial and commercial use. By way of example, the Tomago Aluminium Smelter uses about 12% of ALL electricity use in NSW.

To meet the Government target for installed solar power generation by 2030 requires a more than doubling of solar to be installed until 2030. This equates to 22,000 panels of 500 W being installed every day. Most installations are 400 W panels. This is simply hardly possible.

Another unpalatable factor with solar panels, is that almost all are imported from China where they are said to be manufactured mainly by Uiger slave labour. Australia cannot countenance this and need to lessen our dependence on China, who could become more belligerent towards Australia in the future.

Wind Turbines

To meet the 2030 43% emission reduction target, more than 40 wind turbines of 7 MW capacity are to be installed each month. Again, an almost impossible target. Most supply also comes from China. As per solar panels, we need to lessen our dependence on China, who could become more belligerent towards Australia in the future.

Wind farms are increasingly being developed offshore, where at least they aren't proximal to farmers and other residential communities, who have long complained of health issues said to have originated from proximity to wind turbines.

The impact on local bird life is well documented, but substantially ignored by approving authorities.

Both wind and solar have no ability to provide 'peaking power' on call.

Transmission Issues

The CSIRO has estimated that the cost of constructing the transmission network to match the renewables installation on the Australia mainland will exceed $1 trillion. This cost needs to be met by the consumer in the price paid for their electricity.

Mass Battery Storage

Australia boasts two of the largest battery storage farms in the world. The South Australia network can be supported by the 150MW battery at Hornsdale.

The Loy Yang Valley battery farm has a capacity of 200 MW and provides 4-hour-grid-scale power.

Battery technology will advance, and costs will reduce, but with the EV world chasing scarce minerals, base costs are unlikely to reduce significantly in the next decade or two.

Gas-Generated Power

This form of power can be called on, at short notice, to provide base load that might be required.

Victoria have banned exploration and development of any new gas projects. Banks are also interfering in the financing of fossil fuel projects. So, the availability of new gas-generated capacity is hampered in Australia which has he most abundant gas reserves of any country on the planet.

The Beetaloo Basin in the Northern Territory offers Australia more than 100 years of gas for industrial and power generation. Whilst the NT Government are generally supportive of this huge project, its usefulness to the nation, requires an additional pipeline to take the gas to meet existing SE Australia and Queensland pipeline infrastructure.

The capital cost of building gas-fired power plants is modest compared to other energy production, and plants can be built quickly, to match the retirement of present coal-fired capacity.

Incidentally, Australia's remaining coal-fired power stations have a minimal emission output due to abatement technology and by burning low polluting coal (excluding Victoria's brown coal burning plants). New High Efficiency, Low Emissions coal power plants should have a place in Australia's energy mix, but investors are not going to support such plants, without firm long term Governmental commitments and with more positive support from the financial markets.

3. Safety and Nuclear Power

Were you to survey average Australians about a Nuclear power station, to be built in their near location, they would overwhelmingly say NO.

However, there was only minimal public dismay and opposition to the replacement of the old nuclear reactor at Lucas Heights with the new OPAL reactor that was commissioned in 2007.

The biggest stigma with nuclear is they are considered as Atomic Bombs. Also, Nuclear Power Stations are dangerous even though more that 440 plants have been in use for many years and 60 more presently under construction.

What about:

Three Mile Island – USA -1979 - A minor radiation leak that killed no one.

Chernobyl – Ukraine – 1986 - A major incident that killed 31 workers at the site and perhaps a few residents from cancer. This reactor was a first generation Russian designed and built system that did not have the electronic controls and safety feedback systems of more modern reactors.

Fukashima -Japan – 2015 – A tsunami wave flooded the emergency backup generator pit that largely caused the operators to lose partial control of the reactor. No deaths originated from the incident. Interestingly, Japan have re-started 7 of their 22 nuclear station to date with five more awaiting final approvals. Almost all have had safety systems updated to match the latest technology available in 2022.

What about Community Acceptance of a New Nuclear Power Plant

A case in point is the strong community acceptance of the planned and financed Sizewell C power station (3,200MW) in East Sussex. According to **YouGov**, support for nuclear is up 21 points since summer 2021.
Polling by **ICM** shows that **61%** of local people want Sizewell C to go ahead - that's well over double the proportion (24%) who are opposed.
Most local people (66%) believe it will bring jobs and training to the area while a majority **(59%)** agree the benefits will outweigh any temporary disruption during construction. A large local majority say nuclear is needed as part of the energy mix **(70%)** and that it could help Britain become more energy self-sufficient **(70%)**.

Hinkley Point C is the first new nuclear power station to be built in the UK in over 20 years. (Hinkley Point C in Somerset will provide low-carbon electricity for around 6 million homes, create thousands of jobs, and bring lasting benefits to the UK economy).
This plant is being built adjacent to the earlier Hinkley A and B plants, with the former now de-commissioned after more than 30 years of safe operation.

850,000 hours of engineering studies were part of the rigorous four-year design approval process; construction and operation of Hinkley Point C will create 25,000 employment opportunities and up to 1,000 apprenticeships. About 64% of the project's construction value is predicted to go to UK companies. Hinkley Point C will make a major contribution to the UK's move to **reduce carbon emissions**. The electricity generated by its two European Water Pressure Reactors (EPR) will offset 9 million tonnes of carbon dioxide emissions a year, or 600 million tonnes over its 60-year lifespan and will be amongst the safest and most efficient civil nuclear power generators ever designed. This project will be completed by 2026 after more than GPB 25 billion has been expended.

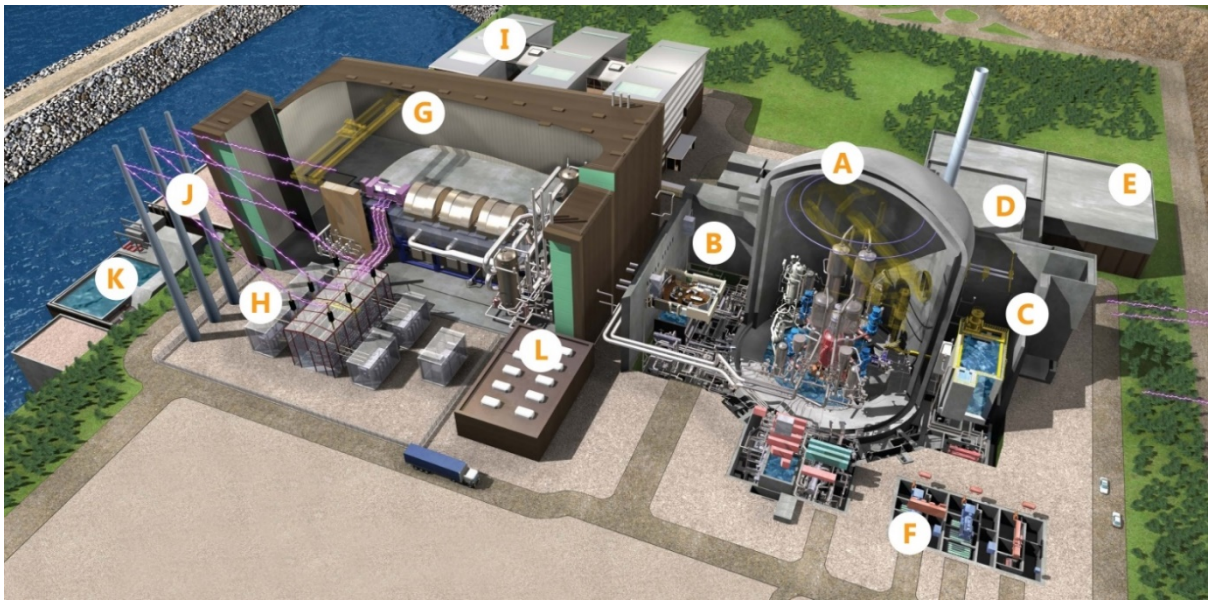
To see how complex the building of a full-sized nuclear plant is, see the recent SBS documentary viewable at https://www.sbs.com.au/ondemand/tv-series/how-to-build-a-nuclear-power-station. (This documentary is only 'up' on SBS until about the 11th February 2023)

There is an important role for all Australian Governments to 'sell' nuclear power to all Australians. The planned move to acquire nuclear-powered submarines is a significant opportunity to start this 'selling' job.

4. What Format of Nuclear Power would Suit Australia

Australia is the only G20 country that does not have nuclear power. Many lesser countries also have nuclear energy, with more already building or planning one or more nuclear plants.

The huge cost and minimum of a 10 year-build time after a lengthy approvals process would not see a large-scale nuclear power plant/s in production until at least 2036 at the earliest. By this date, we will have retired 65% of our present coal fired fleet. In fact, we will almost certainly be in extreme jeopardy as far as affordable and reliable power is concerned. This will present a major national security risk.



Indicative Illustration of Hinkley C Power Station. Photo courtesy of EDF Energy.

We know that renewables (solar and wind) won't deliver sufficient base load power to keep the lights only. If we decided to dam three or four of the East Coast rivers, hydro power could offer significant base load energy. Sadly, Governments don't have the fortitude or nation building foresight to follow this affordable and relatively short-term solution. Outside hydro, only gas-generation is affordable and doable before 2030.

We have seen that one or more large scale nuclear power stations could not be available until 2036 at the earliest.

This means we must seriously consider small modular nuclear reactors (SMR - power capacity of up to 300 MW(e) per unit).

Given their smaller footprint, SMR's can be sited on locations not suitable for larger nuclear power plants. Prefabricated units of SMRs can be manufactured and then shipped and installed on site, making them more affordable and much quicker to build than large power reactors. Another benefit of SMRs is to locate them at former sites of coal-fired stations, so that their power distribution infrastructure can be utilised.

The USA, UK, Chinese, Japanese and various European Governments are spending considerable funds to support their own developing SMR and vSMR (very small modular or micro reactors - typically up to 10 MW(e)). These smaller reactors are typically used in regional areas or for a single large-scale industrial project).

Some 70 SMR designs exist, and units are under construction or in the licensing stage in Argentina, Canada, China, Russia, South Korea, and the USA. Two floating-35 MW reactors have been in use in Russia since May 2020.

SMRs could be paired with and increase the efficiency of renewable sources in a hybrid energy system. These characteristics position SMRs to play a key role in clean energy transition. This could be a key selling point for Labor for the uptake of nuclear energy.

5. Nuclear Engineering Task Force

Australia lacks the engineering skills to design and build its own nuclear power stations, of any size. The Opal reactor at Lucas Heights was engineered in Argentina, with personnel from South America being prominent in its installation.

It is interesting to note that the pressure reactor vessels for Hinkley Point C are being built in France with the same company building the last similar reactor in 1991. This suggests that most of the 25,000 people involved in the new build are supported by them being trained by the French and critically supported by their technical staff. This suggests that Australia could cope without having a large domestic nuclear industry workforce available.

Indicative Illustration of Hinkley Point C Pressure Reactor Chamber

Photo: Courtesy of EDF Energy

6. Uranium Mining in Australia

Australia has been blessed with the world's largest reserves of uranium (32% of the world's reserves). We are the 4th largest exporter of yellow cake (U_3O_8 unprocessed uranium). We do not have the technology to enrich the yellow cake in Australia, nor are we ever likely to have this capability. We have three uranium producers in Australia
(Olympic Dam – BHP: Beverley – Heathgate Resources and 4 Mile- Heathgate Resources). In Q4 this year, Boss Energy, will re-start the Honeymoon in situ leaching Uranium mine in South Australia, which has been upgraded to modern standards and will export 2.45 million lbs of U3O8 per annum. It has all necessary approvals for mining, processing, and export.
Advanced exploration is ongoing in the Northern Territory, but WA and some other states prohibit uranium exploration and mining. We have very significant opportunities to expand our uranium resources and over time, output, to meet the increased needs of more than 60 new full scale Nuclear Power Stations being added to the 440 already operating plants around the world.
Uranium has been designated by the EU parliament as sustainable investments, under certain circumstances.

7. Funding Nuclear Power in Australia.

The Federal Government is likely to make a firm and binding commitment by mid-2023 to purchase several US Virginia Class submarines. This announcement could be the catalyst to repeal the two laws that prohibit the use of nuclear energy in Australia. Hopefully, the present Senate inquiry will go some way to making this happen. The issue is simply too important to let the Parliament divide on ideological grounds.

Once these prohibitions are removed, it will then be up to industry to step up to finance one or more projects. As has happened in the UK, with the Sizewell C project, the UK Government have committed GPB 700 million to be a partner in the project with EDF Energy. One would expect the Australian and State Government of residence, be financially supportive of the project. (Snowy 2.0 comes to mind).

8. Conclusions

8.1 Some technology to reach Net Zero by 2050 does not yet exist or confirmed as being viable.

8.2 It is desirable for several reasons not to be majority dependant on China for our solar panel and wind turbine needs.

8.3 It is considered by main groups, to be highly unlikely, for the Federal Government's 'build' target for solar and wind installations to be met by 2030.

8.4 Transmission infrastructure build costs are likely to kill any chance of a return to cheap, affordable, and stable electricity, as we had nationally just a few years ago.

8.5 The massive demand for EV battery minerals will ensure that the expected price reductions in mass battery storage will not fully eventuate.

8.6 New gas and high efficiency coal-fired generation should not be discounted. East Coast rivers hydro should also be in the energy mix.

8.7 New generation nuclear power generation is completely safe with no need for remote locations being used.

8.8 Governments need to embark on a national educational program to outline the benefits of nuclear power which is now considered to be an environmentally friendly energy source.

8.9 Ensure that the Beetaloo Basin gas reaches the East Coast distribution network.

8.10 With 65 % of presently available coal-fired capacity lost by 2036, it is essential that nuclear energy options are fully evaluated as a matter of urgency.

8.11 Encourage financial institutions to withdraw or ameliorate their opposition to financing non-renewable energy projects.

8.12 Remove the bans on uranium exploration and mining, wherever they exist.

8.13 To achieve most of the above, repeal all the laws that prevent the development of the nuclear energy industry.

END

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