Save Our Surroundings (SOS) submission to FADT

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https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Foreign_Affairs_Defence_and_Trade/NuclearPropulsionBill23

Submission from: Save Our Surroundings (SOS)
Uploaded: 23 May 2023

Dear Committee Secretariat
**DEFENCE LEGISLATION AMENDMENT (NAVAL NUCLEAR PROPULSION) BILL 2023**

Save Our Surroundings (SOS) welcomes Australia's acquisition of state-of-the art nuclear submarines and the development of an Australian nuclear submarine building and maintenance capability and expanding our existing nuclear waste management capability.

A strong defence capability for our nation is essential to protect our sovereignty and independence in an uncertain world of increasing national hostilities and threats. Also, a robust, reliable, plentiful and always available source of electricity across our nation is essential for our energy independence and our sovereign security.

However, the DEFENCE LEGISLATION AMENDMENT (NAVAL NUCLEAR PROPULSION) BILL 2023 will be unnecessary if the parliament instead removes the ban on nuclear power electricity generation in Australia. Australia cannot continue as the only G20 country with a legislated prohibition on nuclear energy. More and more nations are building nuclear reactors or have contracted to build reactors, including small nuclear reactors (SMRs), as a growing part of their energy generation mix and greenhouse reduction plans. Australia will be left behind on both counts if it does not change its energy and net zero policies.

**Lucas Heights, Sydney Nuclear Reactors**
Australia has a safe and extremely successful nuclear industry that began in 1958 with the commissioning of the 10MWe High Flux Australian Reactor (HFAR), which operated for 49 years . The HIFR was replaced by a 20MWe Open Pool Australian Lightwater Reactor (OPAL) in August 2007. OPAL is operated by Australia's Nuclear Science and Technology Organisation (ANSTO).

ANSTO facilities have supported achievements too numerous to describe but extend to COVID research, new cancer diagnostics and therapies, developments in advanced energy systems, electronics and quantum materials, agriculture improvements, and cultural heritage. It can be credited with saving countless lives.

**Small Nuclear Reactors**

Small Nuclear Reactors already in operation with the Westinghouse Electric's Vogtle AP1000 (1000MWe) having four units operating in China and one unit in Georgia USA. Six more AP1000 units are under construction in China and one in Georgia.

The next generation of nuclear power plants are Small Modular Reactors (SMRs), some of which already have design approvals and are under development or manufacture. Companies in the SMR space include Rolls Royce, General Electric Hitachi, Nuscale, Westinghouse Electric Co, BWXT Technologies Inc, and TerraPower, and Kairos power, to name a few. The first SMR to be operational is expected in 2029.

Small modular reactors (SMRs) are disrupting conventional notions surrounding nuclear power. Smaller, more compact, and producing minimal emissions, this innovative alternative to traditional nuclear power is receiving more public and private sector attention as governments across the world scramble to meet global energy needs reliably and responsibly.

For example, the **Rolls Royce 470MWe UK SMR**, which has UK government support, is an SMR that:

- is a fully scalable modular design using proven components and technology of which 90% is manufactured offsite.

- consists of 1500 container size modules that are easily, quickly and cheaply transportable by road, sea, rail or barge.

- can be built in four years (2 years site preparation, 2 years construction and commissioning), which is a similar time-frame for a 470MWac Wind or Solar Electricity Generating Works.

- can be constructed on existing or decommissioned power station sites, thereby utilising existing transmission infrastructure, which is not the case for wind and solar generation works.

- has 93% availability (capacity factor) producing electricity 24/7 over its 60 years plus lifespan, compared to wind or solar electricity generation with capacity factors about 30%, producing intermittent or no electricity during their economic lifespan of 20 to 25 years.

- will store all waste safely and securely onsite, which over its 60 years lifespan would amount to 283m3, which is the equivalent of a slab 1 metre thick and the size of a tennis court; by contrast 470MWac wind or solar works will generate thousands of tonnes of largely non-recyclable toxic waste multiple times over 60 years.

- the once off unsubsidised capital cost of 1.8 billion British pounds (A$3.37b) includes the cost of decommissioning and waste management as well as not requiring additional transmission lines or energy storage, whereas a 470MW wind or solar works cost A$840m multiple times over 60 years (A$2.5b) before even adding the

cost of substantial frequently replaced energy storage, significant additional transmission infrastructure, decommissioning, waste disposal/recycling, land rehabilitation and the need to have three 470MWac wind and solar plants to generate a similar amount of megawatt hours of electricity as a 470MWe SMR (say, well in excess of A$10 billion).

- only requires a footprint of 1.62 hectares (4 acres) or less than the size of two football fields, whereas a 470MWac wind works requires 7,555ha or a 470MW solar works about 1300ha.

- over a 60 years lifespan at full operational availability (93%) generate 229,740 GigaWatt hours (GWh) of electricity, whereas a 470MWac wind or solar works (30% availability) and assuming three full replacements will generate 74,110GWh, or only 32.3% of the output of a single 470MW SMR.

Another example is **Westinghouse Electric's 300MWe Voglte AP300 SMR** which:

- is based on the already in service AP1000 (4 units in China, 1 unit in USA) with a further seven units under construction in China and the USA.

- shares the all the same proven technology and components as the AP1000 that should result in falling costs and faster construction times.

- requires only the land area equivalent to 25% of a football field.

- is expected to cost US$1 billion (A$1.5 billion), which is less than for wind or solar works of similar electricity generating output (MWh).

- has begun being manufactured in South Korea (forging by Doosan Enerbility Co who are also forging for NuScale's SMR) for deployment in the USA.

- has an expected operational life of 60 to 100 years.

**Safety**

Existing and past operating nuclear power plants, including Australia's Lucas Heights reactor, have an enviable safety record due to being the most regulated industry in the world. The two worst accidents of Chernobyl (human judgement error) in 1986 and Fukushima Daiichi (earthquake and tsunami) in 2011 had minor impact on lives lost (31 and nil) compared to many other disasters, such as the 2011 tsunami that struck Northeast Japan killing in excess of 20,000 people.

SMR designs exclude human intervention and have many safety features not in the older and larger nuclear power plants. SMR's have passive safety systems and so have less reliance on active safety systems, external power and additional pumps for water cooling the SMR. Several SMR designs have already passed stringent safety requirements.

The Office of Nuclear Energy# states that the resilient features of Small Modular Reactors are:

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1. **Black Start** - can start up from a completely de-energised state without receiving power from the grid.

2. **Islanding** - can operate connected to the grid or independently.

3. **Underground construction** - makes reactors less vulnerable to extreme weather and physical attacks.

4. **Fuel security** - can easily store fuel on-site for a decade or more without the need of an external fuel supply.

5. **Modularity** - minimises the use of electrical parts and uses passive cooling features to safely shutdown without pumps or operator intervention.

# INFOGRAPHIC: 5 Resilient Features of Small Modular Reactors | Department of Energy

On the other hand wind and solar electricity generating works:

1. can only produce electricity when weather conditions are favourable and so require alternative sources of power to the grid to fill, on average over a full year, the 70% of the times wind and solar cannot produce sufficient or any electricity.

2. are extremely vulnerable to weather and physical attacks, including from grass fires, lightning strikes, heavy rains, strong winds, hail and sabotage

3. require huge areas of land or sea, which makes them virtually impossible to defend in times of conflict.

4. that are constructed in Australia, use components that are very largely sourced from one country, so making us dependent on a supply chain that can easily be interrupted.

5. require large amounts of resources and produce huge amounts of toxic waste, such as leaching from solar panels or micro and nano particles from deteriorating turbine blades.

6. cause significant environmental damage right through the lifecycle from mining to end-of-life disposal.

7. cause property damage and endanger lives and health from toxic fires, especially in regional areas and properties with roof top solar.

8. have short economic operating lives as they continually lose efficiency, as much as 0.5% to 1.6% or more annually.

An example of the extent of PV solar panels toxicity is from just one of several studies done in recent years. An extract from a study and experiments is provided below.

https://www.mdpi.com/1996-1073/14/3/692#B12-energies-14-00692 All PV solar panels leach toxic chemicals with thin film (CdTe) the most likely and most toxic. This study identifies unstable and soluble layers in commercial photovoltaic modules during 1.5 year long-term leaching. Our experiments cover modules from all major photovoltaic technologies containing solar cells from crystalline silicon (c-Si), amorphous silicon (a-Si), cadmium telluride (CdTe), and copper indium gallium diselenide (CIGS). These technologies cover more than 99.9% of the world market. Our long-

term experiments clearly demonstrate that it is possible to leach out all, or at least a large amount, of the (toxic) elements from the photovoltaic modules.

Citing: Nover, J.; Zapf-Gottwick, R.; Feifel, C.; Koch, M.; Werner, J.H. Leaching via Weak Spots in Photovoltaic Modules. *Energies* **2021**, *14*, 692. https://doi.org/10.3390/en14030692

Also, refer to Appendices A and B for examples of why vulnerable, unreliable, intermittent, high cost industrial wind and solar electricity generators are considerably inferior to proven cheap, always available nuclear power, especially when utilising the small modular reactors.

**Conclusion**

Exempting the building and maintenance of our proposed nuclear submarine fleet from the continued outdated ban on nuclear power generation in Australia is a short-sighted decision. SOS supports the repeal of Australia's ban on nuclear power and believes therefore that the proposed DEFENCE LEGISLATION AMENDMENT (NAVAL NUCLEAR PROPULSION) BILL 2023 is unnecessary.

Australia needs a robust, reliable, plentiful, environmentally friendly and secure source of electricity generation for it to achieve energy independence and sovereign security. Nuclear reactors and, particularly in the near future, SMRs can meet these requirements. Industrial wind and solar electricity generators, even with their essential 100% energy storage backup cannot meet these requirements, as proven by every country that has passed 30% of wind and solar in their electricity capacity mix.

Without a ban on nuclear energy Australia could expand its current 65 years of nuclear experience to not just acquire SMRs but also to obtain licences to build them here. With reliable cheap electricity we would also develop important defence skills and attract back some of the industries we have lost, such as steel making.

We do hope that the Committee report back to Parliament that the ban on nuclear energy in Australia must be lifted.

Yours faithfully
Save Our Surroundings (SOS)

Save Our Surroundings (SOS) is part of network of groups of like-minded concerned and impacted citizens that are directly affected by the proliferation of industrial scale weather-dependent “renewables” and their negative impacts on local and global environments and communities. The independently run groups span multiple States and share and distribute information, research and experiences with each other and other parties.

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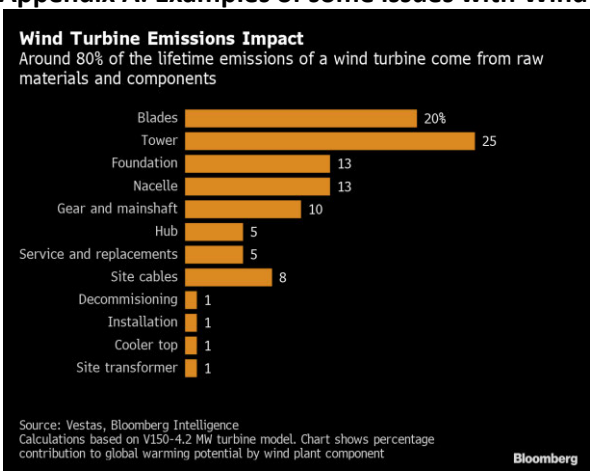
**Appendix A: Examples of some issues with Wind Turbine Works**




Wind turbines emissions impact

A Lithium mine could swallow many regional towns

Child slave labour used in DRC

Insect encrusted turbine blade attracts bats & birds

Bird and bats at risk when in flight

Burning turbines create toxic smoke

55,000ha Leadville fire 2/17#

Traffic disruption (e.g. blade movement)


Accidents may occur

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Turbines can fail catastrophically

Is this the fate of all discarded turbine blades?

A big hole filled with lots and lots of concrete and steel


Sure can, they just have to start

# The February 2017 Leadville-Dunedoo fire moved very fast and destroyed 35 homes, killed 6000 livestock & burnt 500km2 of bush and grassland in one day. Grass fires are frequent occurrences in the regions, especially during periods of drought. While this fire was not started by a non-fossil fuel electricity plant, such plants may start grass/bush fires or be vulnerable to such fires in the future. Fighting wind, solar, and BESS related fires is much more difficult than other types of fires.

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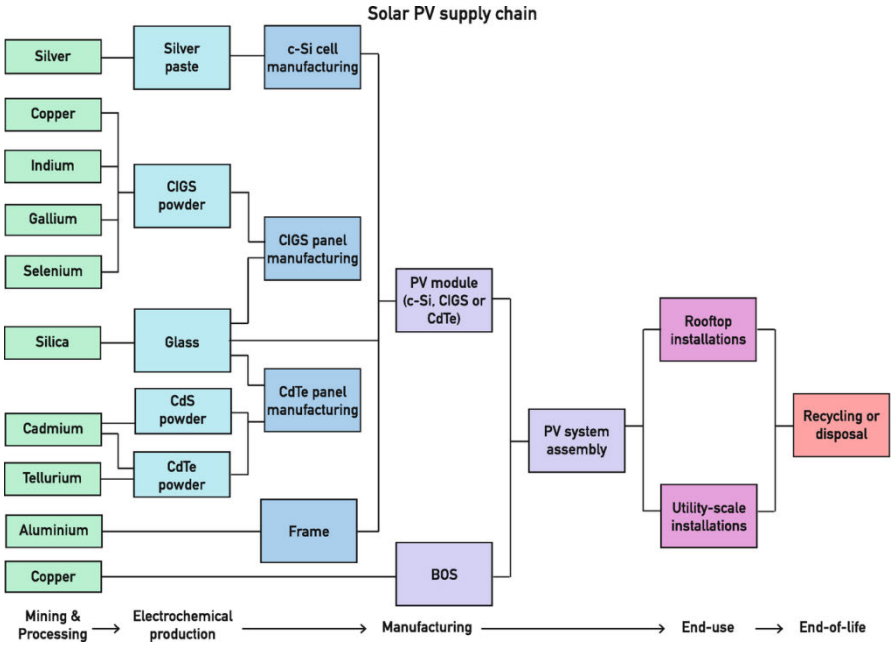
## Appendix B: Examples of some issues with PV Solar Works




Toxic chemicals used in solar panels

Damaged & end of life solar panels leach toxic chemicals: end up in landfill in many states

Mining lithium for batteries used in a BESS

Child slave labour used in DRC for Batteries

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Artisanal mining for cobalt & copper

Lots of km2 of farmland stripped of surface & fenced

Solar works burn & the smoke is toxic


Beryl grass fire (solar works at top) 26/08/2022

**This**

**Or This over thousands of km2 for decades?**

**There is a much better alternative e.g.**

NuScale SMR requires a very small land footprint