13th September 2019

Committee Secretariat
Standing Committee on Environment and Energy
PO Box 6021
Parliament House
Canberra ACT 2600

Dear Committee

Re: Inquiry into the prerequisites for nuclear energy in Australia.

This submission is founded on our experience and our knowledge from working in, teaching, and researching nuclear energy systems and associated electrical power grids at the University of New South Wales.

Circumstances

As Australia transitions to a lower-emissions energy system, much more of society's need for energy will be delivered through the electrical grid. An example is the huge extra demand for electrical energy from the electrification of transportation. Nuclear energy, particularly using small modular reactors (SMRs), presents an ideal technical fit for Australia's electrical grid.

SMRs can provide some degree of *load-following*. SMRs, when supplemented by renewables and the necessary energy storage for short-term load stabilisation, can replace baseload coal and avoid the use of gas-fired generation. This will reduce pressure of extracting gas through fracking operations. A diverse energy generation portfolio that includes SMR technology will reduce exposure to rising energy costs and allow the grid to grow in increments, as demand requires. This will have important cost benefits as we track the increased demand for electrical energy in the 2030-2050 period.

SMR technology is currently being pursued in Canada and the UK for applications in their electrical grid. It is a technology that is close to market and should be considered seriously in Australia as a low-carbon energy source that can replace baseload fossil-fuelled generation as it retires. It is also appropriate for powering remote locations, generating hydrogen and synthetic fuel, and for water desalination. SMRs would provide new energy-intensive manufacturing opportunities for Australia, creating jobs and wealth for Australians, preserving both peoples' livelihoods and Australia's magnificent and varied ecosystems.

Prerequisites

a) Nuclear waste management. There is no technical barrier to environmentally responsible storage, disposal or reprocessing of nuclear waste. Success in these areas is being demonstrated in Sweden, France and Finland.

b) Health and safety. Nuclear power systems have achieved an extraordinarily high level of safety compared to other energy generation technologies. Indeed, the mortality rates of most power sources are higher than that of nuclear power. A prerequisite to adoption of nuclear energy is to achieve a comfortable balance between the perceived risk of radiation exposure (which is very high, and can in itself lead to health impacts), and the actual risk of radiation exposure (which is very low, but must always be understood).

c) Environmental impacts. Nuclear energy is unequalled in its potential to reduce human impact on the natural world. Fission produces no carbon dioxide and requires small amounts of land and natural

resources. Nuclear energy is an opportunity to decouple the primary energy supply from natural climate cycles and from land exploitation. Environmental externalities are minimal.

f) Community engagement. The hazard from exposure to low radiation doses is either non-existent or is so small that it is completely obscured by confounding lifestyle and individual factors. Including in a worst possible case scenario, public radiation dose emitted from an SMR would be in this range. Yet this does not detract from the very real distress and psychological impact arising from the perceived danger of such radiation exposure. Societal acceptance of nuclear energy must be based on a sustained discussion of its unique benefits, and agreement that these are worthwhile pursuing.

g) Workforce capability. The option to use nuclear energy relies on nurturing a skilled workforce. A small but important sector of a nuclear workforce requires specialist tertiary education in nuclear engineering. The UNSW Masters of Nuclear Engineering, which enjoys solid enrolments, is an example of such a program. Australia can further train these people now, by providing practical experience through postgraduate qualifications and hands-on experience in nuclear facilities, both those existing in Australia and overseas. The remainder of the nuclear workforce are professionals educated in a range of technical and engineering fields largely outside of nuclear engineering. There is no exceptional barrier to Australia being able to train these people.

h) Security. The nuclear Non-Proliferation Treaty specifically empowers signatory states, like Australia, with an inalienable right to develop nuclear technology for peaceful purposes. Australia is internationally well-regarded for exemplary leadership in nuclear security and nuclear safeguards.

Nuclear reactors, including SMRs, utilise a fuel with an energy density that allows years-worth of fuel to be stored onsite, thereby insuring against geopolitical risks, dependency on third party manufacturing and shipping through at-risk channels. Diversity in supply of energy and energy technologies de-risks exposure to uncertainty in international relations and trade.

On a global scale, in order to reduce emissions, the world is investing in nuclear generation and in a way that will eclipse by multiples the advances made in nuclear in the 1960-1980 era, particularly within our region. Australia must prepare itself for a global nuclear future whether it wishes it or not.

i) National Consensus. Realization of a nuclear energy program would require legislation to create a Nuclear Energy Programme Implementing Organization, something which Australia does not currently have.

j) Any other matter. Australia brings important advantages for utilizing nuclear energy that go beyond geology and uranium resources. We are advanced in our existing institutions and governance, an area that normally constitutes the greatest challenge for nuclear new-entrant countries. Our safety and nuclear regulatory paradigms are a competitive advantage. The development of nuclear energy would provide opportunities for Australian global leadership in research and in technology as we engage further in the nuclear fuel cycle. Unencumbered by dated technology and driven by our unique perspectives, we are presented with the opportunity of putting nuclear energy to work on our terms.

We believe that a legislative change is needed to enable serious, informed and open discussion about Nuclear Energy in Australia.

Your faithfully,

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