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Plenary Panel: What is the future for nuclear energy in Australia

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Nuclear energy in Australia and worldwide has a troubled past, an increasingly contested present and hence uncertain future.

Some argue that civilian nuclear power is a great success story. What began as a devastating weapon technology now provides a significant proportion of electricity supply in over 30 countries in both the developing and industrialised world. However, it has also failed to live up to early promises of being 'too cheap to meter', turned out to be a vehicle for weapons proliferation, suffered a number of concerning accidents and created a legacy of dangerous waste.

Around 25GW of new plant is currently under construction, but new capacity since 2000 represents barely 2% of total new global generating capacity over that time. However, nuclear power is now clearly back on the agenda worldwide. Its revival is partly due to progress on some of the 'old' issues, including economics, safety and waste management. More important, however, are 'new' issues including climate change, energy security and, concerningly, growing fears of a new round of nuclear weapons proliferation.

Australia considered nuclear power options in the 1960's but its current involvement in the worldwide nuclear energy industry is through the country's major uranium exports. The Federal Government's Energy White Paper of 2004 concluded that nuclear power was a low priority 'reserve' option. More recently, however, the Government has expressed growing support for the technology and a Prime Ministerial Taskforce was appointed to undertake "a review of uranium mining, processing and the contribution of nuclear energy in Australia in the longer term." This inquiry will release its findings shortly.

In our view, the inquiry's findings may play a useful role in helping determine the future for nuclear energy in Australia. Much, however, depends on international developments in terms of future markets for uranium, possible nuclear proliferation, waste management and nuclear power plant technology – an area where we have almost no expertise and will have to rely on overseas providers. Also important are the growing international concerns regarding energy security and climate change. Furthermore, nuclear options for Australia can only be sensibly assessed through a rigorous and transparent process that fully considers our other energy options as well. Other than conventional coal plant, these include possible expanded roles for gas-fired generation and cogeneration, a range of renewable technologies, and improved energy efficiency. Promising but still emerging options include Carbon Capture and Storage and renewables such as 'hot rocks'.

Nuclear weapons proliferation: Nuclear weapons have undoubted attractions to countries operating in an uncertain and increasingly competitive world. They offer a right of veto on military action and a ticket to international standing and influence in foreign policy. Civilian and nuclear programs share in large part nuclear materials, technologies and know how. Thus a civilian program offers some of the foreign policy benefits of a military program. While only eight nations are known to have nuclear weapons, the genie is well and truly out of the bottle. The International Atomic Energy Agency estimates that some 35 to 40 non-weapon states now possess the technical know-how to build a bomb. Increased geopolitical tensions might see the nuclear club expand rapidly. In the Australian context, there was certainly interest in the highest levels of Government in the 1960s to develop a 'nuclear option' through a civilian nuclear power program. Some of our neighbours have also expressed a desire to develop civilian nuclear power.

Waste management: The nuclear fuel cycle produces relatively small amounts of high-level wastes requiring significant care over very long periods of time, and much larger amounts of medium and low level wastes requiring less specialized management. Industrial societies create many wastes such as Persistent Organic Pollutants (POPs) that are difficult to manage safely. Nevertheless, the high level nuclear waste streams are special because of potential proliferation risks and the very long-time frames of risk. Deep geological disposal may offer a reasonable compromise between safety, security, economics and possible future opportunities to treat or even reuse some of the nuclear materials. A number of countries have advanced preparations in place, however, there is, as yet, not a single authorized and operational final disposal repository for high-level wastes. Australia appears to have suitable geological areas for such repositories and our role as a major uranium exporter raises questions of our responsibilities to take nuclear wastes back for disposal. Domestic power plants would almost certainly require a local repository.

Nuclear power plant technology: We are now seeing so-called 'Generation III and III+' plants under construction or proposed around the world. These appear to offer safety, efficiency and economic advantages over current designs. However, some of these designs including the plant proposed by ANSTO for Australia (the Westinghouse AP1000) have not yet been built anywhere in the world and therefore involve some technical uncertainty and risk. There is also growing interest in advanced Generation IV designs although these are not expected to be commercially available for several decades. The industry has received decades of major public R&D support.

Energy security: The oil crises of the 1970s illustrated potential risks to industrialised nations from fossil fuel dependence and drove considerable nuclear development in countries such as France and Japan. We are now seeing renewed interest in nuclear power in countries dependent on fossil fuel imports (particularly gas) for electricity generation. With regard to uranium supply, the OECD estimates that over 40 countries have potentially economic uranium resources. Nevertheless, Canada and South Africa are among the few countries with nuclear power programs that are currently self-sufficient in uranium. Australia has over a third of currently known low-cost uranium reserves around the world. However, we also have considerable reserves of coal and gas, bountiful renewable energy resources and therefore more options than many other countries in terms of energy security.

Climate change: The recently released Stern Review has, again, highlighted the need for urgent international action on climate change. Avoiding dangerous warming seems likely to require global greenhouse emissions to peak within the next two decades and then fall by some 60% from present levels by 2050. Given the legitimate aspirations of the developing world, developed nations must begin reducing their emissions immediately. Furthermore, delaying action by 20 years requires that emissions then fall three to seven times faster than if we respond now. Nuclear power's contribution to global electricity supply is some 15%, and it is therefore already making a significant contribution to reduced emissions. However, it is only one of a range of existing and emerging options for achieving emissions reductions so needs to be assessed in that regard. Meanwhile, Australia's per-capita emissions are amongst the highest in the world (twice the developed world average) with electricity accounting for around one third of them.

Assessing Australia's energy options: Australia has plentiful coal and uranium and reasonable reserves of gas, major renewable energy resources and an energy intensive economy that demonstrates low levels of energy efficiency compared with many other developed countries. It therefore has a wide range of options in responding to the changing economic, social and environmental drivers within the energy sector. Assessing and comparing these options requires a risk-based technology assessment framework that considers factors including current technical status, ease of integration into the existing energy industry, present costs where known and possible future costs, potential scale of deployment and emissions abatement, potential speed of deployment and other possible societal outcomes.

Nuclear power technologies are well proven however there are questions about some of the latest Generation III plant designs given that they haven't yet been built. They offer reliable baseload operation although their inflexible operation and generally large unit sizes have some disadvantages.

Establishing the costs of nuclear power continues to prove difficult and different international studies draw widely divergent conclusions on the cost of nuclear power. This reflects the large externalities associated with this technology – the nuclear industry has received more government subsidies than any other energy technology over the last thirty years while having long-term waste management and decommissioning questions, and low-probability but very high consequence safety and proliferation risks. All of these are very difficult to price. Deregulated competitive energy markets have certainly shown little interest in investing in new nuclear plants to date.

The recent ANSTO study on the costs of nuclear power in Australia had the added risks of an unproven plant design, large-scale rollout of nine plants and unclear financing and liability arrangements to further confuse the issues. Perhaps more importantly, Australia is unlikely to have any international competitive advantage with nuclear power – fuel is only a small cost component of the technology and requires advanced enrichment and fabrication processes, while the plant technology will be almost entirely imported. Any major move to nuclear power here would therefore work against the country's current focus on energy intensive industry development. For example, it is estimated that less than 5% of world aluminium production is smelted with electricity from nuclear power.

Nuclear power offers a proven technology for reducing greenhouse emissions and merits careful consideration in this regard. However, it is unlikely that commercial deployment within Australia would be possible before around 2020 given the infrastructure requirements, institutional framework and societal acceptance that all needs to be established. While it may prove to be one of our best longer-term emission reductions options, it will therefore not be able to contribute to the immediate emission reductions required to avoid dangerous climate change.

In conclusion, nuclear power in Australia would seem to potentially offer significant emissions abatement and good integration into the existing energy industry. There are, however, outstanding questions regarding its safety and waste management requirements, its delivered abatement is likely to come at some cost and it is unlikely to be able to make a significant contribution to emission reductions for well over a decade.

In our view, therefore, we don't know yet what role nuclear power can and should play in Australia's future energy mix and shouldn't rely on it, or any other particular technology, to answer all our challenges. What is needed is a policy framework that doesn't try to pick winners but will resolve the question of what role nuclear and these other options might play in the medium to longer term for Australia while reducing risks and maximising opportunities through much greater and immediate support of existing, technically proven, abatement options. These include improved energy efficiency, gas-fired generation and cogeneration, and a range of renewable energy sources. Market-based mechanisms including a price on carbon as well as more targeted policy efforts for energy efficiency and renewables are therefore the key policy needs at this time.