

Nuclear Power for Australia: Irrelevant or inevitable?

Symposium held by Sydney Branch, June 8th 2005

A total of 64 (54 registrants and 10 speakers) attended this full-day symposium held at the Sydney Tattersalls Club.

Why was it held?

When the idea of a symposium on whether nuclear power should be considered an option for meeting some of Australia's growing demand for power was first aired earlier this year, some Sydney Branch Committee members were concerned that there would be no interest; nuclear power was, after all, off essentially all political agendas. Still, a key task of the AIE is to raise the level of debate on matters energy, and at that time there was evidence of resurgence in interest worldwide in the nuclear option. The symposium would go ahead.

As events transpired it proved to be very timely, with NSW Premier Bob Carr surprising everyone in the week prior to the symposium by saying that nuclear power should be considered as a potential contributor to the State's electricity supplies,. This led to much media interest, one consequence being some publicity for our symposium, to the extent it was picketed by a small but noisy group of protesters mainly from the NSW Greens Party. Several of the speakers and attendees were interviewed by some ABC and commercial radio stations. As well, our invited overseas speaker, Dr Alan Baxter of General Atomics, featured prominently in an item on nuclear power in the ABC's "7.30 Report" on June 16th.

The point made by Mr Carr is a powerful one: our demand for power continues to rise, and we face pressure on other resource fronts, notably our supplies of potable water. We want our power to come from renewable sources, greenhouse-gas free--but even the most rudimentary analyses reveal that wholly renewable sources cannot hope to supplant coal and other fossil fuels for decades yet. Australia stands alone as the only substantial developed country which does not meet a significant proportion of its energy needs from nuclear power stations, yet we hold the dubious distinction of being the developed-world's highest per-capita emitter of greenhouse gases. We also have the world's largest reserves of uranium.

The day was divided into three sessions each with three papers by specialists in their fields: *Australian perspectives and directions*; *Global happenings: today, and towards tomorrow*; and, *Societal concerns and responses*. As well, the symposium was opened by Dr Dennis Jensen MHR, the Federal Member (Liberal) for Tagney (a Perth metropolitan electorate), and closed by way of a general discussion session.

Dr Dennis Jensen MHR

Dr Jensen (his PhD is in Physics, from Monash University, making him one of the very few politicians having a strong technical background) systematically reviewed the options available to Australia for meeting its future energy demands. His basic message was that renewables are not yet contenders, while of technologies that are, the most significant of these, coal and other fossil fuels, as well as being greenhouse gas emitters, exact a substantial toll worldwide of deaths and injuries. This leaves nuclear power, prompting

him to support a more substantial and enlightened debate about the role it should play in our energy future, and he promised to continue to exert pressure in Parliament and the Liberal Party room to secure such a debate.

Session 1: Australian perspectives and directions

Brief summaries of papers presented in first session, chaired by Dr Tony Vassallo, Chairman of the AIE Sydney Branch, follow (the full presentations, plus brief author biographies, are available on the AIE Sydney Branch website: www.aie.org.au/syd).

- Dr Clarence Hardy's presentation *From Radium Hill through Rum Jungle and Jervis Bay to Olympic Dam: Australia's involvement in the Nuclear Fuel Cycle*, reviewed Australia's on-again, off-again relationship with nuclear power, uranium, and waste disposal over the post-war years. The one thing we in Australia appear to have done well is to rehabilitate old uranium mines, otherwise the story is rather dismal. He recounted efforts to build a large (c. 600 MWe) modern nuclear power plant at Jervis Bay south of Sydney in the early 1970s. This scheme was abandoned, ultimately by a Liberal government. A subsequent program saw major progress with gas centrifuge-based uranium enrichment technology through the 1970s, but this was also abandoned, this time in 1984 under instructions from the Hawke Labor Government. Our sole success, he claimed, has been the development of the Ranger, Olympic Dam, and Beverley uranium mines.
- M Leslie Kemeny's presentation *Nuclear Power for Australia: Irrelevant or Inevitable*, continued the theme he has argued so persuasively and frequently in the national press: that nuclear power is a clean, safe and economical source of power, and the logical choice for Australia as concern increases over increasing levels of carbon dioxide in the atmosphere.
- Dr Ron Cameron, of ANSTO looked to the future: *Current and future nuclear power developments*. He first outlined the current state of play: 440 operating nuclear power plants worldwide, supplying around 16% of the world's electricity, with some countries securing a much higher proportion: they supply France with 78% of its electricity. 31 plants are under construction, and many more are planned, 50 for China alone. Nuclear power's recent record has been one of increasing reliability and capacity factors, and falling production costs, to around US\$16.90/MWh (these figures exclude any allowance for covering the cost of capital). In full-cost terms, nuclear power is the low-cost alternative in many countries. He acknowledges the challenges facing proponents of nuclear power: perceptions of high capital costs; and, unresolved issues with spent fuel handling; nuclear waste disposal and proliferation, but believes that the next generation of reactor designs, so-called Generation IV, promise to be equal to these challenges. He concluded by quoting a number of influential "deep green" environmentalists arguing not to dismiss the nuclear option in a world threatened by climate change.

Session 2: Global happenings, today, and towards tomorrow

Brief summaries of presentations in the second session: *Global happenings today, and towards tomorrow* (chaired by Richard Hunwick, also of the AIE Sydney Branch) follow.

- Dr Ian Smith, CEO of ANSTO, in *The Future of nuclear power in a global greenhouse era* drew attention to how carbon dioxide levels in the atmosphere

have varied over geological timescales. He noted how they appear to be higher now than they have been for millions of years, having risen 50 per cent in what is in geological terms, an instant, and that the International Energy Agency forecasts emissions increasing by a further 50% over the next 25 years, mostly because of the growth in fossil fuel-based energy consumption by developing countries. He cited UK data compared total electricity costs from a range of sources: fossil fuels, renewables and nuclear. Once a carbon tax equivalent to A\$70/tonne CO₂-e is factored in (seen as the cost of carbon sequestration) nuclear power emerges as the low-cost option by far. He cited then the excellent safety record of nuclear power, and put into perspective the waste disposal problem.

- Dr Alan Baxter's company, General Atomics, headquartered in San Diego, is a nuclear reactor designer that has always favoured passive safety and gas cooling, so is a leader in the development of so-called "Generation 4" designs, i.e. that: have a core that cannot melt; are passively safe; are easy to site; are thermally efficient; generate power at costs competitive with fossil fuel power stations even without considering carbon taxes; and, minimise the threats posed by radioactive waste disposal, proliferation, and vulnerability to terrorist threats. In his presentation *Pebble beds and prisms, clean water and hydrogen*; he first described GA's concept of a Generation 4 reactor: the Gas Turbine-based Modular Helium Reactor (GT-MHR), which invites comparison with the Pebble Bed Modular Reactor (PBMR) design being promoted by South African utility Eskom. Each GT-MHR unit would generate 300 MWe with a thermal efficiency approaching 50%. GA believes a prototype could be operating in the USA or Russia (where it would help dispose of weapons-grade plutonium) by 2014. As well, the GT-MHR's high reactor operating temperatures (up to 950°C) are well suited to hydrogen production: at these temperatures hydrogen may be made directly and efficiently (around 50% heat-to-hydrogen) from water via their novel S-I (sulphur-iodine) process. Finally, the low-grade waste heat lends itself to driving a range of efficient seawater desalination processes.
- Dr E.R. (Lou) Vance of ANSTO in his presentation *High level nuclear waste, progress towards technical solutions*, reviewed local and overseas efforts towards the goal of safely and permanently disposing of high-level radioactive waste (HLW). He explained the magnitude of the challenge, given that there must be general acceptance that the HLW will be immobilised for geological time periods. While the local approach, epitomised by the elegant Synroc Process (for synthetic rock) is to incorporate the HLW atoms in stable rock structures known to have been stable for millions if not billions of years, the world appears to be inclining more towards an approach based upon vitrification.

Session 3: Societal concerns and responses

Brief summaries of presentations in the third session: *Societal concerns and responses* (chaired by Leslie Kemeny, also of the AIE Sydney Branch) follow.

- Dr Don Macnab of the Australian Radiation Protection and Nuclear Safety Authority (ARPANSA) in his presentation *International Nuclear Safety, the Nuclear Safety Convention*, overviewed the elaborate frameworks that have been established by the International Atomic Energy Agency, the Nuclear Safety Convention, and the Third Review Meeting, to set and monitor standards and facilitate communications in the areas of nuclear safety, radiation protection,

waste management, transport of radioactive materials and safety of nuclear fuel cycle facilities.

- Dr Annette Berriman of the Australian Safeguards and Non-Proliferation Office (ASNO) in her presentation *Proliferation: threats and safeguards*, reviewed potential “leakages” of fissile material from the total nuclear fuel cycle, with greatest vulnerability during: uranium enrichment, and fuel reprocessing. She reviewed the status of proliferation worldwide: Iraq, Libya and North Korea are past violators of the Nuclear Non-Proliferation Treaty, but of these, only North Korea is currently of concern, and there is now some concern over Iran. Australia’s role, working in with the IAEA, and consistent with its having the world’s largest reserves of uranium, is an important one.
- Dr Hugh Outhred of the Centre for Energy and Environmental Markets at the University of NSW in *Nuclear Power: Magic Lantern or Pandora’s Box?* held that there was no clear case in favour of nuclear power for Australia. Expert as well as lay opinion is sharply divided over the most contentious aspects of nuclear power including terrorism and proliferation, and whether it is even necessary to consider it. He argued that progress will not be made until some sort of consensus on these matters is achieved, even doubting whether society’s available decision-making processes are up to the task of achieving such a consensus.

Inevitably, the presentations at a symposium such as this will be dominated by people who are professionally employed or otherwise work in one or other areas of the nuclear industry: in the technical aspects of the fuel cycle, and the regulation and control of potential risks. The organising committee was, therefore, concerned that the AIE’s impartiality could be compromised. As events transpired, these concerns were not justified; the quality of presentations and the subsequent discussions were in the best tradition of Sydney Branch symposia. To the extent it is possible to draw any single conclusion, it is that given the need to gain public acceptance, pass the necessary enabling legislation, select a suitable location, and secure all planning and other approvals, short of some unforeseeable emergency it will take so long for a nuclear power station to be commissioned in Australia (2025 or thereabouts) that it is largely irrelevant to our short- and medium-term energy requirements.

R J Hunwick

June 2005